

SenseTime (20 HK)

Unrivalled computer vision leader in China

SenseTime is China's AI computer vision pioneer with 11% market share in 2020. We expect SenseTime FY20-23E revenue to grow at 43% CAGR on the expansion of AI deployment across Smart Business, Smart City, Smart Life and Smart Auto verticals. We initiate at BUY with target price of HK\$8.08, based on 34x FY22E EV/sales.

- **China's largest AI computer vision software company.** SenseTime, founded in 2014, is China's largest AI computer vision (CV) software company in terms of revenue with 11% market share in 2020, according to Frost & Sullivan. Revenue is primarily generated through the sales of AI software platform to companies across Smart Business, Smart City, Smart Life and Smart Auto verticals. As of 30 Jun 2021, SenseTime has produced 22,196 AI models and has served over 2,400 customers and 119 cities.
- **China CV software market to grow at 43.5% CAGR in 2020-2025E.** China CV software market size is expected to reach RMB101.7bn in 2025E (23.0% of the global CV software market), according to Frost & Sullivan. We think SenseTime prevails over other CV-centric software peers in terms of revenue size (RMB3.4bn in FY20), gross margin (70.6% in FY20), R&D capability (3,593 R&D staff) and computing capacity (>20,000 GPUs).
- **Proprietary AI infrastructure is the key success factor.** SenseTime's secret sauce is its proprietary AI infrastructure – SenseCore. The Company relies on its self-developed deep learning framework to streamline AI model production process. Meanwhile, by adopting a base model approach, SenseTime can address “long-tail” demands arising from different industrial scenarios. Annual average AI models produced per person has significantly improved from 0.44/3.45 in 2019/2020 to 5.24 in 1H21.
- **Initiate at BUY.** We expect SenseTime revenue to grow at 37% CAGR from RMB3,446mn in FY20 to RMB8,825mn in FY23E. We initiate at BUY with target price of HK\$8.08, based on 34x FY22E EV/sales (20% premium to closest comparable Cambricon). Key risks include tightening U.S. restrictions, evolving data privacy regulations, lengthening working capital and weakening macro environment that results in a slower enterprise/ gov't AI adoption pace.

Earnings Summary

(YE 31 Dec)	FY19A	FY20A	FY21E	FY22E	FY23E
Revenue (RMB mn)	3,027	3,446	4,678	6,399	8,825
YoY (%)	63%	14%	36%	37%	38%
Adj. Op. profit (RMB mn)	(1,416)	(2,148)	(3,818)	(2,584)	(2,392)
YoY (%)	n.a.	n.a.	n.a.	n.a.	n.a.
Net profit att. (RMB mn)	(4,963)	(12,158)	(32,489)	(1,812)	(1,547)
YoY (%)	n.a.	n.a.	n.a.	n.a.	n.a.
Adj. net profit att. (RMB mn)	(1,150)	(708)	(2,072)	(1,306)	(975)
YoY (%)	n.a.	n.a.	n.a.	n.a.	n.a.
EV/sales (x)	59.1	49.6	36.6	27.2	19.9
FCF margin (%)	-125%	-74%	-128%	-40%	-21%
ROE (%)	n.a.	n.a.	n.a.	n.a.	n.a.
Net gearing (%) *	net cash	net cash	net cash	net cash	net cash

Source: Company data, Bloomberg, CMBIS estimates, *excl. preferred shares liabilities

BUY (Initiation)

Target Price	HK\$8.08
Up/Downside	+20.1%
Current Price	HK\$6.73

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Stock Data

Mkt Cap (HK\$ mn)	225,505
Avg 3 mths t/o (HK\$ mn)	N/A
52w High/Low (HK\$)	9.70/ 3.90
Total Issued Shares (mn)	25,979

Source: Bloomberg

Shareholding Structure

Prof. Tang	26.3%
Softbank	14.1%
Alibaba	7.2%

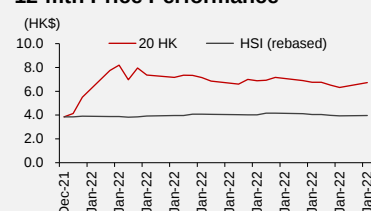
Source: HKEX

Share Performance

	Absolute	Relative
1-mth	53.0%	50.2%
3-mth	NA	NA
6-mth	NA	NA

Source: Bloomberg

12-mth Price Performance



Source: Bloomberg

Auditor: PwC

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Investment Thesis

Massive untapped AI computer vision opportunities

China computer vision software market is expected to grow at 43.5% CAGR from RMB16.7bn in 2020 to RMB101.7bn in 2025E, according to Frost & Sullivan. In 2018 to 2020, Computer Vision applications centered around City Management and Enterprises applications but the mix is expected to change as Consumer (55.0% CAGR) and Automotive (66.4% CAGR) markets will outgrow in 2020 to 2025E.

Largest computer vision software provider in China with 11% share

SenseTime is the largest AI software provider in Asia, and the largest computer vision software provider in China with 11% market share in terms of revenue in 2020, according to Frost & Sullivan. We think SenseTime prevails over other computer vision-centric software peers given larger revenue size (RMB3,446mn in FY20), higher gross margin (70.6% vs. peers avg. 51%), stronger R&D capability (RMB2,454mn R&D spending in FY20, 3,593 R&D staff as of FY1H21) and superior computing capacity (23 supercomputing clusters, over 20,000 GPUs).

Proprietary AI infrastructure as the secret sauce

Traditional approach in producing AI model demands large volumes of domain-specific training data and lengthy training process. SenseTime relies on its self-developed deep learning framework to develop AI models efficiently and address “long-tail” demands through a base model approach. AI models are first trained with massive generalized data and the “knowledge” learned is fine-tuned to produce scenario-specific models. SenseCore enables shorter AI model development time. In 2019 and 1H21, annual average AI models produced per person significantly improved from 0.44 to 5.24 respectively.

Diversified and expanding business use cases

SenseTime has over 22,000 commercialized AI models and has served over 2,400 customers as of 30 Jun 2021. The Company has a broad customer base that covers a wide range of scenarios, such as city/ traffic management, defects identification for manufacturing production lines, human-machine interactions in the Metaverse, disease diagnosis and autonomous driving.

FY20-23E revenue to grow at 37% CAGR

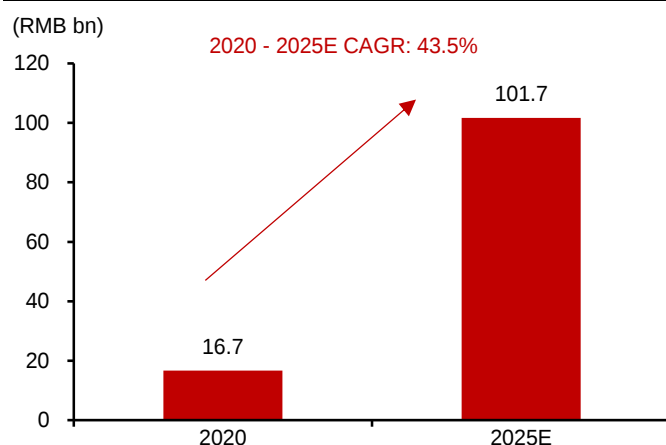
We estimate SenseTime revenue to grow at 37% CAGR from RMB3,446mn in FY20 to RMB8,825mn in FY23E, driven by expanding customer/ cities coverage, more AI applications, and new revenue stream from AI-as-a-Service/ CMOS sensors/ ISP chips. However, we expect adjusted net loss to widen from RMB708mn in FY20 to RMB975mn in FY23E as GPM will decline with more hardware sales (ISP chip, Robobus).

