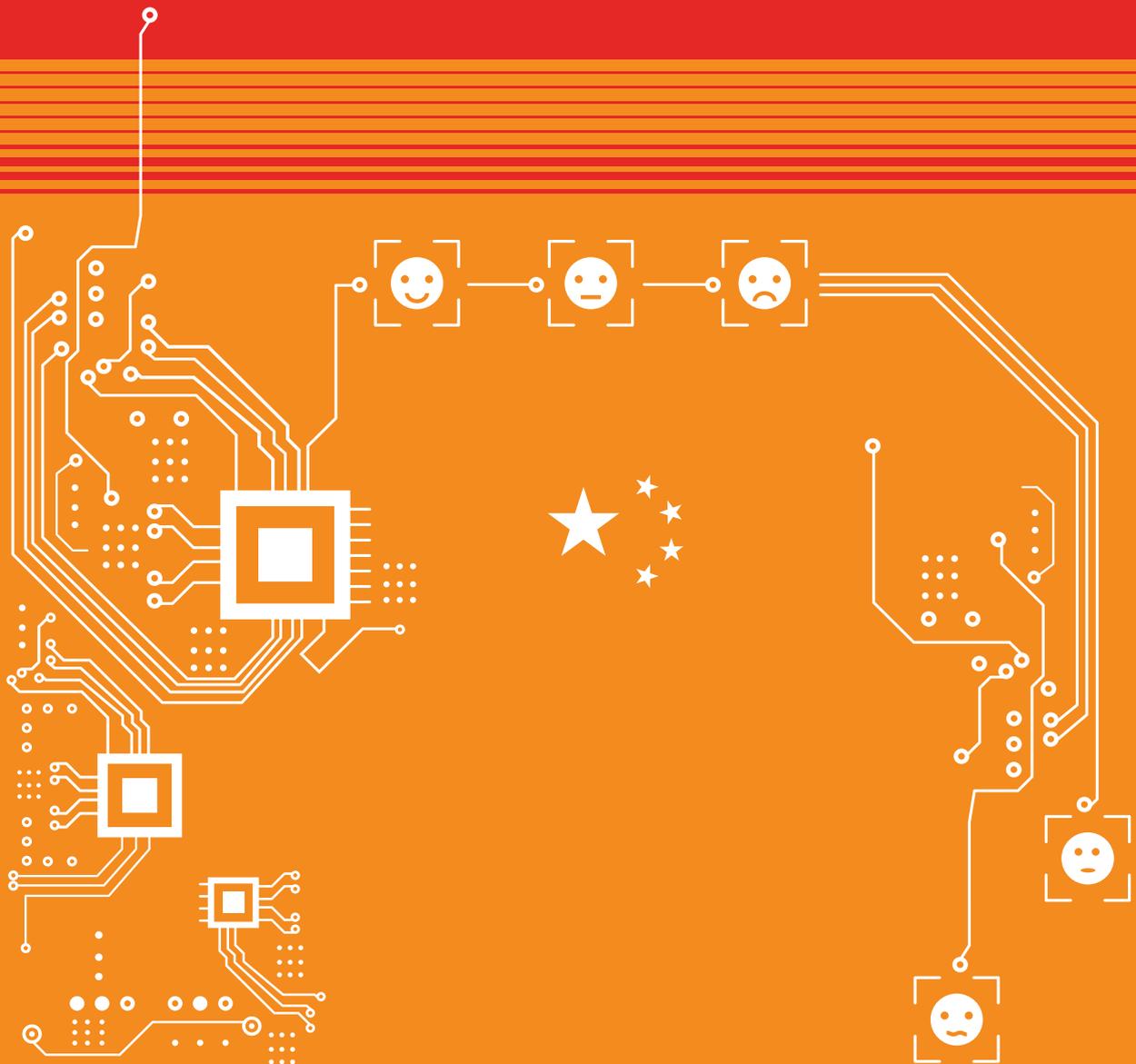


# Emotional Entanglement:

China's emotion recognition market and its implications for human rights



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## Executive Summary

In this report, ARTICLE 19 provides evidence and analysis of the burgeoning market for emotion recognition technologies in China and its detrimental impact on individual freedoms and human rights, in particular the right to freedom of expression. Unlike better-known biometric applications, like facial recognition, that focus on identifying individuals, emotion recognition purports to infer a person's inner emotional state. Applications are increasingly integrated into critical aspects of everyday life: law enforcement authorities use the technology to identify 'suspicious' individuals, schools monitor students' attentiveness in class, and private companies determine people's access to credit.

Our report demonstrates the need for strategic and well-informed advocacy against the design, development, sale, and use of emotion recognition technologies. We emphasise that the timing of such advocacy – *before* these technologies become widespread – is crucial for the effective promotion and protection of people's rights, including their freedoms to express and opine. High school students should not fear the collection of data on their concentration levels and emotions in classrooms, just as suspects undergoing police interrogation must not have assessments of their emotional states used against them in an investigation. These are but a glimpse of uses for emotion recognition technologies being trialled in China.

This report describes how China's adoption of emotion recognition is unfolding within the country, and the prospects for the technology's export. It aims to:

1. Unpack and analyse the scientific foundations on which emotion recognition technologies are based;
2. Demonstrate the incompatibility between emotion recognition technology and international human rights standards,

particularly freedom of expression, and the potential and ongoing detrimental impact of this technology on people's lives;

3. Provide rich detail on actors, incentives, and the nature of applications within three emotion recognition use cases in the Chinese market: public security, driving, and education;
4. Analyse the legal framework within which these use cases function; and
5. Set out recommendations for stakeholders, particularly civil society, on how to respond to the human rights threats posed by emotion recognition technologies in China.

This report will better equip readers to understand the precise ways in which China's legal, economic, and cultural context is different, the ways in which it is not, and why such distinctions matter. Each use case bears its own social norms, laws, and claims for how emotion recognition improves upon an existing process. Likewise, the interaction between pre-existing Chinese surveillance practices and these use cases shapes the contributions emotion recognition will make in China and beyond.

The implications of the report's findings are twofold. First, a number of problematic assumptions (many based on discredited science) abound amongst stakeholders interested in developing and/or deploying this technology. This report unpacks and critically analyses the human rights implications of emotion recognition technologies and the assumptions implicit in their marketing in China. Second, Chinese tech firms' growing influence in international technical standards-setting could encompass standards for emotion recognition. Using a human rights lens, the report addresses the most problematic views and practices that, if uncontested, could become codified in technical standards – and therefore reproduced in technology at a massive scale – at technical standard-setting bodies, like the International Telecommunications Union (ITU) and the Institute of Electrical and Electronics Engineers (IEEE).

Some of the main findings from the research on deployment of emotion recognition technology in China include the following:

**The design, development, sale, and use of emotion recognition technologies are inconsistent with international human rights standards.** While emotion recognition is fundamentally problematic, given its discriminatory and discredited scientific foundations, concerns are further exacerbated by how it is used to surveil, monitor, control access to opportunities, and impose power, making the use of emotion recognition technologies untenable under international human rights law (pp. 36–44).

**The opaque and unfettered manner in which emotion recognition is being developed risks depriving people of their rights to freedom of expression, privacy, and the right to protest, among others.** Our investigation reveals little evidence of oversight mechanisms or public consultation surrounding emotion recognition technologies in China, which contributes significantly to the speed and scale at which use cases are evolving. Mainstream media is yet to capture the nuance and scale of this burgeoning market, and evidence collection is crucial at this moment. Together, these factors impede civil society's ability to advocate against this technology.

**Emotion recognition's pseudoscientific foundations render this technology untenable as documented in this report.** Even as some stakeholders claim that this technology can get better with time, given the pseudoscientific and racist foundations of emotion recognition on one hand, and fundamental incompatibility with human rights on the other, the design, development, deployment, sale, and transfer of these technologies must be banned.

**Emotion recognition technologies' flawed and long-discredited scientific assumptions do not hinder their market growth in China.** Three erroneous assumptions underlie justifications for the use and sale of emotion recognition technologies: that facial expressions are universal, that emotional states can be unearthed from them, and that such inferences are reliable enough to be used to make decisions. Scientists across the world have discredited all three assumptions for decades, but this does not seem to hinder the experimentation and sale of emotion recognition technologies (pp. 18–35).

**Chinese law enforcement and public security bureaux are attracted to using emotion recognition software as an interrogative and investigatory tool.** Some companies seek procurement order contracts for state surveillance projects (pp. 18-22) and train police to use their products (p. 22). Other companies appeal to law enforcement by insinuating that their technology helps circumvent legal protections concerning self-incrimination for suspected criminals (pp. 42-43).

**While some emotion recognition companies allege they can detect sensitive attributes, such as mental health conditions and race, none have addressed the potentially discriminatory consequences of collecting this information in conjunction with emotion data.** Some companies' application programming interfaces (APIs) include questionable racial categories for undisclosed reasons (p. 41). Firms that purportedly identify neurological diseases and psychological disorders from facial emotions (pp. 41-42) fail to account for how their commercial emotion recognition applications might factor in these considerations when assessing people's emotions in non-medical settings, like classrooms.

**Chinese emotion recognition companies' stances on the relationship between cultural background and expressions of emotion influence their products.**

This can lead to problematic claims about emotions being presented in the same way across different cultures (p. 40) – or, conversely, to calls for models trained on 'Chinese faces' (p. 41). The belief that cultural differences do not matter could result in inaccurate judgements about people from cultural backgrounds that are underrepresented in the training data of these technologies – a particularly worrying outcome for ethnic minorities.

**Chinese local governments' budding interest in emotion recognition applications confer advantages to both startups and established tech firms.**

Law enforcement institutions' willingness to share their data with companies for algorithm-performance improvement (p. 22), along with local government policy incentives (pp. 18, 20, 22, 24, 25, 33), enable the rapid development and implementation of emotion recognition technologies.

**The emotion recognition market is championed by not only technology companies but also partnerships linking academia, tech firms, and the state.**

Assertions about emotion recognition methods and applications travel from academic research papers to companies' marketing materials (pp. 22, 25-26) and to the tech companies' and state's public justifications for use (pp. 20, 22-33). These interactions work in tandem to legitimise uses of emotion recognition that have the potential to violate human rights.

**None of the Chinese companies researched here appears to have immediate plans to export their products.** Current interest in export seems low, (p. 40) although companies that already have major markets abroad, such as Hikvision and Huawei, are working on emotion recognition applications (pp. 23, 27, 29-33, 40).

**People targeted by these technologies in China – particularly young adults (pp. 30–31) – predominantly report feeling distrust, anxiety, and indifference regarding current emotion recognition applications in education.**

While some have criticised emotion recognition in education-use scenarios (pp. 30-31, 34), it is unclear whether there will be ongoing pushback as awareness spreads.

**Civil society strategies for effective pushback will need to be tailored to the context of advocacy.**

Civil society interventions can focus on debunking emotion recognition technology's scientific foundations, demonstrating the futility of using it, and/or demonstrating its incompatibility with human rights. The strategy (or strategies) that civil society actors eventually employ may need to be adopted in an agile manner that considers the geographic, political, social, and cultural context of use.



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## Glossary

- Biometric data:** Data relating to physical, physiological, or behavioural characteristics of a natural person, from which identification templates of that natural person – such as faceprints or voice prints – can be extracted. Fingerprints have the longest legacy of use for forensics and identification,<sup>1</sup> while more recent sources include (but are not limited to) face, voice, retina and iris patterns, and gait.
- Emotion recognition:** A biometric application that uses machine learning in an attempt to identify individuals' emotional states and sort them into discrete categories, such as anger, surprise, fear, happiness, etc. Input data can include individuals' faces, body movements, vocal tone, spoken or typed words, and physiological signals (e.g. heart rate, blood pressure, breathing rate).
- Facial recognition:** A biometric application that uses machine learning to identify (1:n matching) or verify (1:1 matching) individuals' identities using their faces. Facial recognition can be done in real time or asynchronously.
- Machine learning:** A popular technique in the field of artificial intelligence that has gained prominence in recent years. It uses algorithms trained with vast amounts of data to improve a system's performance at a task over time.
- Physiognomy:** The pseudoscientific practice of using people's outer appearance, particularly the face, to infer qualities about their inner character.

## List of Abbreviations

<b>AI</b>	Artificial intelligence
<b>BET</b>	Basic Emotion Theory
<b>CCS</b>	Class Care System
<b>DRVR</b>	Driving Risk Video Recognition
<b>FACE KYD</b>	Face Know Your Driver
<b>GDPR</b>	General Data Protection Regulation
<b>HRC</b>	UN Human Rights Council
<b>ICCPR</b>	International Covenant on Civil and Political Rights
<b>ICT</b>	Information and communications technologies
<b>ITU</b>	International Telecommunications Union
<b>MOOC</b>	Massive open online courses
<b>OBOR</b>	One Belt, One Road
<b>PSB</b>	Public security bureau
<b>SPOT</b>	Screening of Passengers by Observation Techniques
<b>TAL</b>	Tomorrow Advancing Life
<b>UE</b>	Universal facial expressions

# 1. Introduction

Biometric technologies, particularly face-based biometric technologies, are increasingly used by states and private actors to identify, authenticate, classify, and track individuals across a range of contexts – from public administration and digital payments to remote workforce management – often without their consent or knowledge.<sup>2</sup> States have also been using biometric technologies to identify and track people of colour, suppress dissent, and carry out wrongful arrests, even as a rapidly growing body of research has demonstrated that these systems perform poorly on the faces of Black women, ethnic minorities, trans people, and children.<sup>3</sup>

Human rights organisations, including ARTICLE 19, have argued that public and private actors' use of biometrics poses profound challenges for individuals in their daily lives, from wrongfully denying welfare benefits to surveilling and tracking vulnerable individuals with no justifications. As they are currently used, biometric technologies thus pose disproportionate risks to human rights, in particular to individuals' freedom of expression, privacy, freedom of assembly, non-discrimination, and due process. A central challenge for civil society actors and policymakers thus far is that pushback against these technologies is often reactive rather than proactive, reaching a crescendo only after the technologies have become ubiquitous.<sup>4</sup>

In an attempt to encourage pre-emptive and strategic advocacy in this realm, this report focuses on emotion recognition, a relatively under-observed application of biometric technology, which is slowly entering both public and private spheres of life. Emerging from the field of affective computing,<sup>5</sup> emotion recognition is projected to be a USD65 billion industry by 2024,<sup>6</sup> and is already cropping up around the world.<sup>7</sup> Unlike any ubiquitous biometric technology, it claims to infer individuals' inner feelings and emotional states, and a ground truth about a subjective, context-dependent state of being. While face recognition asked who we *are*, emotion recognition is chiefly concerned with how we *feel*. Many believe this is not possible to prove or disprove.<sup>8</sup>

In this report, ARTICLE 19 documents the development, marketing, and deployment of emotion recognition in China, and examines the various actors, institutions, and incentives that bring these technologies into existence.