Initiate at BUY with target price of HK\$8.08

We initiate coverage with BUY recommendation and target price of HK\$8.08, based on 34x FY22E EV/sales. We use EV/sales as the primary valuation methodology as operating leverage is insignificant in the early stage of AI deployment given high R&D, marketing and depreciation. Our target multiple is based on 20% premium to Cambricon (688256 CH). We think Cambricon, leading AI chip design company in China, is the closest comparable. We also take into account the business scale, scarcity in number of listed AI companies and free float into our consideration. Key risks include tightening U.S. restrictions, evolving data privacy regulations, lengthening working capital and weakening macro environment.

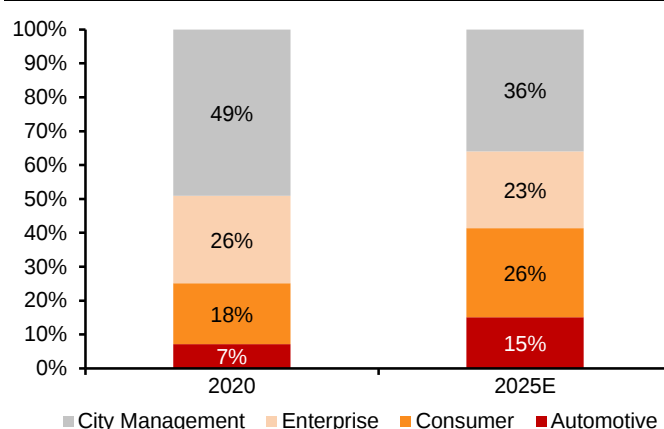
Focus Charts

Figure 1: China computer vision market to increase at 43.5% CAGR in FY20-25E



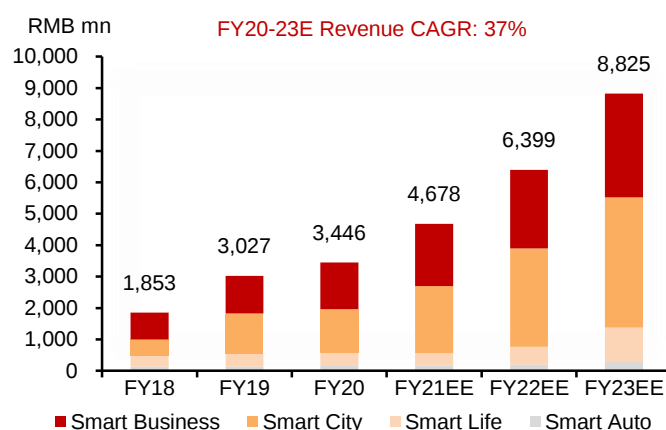
Source: Frost & Sullivan, CMBIS

Figure 2: China CV software market mix will change on stronger Consumer and Automotive growth



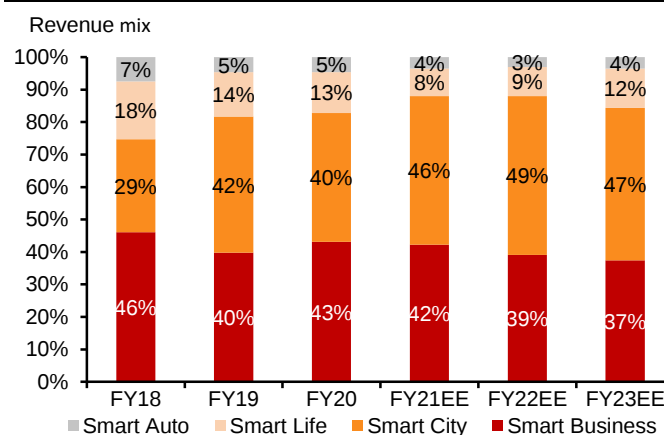
Source: Frost & Sullivan, CMBIS

Figure 3: SenseTime revenue to grow at 37% CAGR in FY20-23E



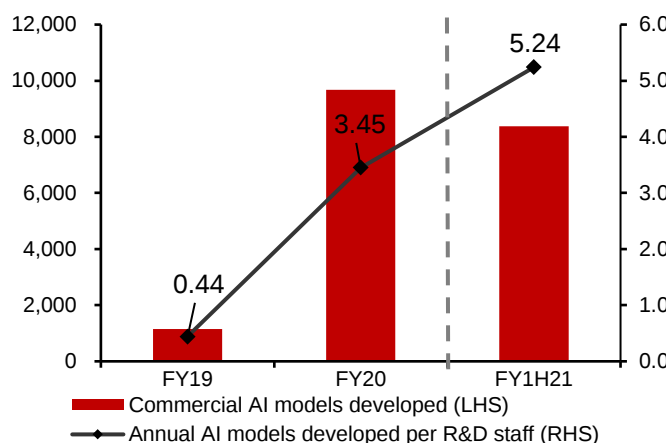
Source: Company data, CMBIS estimates

Figure 4: SenseTime AI are deployed in a wide range of scenarios



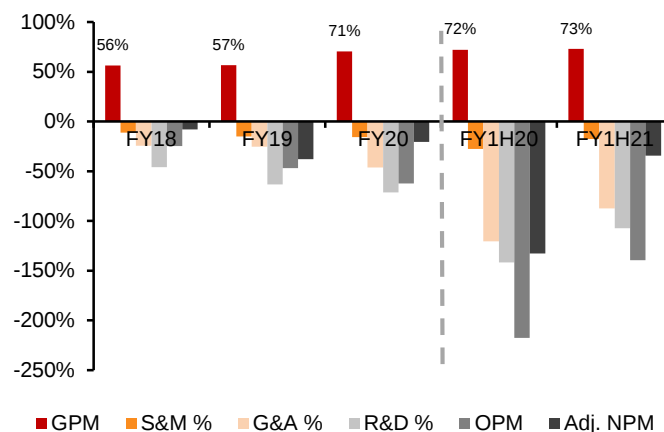
Source: Company data, CMBIS estimates

Figure 5: SenseCore enables more efficient AI model development



Source: Company data, CMBIS

Figure 6: SenseTime has high GPM (71% in FY20) due to its AI software-centric business model

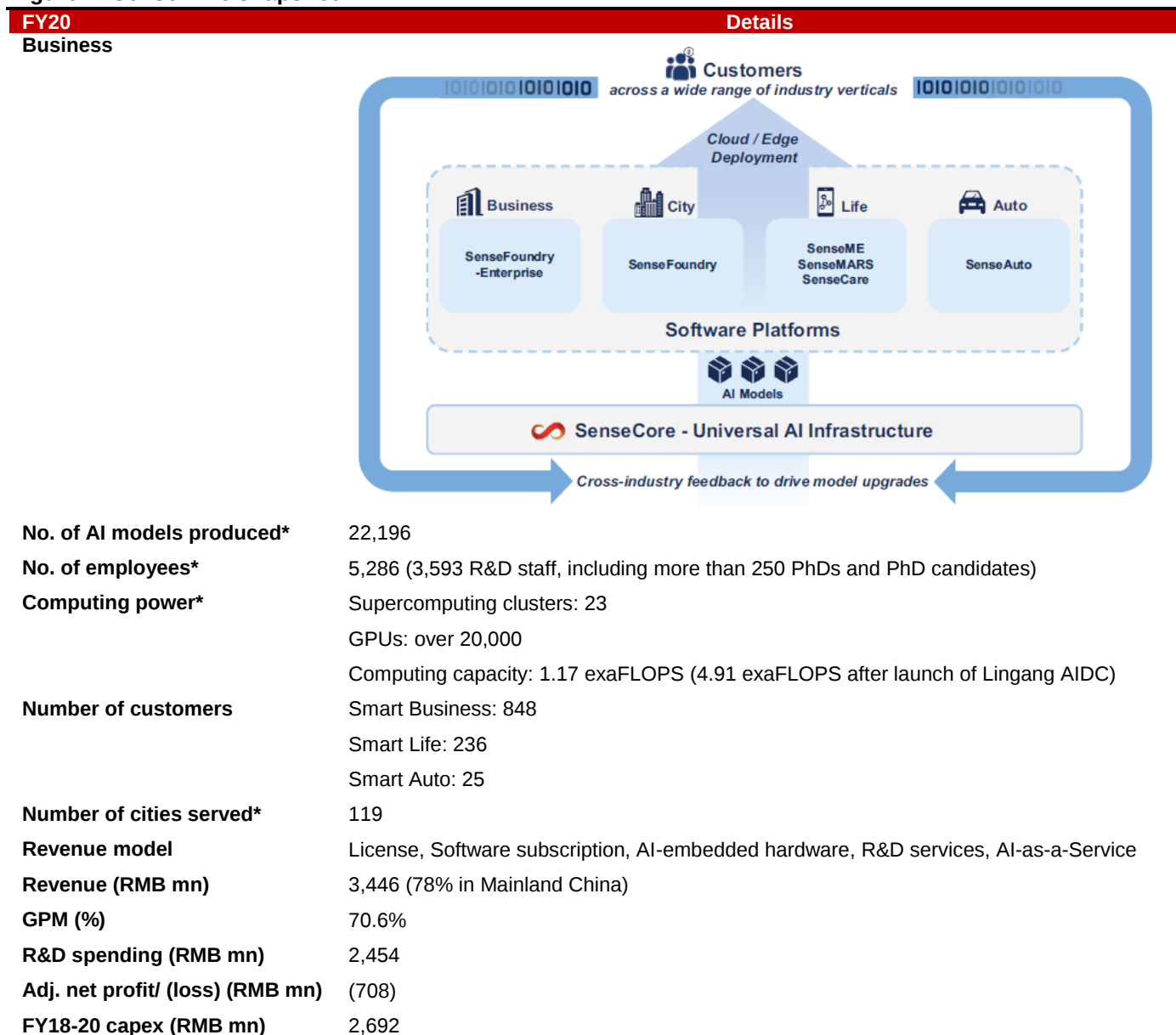


Source: Company data, CMBIS

Company overview

SenseTime, founded in 2014, is China's largest AI computer vision software company with 11% market share in terms of revenue in 2020, according to Frost & Sullivan. SenseTime has four business segments including Smart Business, Smart City, Smart Life and Smart Auto. The Company generates revenue primarily from sales of software platforms, comprising software licenses, AI software-embedded hardware and related services. As of 30 Jun 2021, SenseTime has produced 22,196 AI models and has served a total of 2,400 customers, 119 cities and over 30 automobile companies, while empowering over 450mn mobile phones and over 200 mobile apps.

Figure 7: SenseTime snapshot



Source: Company data, CMBIS, *as of 30 Jun 2021

Massive untapped AI computer vision opportunities

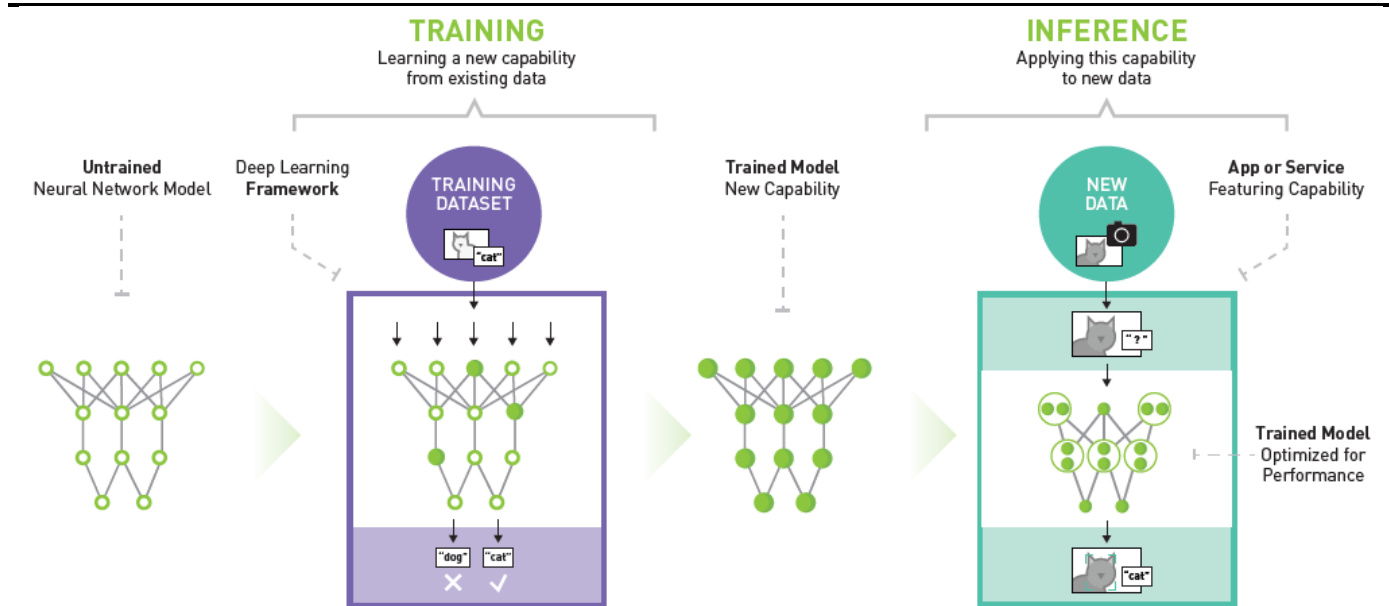
China AI software market is expected to grow at 41.5% CAGR from RMB29.5bn in 2020 to RMB167.1bn in 2025E and that Computer Vision will contribute 60.9% in 2025E, according to Frost & Sullivan. In 2018 to 2020, Computer Vision applications centered around City Management and Enterprises applications but the mix is expected to change as Consumer and Automotive markets will outgrow in 2020 to 2025E. Although the U.S. government has imposed a series of restrictions towards China AI companies, we find no material adverse impact to SenseTime business.