We discuss the use of emotion recognition in three distinct sectors in China: public security, driving safety, and education. In doing so, the report foregrounds how civil society will face different sets of social norms, policy priorities, and assumptions about how emotion recognition serves each of these three sectors. At the same time, these sectors share some commonalities:

1. They all hint at how 'smart city' marketing will encompass emotion recognition.
2. They all take place in spaces that people often have no choice in interacting with, leaving no substantial consent or opt-out mechanisms for those who do not want to participate.
3. Although major Chinese tech companies – including Baidu and Alibaba – are experimenting with emotion recognition, this report focuses on the majority of commercial actors in the field: smaller startups that go unnoticed in major English-language media outlets, but that have nonetheless managed to link up with academics and local governments to develop and implement emotion recognition.

## Why China?

This report focuses on China because it is a dominant market with the technologically skilled workforce, abundant capital, market demand, political motivations, and export potential for artificial intelligence (AI) that could enable rapid diffusion of emotion recognition technologies.<sup>9</sup> Over the past few years, Chinese tech companies have fuelled an international boom in foreign governments' acquisition of surveillance technology.<sup>10</sup> China's One Belt, One Road (OBOR) initiative has enabled the wide-scale

implementation of Huawei's Safe Cities policing platforms and Hikvision facial recognition cameras, in democracies and autocracies alike, without accompanying public deliberation or safeguards. In the context of facial recognition in particular, policymakers were taken aback by how quickly the Chinese companies that developed this technology domestically grew and started to export their products to other countries.<sup>11</sup>

Discussing emotion recognition technologies, Rosalind Picard – founder of major affective computing firm, Affectiva, and one of the leading researchers in the field – recently commented:

*"The way that some of this technology is being used in places like China, right now [...] worries me so deeply, that it's causing me to pull back myself on a lot of the things that we could be doing, and try to get the community to think a little bit more about [...] if we're going to go forward with that, how can we do it in a way that puts forward safeguards that protect people?"<sup>12</sup>*

To effectively advocate against emotion recognition technologies, it is crucial to concentrate on the motivations and incentives of those Chinese companies that are proactive in proposing international technical standards for AI applications, including facial recognition, at convening bodies like the ITU.<sup>13</sup> Internationally, a head start on technical standards-setting could enable Chinese tech companies to develop interoperable systems and pool data, grow more globally competitive, lead international governance on AI safety and ethics, and obtain the 'right to speak' that Chinese representatives felt they lacked when technical standards for the Internet were set.<sup>14</sup> This codification reverberates throughout future markets for this particular technology, expanding the technical standards' worldwide influence over time.

Focusing on the Chinese emotion recognition market, in particular, provides an opportunity to pre-empt how China's embrace of emotion recognition can – and will – unfold outside of China's borders. If international demand for emotion recognition increases, China's pre-existing market for technology exports positions a handful of its companies to

become major suppliers, following on the heels of their dominance of the facial recognition market.<sup>15</sup> With this report, ARTICLE 19 therefore seeks to galvanise civil society attention to the increasing use of emotion recognition technologies, their pseudoscientific underpinnings, and the fundamental inconsistency of their commercial applications with international human rights standards. We seek to do so early in emotion recognition's commercialisation, before it is widespread globally, to pre-empt the blunt and myopic ways in which adoption of this technology might grow.

## Methodology

The research for this report began with a literature review built from Mandarin-language sources in two Chinese academic databases: China National Knowledge Infrastructure and the Superstar Database (超星期刊). Search keywords included terms related to emotion recognition (情绪识别), micro-expression recognition (微表情识别), and affective computing (情感计算). In parallel, the authors consulted Chinese tech company directory Tianyancha (天眼查), where 19 Chinese companies were tagged as working on emotion recognition. Of these, eight were selected for further research because they provided technology that fit within the three use cases the report covers. The additional 19 companies investigated came up in academic and news media articles that mentioned the eight firms chosen from the Tianyancha set, and were added into the research process. Google, Baidu, and WeChat Mandarin-language news searches for these companies, as well as for startups and initiatives unearthed in the academic literature, formed the next stage of source collection.

Finally, where relevant, the authors guided a research assistant to find English-language news and academic research that shed light on comparative examples.

We mention and analyse these 27 companies based on the credibility and availability of source material, both within and outside company websites, and examples of named institutions that have pilot tested or fully incorporated these companies' products. For a few companies, such as Miaodong

in Guizhou, news coverage is not recent and it is unclear whether the company is still operating. Nonetheless, such examples were included alongside more recently updated ones to highlight details that are valuable to understanding the broader trend of emotion recognition applications, such as access to law enforcement data for training emotion recognition models, or instances where public pushback led to modification or removal of a technology. Even if some of these companies are defunct, a future crop of competitors is likely to follow in their stead.

Finally, although other types of emotion recognition that do not rely on face data are being used in China, the report focuses primarily on facial expression-based and multimodal emotion recognition that includes face analysis, as our research revealed these two types of emotion recognition are more likely to be used in high-stakes settings.

## Background to Emotion Recognition

### What Are Emotion Recognition Technologies?

Emotion recognition technologies purport to infer an individual's inner affective state based on traits such as facial muscle movements, vocal tone, body movements, and other biometric signals. They use machine learning (the most popular technique in the field of AI) to analyse facial expressions and other biometric data and subsequently infer a person's emotional state.<sup>16</sup>

Much like other biometric technologies (like facial recognition), the use of emotion recognition involves the mass collection of sensitive personal data in invisible and unaccountable ways, enabling the tracking, monitoring, and profiling of individuals, often in real time.<sup>17</sup>

Some Chinese companies describe the link between facial recognition technologies (based on comparing faces to determine a match) and emotion recognition (analysing faces and assigning emotional categories to them) as a matter of incremental progress. For example, Alpha

Hawkeye (阿尔法鹰眼), a Chinese company that supplies emotion recognition for public security, characterises it as 'biometrics 3.0'<sup>18</sup>, while a write-up of another company, Xinktech (云思创智), predicts 'the rise of emotion recognition will be faster than the face recognition boom, because now there is sufficient computing power and supporting data. The road to emotion recognition will not be as long.'<sup>19</sup>

### How Reliable is Emotion Recognition?

Two fundamental assumptions undergird emotion recognition technologies: that it is possible to gauge a person's inner emotions from their external expressions, and that such inner emotions are both discrete and uniformly expressed across the world. This idea, known as Basic Emotion Theory (BET), draws from psychologist Paul Ekman's work from the 1960s. Ekman suggested humans across cultures could reliably discern emotional states from facial expressions, which he claimed were universal.<sup>20</sup> Ekman and Friesen also argued that micro-momentary expressions ('micro-expressions'), or facial expressions that occur briefly in response to stimuli, are signs of 'involuntary emotional leakage [which] exposes a person's true emotions'.<sup>21</sup>

BET has been wildly influential, even inspiring popular television shows and films.<sup>22</sup> However, scientists have investigated, contested, and largely rejected the validity of these claims since the time of their publication.<sup>23</sup> In a literature review of 1,000 papers' worth of evidence exploring the link between emotional states and expressions, a panel of authors concluded:

*"very little is known about how and why certain facial movements express instances of emotion, particularly at a level of detail sufficient for such conclusions to be used in important, real-world applications. Efforts to simply 'read out' people's internal states from an analysis of their facial movements alone, without considering various aspects of context, are at best incomplete and at worst entirely lack validity, no matter how sophisticated the computational algorithms".<sup>24</sup>*

Another empirical study sought to find out whether the assumption that facial expressions are a consequence of emotions was valid, and concluded that 'the reported meta-analyses for happiness/amusement (when combined), surprise, disgust, sadness, anger, and fear found that all six emotions were on average only weakly associated with the facial expressions that have been posited as their UEs [universal facial expressions]'.<sup>25</sup>

The universality of emotional expressions has also been discredited through the years. For one, researchers found that Ekman's methodology to determine universal emotions inadvertently primed subjects (insinuated the 'correct' answers) and eventually distorted results.<sup>26</sup> The 'natural kind' view of emotions as something nature has endowed humans with, independent of our perception of emotions and their cultural context, has been strongly refuted as a concept that has 'outlived its scientific value and now presents a major obstacle to understanding what emotions are and how they work'.<sup>27</sup>

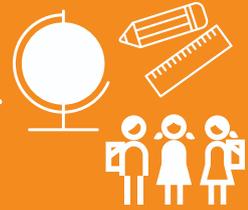
Finally, empirical studies have disproved the notion of micro-expressions as reliable indicators of emotions; instead finding them to be both unreliable (due to brevity and infrequency) and discriminatory.<sup>28</sup> Some scholars have proposed a 'minimum universality' of emotions, insisting 'the finite number of ways that facial muscles can move

creates a basic template of expressions that are then filtered through culture to gain meaning'.<sup>29</sup> This is corroborated by a recent study from the University of Glasgow, which found that culture shapes the perception of emotions.<sup>30</sup> Yet even theories of minimum universality call the utility of AI-driven emotion recognition systems into question. One scholar has suggested that, even if such technologies 'are able to map each and every human face perfectly, the technical capacities of physiological classification will still be subject to the vagaries of embedded cultural histories and contemporary forms of discrimination and of racial ordering'.<sup>31</sup>

Even so, academic studies and real-world applications continue to be built on the basic assumptions about emotional expression discussed above, despite these assumptions being rooted in dubious scientific studies and a longer history of discredited and racist pseudoscience.<sup>32</sup>

Emotion recognition's application to identify, surveil, track, and classify individuals across a variety of sectors is thus **doubly problematic** – not just because of its dangerous applications, but also because it *doesn't even work* as its developers and users claim.<sup>33</sup>

## 2. Use Cases



## Paving the Way for Emotion Recognition in China

As one of the world's biggest adopters of facial recognition cameras, China has come under scrutiny for its tech firms' far-reaching international sale of surveillance technology.<sup>34</sup> The normalisation of surveillance in Chinese cities has developed in parallel with the government's crackdown on the ethnic minority Uighur population in Xinjiang province. For Xinjiang's majority-Muslim population, security cameras, frequent police inspections, law enforcement's creation of Uighur DNA and voiceprint databases, and pervasive Internet monitoring and censorship of content about or related to Islam are inescapable.<sup>35</sup>

One state-sponsored security venture, the 'Sharp Eyes' project (雪亮工程), has come up in relation to three of the ten companies investigated in this section. Sharp Eyes is a nationwide effort to blanket Chinese cities and villages with surveillance cameras, including those with licence plate-reading and facial recognition capabilities.<sup>36</sup> The project, which the Central Committee of the Chinese Communist Party approved in 2016, relies in part on the government procurement-order bidding process to allocate billions of yuan in funding to (foreign and domestic) firms that build and operate this infrastructure.<sup>37</sup>

A homologous concept resurgent in contemporary surveillance is the 'Fengqiao experience' (枫桥经验), a Mao Zedong-contrived practice in which ordinary Chinese citizens monitored and reported each other's improper behaviour to the authorities. In a story that has come to exemplify Fengqiao, rock musician Chen Yufan was arrested for drug charges when a 'community tip' from within his residential area made its way to authorities.<sup>38</sup> President Xi Jinping has praised the return of the Fengqiao experience through neighbourhood-level community watch groups that report on suspected illegal behaviour. Though senior citizens are the backbone of this analogue surveillance, police have begun to head up watch groups, and technology companies have capitalised on the Fengqiao trend by developing local apps incentivising people to report suspicious activity in exchange for rewards,

such as discounted products and services from major tech firms. In late 2018, a conference on digital innovation and social management, The New Fengqiao Experience, convened police officers and companies including Alibaba.<sup>39</sup>

Although reporting on Sharp Eyes and Fengqiao-style policing has not yet touched on emotion recognition, both are relevant for three reasons. For one, Sharp Eyes and the Fengqiao project exemplify templates for how multiple national government organisations, tech companies, and local law enforcement unite to implement surveillance technology at scale. Second, companies specialising in emotion recognition have begun to either supply technology to these projects or to incorporate both Sharp Eyes and Fengqiao into their marketing, as seen below with companies Alpha Hawkeye (阿尔法鹰眼), ZNV Liwei, and Xinktech.<sup>40</sup> Finally, Chinese tech firms' commercial framing of emotion recognition as a natural next step in the evolution of biometric technology applications opens up the possibility that emotion recognition will be integrated in places where facial recognition has been widely implemented. Independent researchers are already using cameras with image resolution sufficiently high to conduct face recognition in experiments to develop emotion and gesture recognition.<sup>41</sup>

It is important to note that interest in multimodal emotion recognition is already high. Media coverage of the company Xinktech predicts that micro-expression recognition will become a ubiquitous form of data collection, fuelling the rise of 'multimodal technology [as an] inevitable trend, a sharp weapon, and a core competitive advantage in the development of AI'.<sup>42</sup> By one estimate, the potential market for multimodal emotion recognition technologies is near 100 billion yuan (over USD14.6 billion).<sup>43</sup> How did multimodality garner such hype this early in China's commercial development of emotion recognition? Part of the answer lies in how Chinese tech firms depict foreign examples of emotion recognition as having been unilateral successes – ignoring the scepticism that terminated some of these initiatives.

## Public Security

### Foreign Emotion Recognition Precursors as Motivation

A popular theme in China's academic and tech industry literature about using emotion recognition for public security is the argument that it has achieved desirable results abroad. Examples cited include both automated and non-technological methods of training border-patrol and police officers to recognise micro-expressions, such as the US Transportation Security Authority's Screening Passengers by Observation Techniques (SPOT) programme and Europe's iBorderCtrl. Launched in 2007, SPOT was a programme that trained law enforcement officials known as Behaviour Detection officers to visually identify suspicious behaviours and facial expressions from the Facial Action Coding System. Chinese police academies' research papers have also made references to US plainclothes police officers similarly using human-conducted micro-expression recognition to identify terrorists – a practice Wenzhou customs officials dubbed 'worth drawing lessons from in our travel inspection work'.<sup>44</sup> iBorderCtrl, a short-lived automated equivalent trialled in Hungary, Latvia, and Greece, was a pre-screening AI system whose cameras scanned travellers' faces for signs of deception while they responded to border-security agents' questions.

A major omission in the effort to build a case for emotion recognition in Chinese public security is that much of what passes for 'success' stories has been derided for instances that have been heavily contested and subject of legal challenge for violation of human rights. The American Civil Liberties Union, Government Accountability Office, Department of Homeland Security, and even a former SPOT officer manager have exposed the SPOT programme's unscientific basis and the racial profiling it espoused.<sup>45</sup> Officers working on this programme told the *New York Times* that they "just pull aside anyone who they don't like the way they look – if they are Black and have expensive clothes or jewellery, or if they are Hispanic".<sup>46</sup> iBorderCtrl's dataset has been criticised for false positives, and its discriminatory potential led to its retraction.<sup>47</sup>

When discussed in Chinese research, news, and marketing, these final outcomes are glossed over – such as in a feature on Alpha Hawkeye, which made the unsourced claim that the SPOT programme's cost per individual screening was USD20, in comparison to Alpha Hawkeye's USD0.80 per inspection.<sup>48</sup>

### Three Types of Security-Use Contexts and Their Rationales

Emotion recognition software and hardware that are implemented in security settings fall into three categories:

1. 'Early warning' (预警);<sup>49</sup>
2. Closer monitoring after initial identification of a potential threat; and
3. Interrogation.

The firms' marketing approaches vary depending on the category of use. Sometimes marketed as more scientific, accurate descendants of lie-detection (polygraph) machines, emotion recognition-powered interrogation systems tend to extract facial expressions, body movements, and vocal tone from video recordings. In particular, the academic literature coming out of police-training academies provides the boilerplate justifications that tech companies reproduce in their marketing materials.

One Chinese research paper from the Hubei Police Academy discusses the value of facial micro-expressions in identifying 'dangerous people' and 'high-risk groups' who do not have prior criminal records.<sup>50</sup> The author proposes creating databases that contain video images of criminals before and after they have committed crimes, as a basis for training algorithms that can pick up on the same facial muscle movements and behaviours in other people.<sup>51</sup> The argument driving this – and all uses of emotion recognition in public security settings – is the belief that people feel guilt before committing a crime, and that they cannot mask this 'true' inner state in facial expressions so minor or fleeting that only high-resolution cameras can detect them.<sup>52</sup>

Another paper from two researchers at Sichuan Police College envisioned a Tibetan border-patrol inspection system that would fit both the 'early warning' and follow-up inspection functions.<sup>53</sup> They argued that traditional border-security inspections can be invasive and time-consuming, and that the longer they take, the more the individuals being inspected feel they are being discriminated against.<sup>54</sup> Yet if AI could be used to identify suspicious micro-expressions, they reasoned, presumably fewer people would be flagged for additional inspection, and the process would be less labour-intensive for security personnel. Moreover, the speed of the automated process is itself presented as somehow 'fairer' for those under inspection by taking up less of their time. In a similar framing to the Hubei Police Academy paper, the authors believed their system would be able to root out 'Tibetan independence elements' on the basis of emotion recognition.<sup>55</sup> These disconcerting logical leaps are replicated in how the companies themselves market their products.

#### Public Security Implementations of Emotion Recognition

News coverage and marketing materials for the ten companies described in Table 1 flesh out the context in which emotion recognition applications are developed.

According to one local news story, authorities at the Yiwu Railway Station (Zhejiang) used Alpha Hawkeye's emotion recognition system to apprehend 153 so-called 'criminals' between October 2014 and October 2015.<sup>56</sup> The headline focused on the more mundane transgression that these types of systems tend to over-police: individuals' possession of two different state ID cards. Alpha Hawkeye's products have reportedly been used in both Sharp Eyes projects and in the OBOR 'counterterrorism industry'.<sup>57</sup> ZNV Liwei (ZNV力维) is also reported to have contributed technology to the Sharp Eyes surveillance project and to have provided police in Ningxia, Chongqing, Shenzhen, Shanghai, and Xinjiang with other 'smart public security products', though the company's

website does not indicate whether emotion recognition capabilities are among them.<sup>58</sup> An article from 2017 indicated that Alpha Hawkeye planned to develop its own 'high-risk crowd database' that would match footage collected from its cameras against (unnamed) 'national face recognition databases'.<sup>59</sup> In coordination with local authorities, the company has conducted pilot tests in rail and subway stations in Beijing, Hangzhou, Yiwu (Zhejiang), Urumqi (Xinjiang), and Erenhot (Inner Mongolia), at airports in Beijing and Guangzhou, and at undisclosed sites in Qingdao and Jinan, although it is ambiguous about whether these applications involved only face recognition or also included emotion recognition.<sup>60</sup>

The user interface for an interrogation platform from CM Cross (深圳市科思创动科技有限公司, known as 科思创动) contains a 'Tension Index Table' (紧张程度指数表) that conveys the level of tension a person under observation supposedly exhibits, with outputs including 'normal', 'moderate attention', and 'additional inspection suggested'.<sup>61</sup> Moreover, the CM Cross interrogation platform sorts questions to pose to suspects into interview types; for example, 'conventional interrogations', 'non-targeted interviews', and 'comprehensive cognitive tests'.<sup>62</sup>

At the 8th China (Beijing) International Police Equipment and Counter-Terrorism Technology Expo in 2019, Taigusys Computing representatives marketed their interrogation tools as obviating the need for polygraph machines, and boasted that their prison-surveillance system can prevent inmate self-harm and violence from breaking out by sending notifications about inmates expressing 'abnormal emotions' to on-site management staff. Images of the user interface for the 'Mental Auxiliary Judgment System' (精神辅助判定系统) on the company's website show that numerical values are assigned to nebulous indicators, such as 'physical and mental balance' (身心平衡).<sup>63</sup>

**Table 1: Companies Providing Emotion Recognition for Public Security**

Company Name	Products and Methods of Data Collection	Suggested Uses <sup>64</sup>
Alpha Hawkeye 阿尔法鹰眼	Monitors vestibular emotional reflex and conducts posture, speech, physiological, and semantic analysis. <sup>65</sup>	<ul style="list-style-type: none"> <li>• Airport, railway, and subway station early-warning threat detection</li> <li>• Customs and border patrol</li> </ul>
CM Cross 科思创动	Employs deep-learning-powered image recognition to detect blood pressure, heart rate, and other physiological data. <sup>66</sup>	<ul style="list-style-type: none"> <li>• Customs and border patrol<sup>67</sup></li> <li>• Early warning</li> <li>• Police and judicial interrogations</li> </ul>
EmoKit 翼开科技	EmoAsk AI Multimodal Smart Interrogation Auxiliary System detects facial expressions, body movements, vocal tone, and heart rate. <sup>68</sup> Other products detect similar data for non-interrogation uses.	<ul style="list-style-type: none"> <li>• Detecting and managing mental-health issues at medical institutions</li> <li>• Loan interviews at banks</li> <li>• Police-conducted interrogations<sup>69</sup> and other law enforcement-led questioning of convicted criminals<sup>70</sup></li> </ul>
Joyware 中威电子  NuraLogix	NuraLogix's DeepAffex is an image recognition engine that identifies facial blood flow (which is used to measure emotions) and detects heart rate, breathing rate, and 'psychological pressure'. <sup>71</sup> Joyware also uses NuraLogix's polygraph tests. <sup>72</sup>	<ul style="list-style-type: none"> <li>• Airport and railway station surveillance</li> <li>• Nursing</li> <li>• Psychological counselling</li> </ul>
Miaodong 秒懂	Relies on image recognition of vibrations and frequency of light on faces, which are used to detect facial blood flow and heart rate as a basis for emotion recognition. <sup>73</sup>	<ul style="list-style-type: none"> <li>• Police interrogation</li> </ul>
Sage Data 睿数科技	Public Safety Multimodal Emotional Interrogation System detects micro-expressions, bodily micro-actions, heart rate, and body temperature. <sup>74</sup>	<ul style="list-style-type: none"> <li>• Police and court interrogations</li> </ul>
Shenzhen Anshibao 深圳安视宝	Emotion recognition product detects frequency and amplitude of light vibrations on faces and bodies, which Shenzhen Anshibao believes can be used to detect mental state and aggression. <sup>75</sup>	<ul style="list-style-type: none"> <li>• Early warning<sup>76</sup></li> <li>• Prevention of crimes and acts of terror</li> </ul>
Taigusys Computing 太古计算	One product is referred to as a micro-expression-recognition system for Monitoring and Analysis of Imperceptible Emotions at Interrogation Sites, while others include 'smart prison' and 'dynamic emotion recognition' solutions. Taigusys claims to use image recognition that detects light vibrations on faces and bodies, as well as parallel computing. <sup>77</sup>	<ul style="list-style-type: none"> <li>• Hospital use for detecting Alzheimer's, depression, and panic attacks<sup>78</sup></li> <li>• Police interrogation of suspected criminals<sup>79</sup></li> <li>• Prison surveillance</li> </ul>
Xinktech 云思创智	Products include 'Lingshi' Multimodal Emotional Interrogation System and Public Security Multimodal Emotion Research and Judgment System, among others. They can detect eight emotions and analyses facial expression, posture, semantic, and physiological data. <sup>80</sup>	<ul style="list-style-type: none"> <li>• Judicial interrogation<sup>81</sup></li> <li>• Police interrogation<sup>82</sup></li> <li>• Public security settings, including customs inspections<sup>83</sup></li> </ul>
ZNV Liwei ZNV力维	Collects data on heart rate and blood-oxygen level. <sup>84</sup>	<ul style="list-style-type: none"> <li>• Police interrogation of suspected criminals</li> </ul>

Xinktech (南京云思创智科技公司) aims to create the 'AlphaGo of interrogation'.<sup>85</sup> Their 'Lingshi' Multimodal Emotional Interrogation System' (灵视多模态情绪审讯系统), showcased at the Liupanshui 2018 criminal defence law conference in Hubei, contains 'core algorithms that extract 68 facial feature points and can detect eight emotions (calmness, happiness, sadness, anger, surprise, fear, contempt, disgust).<sup>86</sup> Aside from providing a venue for the companies to showcase their products, conferences double as a site for recruiting both state and industry partners in development and implementation.

In 2018, Hangzhou-based video surveillance firm Joyware signed a cooperative agreement to develop 'emotional AI' with the Canadian image recognition company NuraLogix.<sup>87</sup> NuraLogix trains models to identify facial blood flow as a measure of emotional state and other vital signs.<sup>88</sup> ZNV Liwei has collaborated with Nanjing Forest Police College and CM Cross to establish an 'AI Emotion Big Data Joint Laboratory' (AI情绪大数据联合实验室), where they jointly develop 'psychological and emotion recognition big data systems'.<sup>89</sup> In 2019, Xinktech held an emotion recognition technology seminar in Nanjing. Media coverage of the event spotlighted the company's cooperative relationship with the Interrogation Science and Technology Research Center of the People's Public Security University of China, along with Xinktech's joint laboratory with the Institute of Criminal Justice at Zhongnan University of Economics and Law established earlier that year.<sup>90</sup>

Xinktech's partnerships with both of these universities and Nanjing Forest Police Academy account for some of its training data acquisition and model-building process – contributions that reflect a symbiotic exchange between firms and the state.<sup>91</sup> EmoKit (翼开科技), which professed to have 20 million users of its open APIs four years ago, partnered with the Qujing Public Security Bureau (PSB) in Yunnan Province.<sup>92</sup> According to one source, EmoKit obtained 20 terabytes of interrogation video data from a southern Chinese police department.<sup>93</sup> In Guizhou, a startup called Miaodong (秒懂) received a similar boost from local government in 2016.<sup>94</sup> At first, Miaodong's

interrogation software was reputedly only accurate 50% of the time. They then came to the attention of local officials in the Guiyang High Tech Zone and teamed up with the Liupanshui PSB. After this, the PSB shared several archived police interrogation videos with Miaodong, and the company says its accuracy rates rose to 80%.<sup>95</sup> Similarly, Xinktech partnered with police officers to label over 2,000 hours of video footage containing 4 million samples of emotion image data. When asked why Xinktech entered the public security market, CEO Ling responded: "We discovered that the majority of unicorns in the AI field are companies who start out working on government business, mainly because the government has pain points, funding, and data."<sup>96</sup> Exploiting these perceived 'pain points' further, some companies offer technology training sessions to law enforcement.

At a conference, Xinktech CEO Ling Zhihui discussed the results of Xinktech's product applications in Wuxi, Wuhan, and Xinjiang.<sup>97</sup> Afterwards, Ling facilitated a visit to the Caidian District PSB in Wuhan to demonstrate their pilot programme using Xinktech's 'Public Security Multimodal Emotion Research and Judgment System' (公安多模态情绪研判系统).<sup>98</sup> Xinktech reportedly also sells its 'Lingshi' interrogation platform to public security and prosecutorial institutions in Beijing, Hebei, Hubei, Jiangsu, Shaanxi, Shandong, and Xinjiang.<sup>99</sup> Concurrently with the Hubei conference, Xinktech's senior product manager led the 'Interrogation Professionals Training for the Province-Wide Criminal Investigation Department' (全省刑侦部门审讯专业人才培养) at the Changzhou People's Police Academy in Jiangsu province, an event co-sponsored by the Jiangsu Province Public Security Department.<sup>100</sup> Finally, in late 2019, EmoKit's CEO described a pilot test wherein police in Qujing, Yunnan, would trial the company's interrogation technology. EmoKit planned to submit results from this test run in its application to join the list of police equipment procurement entities that supply the Ministry of Public Security.<sup>101</sup> EmoKit also purports to work with the military, with one military-cooperation contract raking in 10 million RMB (USD1.5 million USD), compared with 1 million RMB (USD152,000 USD) orders in the financial and education sectors, respectively.<sup>102</sup>

## Driving Safety

The span of driving-safety applications of emotion recognition runs from in-car interventions to stationary hardware mounted on roadways. As with the other use cases in this report, this subsector of applications is not unique to China.<sup>103</sup> All of the Chinese examples in this section feature emotion sensing, in addition to driver-fatigue detection, and notably seem to group both under emotion or expression recognition.