Data and computing power drive AI advancement

Artificial Intelligence (AI) is a branch of computer science that seeks to create software that simulates human intelligence by enabling machines to mimic the perceptual and cognitive capabilities. AI models are mathematical algorithms that take unstructured data as input and transform them into informative output through its “intelligence”. An AI application is a software product that integrates a group of AI models.

AI models are produced by a training process that requires a large amount of computing power and data. Breakthroughs in deep learning technology, growing number of IoT devices and increasing computing power have created the pillars for developing AI models.

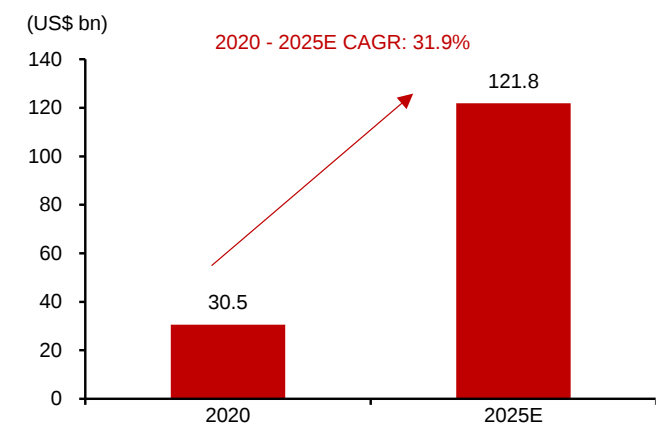
Figure 8: Deep learning basic



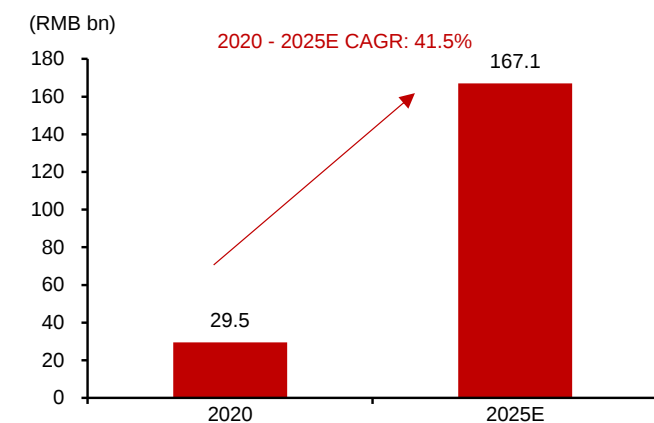
Source: Nvidia (<https://developer.nvidia.com/blog/nvidia-deep-learning-inference-platform-performance-study/>)

China AI software market to grow at 41.5% CAGR in FY20-25E

In terms of market size, the global AI software market size is expected to grow at 31.9% CAGR from US\$30.5bn in 2020 to US\$121.8bn in 2025E, according to Frost & Sullivan. China AI software market is projected to grow at a faster pace at 41.5% CAGR, from RMB29.5bn in 2020 to RMB167.1bn in 2025E.

Figure 9: Global AI software market size

Source: Frost & Sullivan, CMBIS

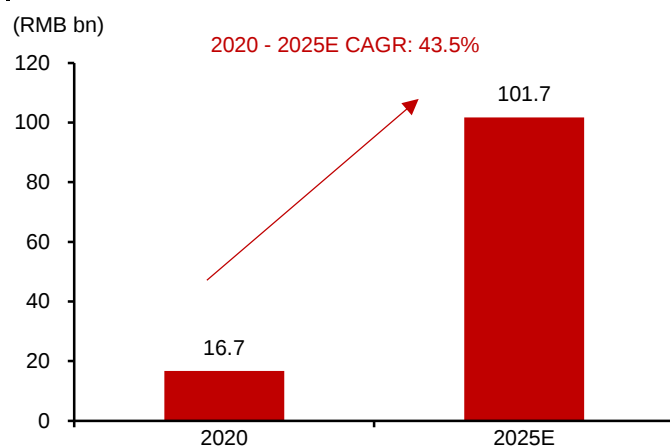
Figure 10: China AI software market size

Source: Frost & Sullivan, CMBIS

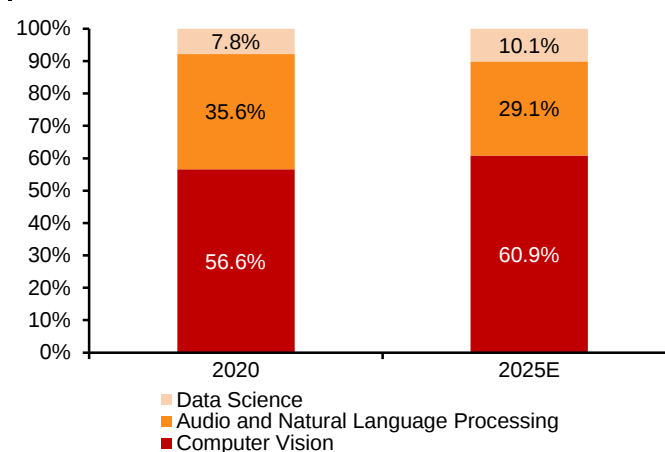
Computer vision to take up 60.9% of China AI software market

AI software markets can be categorized into three segments including (i) computer vision, (ii) speech recognition and natural language processing, and (iii) data science (decision intelligence). Among the AI software segment, computer vision is a major perception capability that has been successfully commercialized. Contribution from computer vision to China AI software market is estimated to reach 60.9% in 2025E (vs. 56.6% in 2020).

China computer vision software market is expected to grow at 43.5% CAGR, from RMB16.7bn in 2020 to RMB101.7bn in 2025E, accounting for 23.0% of the global computer vision software market, compared to 18.0% in 2020, according to Frost & Sullivan.