### In-Vehicle Emotion Recognition

Smart car manufacturer LeEco was reported to have incorporated face and emotion recognition into its LeSee concept car model in 2016.<sup>104</sup> In its 2019 corporate social responsibility report, Great Wall Motors announced that in at least three of its models it had launched an 'intelligent safety system', Collie, which includes 'emotion/expression recognition' and facial recognition capabilities among a total of 43 features to protect drivers, passengers, and pedestrians.<sup>105</sup> A reporter who tested one of these Great Wall Motors models, the VV7, found that when the car's emotion recognition technology sensed the reporter was 'angry' it automatically played more up-tempo music.<sup>106</sup> Additional media coverage of Great Wall Motor's VV6 model, which is reported to be released in 2021, indicates that the emotion recognition system can be continually upgraded as firmware-over-the-air, such that the emotion and fatigue recognition system can receive push updates of 'relevant' music.<sup>107</sup>

When state-owned car manufacturer Chang'an Automobiles promoted its UNI-T SUV crossover model at a connected-car technology expo in April 2020, media coverage described the in-vehicle UNI-T system as able to detect drivers' emotions and fatigue levels through facial emotion recognition.<sup>108</sup> Frequent yawning and blinking might prompt the UNI-T system to verbally warn the driver to be more alert, or – as with the Great Wall Motors cars – the system might automatically play 'rejuvenating' music.<sup>109</sup>

Aside from automobile manufacturers, hardware companies and AI startups are also contributing to the emerging trend of outfitting cars with emotion recognition functions. For instance, in late 2020, Huawei showcased its HiCar system that links drivers' mobile phones to their cars, enabling applications of computer vision, including emotion recognition and driver-fatigue recognition.<sup>110</sup> Taigusys Computing, the company that has provided emotion and behaviour recognition cameras for monitoring prisons and schools, has likewise developed a 'driver abnormal behaviour recognition system' that assesses drivers' facial expressions, body movements, and the content of their speech to issue early warnings if any of these actions is deemed unsafe.<sup>111</sup>

While most instances of in-vehicle emotion recognition focus on drivers, one Chinese car manufacturer has chosen to broaden its scope to additionally identify the emotional states of passengers. ALWAYS (爱驰汽车) has developed 'smart companion technology' that news reports describe as being able to detect a child passenger's emotions that may distract a parent's driving. If a child is crying in the backseat, the ALWAYS system can 'appease the child by playing songs the child likes, stories, and even sounds of the child's own happy laughter'.<sup>112</sup>

### Insurance Companies and Emotion Recognition of Drivers

Insurance providers have also begun turning to emotion recognition to streamline their operations. China's biggest insurance firm, Ping An Group, demonstrated an in-vehicle facial expression recognition system that merges two of the company's products, Face Know Your Driver (FACE KYD) and Driving Risk Video Recognition (DRVR), at an expo in late 2019. The former extracts drivers' facial micro-expressions in real time and then runs these data through a model that predicts driving risks. The DRVR system uses facial expression-based driver attention and fatigue models to 'provide diverse in-process risk management solutions' meant to avert accidents and subsequent insurance-claim filings. A representative of Ping

An's Property and Casualty Insurance Technology Center revealed that, in addition to driver facial expression data, the cars are outfitted to incorporate real-time data on other cars and the roads being used.<sup>113</sup> This real-time analysis can allegedly catch drivers 'dozing off, smoking, playing with mobile phones, carelessly changing lanes, [and] speeding'. Ping An's Chief Scientist, Xiao Jing, praised this AI system's acceleration of the insurance-claim investigation process.<sup>114</sup>

#### Emotion Recognition Outside of Cars

To date, Chinese driving-safety applications of emotion recognition capabilities tend to focus on individuals inside of cars; yet there is also emerging interest in how the technology could be used at highway toll booths. An academic paper by four researchers at the Xi'An Highway Research Institute proposes an early-warning system that would use micro-expression recognition to detect drivers likely to commit highway fare evasion.<sup>115</sup> The authors note that, in some parts of China, highway toll booths are already outfitted with automated licence plate readers and facial recognition-equipped cameras to track the vehicles of drivers who evade tolls. In addition to their proposal that micro-expression recognition be used to detect suspects likely to commit fare evasion, they broaden the scope to include 'early detection' of drivers who may pose a physical threat to tollbooth operators.<sup>116</sup> Such a system would require the creation of a facial-expression database comprising people who have evaded fares or perpetrated violence against tollbooth operators in the past, which could be shared across multiple highway systems and updated with the facial expression data it would continually amass.<sup>117</sup> This envisioned system would connect to existing highway-monitoring systems, and could link a driver's facial recognition and facial expression data with the same individual's licence information, creating what the authors describe as a 'highway traveller credit database' (高速公路出行者信用数据库) that could be shared with the Ministry of Public Security, as well as with transportation and security-inspection authorities, as evidence of

fare evasion.<sup>118</sup> While there has been no indication that this particular project is to be trialled or implemented thus far, there are some signs of state support for the development of emotion recognition for driving safety.

#### State and Tech Industry Interest

The city of Guangzhou issued a suggested research topic, 'Research and Development on Applications of Video Surveillance Inside and Outside of Vehicles', in its 2019 special application guide for 'smart connected cars'. Specifically, the application guide expressed interest in supporting 'recognition of and feedback on mental state, emotional conditions, vital signs, etc. to improve security in the driver's seat', and 'achievable emotion recognition of drivers, automated adjustment of the vehicle's interior aroma/music category/colour of ambient lighting to stabilize the driver's mental state'.<sup>119</sup>

Tech companies that have provided emotion recognition capabilities in other use cases have shown interest in the driving-safety subsector. Xinktech, for instance, has mentioned highway management as a next step for its 'Lingshi' multimodal emotion analysis system.<sup>120</sup> The company is also researching in-car emotion recognition for potential use in taxis. In making a case for studying the emotional expressions of taxi drivers and passengers before and after incidents of verbal and physical conflict erupt, Xinktech CEO Ling Zhihui cited a series of murders and rapes that drivers for ride-hailing company Didi Chuxing committed. Ling suggests these data can be used to train early-warning models that would alert Didi's customer-service representatives to intervene and prevent passenger harm.<sup>121</sup> Much like with technologies that purport to predict acts of terror, these 'solutions' could instead cause problems for drivers incorrectly flagged as at-risk of harming a passenger. Recording suspicious behaviour in the driver's ridesharing profile, banning the driver from the platform, or escalating the situation to involve the police are all potential negative outcomes if emotion recognition is applied in this setting.

## Education

### Emotion and Edtech

Educational technology (edtech) makes a mix of promises about student safety, learning progress, and effective teaching approaches in its applications, although (for reasons discussed below) it is clear there is a burgeoning market for these tools across the world, and within China in particular. Face-recognition technologies used in addition to, or embedded within, edtech products have sparked debate around student privacy and the discriminatory potential of such technologies in various national contexts.<sup>122</sup> For instance, as the sales of test-proctoring software have skyrocketed due to COVID-19 school shutdowns, educators are alarmed at how these platforms monitor students to detect signs of cheating.<sup>123</sup> Due to these systems' design, darker-complexioned students have encountered technical difficulties in which systems struggle to identify their faces. Nonbinary-identifying students, as well as student parents and neurodiverse students, have also come up against problems with how test-proctoring systems identify their faces and body movements.<sup>124</sup>

### China's Push for 'AI+Education'

Pre-pandemic uses of face and facial expression recognition in schools tended to fall into three general purposes: conducting face-based attendance checks, detecting student attention or interest in a lecture, and flagging safety threats. There are two main reasons for the push for edtech at the local and regional levels in the Chinese education sector. First, promises of progress tracking, exam preparation, and higher quality of learning resonate strongly with parents, who are willing to spend large amounts of money in a competitive education system predicated on standardised testing.<sup>125</sup> Second, state- and national-level AI ambitions and education-focused incentives, in particular, incentivise new edtech development and deployment.

In 2018, the Action Plan for Artificial Intelligence Innovation in Colleges and Universities stated the intention to accelerate the innovation and applications of AI in the education sector.<sup>126</sup> Another driver is China's New Generation AI development plan, under which local governments carry out the central government's vision of AI innovation through subsidies and other support mechanisms that enable rapid AI adoption throughout a variety of institutions.<sup>127</sup> The fervour for personalised learning and other technology-enhanced education outcomes in plans such as 'China Education Modernization 2035' (中国教育现代化2035) adds to the nationwide impetus.<sup>128</sup> As one paper on the role of private companies in the edtech sector in China posits, 'it is this pursuit of marketable products that appears to define the general approach of the private sector, rather than any underlying educational rationale for the design and development of AI applications'.<sup>129</sup>

### Chinese Academic Research on Emotion Recognition in Education

Emotion recognition technologies gain an additional sense of urgency in light of an accompanying trove of domestic academic research in this area. Among the dozens of research papers Chinese scholars have published about machine learning-dependent emotion recognition methods and their applications, education-related applications may be viewed as less controversial, net-positive use cases. They do not consider these technologies' potential harms to students and teachers. As demonstrated in this report, academic researchers' assumptions and arguments then reappear in marketing for commercial emotion recognition technologies – even trickling down to school administrators' own descriptions of why these technologies should be used to manage students and teachers.

Researchers have explored using emotion recognition to detect students' cognitive disabilities, and isolate specific moments that interest them, as a basis for teachers to modify their lesson

plans.<sup>130</sup> The presumed causal link between content taught and students' outward expressions of interest are the foundations of an argument for personalised learning that many firms (described in [China's Market for Emotion Recognition in Education](#)) repeat. Another study applies deep-learning algorithms to identify students' real-time facial expressions in massive open online courses (MOOCs).<sup>131</sup> The authors believe emotion recognition benefits MOOCs in particular because teachers are not co-located with their students and need to enhance the quality of student–teacher interaction.<sup>132</sup> Although at least one study acknowledges that equating students' facial emotions with states of learning engagement is a highly limited approach, the main response to this shortcoming has been to create new versions that learn from past data (or, 'iterate') on unimodal emotion recognition with multimodal alternatives.<sup>133</sup>

One multimodal study of Chinese MOOC participants collected facial-image and brainwave data to create a novel dataset, comprised of Chinese learners (as opposed to human research subjects of other ethnicities), and to address low course-completion and participation rates in MOOCs.<sup>134</sup> Others investigated methods for using Tencent's near-ubiquitous messaging app, WeChat, to conduct face, expression, and gesture recognition that would be implemented in classrooms as a continuous, cost-efficient alternative to end-of-term questionnaire evaluations of teachers.<sup>135</sup> In a similar vein, another paper suggests vocal tone-recognition technology can be used like a 'smoke alarm': if teachers' voices express insufficient warmth or affinity (亲和力), they can receive reminders to do so.<sup>136</sup>

Academic literature within China does not touch on an important consideration in the use of emotional recognition in schools: recent research has found that current facial-emotion recognition methods demonstrate subpar performance when applied to children's facial expressions.<sup>137</sup> Nonetheless, as the 11 companies in Table 2 demonstrate, physical and virtual classrooms across China are test sites for

emotion recognition in education. As the COVID-19 pandemic has popularised 'blended learning' (混合学习) – where some classroom instruction is conducted using digital technologies, while the rest retains the traditional face-to-face approach – several of these companies are prepared to absorb new demand.

#### China's Market for Emotion Recognition in Education

Given how similar emotion recognition product offerings in the education field are, one way to differentiate between them is to examine how they came to incorporate emotion recognition into their core offerings. One set is companies that did not start out in the education sector but later developed their emotion recognition software and/or hardware for education use cases (Hanwang, Hikvision, Lenovo, Meezao, Taigusys Computing). Another is edtech firms with emotion recognition capabilities ostensibly built in-house (Haifeng Education, New Oriental, TAL, VIPKID). The third comprises partnerships between edtech firms and major tech companies specialising in emotion, face, voice, and gesture recognition (EF Children's English, VTron Group). As with security applications, user interfaces from these companies illuminate which data points are used to restructure the learning experience.

As of December 2017, Hanwang Education supplied at least seven schools around China with its CCS.<sup>138</sup> In an interview for *The Disconnect*, Hanwang Education's general manager logged into the CCS user account of a teacher at Chifeng No. 4 Middle School in the Inner Mongolia Autonomous Region to demonstrate the app.<sup>139</sup> Aside from behavioural scores, the app breaks down percentages of class time spent on each of the five behaviours it recognises, and compares individual students with the class average. For example, a student who was marked as focused 94% of the time in his English class, but was recorded as only answering one of the teacher's questions in a week, was considered to have low class participation.<sup>140</sup>

**Table 2: Companies Providing Emotion Recognition for Education**

Company	Type of Instruction	Product Name and Description
EF Children's English 英孚少儿英语	In person and online	Partners with Tencent Cloud to conduct image, emotion, and voice recognition, and receives curriculum design assistance to EF's product-development teams and teachers. <sup>141</sup>
Hanwang Education 汉王教育	In person	Class Care System (CCS) cameras take photos of whole classes once per second, connect to a programme that purportedly uses deep-learning algorithms to detect behaviours (including 'listening, answering questions, writing, interacting with other students, or sleeping') and issue behavioural scores to students every week. Scores are part of a weekly report that parents and teachers access via the CCS mobile app. <sup>142</sup>
Haifeng Education 海风教育	Online	Cape of Good Hope multimodal emotion recognition platform tracks students' eyeball movements, facial expressions, vocal tone, and dialogue to measure concentration. <sup>143</sup>
Hikvision 海康威视	In person	Smart Classroom Behaviour Management System integrates three cameras, positioned at the front of the classroom, and identifies seven types of emotions (fear, happiness, disgust, sadness, surprise, anger, and neutral) and six behaviours (reading, writing, listening, standing, raising hands, and laying one's head on a desk). <sup>144</sup> Cameras take attendance using face recognition, and scan students' faces every 30 seconds. <sup>145</sup>
Lenovo 联想	In person	'Smart education solutions' include speech, gesture, and facial emotion recognition. <sup>146</sup>
Meezao 蜜枣网	In person	Uses facial expression recognition and eye-tracking software to scan preschoolers' faces over 1,000 times per day and generate reports, which are shared with teachers and parents. <sup>147</sup> Reports contain data visualisations of students' concentration levels at different points in class. <sup>148</sup>
New Oriental 新东方	Blended learning	AI Dual Teacher Classrooms contain a 'smart eye system based on emotion recognition and students' attention levels', which the company says can also detect emotional states, including 'happy, sad, surprised, normal, and angry'. <sup>149</sup> A subsidiary, BlingABC, offers online teaching tools such as the AI Foreign Teacher, which contains face- and voice-recognition functions. BlingABC counts how many words students speak, along with data about students' focus levels and emotions, and claims reports containing this combination of data can help students, parents, and teachers zero in on exactly which parts of a lesson a student did not fully understand. <sup>150</sup>
Taigusys Computing 太古计算	In person	Collects data from three cameras, one each on students' faces, teachers, and a classroom's blackboard. The system detects seven emotions (neutral, happy, surprised, disgusted, sad, angry, scared) and seven actions (reading, writing, listening, raising hands, standing up, lying on the desk, playing with mobile phones). <sup>151</sup>

Tomorrow Advancing Life (TAL)	Online	Xueersi Online School provides extracurricular instruction for elementary, junior high, and high school students. <sup>152</sup> It and other TAL online learning platforms incorporate the Magic Mirror System, which identifies 'concentration, doubt, happiness, and closed eyes' based on facial expressions. A display monitor relates information about students' attentiveness to teachers in real time, and reports are generated for parents to track their children's learning progress. <sup>153</sup>
VIPKID	Online	Conducts face and expression recognition on students and teachers. Generates reports to share with teachers and parents. <sup>154</sup>
VTron Group 威创集团	In person	Partners with Baidu and Megvii to develop face, emotion, and voice recognition technology to monitor preschoolers and generate reports for their teachers and parents. <sup>155</sup>

Taigusys Computing (太古计算), which has produced emotion recognition platforms for prison surveillance and police interrogations, (see the **Public Security** section), has a teacher user interface that displays 'problem student warnings' with corresponding emotions, such as sadness and fear. Other data visualisations combine data on expression and behaviour recognition alongside academic performance to typologise students. For instance, the 'falsely earnest type' is assigned to a student who 'attentively listens to lectures [but has] bad grades', while a 'top student' might be one with 'unfocused listening, strong self-study abilities, but good grades'.<sup>156</sup>

Although most of these systems are developed solely within companies, a few draw from academic partnerships and funding of smaller startups. Some of the support for emotion, gesture, and face recognition in products from one of China's biggest edtech suppliers, TAL, comes from its Tsinghua University–TAL Intelligent Education Information Technology Research Center, and from technology TAL has acquired through FaceThink (德麟科技), an expression recognition startup it has funded.<sup>157</sup> When it comes to selling and implementing products, several of the companies examined here have been known to play to two narratives that surpass education: parents' fears about students' safety, and 'digital divide' concerns that less-developed regions of China will technologically lag behind wealthier coastal provinces.