Figure 11: China computer vision market size

Source: Frost & Sullivan, CMBIS

Figure 12: China AI software market segments

Source: Frost & Sullivan, CMBIS

Expanding computer vision applications amid digitalization

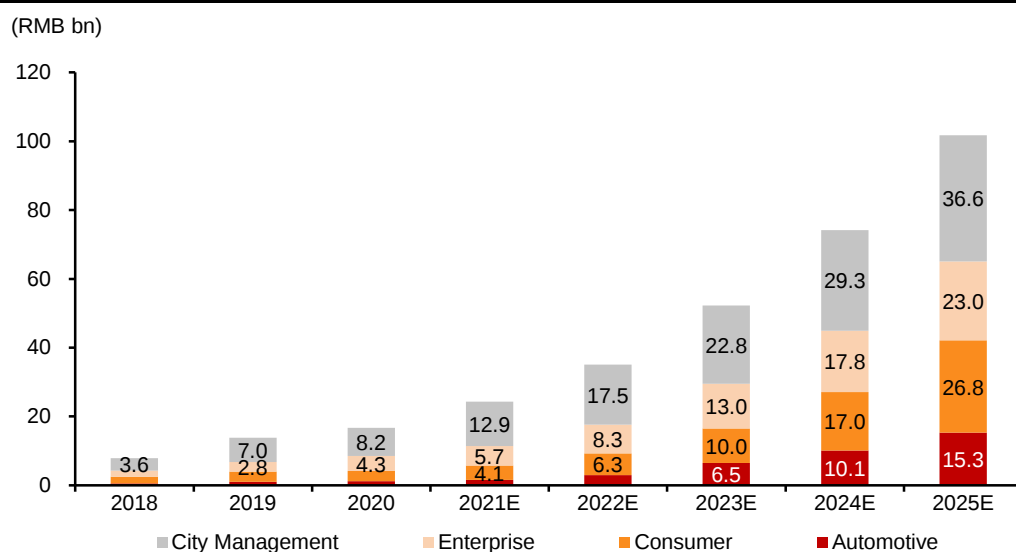
Computer vision applications can be classified based on use case.

In 2018 - 2020, computer vision applications in China centered around City Management (49% of the market in 2020) and Enterprise (26%). City Management includes public services in traffic management, safety, environmental protection, urban management and emergency responses. Market size has grown from RMB3.6bn in 2018 to RMB8.2bn in 2020 (50.9% CAGR). For Enterprise applications, it mainly includes operation digitalization

to improve labor efficiency and enhance user experience. Market has grown from RMB1.8bn to RMB4.3bn at 54.6% CAGR between 2018 and 2020.

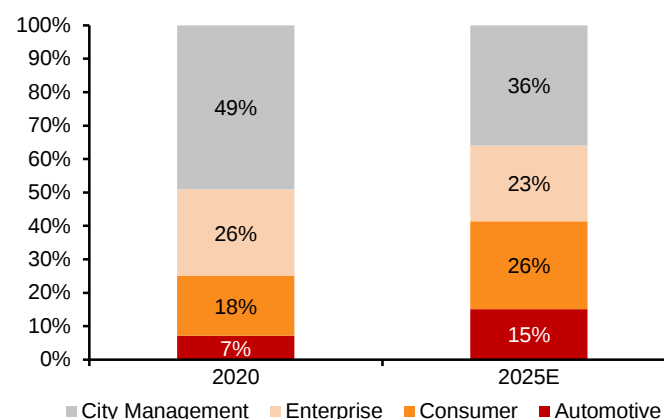
In 2020 - 2025E, the mix is expected to change as Consumer and Automotive applications market will outgrow that of enterprise and city management. Computer vision applications for consumer industry is expected to increase from RMB3.0bn in 2020 to RMB26.8bn in 2025E (55.0% CAGR). This is mainly driven by proliferation of IoT devices, increasing demand for AI-enhanced user experience and expanding AI applications in the healthcare industry. For Automotive, the growth will be even faster at 66.4% CAGR from RMB1.2bn in 2020 to RMB15.3bn in 2025E, as a result from wider adoption of autonomous driving technologies, increasing demand for intelligent features and favorable environment for autonomous driving.

Figure 13: China computer vision software market (by segment)



Source: Frost & Sullivan, CMBIS

Figure 14: China computer vision software market mix (by segment)



Source: Frost & Sullivan, CMBIS

Figure 15: China computer vision software market growth (by segment)

CAGR	2018 - 2020	2020 - 2025E
Automotive	54.9%	66.4%
Consumer	22.5%	55.0%
Enterprise	54.6%	39.8%
City management	50.9%	34.9%
Total	46.3%	43.5%

Source: Frost & Sullivan, CMBIS

The U.S. has imposed a series of restrictions towards China technology sector

The U.S. government has imposed a series of restrictions over Chinese technology companies since Apr 2018 when ZTE was being added into the Entity List. We identified three types of restrictions that the U.S. has taken towards the China technology industry.

1) Entity List

Companies under the entity list are subject to the EAR (Export Administration Regulations) for the export or transfer of U.S. hardware, software or technology. Items subject to EAR include:

- Items located in or exported from the U.S. and all items produced in the U.S.
- Items not made in the U.S. but contain more than a *de minimis* amount (25% in general) of controlled U.S.-origin content.

As a result, component suppliers have to determine the % of U.S.-origin content in every product that they ship to companies under the Entity List based on cost of goods sold (raw materials, assembly, testing) and software (lines of code, R&D headcount distribution).

In May 2020, U.S. amended the Foreign Direct Product rule to restrict Huawei's ability to use U.S. technology and software to design and manufacture its semiconductors abroad. This bans Hisilicon completely as in 1) Hisilicon cannot use U.S. EDA (Electronic Design Automation) tool to design chips and 2) foundry (e.g. TSMC, Samsung, SMIC) will have to apply for license before supplying Hisilicon given that U.S. equipment is used when making those chips.

2) Non-SDN Chinese Military Industrial Complex Companies List (NS-CMIC list)

On 3 Jun 2021, U.S. president Joseph Biden replaced the Communist Chinese Military Company (CCMC) list issued by the Department of Defense with the Non-SDN Chinese Military Industrial Complex Companies List (NS-CMIC list).

The NS-CMIC list prohibits U.S. persons from "purchase or sale of any publicly trade securities, or any public traded securities that are derivative of such securities or are designed to provide investment exposure to such securities, of any person listed as a CMIC", subject to a 365 days grace period.

3) Barring U.S. government from buying products from certain companies

Since Aug 2018, U.S. prohibited federal agencies to procure from Huawei, ZTE, Hikvision, Dahua and Hytera, under the National Defense Authorization Act (NDAA) 2019. The rule does not apply to U.S. enterprises.

Implications to SenseTime related to U.S. restrictions

We think the current U.S. restrictions imposed on SenseTime have no material adverse impact to SenseTime business, although we cannot rule out the possibility that the U.S. government may place tighter regulations in the future.

Impact to SenseTime from existing U.S. restrictions:

1) Entity List only applies to one subsidiary, not the listed entity

Beijing SenseTime, one of SenseTime's subsidiaries, was added to the Entity List on 9 Oct 2019. SenseTime's legal advisors as to U.S. export control laws, Hughes Hubbard & Reed LLP, confirmed that suppliers can continue to provide items subject to the EAR to other Group entities as long as such items are not transferred to Beijing SenseTime in any means and that Beijing SenseTime is not the end-user.

2) NS-CMIC list applies to one subsidiary, not the listed entity

SenseTime Group Limited is being added to the NS-CMIC list on 10 Dec 2021. Based on Hughes Hubbard & Reed LLP, the designation of SenseTime Group Limited as a CMIC only restricts U.S. person from purchasing or selling the relevant securities of SenseTime Group Limited, a wholly owned subsidiary of the listed entity (SenseTime Group Inc.). However, SenseTime Group Inc. has excluded U.S. investors from subscribing for IPO given evolving nature of U.S. regulations.

3) SenseTime can still supply to U.S. companies, including federal government

SenseTime is not being banned from doing business with U.S. companies or even the federal government agencies, unlike Huawei, ZTE, Hikvision, Dahua and Hytera.

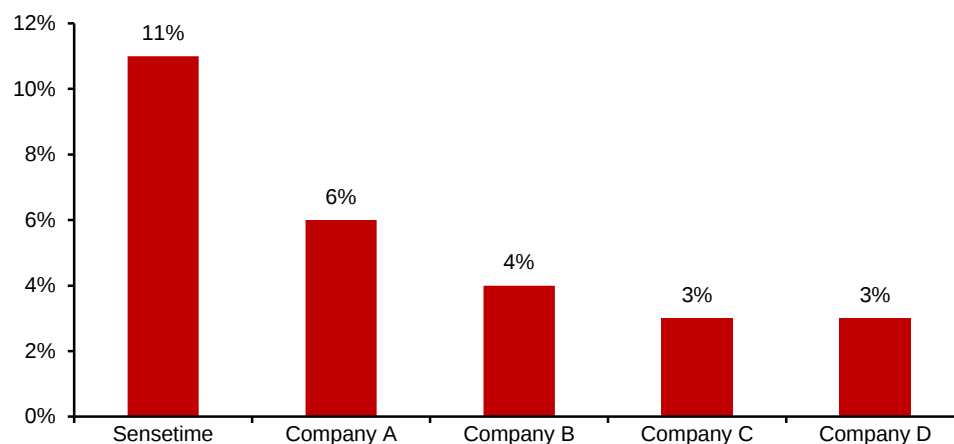
Competitive landscape

SenseTime is the largest AI software provider in Asia, and the largest computer vision software provider in China with 11% market share in terms of revenue in 2020, according to Frost & Sullivan. We think SenseTime prevails over other computer vision-centric software peers given larger revenue, higher gross margin, stronger R&D capability and superior computing capacity.

Competitors in computer vision software market in China can be categorized into

- 1) **Computer vision-centric software companies:** We identified Megvii, Yitu, CloudWalk, Intellifusion, Alinnovation, DeepGlint, ArcSoft being major competitors. We think SenseTime competes with these companies directly in public sector, enterprise and consumer markets but not in automotive industry.
- 2) **Computer vision related hardware providers:** We identified Hikvision and Dahua being close competitors. Hikvision and Dahua are hardware-centric total solution providers (from hardware manufacturing to on-site implementation). This is different from SenseTime which focuses specifically on AI software. As such, SenseTime FY20 gross margin was at 71% (vs. Hikvision and Dahua average of 45%).
- 3) **Cloud service providers.** We identified Huawei, Alibaba, Baidu and Tencent being close competitors. These companies provide a range of AI capabilities (not only computer vision but also speech recognition and decision intelligence) as part of the product offerings on their respective cloud platforms.

Figure 16: SenseTime has 11% share in China computer vision software market



(1) Company A is a leading computer vision-related hardware provider with business mainly covering the public sectors and enterprises. Company A is listed on the Shenzhen Stock Exchange.

(2) Company B is a leading cloud service, telecom equipment and consumer electronics provider.

(3) Company C is a leading computer vision-centric software company with businesses mainly covering public sectors and enterprise applications.

(4) Company D is a leading technology company offering internet-related services and products in entertainment, artificial intelligence, cloud services and other technologies. Company D is listed on both the Nasdaq and the Stock Exchange.

Source: Frost & Sullivan, CMBIS

Figure 17: China AI computer vision peers

	SenseTime 商汤科技	Megvii 旷视科技	Yitu^ 依图	CloudWalk 云从	Intellifusion 云天励飞	Alinnovation 创新奇智	DeepGlint 格灵深瞳	ArcSoft 虹软科技
2020	20 HK	Private	Private	Private	Private	Private	Private	688088 CH
Year established	2014	2011	2013	2015	2014	2018	2012	2003
Revenue size (RMB mn)	3,446	1,391	717	755	426	462	243	683
Geographic mix								
China	78%	95%	85%	100%	100%	100%	99%	52%
Overseas	22%	5%	15%	0%	0%	0%	1%	48%
Margins								
GPM	71%	33%	64%	43%	37%	29%	62%	90%
OPM	-62%	-103%	-131%	-100%	-226%	-65%	-46%	28%
NPM	-25%	-94%	-509%	-86%	-52%	-31%	21%	11%
Employee								
Total *	5,286	2,899	1,507	1,799	789	365	263	679
R&D *	3,593	1,345	837	997	470	196	146	460
R&D								
Expenditure (RMB mn)	2,454	999	657	578	219	182	114	259
as % of revenue	71.2%	71.9%	91.7%	76.6%	51.4%	39.3%	47.1%	38.0%
No. of patents granted *	1,324	699	115	258	263	104	28	172

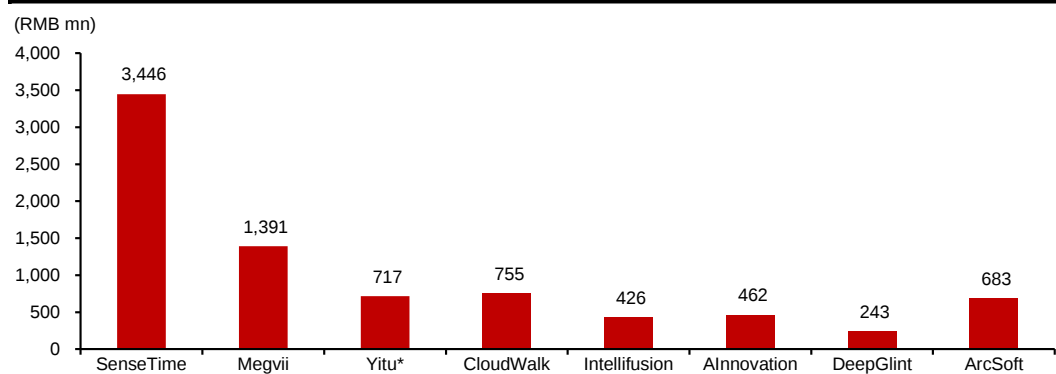
Source: Company data, Bloomberg, CMBIS * as of latest available date, ^Yitu data as of FY19

Revenue and verticals

SenseTime, Megvii, Yitu, CloudWalk, Intellifusion and DeepGlint are AI software-centric providers of city/ enterprise management products and services. Hikvision and Dahua are hardware-centric companies that provide total solution, from manufacturing their own cameras and servers to on-site testing and implementation. Alinnovation focuses more on manufacturing (42% of FY20 revenue) and financial (40%) industries while ArcSoft provides computer vision software mainly to smartphone brands (88%).