Tech companies use slightly different arguments for emotion recognition depending on students' age group and whether the technology is to be used for online teaching or in-person classrooms. Companies that have produced online teaching platforms for nursery school-aged children, for example, market their products as critical to not only assessing young children's budding abilities to concentrate and learn but also protecting these students' safety. Meezao (蜜枣网), which won awards from Microsoft Research Asia for its applications of emotion recognition technology in retail and banking before turning to the education field, provides one example.<sup>158</sup>

Meezao's founder, Zhao Xiaomeng, cited the November 2017 RYB incident, in which Beijing kindergarten teachers were reported to have abused students with pills and needles, as having made him 'recognise [that] emotional intelligence [technology's] reflection of children's emotional changes can help administrators more accurately and quickly understand hidden dangers to children's safety, such that they can prevent malicious incidents from happening again'.<sup>159</sup> Zhao described a trial of Meezao's technology in a preschool classroom, where the software identified fear on many of the children's faces when a male stranger with an athletic build entered the classroom.<sup>160</sup>

Similarly, according to VTron Group (威创集团) CEO, Guo Dan, their collaborations with teams from both Baidu and Megvii enables the use of:

*“AI cameras, recognition algorithms, and big data analysis, to accurately obtain information on individuals' identities and teachers' and students' emotions, and to provide complete solutions for [ensuring] kindergarteners can be picked up [from school] safely, for teachers' emotional guidance, and for early warning mechanisms [that detect] child safety crises”.*<sup>161</sup>

The faulty assumptions that these security arguments are based on remain unchallenged in the Chinese literature. As with narratives about ameliorating education across rural and lower-resourced regions of China, the companies make promises the technology alone cannot deliver on – and, indeed, are not held accountable for upholding.

Hardware giant Lenovo has extended its emotion recognition capabilities (originally used in customer-service settings) to Chinese classrooms.<sup>162</sup> Lenovo has sold edtech to elementary and high schools in Sichuan, Tibet, Shandong, and Yunnan (among at least a dozen provinces the company contracts with), touting sales to these provinces as a means of closing the digital divide. However, because Lenovo's emotion recognition feature is modular, it is difficult to pinpoint exactly how many of these schools use it.<sup>163</sup> New Oriental (新东方), which has brought its AI Dual Teacher Classroom (AI双师课堂) to over 600 classrooms in 30 cities across China, strategically spotlights its efforts in cities like Ya'an in Sichuan province.<sup>164</sup> Despite these sizeable user bases, in-depth testimonials of how these technologies are viewed within schools are scarce. One exception comes from the country's best-documented – and perhaps most contentious – implementation of emotion recognition, at a high school in the coastal tech hub of Hangzhou.

Public criticism directed at various applications of emotion recognition in Chinese schools does not appear to impede the likelihood that more domestic companies will apply voice and facial expression-based emotion recognition in the education sector. Factors that contribute to this potential proliferation include the breadth of market opportunities, both within and beyond schools; perceptions of technological prestige, attributed to specific institutions and the country as a whole, for leading the adoption of these tools; and local governments' policy support and subsidies of these technologies' installation and upkeep.

#### Emotion Recognition in Online and In-Person Classrooms

In May 2018, Hangzhou No. 11 Middle School held a 'smart campus' seminar where it unveiled a Smart Classroom Behaviour Management System (智慧课堂行为管理系统), which the world's biggest surveillance-camera producer, Hikvision, produced in conjunction with the school.<sup>165</sup> Computer monitors near teachers' desks or lecture stands displayed the system's assignment of the values A, B, and C to students, based on emotional and behavioural indicators, and included a column representing 'school-wide expression data'. According to the school's administration, the only behaviour registered as 'negative' was resting one's head on a desk; and if a student did this often enough to surpass a preset threshold, they were assigned a C value. Twenty minutes into each class, teachers' display screens issued notifications about which students were inattentive. These notifications disappeared after three minutes.<sup>166</sup> Outside of classrooms, monitors showing how many students were making 'sour faces' (苦瓜脸) and neutral faces were mounted in hallways.<sup>167</sup> Some media accounts in English and Mandarin suggest the technology has since been scaled back, while others indicate it has been removed altogether. Yet, in its brief trial period, the Smart Classroom Behavioural Management System revealed how perceptions of emotion recognition changed social dynamics in schools.

## Students' Experiences of Emotion Recognition Technologies

Despite avowals from companies such as Meezao and Hikvision that their emotion recognition applications were designed in conjunction with the schools that use them, students appeared to have been left out of these consultations. As a Hanwang Education technician put it: "We suggest the schools ask for the students' consent before using CCS [...] If they don't, there's nothing we can do."<sup>168</sup> Of the few students interviewed about their experiences of emotion recognition technologies in Chinese classrooms, none supported their schools' use of these systems.

At Hangzhou No. 11, which claims to have only tested the Hikvision Smart Classroom Behaviour Management System on two tenth-grade classes, some students were afraid when their teachers demonstrated the technology.<sup>169</sup> While one student's fear was grounded in her understanding of how powerful Hikvision's high-resolution surveillance cameras are, others worried about being academically penalised if any of their movements were recorded as unfocused.<sup>170</sup> "Ever since the 'smart eyes' have been installed in the classroom, I haven't dared to be absent-minded in class," reflected one student at Hangzhou No. 11.<sup>171</sup> This narrative can fuel belief in the power of a technology that potentially exceeds what it is being used for; one student at Niulanshan First Secondary School in Beijing was anxious that data about the moments when he is inattentive in class could be shared with universities he wants to attend.

Examples of behaviour changes in students bear out a concern that Chinese academics have regarding emotion recognition; namely, that students will develop 'performative personalities' (表演型人格), feigning interest in class if this becomes another metric on which their academic abilities are judged.<sup>172</sup> Some students found staring straight ahead was the key to convincing the system they were focused.<sup>173</sup> Experts who agree that the cameras

elicit this performative instinct, however, are not in agreement about how to respond. Shanghai Jiaotong University professor Xiong Bingqi castigates the cameras as a "very bad influence on students' development [...] [that] take[s] advantage of students" and should be removed.<sup>174</sup> He Shanyun, an associate professor of education at Zhejiang University, believes the 'role-playing' effect could be mitigated if classroom applications of emotion recognition are not tied to rewards and disciplinary measures against students, and are only used for follow-up analysis of students' learning progress. Shanghai University of Finance and Economics law professor, Hu Ling, emphasised that schools needed to do the work to convince parents and students that the technology was not being used to assess academic performance.<sup>175</sup> Yet, to place the onus for seeking consent on the school alone absolves the companies of responsibility.

Niulanshan First Secondary School teamed up with Hanwang to use the company's CCS cameras to conduct facial sampling of students every few months to account for changes in their physical appearance.<sup>176</sup> This continual sampling – coupled with accounts from students at Hangzhou No. 11, who found their school's face-recognition-enabled Hikvision cameras often failed when they changed hairstyles or wore glasses – suggests this converse scenario of error-prone cameras both undermines the argument that these new technologies are fool proof and can even lead to students being apathetic about these new measures.<sup>177</sup> At Hangzhou No. 11, some students noticed attentive classmates were sometimes mislabelled 'C' for unfocused behaviour.<sup>178</sup> Perception of this error led these students to discredit the system, with one commenting: "it's very inaccurate, so the equipment is still continually being debugged," and another admitting: "We don't look at this thing too often."<sup>179</sup>

Perceptions of inaccuracies do not always end with ignoring technology, however. Some Chinese academics see the misjudgements of emotion

recognition systems as merely a function of insufficient data, therefore requiring additional data collection for improvement. For instance, Professor He posited that a silent, expressionless student's cognitive activity may not be legible to a facial emotion-reading system, supporting a 'need for further empirical research and real-world applications to explain the relationship between [facial] expression and learning results.'<sup>180</sup> This support for more emotion recognition experiments, rather than an interrogation of the premise that emotion recognition is appropriate in classrooms, is shared among education experts who advise the government. In a panel that Hangzhou No. 11 held to seek expert opinions on its applications of Hikvision's Smart Classroom Behaviour Management System, Ren Youqun – East China Normal University professor and Secretary-General of the Education Informatization Expert Committee of China's Ministry of Education – echoed Professor He's call for more research while the technology is still immature.<sup>181</sup> Headmaster of Qingdao Hongde Elementary School and edtech expert, Lü Hongjun, concurred – with the caveat that these technologies should only be rolled out experimentally in some classrooms, rather than becoming omnipresent in schools and placing too much pressure on students.<sup>182</sup> Finally, frustration with emotion recognition in schools has cropped up in classrooms. According to Hanwang's Zhang, students at Chifeng No. 4 Middle School unplugged the system's cameras the day before their final exams.<sup>183</sup>

Students, of course, are not the only ones whose classroom experiences have been reconfigured by the introduction of emotion recognition technologies. The managerial nature of these technological interventions extend to teachers, whether they are treated as tools to measure teachers' performance or as a disciplinary aid to draw teachers' attention to distracted students.

### Teachers' Experiences of Emotion Recognition Technologies

Almost all the companies working on applying emotion recognition in educational settings claim the data they generate on students' attention levels and emotional states can be used to make teachers more effective at their jobs. The implicit and explicit pitches that emotion recognition vendors make about the technology's benefit to teachers echo the Chinese research literature, which equates facial reactions to course content with interest in the material. Statements about students' emotional responses inevitably become a commentary on teachers' performance.

New Oriental characterises facial expressions as representing 'students' true feedback' to teachers' instruction.<sup>184</sup> Comparing traditional classrooms to 'black boxes', where 'the quality of teaching could not be quantified', one account of TAL's Magic Mirror claims teachers can obtain effective suggestions to improve their instruction methods from the reports the product derives.<sup>185</sup> Haifeng Education depicts its Cape of Good Hope platform as capable of student-concentration monitoring, 'course quality analysis', and reduction of teachers' workloads. As in the papers studying how to apply emotion recognition to MOOCs, Haifeng suggests teachers can consult their platform's real-time data visualisation of students' emotional responses to a lecture, and judge how to adjust their teaching in response.<sup>186</sup> A write-up of Hangzhou No. 11's Hikvision collaboration in *ThePaper* (澎湃) likewise maintained that a teacher's popularity can be determined through comparing data on the number of 'happy' students in their class to that of another teacher who lectures the same students.<sup>187</sup> A representative of VIPKID, a popular online English teaching platform that hires foreign teachers to provide remote instruction, noted that, 'through facial expressions, parents can understand the state of their children's learning. We can also closely follow foreign teachers' teaching situation at any time.'<sup>188</sup>

At the same time, promises about advancing personalised learning and improving teacher quality fail to elaborate on what kinds of recommendations teachers are given to achieve these vague outcomes. For example, there is no clear differentiation regarding whether data on which students were 'attentive' during certain parts of a lecture reflects interest in the material, approval of a teacher's pedagogical methods, or another reason altogether – let alone guidance on how the data can be converted into personalised solutions tailored to each student.

In the aforementioned expert panel on the use of the Smart Classroom Behaviour Management System at Hangzhou No. 11, the difficulty of balancing competing interests and drawbacks to teachers and students was evident. Ni Mijing, a member of the national Committee of the Chinese People's Political Consultative Conference and deputy director of the Shanghai Municipal Education Commission, acknowledged the value of data on students' reactions to evaluations of teachers, and advocated openness to edtech trials as a way for schools to learn from their mistakes.<sup>189</sup> However, he also warned:

*"We should oppose using technology to judge the pros and cons of children's study methods, [and we] should even oppose using this set of technologies to judge teachers' teaching quality, otherwise this will produce data distortion and terrible problems for education [...] Excessive top-level design and investment are very likely to become a digital wasteland, a phenomenon I call a digital curse."<sup>190</sup>*

As with students who expressed doubts about the accuracy of Hikvision's Smart Classroom Behaviour Management System and other Hikvision face recognition cameras at their school, teachers have implied the technology has not changed much about how they do their work. For example, one teacher at Hangzhou No. 11 said: "Sometimes during class I'll glimpse at it, but I still haven't criticised students because their names appear on it."<sup>191</sup> Chinese news

reporting has paid little attention to teachers' impressions of emotion recognition, focusing more on students, as well as on the biggest champions of these technologies: school administrators.

#### School Administrators' Perceptions of Emotion Recognition Technologies

School administrators have tended to take defensive stances on the value of emotion recognition technology to their schools. The defensiveness is, in part, a response to spirited public discussion about privacy concerns surrounding the use of emotion recognition in schools in China. For instance, Megvii's implementation of an attendance-, emotion-, and behaviour-recognition camera, the MegEye-C3V-920, at China Pharmaceutical University in Nanjing met with criticism on Chinese social media.<sup>192</sup> While social media commentary focuses on a suite of privacy and rights violations, news media accounts instead tend to focus on the risks of data leakage and third-party misuse.<sup>193</sup>

Hangzhou No. 11 Principal, Ni Ziyuan, responded to criticisms that the Hikvision-built Smart Classroom Behaviour Management System violates student privacy with the rebuttal that it does not store video recordings of classroom activity, but instead merely records the behavioural information extracted from video footage.<sup>194</sup> Vice Principal Zhang Guanchao has also tried to assuage privacy concerns by pointing out that students' data are only stored on local servers (rather than in the cloud), supposedly preventing data leaks; that the school's leadership and middle management have differentiated permissions for who can access certain student data; and that the system only analyses the behaviour of groups, not individuals.<sup>195</sup> Hanwang Education's CEO maintains the company's CCS does not share reports with third parties and that, when a parent is sent still images from classroom camera footage, all students' faces except their child's are blurred out.<sup>196</sup> In general, the defences that administrators have raised ignore the concerns that students and education experts have voiced about these technologies.

Other administration accounts of the Hikvision system at Hangzhou No. 11 stand in questionable contrast with students' and teachers' comments. In an interview for *ThePaper*, Vice Principal Zhang boasted the system had achieved positive results: students were adapting their behaviour to it, and teachers used data about students' expressions and behaviour to change their approach to teaching.<sup>197</sup> While Hangzhou No. 11's principal and vice principal said facial expression and behavioural data would not affect evaluations of students' academic performance, in an interview with the *Beijing News*, Zhang said: "Right now [I] can't discuss [whether this system will extend to] evaluations."<sup>198</sup>

Despite administrators' ardent defences of the Smart Classroom Behaviour Management System, one account suggests its use was halted the same month it was launched.<sup>199</sup> In spring 2019, Vice Principal Zhang announced the school had modified its system to stop assessing students' facial expressions, although the cameras would still detect students resting heads on desks and continue to issue behavioural scores.<sup>200</sup> The contradictory statements the administration issued, along with this retraction of facial expression detection, may point to a mismatch between expectations and reality when it comes to applying emotion recognition in schools.