Among the vision-centric software companies, SenseTime is the largest in terms of revenue size. Its FY20 revenue was more than double than Megvii, who ranked the second in terms of revenue size.

Figure 18: Revenue comparison among computer vision peers



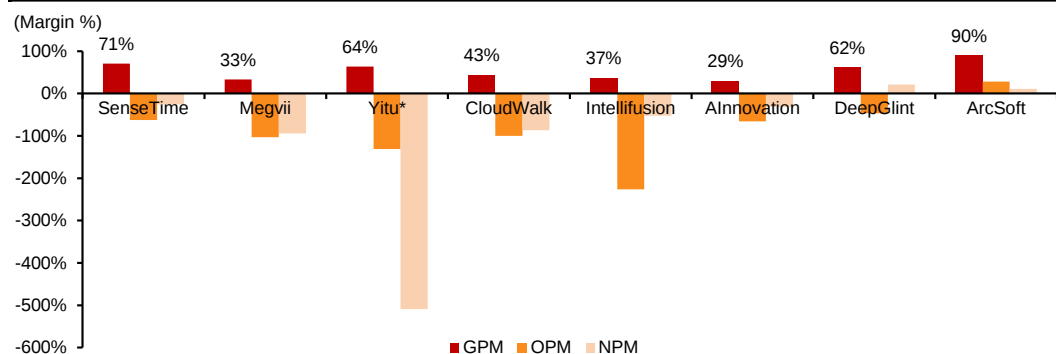
Source: Company data, Bloomberg, CMBIS *Yitu data as of FY19

Margins and business model

Most of the software-centric computer vision companies are in operating loss position in FY20 given high R&D/ S&M expenses. SenseTime is among which having the highest gross margin in FY20 at 71%. Other software-centric companies' gross margin ranges from 29% to 64%, if we excludes ArcSoft that focuses on smartphone with standardized and mature software product.

We believe the gross margin gap reflects SenseTime positioning (AI software centric) while other companies involve more hardware sales and software customization. Total solution providers like Hikvision and Dahua have average gross margin of 45% in FY20.

Figure 19: Margins comparison among computer vision peers



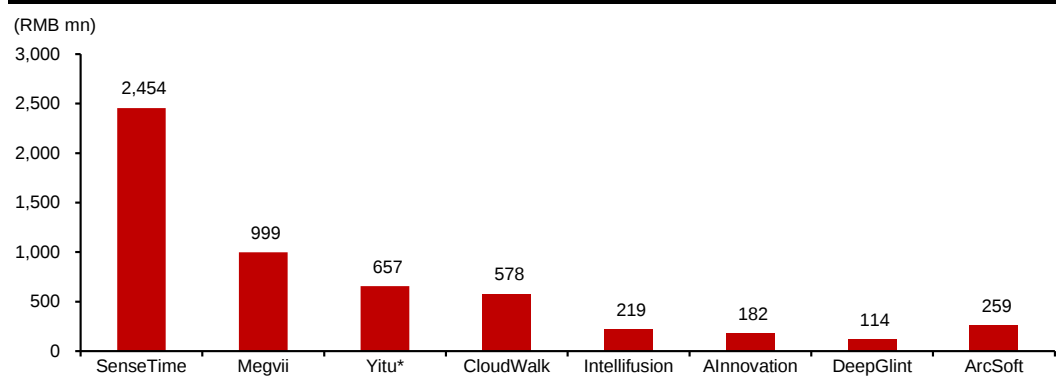
Source: Company data, Bloomberg, CMBIS *Yitu data as of FY19

R&D capability

SenseTime R&D spending was RMB2,454mn in FY20. If we exclude Hikvision and Dahua which spend not only on AI software but also a wide scope of hardware design (e.g. camera, video recorder, server, sensor, robotics, etc.), SenseTime R&D spending was the highest among software-centric AI peers. Compared to the 2nd player Megvii, SenseTime spending was around 2.5x more.

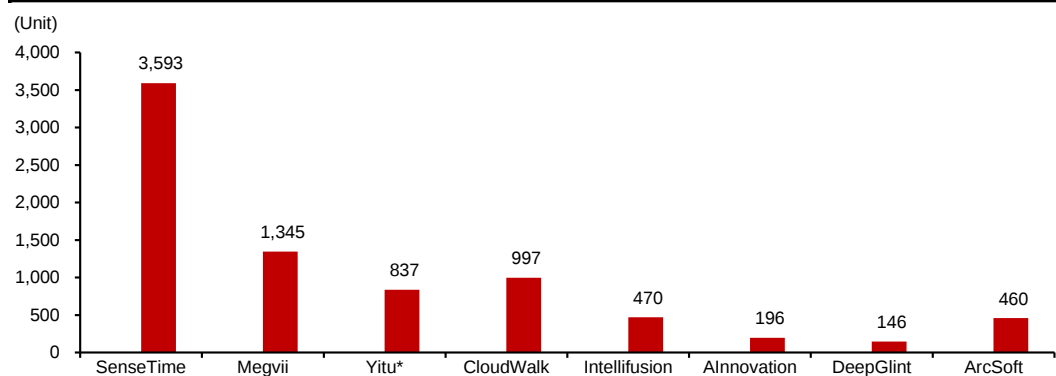
As of 30 Jun 2021, 40 professors led SenseTime R&D and approximately two thirds of their 3,593 R&D staff members held or were pursuing master's or higher degrees, including more than 250 PhDs and PhD candidates.

Figure 20: R&D expenditure comparison among computer vision peers



Source: Company data, Bloomberg, CMBIS *Yitu data as of FY19

Figure 21: Number of R&D staff comparison among computer vision peers



Source: Company data, Bloomberg, CMBIS *Yitu data as of FY19

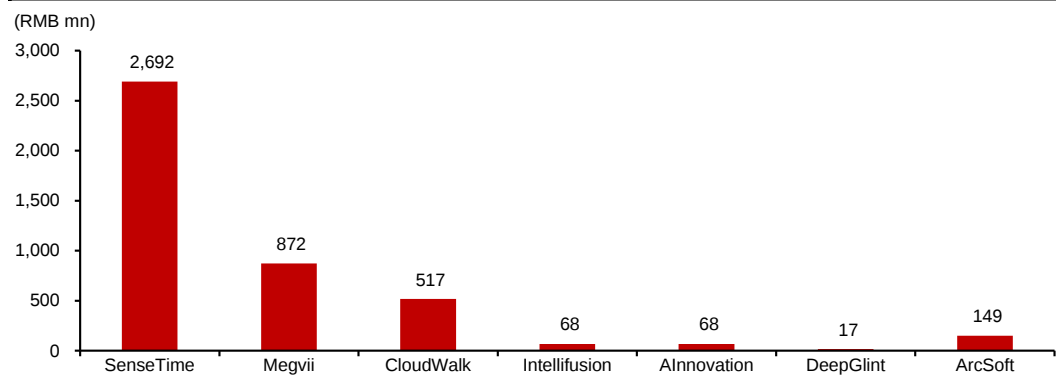
Capex and computing capacity

Training of AI models requires hundreds of GPUs or more. As such, capex for AI companies is high, compared to the traditional asset-light software business model. We tried to summarize past three-year capex of AI computer vision peers and use it as a proxy to reflect the computing power of these AI companies. Excluding Hikvision and Dahua which may spend a lot of capex on manufacturing plant and equipment, SenseTime incurred highest amount of capex among AI software-centric peers.