Positive media coverage of schools' embrace of new technologies prevail over accounts of the ultimate underuse and distrust of emotion recognition technologies in the education sector. Moreover, school administrators continue to benefit from touting these technological acquisitions when publicising themselves to local government authorities as progressive and worthy of more funding. On a national level, being the first country to publicly trial these technologies is a source of pride. For instance, one account of TAL's Magic Mirror posited that 'emotion recognition technology is also China's "representative product of independent intellectual property rights"' – a description that reappears on Hangzhou No. 11's official WeChat account in a write-up of the Hikvision Smart Classroom Behaviour Management System.<sup>201</sup>

At a local level, policymakers' guidance is more directed. The May 2018 event, at which the Hangzhou No. 11–Hikvision collaboration was first launched, was organised by the Hangzhou Educational Technology Center – itself supervised by the Hangzhou Education Bureau. The Hangzhou Educational Technology Center is in charge of both edtech procurement and technical training for primary and secondary schools in the city.<sup>202</sup> While Hangzhou is among China's wealthier cities, with resources at its disposal to conduct edtech experiments, the user bases of the aforementioned tech companies are likely to grow, leading more of them to come up against the same issues Hangzhou No. 11 did. Not all municipal and provincial governments neglect public responses to these technological interventions; Shenzhen's Municipal Education Bureau decided against implementing online video surveillance of kindergarten classrooms to protect student privacy.<sup>203</sup> Examples like this are the exception, however, and do not preclude other cities and provinces from experimenting with emotion recognition.

A central tension that schools will continue to face concerns whether emotion recognition will be used to measure academic performance, student behaviour, or both. 'Function creep' – technologies' expansion into collecting data and/or executing functions they were not originally approved to collect or execute – is another possibility. For example, in acknowledging that Hangzhou No. 11's Smart Classroom Behaviour Management System may label students who rest their heads on their desks due to illness as 'inattentive', Vice Principal Zhang suggested the school nurse's office could establish 'white lists' of ill students to prevent them from being unfairly marked as unfocused in class.<sup>204</sup> Similarly, Hangzhou No. 11 implemented facial recognition as a form of mobile payment authentication in its cafeteria in 2017. Not long after, the school used face recognition to monitor library loans and compile annual nutrition reports for each student, which shared information about students' cafeteria food consumption with their parents.<sup>205</sup>

### Parents' Perceptions of Emotion Recognition Technologies

Although parents can – in theory – advocate for their children's interests in schools, the extent to which they have done so regarding schools' use of emotion recognition is unclear. One article, reporting on a Chinese Communist Party-sponsored technology expo that featured TAL's Magic Mirror, quoted an impressed parent who felt the use of this technology made their child's education better than that of their parents' generation.<sup>206</sup> Yet, a blog post declared that parents disliked this monitoring of their children, and that some companies subsequently removed phrases like 'emotion recognition', 'facial recognition', and 'magic mirror' from their marketing.<sup>207</sup>

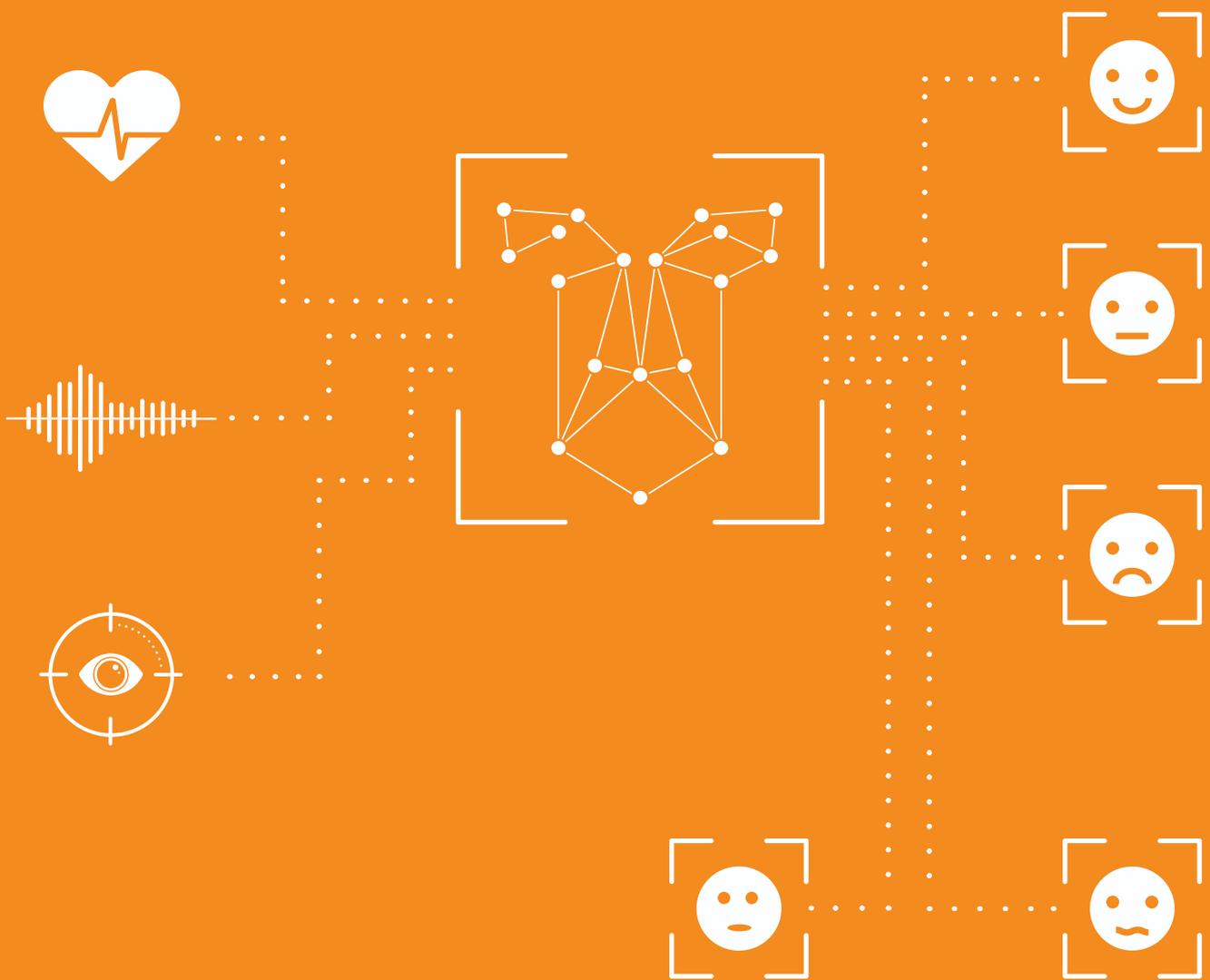
Regardless of parents' views on the issue, Professor Hu Ling of Shanghai University of Finance and Economics noted that "schools hold the power to evaluate, punish, and expel", and so "parents won't sacrifice the students' futures by standing up against the schools, which leaves the students in the most vulnerable position."<sup>208</sup> Companies, too, wield power over parents. In discussing the appeal of their product, Hanwang Education's CEO

commented on Chinese parents' vigilance over their children's academic performance and behaviour in class as a product of the national education system's focus on testing as a central determinant of future opportunities.<sup>209</sup>

Professor Hu hit upon the question that schools will continue to revisit regarding not only emotion recognition, but also all future technological interventions that purportedly make education more efficient, effective, quantifiable, and manageable:

“ *The most fundamental question is, what do we expect education to become? If it is guided by efficient test-taking, it will naturally cut all classroom behaviour into fragments, layers, and scores, [and] an algorithm will evaluate if you are a child who loves to learn or if you are a child who doesn't love to learn.*”<sup>210</sup>

### 3. Emotion Recognition and Human Rights



International human rights are guaranteed by the Universal Declaration of Human Rights and given binding legal force through the International Covenant on Civil and Political Rights (ICCPR) and in regional treaties.

States are under binding legal obligations to promote, respect, protect, and guarantee human rights in these treaties. They are also under the obligation to provide guidance to businesses on how to respect human rights throughout their operations.<sup>211</sup>

Private companies also have responsibility to respect human rights; the *Guiding Principles on Business and Human Rights* provide a starting point for articulating the role of the private sector in protecting human rights in relation to digital technologies. Even though these principles are not binding, the UN Special Rapporteur on Freedom of Expression and Opinion has stated that 'the companies' overwhelming role in public life globally argues strongly for their adoption and implementation'.<sup>212</sup>

While we have discussed the dubious scientific foundations that underpin emotion recognition technologies, it is crucial to note that, emotion recognition technologies serve as a basis to restrict access to services and opportunities, as well as disproportionately impacting vulnerable individuals in society. They are therefore fundamentally inconsistent with international human rights standards, described in this chapter.

Human dignity underpins and pervades these human rights instruments.<sup>213</sup> As stated in the Preamble to the ICCPR, '[human] rights derive from the inherent dignity of the human person', which is underscored by the fact that it [dignity] is not a concept confined to preambulatory clauses alone but is also used in context of substantive rights.<sup>214</sup> Emotion recognition strikes at the heart of this concept by contemplating analysing and classifying human beings into arbitrary categories that touch on the most personal aspects of their being. Overarchingly, the very use of emotion recognition imperils human dignity and, in turn, human rights –

particularly given the discriminatory and discredited scientific foundations on which this technology is built.

## Right to Privacy

Emotion recognition technologies require collecting sensitive personal information for both training and application. Individuals being identified, analysed, and classified may have no knowledge that they are being subject to these processes, making the risks that emotion recognition poses to individual rights and freedoms grave. While these technologies in isolation do not necessarily identify individuals, they can be used to corroborate identities when used among other technologies that carry out identification. This significantly impedes ability to remain anonymous, a key concept in the protection of the right to privacy as well as freedom of expression.<sup>215</sup>

A common thread across all use cases discussed in this report is the concentration of state and industry power; to use emotion recognition technologies, companies and state actors have to engage in constant, intrusive, and arbitrary qualitative judgements to assess individuals. It is important, therefore, to consider surveillance as an inevitable outcome of all emotion recognition applications. For example, all the use cases for early warning, closer monitoring, and interrogation related to public security are deployed on the grounds that they are necessary to prevent crime and ensure safety. In practice, however, they are deployed indiscriminately for fishing expeditions that are unrelated to the needs of a particular operation. Mass surveillance thus increasingly becomes an end in and of itself. Further, the stated purpose of driving-safety applications is to ensure driver and passenger safety, but the outcome includes systematic invasions of privacy and significant mission creep, in the case of biometric information potentially being used for insurance purposes. A basic tenet of international human rights law is that rights may not be violated in ways that confer unfettered discretion to entities in power, which is a feature of – not a bug in – these technologies.

Any interference with the right to privacy must be provided by law, in pursuit of a legitimate aim, and necessary and proportionate.<sup>216</sup> Privacy concerns over biometric mass surveillance have received dedicated attention in the last few years. In a 2018 report on the right to privacy in the digital age, the UN High Commissioner for Human Rights, while discussing significant human rights concerns raised by biometric technologies, stated:

*“Such data is particularly sensitive, as it is by definition inseparably linked to a particular person and that person's life, and has the potential to be gravely abused [...] Moreover, biometric data may be used for different purposes from those for which it was collected, including the unlawful tracking and monitoring of individuals. Given those risks, particular attention should be paid to questions of necessity and proportionality in the collection of biometric data. Against that background, it is worrisome that some States are embarking on vast biometric data-based projects without having adequate legal and procedural safeguards in place.”<sup>217</sup>*

As noted by the UN Special Rapporteur on Privacy, ‘evidence has not yet been made available that would persuade the [Special Rapporteur] of the proportionality or necessity of laws regulating surveillance which permit bulk acquisition of all kinds of data including metadata as well as content’.<sup>218</sup>

Importantly, the nature of these technologies is also at odds with the notion of preserving human dignity, and constitutes a wholly unnecessary method of achieving the purported aims of national security, public order, and so on (as the case may be). While international human rights standards carve out national security and public order as legitimate justifications for the restriction of human rights, including privacy, these situations do not give states free rein to arbitrarily procure and use technologies that have an impact on human rights; nor do they permit states to violate rights without providing narrowly tailored justifications and valid, specific reasons for doing so.<sup>219</sup>

## Right to Freedom of Expression

Freedom of expression and privacy are mutually reinforcing rights. Privacy is a prerequisite to the meaningful exercise of freedom of expression, particularly given its role in preventing state and corporate surveillance that stifles free expression. While freedom of expression is fundamental to diverse cultural expression, creativity, and innovation, as well as the development of one's personality through self-expression, the right to privacy is essential to ensuring individuals' autonomy, facilitating the development of their sense of self, and enabling them to forge relationships with others.<sup>220</sup>

Claims that emotion recognition technology can infer people's 'true' inner states, and making decisions based on these inferences has two significant implications for freedom of expression. First, it gives way to significant chilling effects on the right to freedom of expression – the notion of being not only seen and identified, but also judged and classified, functions as an intimidation mechanism to make individuals conform to 'good' forms of self-expression lest they be classified as 'suspicious', 'risky', 'sleepy', or 'inattentive' (depending on the use case). Second, given the wide range of current applications, it normalises mass surveillance as part of an individual's daily life, in public and private spaces. Proposed uses, such as the research paper suggesting deployment of emotion recognition technology to identify people entering Tibet who have pro-Tibetan independence views, create a dangerously low threshold for authorities to misidentify self-incriminating behaviour in a region that is already over-surveilled. Importantly, freedom of expression includes the right *not* to speak or express oneself.<sup>221</sup>

Right to information is an important part of freedom of expression. This includes transparency of how state institutions are operating and making public affairs open to public scrutiny so as to enable citizens to understand the actions of their governments. The UN Special Rapporteur on the promotion and protection of the right to freedom of opinion and expression emphasised that:

*“Core requirements for democratic governance, such as transparency, the accountability of public authorities or the promotion of participatory decision-making processes, are practically unattainable without adequate access to information. Combating and responding to corruption, for example, require the adoption of procedures and regulations that allow members of the public to obtain information on the organization, functioning and decision-making processes of its public administration.”<sup>222</sup>*

Companies are also subject to transparency obligations under the *Guiding Principles on Business and Human Rights*, which require business enterprises to have in place ‘Processes to enable the remediation of any adverse human rights impacts they cause or to which they contribute’.<sup>223</sup>

## Right to Protest

The use of emotion recognition can have significant implications for right to protest, that also includes freedom of assembly, including potential discriminatory and disproportionate impacts, when deployed for the purpose of public safety and security in the context of assemblies.<sup>224</sup> A number of examples from around the world demonstrate the tendency of states engaging in unlawful, arbitrary, or unnecessary surveillance to identify individuals exercising their right to protest.<sup>225</sup> Emotion recognition adds a layer of complication and arbitrariness to an already worrying trend, given the lack of a legal basis, the absence of safeguards, and the extremely intrusive nature of these technologies. The UN Special Rapporteur on the Rights to Freedom of Peaceful Assembly and of Association has stated:

*“The use of surveillance techniques for the indiscriminate and untargeted surveillance of those exercising their right to peaceful assembly and association, in both physical and digital spaces, should be prohibited. Surveillance against individuals exercising their rights of peaceful assembly and association can only be conducted on a targeted basis, where there is a reasonable*

*suspicion that they are engaging in or planning to engage in serious criminal offences, and under the very strictest rules, operating on principles of necessity and proportionality and providing for close judicial supervision”.*<sup>226</sup>

## Right Against Self-Incrimination

In public and national security use cases, emotion recognition often paves the way for people to be labelled as ‘suspicious’ or meriting closer inspection, and is also used at the stage of interrogation. The attribution of emotions like guilt, anger, frustration, and so on is conducted and determined by the entity deploying this technology, which collects, processes, and categorises information to make inferences that can have a detrimental impact on human rights. This runs counter to the right against self-incrimination contemplated in international human rights law. Article 14(3)(g) of the ICCPR lays down that the minimum guarantee in the determination of any criminal charge is that every person is entitled ‘not to be compelled to testify against himself or to confess guilt’. This includes the right to silence.<sup>227</sup> Emotion recognition flips the script on this right, and is used to detect and signal guilt. Importantly, this right against self-incrimination applies to *all* stages of criminal proceedings, from the time a person is suspected to the time of conviction (if it is so proved).

## Non-Discrimination

Since emotion recognition is intrinsically predicated on mass surveillance, it can have a disproportionate impact on historically disadvantaged groups. For instance, the security applications entail mass surveillance in public spaces, and lend themselves to flagging individuals who belong to historically marginalised groups, like ethnic minorities, or who find immigration and security lines more ‘stressful’ than others. Hence, the use of emotion recognition will lead to new fault lines along which individuals are classified, with no obligations for these fault lines to have any correlation to objective or verifiable truths. This technology is poised to lead to discrimination, as individuals who do not conform to the norms guiding discredited scientific foundations

(e.g. people of colour, transgender, and non-binary individuals) will be disproportionately surveilled, tracked, and judged.

The UN Human Rights Council has emphasised that 'automatic processing of personal data for individual profiling may lead to discrimination or decisions that otherwise have the potential to affect the enjoyment of human rights, including economic, social and cultural rights'.<sup>228</sup> Although profiling can lead to discriminatory outcomes in disproportionate ways regardless of the specific technology in question, this risk is even more pronounced in the case of emotion recognition, as the criteria for classification are primed for discrimination. Consequential decisions in the contexts of hiring, national security, driving safety, education, and criminal investigations are often built on the foundations of such profiling.

## Other Technical and Policy Considerations

A number of additional strategic and substantive threads of analysis in the Chinese context are worth noting. We outline these thematically below to aid in effective civil society advocacy going forward.

### Function Creep

The intended goal for the use of emotion recognition systems has varied between use cases, but indications of function creep beyond use cases discussed in this report already exist. Ping An Group's demonstration, from late 2019, indicates the firm's intention to move past using emotion recognition to monitor safety and avert accidents, and towards feeding into insurance assessments.<sup>229</sup> Meezao has already pivoted from only providing emotion recognition in schools to also offering these technologies at the China Museum of Science and Technology to collect data on children's responses to physics and chemistry experiments.<sup>230</sup> This function creep has happened before: in 2017, Hangzhou No. 11 introduced facial-

recognition authentication for cafeteria payments, and subsequently expanded its use to monitoring library loans and nutrition reports for each student, outlining food consumption information for parents.<sup>231</sup>

This function creep also stems from a more general 'tech-solutionist' tendency to using new technologies to solve administrative and social problems.

### Growing Chorus of Technical Concerns

There is growing recognition of the limitations of emotion recognition technologies from the developers, implementers, and individuals subject to them. Experts who advocate using emotion recognition for security, in particular, acknowledge some drawbacks to this technology. However, most of their critiques address the technical concerns of surveillers at the expense of the real-life impacts on those being surveilled. For example, Wenzhou customs officials published a research paper on automated identification of micro-expressions in customs inspections, which admits that camera-footage quality, lighting, and the added anxiety and fatigue of travel can affect how micro-expressions are produced, recorded, and interpreted.<sup>232</sup>

False positives are another commonly recognised issue; however, the Chinese research and security literature often attributes these to the person under surveillance deliberately feigning emotions, rather than to the system's own flaws. The most well-known of these is the 'Othello error', in which someone telling the truth unintentionally produces micro-expressions associated with liars. This is a particularly important finding, from a human rights perspective, as the overarching issues surrounding dignity, privacy, and freedom of expression seem to be precluded from public deliberation and critique of emotion recognition technologies.

## Misaligned Stakeholder Incentives

Cooperation between academic research institutions, tech companies, and local state actors reveals the perceived benefits to each group of participating in the diffusion of these technologies, which is at odds with the human rights concerns arising from them. As one study of facial recognition firms in China found, companies that received training data from the government were more likely to spin off additional government and commercial software.<sup>233</sup> As such – and aside from procurement contracts to furnish technology for Sharp Eyes, Fengqiao, and related pre-existing government surveillance projects – emotion recognition firms may see longer-term financial opportunities and profits from these multi-institutional collaborations.

## Regional and Global Impact

Throughout the literature on emotion recognition technology in China, few companies have expressed the intention of exporting their products at this phase of their development. Media coverage of EmoKit – the company that partnered with the city of Qujing, Yunnan, to pilot test its emotion recognition interrogation platform – suggested Yunnan's geographical proximity to South and Southeast Asia could be advantageous for exports to countries that comprise the OBOR and Maritime Silk Road regions.<sup>234</sup> While OBOR represents a terrestrial route connecting China to Europe via Central Asia, the Maritime Silk Road is the Indian Ocean-traversing counterpart that connects ports in China, South and Southeast Asia, the Middle East, and Eastern Africa. Alpha Hawkeye has allegedly supplied OBOR countries with its technology for counterterrorism and garnered interest from Southeast Asian security departments in the Philippines, Malaysia, Thailand, Myanmar, and Indonesia.<sup>235</sup> Publicly available data have not provided additional evidence of this, however, and the company's own media presence has dwindled in the last two years.

Yet, if the 'biometrics 3.0' framing of emotion recognition as a next step from face recognition persists – and if these firms demonstrate that emotion recognition capabilities are easily applied

where face recognition cameras are already in use – the other places to watch for potential export are markets where Chinese tech companies have already sold face recognition cameras. For instance, Hikvision has provided surveillance equipment to schools in Canada, Denmark, Dubai, India, Japan, Malaysia, Pakistan, and South Africa,<sup>236</sup> while Huawei has provided numerous cities around the globe – including in Asia, Africa, and Latin America – with policing platforms.<sup>237</sup> In 2017, Huawei issued a call for proposals that included 'dialog emotion detection based on context information', 'emotional state analysis based on speech audio signal', and multimodal emotion recognition.<sup>238</sup>

## Ethnicity and Emotion

Racial, gender-based, and intersectional forms of discrimination in biometric technologies like face recognition have been demonstrated in a wide range of academic and civil society research in the last few years. The UN Special Rapporteur on Contemporary Forms of Racism calls for 'racial equality and non-discrimination principles to bear on the structural and institutional impacts of emerging digital technologies'.<sup>239</sup> Criticisms of facial recognition technologies' inaccuracies across skin tone and gender map onto debates around emotion recognition, along with an additional variable: cultural differences in expressions of emotion.

With some exceptions, Chinese companies tend to tout the narrative that facial emotion expressions are universal,<sup>240</sup> but years of scientific evidence demonstrate cultural differences in facial expressions and the emotions they are interpreted to signify. This marketing strategy is unsurprising, however, given its ability to boost faith in the technology's alleged objectivity and to unearth 'true' emotions, while also paving a future path to its international export. Wang Liying, a technical director at Alpha Hawkeye, proclaimed that 'the entire recognition process is uninfluenced by expression, race, age, and shielding of the face'.<sup>241</sup>

Research suggests otherwise. In her paper 'Racial Influence on Automated Perceptions of Emotions,' Professor Lauren Rhue compiled a dataset of headshots of white and Black male National

Basketball Association (NBA) players to compare the emotional analysis components of Chinese face recognition company Megvii's Face++ software to Microsoft's Face API (application programming interface). In particular, she found 'Face++ rates black faces as twice as angry as white faces,' while Face API views Black faces as three times as angry as white ones.<sup>242</sup>

China is not the only country whose tech firms factor race into facial recognition and related technologies. However, its tech sector's growing influence over international technical standards-setting for these technologies presents an opportunity to address the domestically long-ignored consequences of technological racial and ethnic profiling. Instead of this open reckoning, admission of racial inequities in training datasets tends to become a justification for the creation of datasets of 'Chinese faces' to reduce inaccuracies in domestic applications of emotion recognition.<sup>243</sup> Arguments like this account for the potential bias of datasets that may over-represent a tacitly implied Han Chinese range of facial features and expressions while failing to address if and how new datasets created within China will draw samples from China's 56 officially recognised ethnic groups.

Some companies' open-source APIs include race variables that raise a host of concerns about human rights implications particularly for ethnic minorities – even before considering sources of training data, accuracy rates, and model interpretability. Baidu's face-detection API documentation includes parameters for emotion detection as well as race, with a sample of an API call return including 'yellow' as a type of race. Taigusys Computing's open-source expression-recognition API includes 'yellow', 'white', 'black', and 'Arabs' (黄种人, 白种人, 黑种人, 阿拉伯人) as its four racial categories. Neither company accounts for why race would be assessed alongside emotion in their APIs. This is untenable for two reasons. First, fundamental issues surrounding the discredited scientific foundations and racist legacy of emotion recognition makes

the existence of such systems (and categories) deeply problematic. Second, the solution to the discriminatory effects of these systems is not to add more nuanced alternatives for categorising race, but rather to ban the use of such technologies altogether.<sup>244</sup>

## Companies' Claims About Mental Health and Neurological Conditions

Proposed uses of emotion recognition to help people with neurological conditions, disabilities, and mental health afflictions are not new to the field. Affectiva has stated it began its work by developing a 'Google Glass-like device that helped individuals on the autism spectrum read the social and emotional cues of other people they are interacting with'.<sup>245</sup> While this report excludes an in-depth analysis of similar use cases, which are often carried out in medical institutions, it must take into account a critical omission in the emerging literature on commercial applications of emotion recognition in China: thus far, companies have ignored questions of how these technologies will work for neurodiverse individuals. Companies engaged in non-medical applications make particularly troubling claims about their ability to detect mental health disorders and neurological conditions (both diseases and disorders) – highly discrete categories that this literature often groups together, as though they were indistinguishable.

Chinese companies like Taigusys Computing and EmoKit have mentioned autism, schizophrenia, and depression as conditions they can diagnose and monitor using micro-expression recognition.<sup>246</sup> Meezao CEO Zhao said the company is testing its emotion recognition technology on children with disabilities; for instance, to detect types of smiling that could serve as early indicators of epilepsy.<sup>247</sup> One concern is that these systems will impose norms about neurotypical behaviour on people who do not display it in a way the technology is designed to detect.<sup>248</sup> Another possible issue involves potential discrimination against people the technology perceives as exhibiting such conditions.

Although Meezao's public-facing marketing materials have sidestepped the question of what emotion recognition reveals about students' mental health, a 2018 academic paper featuring the company's CEO as a co-author, entitled 'Application of data mining for young children education using emotion information', briefly touches on this topic.<sup>249</sup> The paper cites research that has found suicide to be the top cause of death among Chinese adolescents, and it partially attributes this to Chinese families lacking contact with their children and paying insufficient attention to their children's emotions.<sup>250</sup> In support of the paper's proposed emotion recognition intervention, the co-authors maintain that:

*"Our system has the potential to help analyze incidents such as child abuse and school bullying. Since our intelligent system can help catch and analyze abnormal situation [sic] for discovering and solving problems in time, it will be easier to protect children from hurt. For instance, if a child shows persistent or extremely negative emotions, it is rational for us to pay attention to what he/she has suffered."<sup>251</sup>*

Of the companies that insist they can detect these conditions, none have offered explanations of how their technologies analyse emotions while taking this assessment into account; for example, how might a student with attention deficit hyperactivity disorder (ADHD) be monitored for attentiveness, compared with her classmates who do not have this diagnosis? In general, Chinese researchers and tech firms appear not to have deliberated about how differently abled and neurodiverse people will interact with emotion recognition systems built into any of the use cases explored in this report.

## Emotion and Culpability

The inherent ethnic and ableist biases that may seep into emotion recognition's use can be amplified when early-warning systems flag individuals or groups who exhibit 'suspicious' emotions as deserving of additional monitoring. Although a 2016 research paper by two engineers from Shanghai Jiaotong University was met with major international criticism for perpetuating racism – the authors developed an algorithmic way to detect facial features that allegedly correlate to criminality – opposition to this type of work has, unfortunately, not hindered related uses of emotion recognition.<sup>252</sup> Claims that emotion recognition technologies' use in surveillance and interrogation reduce prejudice – because they are seen as faster, imperceptible to people under surveillance, and 'objective' compared with human, error-prone alternatives – detract from the greater likelihood that they will instead be more discriminatory for everyone.

Some companies unwittingly expose this reality in their appeals to law enforcement officials. A 'market pain point' that EmoKit singles out is that amendments to Chinese criminal law have *raised* standards for evidence, investigations, and trials. The company claims that, faced with these 'implementations of principles of respect and protections of human rights [...] basic-level police forces are seriously inadequate, and need to achieve breakthroughs in cases within a limited period of time. [They] urgently need new technologies.'<sup>253</sup> The implication here is that emotion recognition technologies, like those EmoKit provides for police interrogation, can circumvent some of the new safeguards set in place to protect suspects' rights.

Although not all police officers view this approach as a way to get around the law, an equally problematic possibility is that some will believe that using emotion recognition in interrogation is more scientific and rights-protective. As far back as 2014, an academic paper from the People's Public Security University of China, detailing how law enforcement officials could be trained to visually observe micro-expressions, made a similar argument:

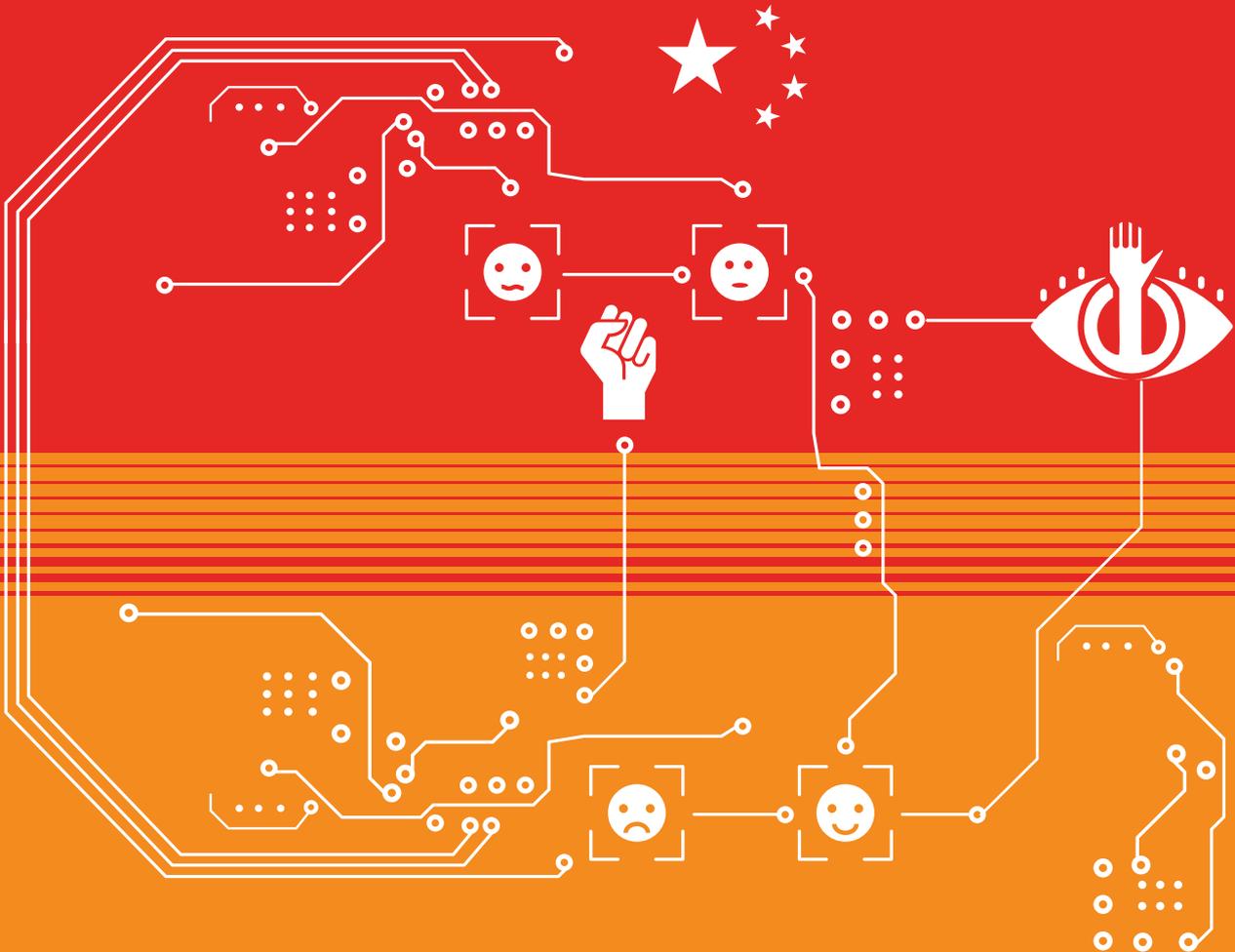
*"Under the new Criminal Procedure Law's principle that 'no individuals can be forced to prove their guilt,' it has become more difficult to obtain confessions. Criminal suspects often respond to questioning with silence and unresponsiveness. In actuality, it is common for investigations to turn up no clues. Micro-expression analysis techniques can now solve this issue."*<sup>254</sup>

Specifically, investigators would be trained to introduce 'stimuli' – such as the names of people and objects related to a crime – while watching for micro-expressions that correspond to these words. They would then treat terms that elicit these minute responses as 'clues' in a case. The paper presaged the ability to return to archival interrogation video footage to search for moments when incriminating micro-expressions appeared. When AI is brought

into the procedure, even more of these moments can presumably be identified. An article about Shenzhen Anshibao confirmed the technology could be used for post-mortem emotion recognition, citing video footage of the Boston marathon bombing as an example.<sup>255</sup>

The role of security blacklists and criminal backgrounds is also critical to the justifications that companies, researchers, and the state present for emotion recognition. Advocates of emotion recognition for public security note that, while face recognition enables cross-checking with police blacklist databases, they fail to account for people who lack criminal records. One paper, from the Public Security College of Gansu University of Political Science and Law, laments that current facial recognition systems in China lack data on residents of Hong Kong, Taiwan, Macao, and other foreign nationals. Micro-expression recognition, the authors argue, would widen the net of which 'dangerous' people can be flagged in early-warning systems.<sup>256</sup> This suggestion takes on added portent in light of China's recent crackdowns on Hong Kong protests and the instatement of China's new national security law there.

# 4. China's Legal Framework and Human Rights



China's legal landscape around data protection and AI is multi-layered and constantly evolving. Two of the main contributions of this report are:

1. Unpacking one national context – including incentives, actors, and narratives – within which these systems are meant to function; and
2. Demonstrating the fundamental incompatibility of emotion recognition systems with international human rights law.

This section lays down relevant Chinese legal standards and norms that will feed into the regulation and development of the emotion recognition market, with the aim of providing a sense of the landscape and open questions to ask in future work.

## China's National Legal Framework

### Relationship to International Legal Frameworks

In October 1998, China signed, but did not ratify, the ICCPR. This has been the focus of much international and national scrutiny, with several pushes for ratification; at the time of writing this report, however, it has still not been ratified.<sup>257</sup> Even so, China remains bound by the provisions of the ICCPR to some degree. In the 2016–2020 National Human Rights Action Plan for China, the Information Office of the State Council states:

*“China shall continue to advance related legal preparations and pave the way for ratification of the International Covenant on Civil and Political Rights.*

*China shall fully participate in the work of the UN's human rights mechanisms, and promote the United Nations Human Rights Council (HRC) and other mechanisms to attach equal importance to economic, social and cultural rights as well as civil and political rights, and function in a fair, objective and non-selective manner”.*<sup>258</sup>

The legal preparations to ratify the ICCPR have been in motion for at least a decade, with little tangible progress.<sup>259</sup> It is not clear what incremental advances towards this goal are implied in the 2016–2020 National Human Rights Action Plan.

## National Law

### Chinese Constitution

Article 40 of the Chinese Constitution enshrines the privacy of correspondence, although this does not extend to individual data or information.<sup>260</sup> While Article 35 states: ‘Citizens of the People's Republic of China enjoy freedom of speech, of the press, of assembly, of association, of procession and of demonstration’, there is little elaboration on what this encompasses or how it is legally construed. Given that the constitution does not qualify as a valid legal basis of judicial decision or interpretation in China, its scope is decidedly limited.<sup>261</sup>

Even so, the pushback against unfettered collection of biometric data and mass surveillance of individuals is steadily growing through a constitutional focus. In a compelling case against the use of facial recognition in subways, for instance, a professor at Tsinghua University argued that the authorities in question did not prove the legitimacy of collecting sensitive personal information for this purpose, and invoked constitutional principles of equality, liberty, and personal freedoms.<sup>262</sup>

### Data Protection

China's data-protection landscape is chiefly motivated by the pursuit of corporate accountability, as opposed to the protection of individual autonomy, of human rights, or against overreach of government power.<sup>263</sup> This stems from a generally low level of trust within the economy and increasing suspicion of fraud and cheating. The construction of safeguards and guidelines, despite drawing strong influences from the General Data Protection Regulation (GDPR), are therefore similar in form but not in incentives.

## Instruments

The Chinese data-protection landscape consists of multiple instruments. At the time of writing, the interplay between these instruments is unclear, as are precise legal definitions and practical enforcement of proposed standards. The room for interpretation and executive decisions around definitions is large, which is an important consideration in dissecting this area of law.

The 2017 Cybersecurity Law is the most authoritative piece of data-protection legislation in China thus far, entering the public eye amid aggressive plans for AI development and leadership.<sup>264</sup> It was enacted to 'ensure cybersecurity; safeguard cyberspace sovereignty and national security, and social and public interests; protect the lawful rights and interests of citizens, legal persons, and other organizations; and promote the healthy development of the informatization of the economy and society'.<sup>265</sup> Within China's governance framework, and in tandem with the National Security Law and the Counterterrorism Law, the Cybersecurity Law reinforces the amalgamation of data security and national security that is pervasive throughout China's data-protection regime.<sup>266</sup> In general, the approach to data protection in China is risk-based, and does not stem from wider rights-based considerations. The Consumer Rights Protection Law, for instance, explicitly lays down provisions for the protection of consumers' personal information, and was the instrument through which consumers challenged Alibaba over a breach of personal data in 2018.<sup>267</sup>

The Draft Data Security Law, released in 2020, fleshes out regulation and specifications for the governance of data related to national security and the public interest.<sup>268</sup> Alongside the Data Security Law, the draft Personal Information Protection Law, released in October 2020, focuses on the protection of personal-information rights and specifically addresses the installation of image-collection and -recognition equipment, stating that such collection can only be used 'for the purpose of safeguarding

public security; it may not be published or provided to other persons, except where individuals' specific consent is contained or laws or administrative regulations provide otherwise'.<sup>269</sup>

The Cybersecurity Law makes China's priorities around governing information and communications technologies (ICT) explicit, and gives rise to wide-ranging institutional actors, substantive areas of focus, regulations, and standards. The Cybersecurity Law has been described as sitting astride six distinct systems, which make up the evolving framework governing ICT in China.<sup>270</sup> The Personal Information and Important Data Protection System is one example.

The first significant set of rules for the protection of personal information, the Personal Information Security Specification, became operational in May 2018 and was revised in 2020.<sup>271</sup> Issued by China's national standards body, TC260, it contains guidelines for collection, storage, use, sharing, transfer, and public disclosure of personal information. 'Standards', in the Chinese context, are understood as not only technical specifications but also policy guidelines or legislation laying down benchmarks against which companies can be audited. Standards are also powerful indicators of what authorities and legislators should aspire to, both at the time of enforcement and while formulating laws. This makes them a significant piece of the data-protection puzzle in China, given the wide ambit for authorities' discretion in interpretation and enforcement.

The Specification is chiefly meant to address security challenges. According to drafters of the standard, it was modelled after the GDPR, but with important differences regarding the definition of consent (by allowing implied or silent consent) and personal-data processing in lieu of consent – a salient departure for the purposes of this report, as the intention was to be more 'business-friendly' than the GDPR and to enable the proliferation of China's AI economy, which depends on access to large datasets.<sup>272</sup>

## Biometric Data

Biometric information is explicitly included in the definition of personal information under both the Cybersecurity Law and the Specification. However, the Specification includes it under the definition of both personal information and sensitive personal information, calling for encryption at the time of transferring and storing the latter class of data. Sensitive personal information includes the personal data of children aged 14 and younger. This creates confusion as to legitimate grounds for the collection and use of biometric data, especially given the different standards of consent required for each: while personal data requires authorised consent, sensitive personal data mandates explicit consent. Crucially, under the Specification, consent need not be obtained in cases related to national security, public safety, significant public interest, and criminal investigations, among others – all grounds that will be invoked in the use cases discussed in this report.

However, the regulation of biometric data within this evolving regime potentially goes beyond the confines of personal data. The Cybersecurity Law contemplates two broad types of data: personal information and 'important data'. Requirements for the storage, processing, sharing, and consent of data depend on how they are classified. Although 'important data' has yet to be defined clearly, one essay by the lead drafter of the Specification, Dr Hong Yanqing, states that personal data refers to autonomy and control over one's data, whereas important data affects national security, the national economy, and people's livelihoods.<sup>273</sup> Although a more precise definition is crucial for in-depth analysis, at first glance, biometrics falls under both categories.

The Draft Data Security Law, for instance, establishes a system for classification of data which would invoke distinct grades of data protection, contingent on the level of risk and potential severity of harm that may arise from the abuse of data in the context of, inter alia, national security, public interests, falsifying data, and so on. It also anticipates that governments and concerned agencies will define what constitutes 'important data'.

## Standardisation

A number of data- and AI-related standards have cropped up in China over the last few years and, given their function as both regulatory tools and technical specifications, deserve special attention. In addition to the international standardisation efforts already discussed in this paper (e.g. ITU and the unique regulatory effect of standards like the Personal Information Security Specification), a number of developments significantly impact biometric technologies.

In 2018, the Standards Administration of China released a White Paper on AI Standardization, which recognises that, 'because the development of AI is occurring as more and more personal data are being recorded and analyzed [...] in the midst of this process, protecting personal privacy is an important condition for increasing social trust'.<sup>274</sup> Trust seems to be a prevalent theme throughout standardisation efforts: in 2019, the China Electronics Standardization Institute released a Biometric Recognition White Paper noting the importance of standardisation in ensuring product quality and testing capabilities.<sup>275</sup> The State Council's New Generation Artificial Intelligence Development Plan calls for establishing an AI standards system and places immediate emphasis on the principles of security, availability, interoperability, and traceability.<sup>276</sup>

In line with the risk-based approach to biometric governance, TC260 released the Information Security Technology Security Impact Assessment Guide of Personal Information, which was intended to establish privacy impact assessments that lend structure to identifying risks to personal information, and which addresses both private and government actors. In forging principles for assessing impact on data subjects' rights and interests, it classifies discrimination, reputational damage, fraud, and health deterioration as high-impact risks. Discrimination, in particular, is also classified as a serious impact insofar as data subjects suffer major, irrevocable, and insurmountable impacts.<sup>277</sup>

## Ethical Frameworks

One of the most prominent AI ethics statements to come out of China is from the Artificial Intelligence Industry Alliance, which, in 2019, published a self-discipline 'joint pledge' underscoring the need to:

*"Establish a correct view of artificial intelligence development; clarify the basic principles and operational guides for the development and use of artificial intelligence; help to build an inclusive and shared, fair and orderly development environment; and form a sustainable development model that is safe/secure, trustworthy, rational, and responsible."*<sup>278</sup>

In line with priorities across regulatory tools, antidiscrimination is a prominent standard on which AI testing and development is predicated. The joint pledge calls for AI to avoid bias or discrimination against specific groups or individuals, and for companies to: 'Continually test and validate algorithms, so that they do not discriminate against users based on race, gender, nationality, age, religious beliefs, etc.' In June 2019, an expert committee set up by China's Ministry of Science and Technology put forward eight principles for AI governance, which – in line with similar efforts – underlined the importance of eliminating discrimination.<sup>279</sup> The committee's recommendations came on the heels of the Beijing Academy of Artificial Intelligence's Beijing AI Principles, which called for making AI systems 'as fair as possible, reducing possible discrimination'.<sup>280</sup>

## 5. Recommendations

This report has covered vast terrain: from the legacy and efficacy of emotion recognition systems to an analysis of the Chinese market for these technologies. We direct our recommendations as follows.

To the Chinese Government:

1. **Ban the development, sale, transfer, and use of emotion recognition technologies.** These technologies are based on discriminatory methods that researchers within the fields of affective computing and psychology contest.
2. **Ensure that individuals already impacted by emotion recognition technologies have access to effective remedies for violation of their rights** through judicial, administrative, legislative or other appropriate means. This should include measures to reduce legal, practical and other relevant barriers that could lead to a denial of access to remedies.

To the International Community:

1. **Ban the conception, design, development, deployment, sale, import and export of emotion recognition technologies,** in recognition of their fundamental inconsistency with international human rights standards.

To the Private Companies Investigated in this Report:

1. **Halt the design, development, and deployment of emotion recognition technologies,** as they hold massive potential to negatively affect people's lives and livelihoods, and are fundamentally and intrinsically incompatible with international human rights standards.
2. **Provide disclosure to individuals impacted by these technologies and ensure that effective, accessible and equitable grievance mechanisms** are available to them for violation of their rights as result of being targeted emotion recognition.

To Civil Society and Academia:

1. **Advocate for the ban on the design, development, testing, sale, use, import, and export of emotion recognition technology.**
2. **Support further research in this field,** and urgently work to build resistance by emphasising human rights violations linked to uses of emotion recognition.

## Endnotes

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