As of 30 Jun 2021, SenseTime has built 23 AI supercomputing clusters strategically located in major geographic markets, with over 20,000 GPUs sustaining an aggregate computing capacity of 1.17 exaFLOPs to support AI model production. To train large base models within a reasonable timeframe, the training framework needs to coordinate multiple servers with hundreds of GPUs or more. SenseParrots can scale a training task to thousands of

GPUs. It achieves a high parallel efficiency at 91.5% on 1,024 GPUs, while the efficiency of a mainstream training framework is around 25%. SenseTime has trained an AI model for visual recognition that contains over 30bn parameters, which is the largest in the computer vision industry based on public information, according to Frost & Sullivan.

Figure 22: Past 3 years' capex comparison among computer vision peers



Source: Company data, Bloomberg, CMBIS, *data as of latest available date

Most AI computer vision companies are in U.S. Entity List

As we mentioned in the industry section, there are three type of restrictive policies that U.S. has imposed on AI companies, including (i) Entity List, (ii) Non-SDN Chinese Military Industrial Complex Companies List (NS-CMIC list) and (iii) barring federal agencies from sourcing.

Among the AI Computer Vision peers, SenseTime's Beijing subsidiary, Megvii, CloudWalk, Yitu, Intellifusion, DeepGlint, Hikvision and Dahua are being put under the Entity List. Alinnovation and ArcSoft, given no exposure to city management solution, are not on the list.

For the NS-CMIC list, Hikvision and one of SenseTime's subsidiary - SenseTime Group Limited are on the list.

For the third method regarding sourcing restriction, only Hikvision and Dahua are being banned by the U.S. government. All other AI companies can still supply to U.S. companies, including U.S. federal agencies.

The core of SenseTime AI capabilities

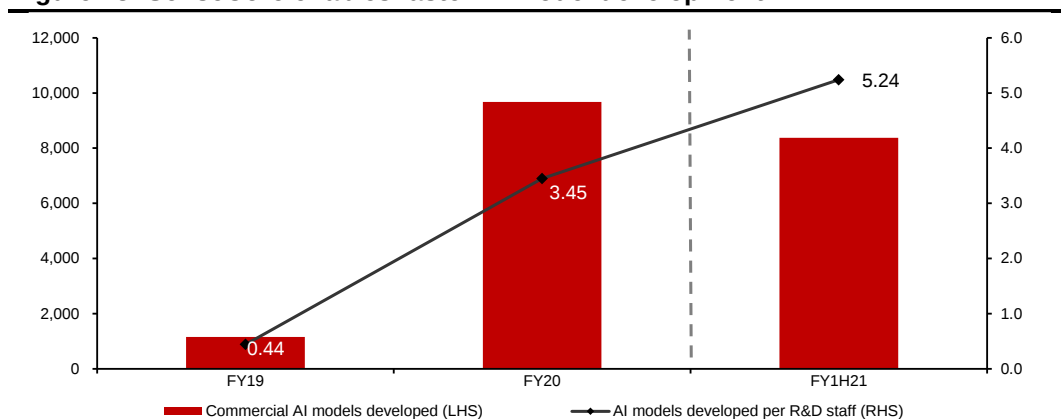
SenseTime's secret sauce is its proprietary AI infrastructure – SenseCore. The Company adopts a two-stage base model approach that first trains AI models on massive generalized data and the “knowledge” learned is fine-tuned to produce scenario-specific models. SenseTime relies on its self-developed deep learning framework instead of open-source framework to streamline the AI model production process with its 20,000 GPUs. This allows the Company to develop AI models more efficiently and address demands from “long-tail” scenarios.

Centralized mass production of AI models enabled by SenseCore

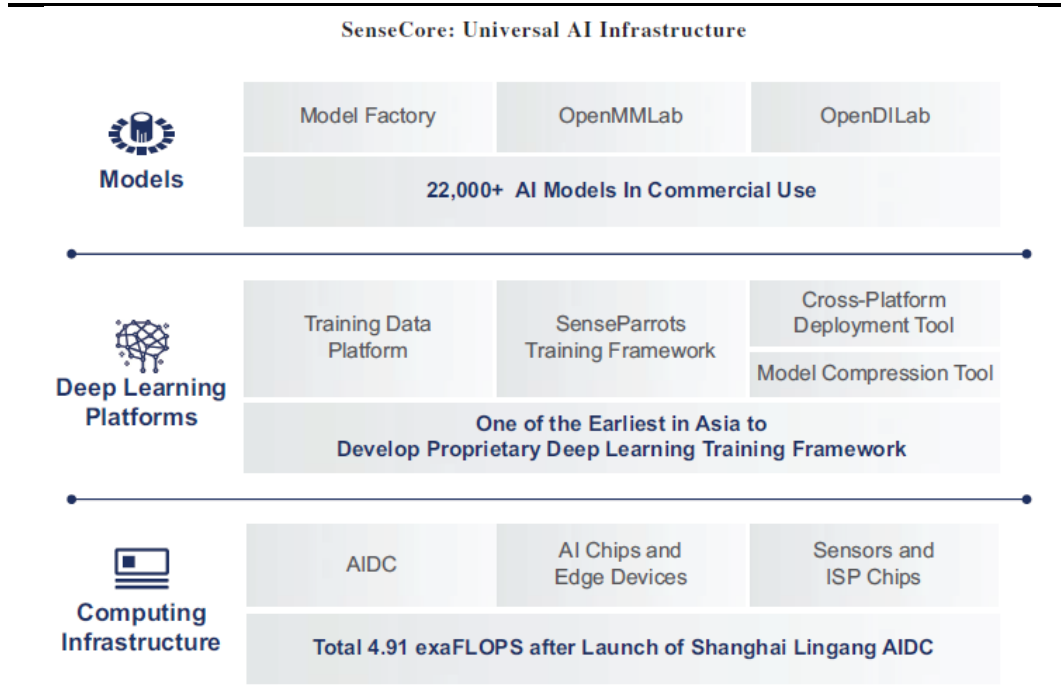
SenseTime has developed over 22,000 commercialized AI models, as of 30 Jun 2021. SenseTime uses a centralized mass production of AI models approach to improve the availability and productivity of AI models. This is achieved by the Company's proprietary AI infrastructure SenseCore. SenseCore is the universal AI infrastructure underlying SenseTime software platform. It comprises three layers: (i) models, (ii) deep learning platforms and (iii) computing infrastructure.

SenseCore allows researchers and engineers to shorten AI model development time. To illustrate, in 2019, 2020 and 1H21, SenseTime's R&D staff developed an aggregate of 1,152, 9,673 and 8,377 commercial AI models. Annual average AI models produced per person have significantly improved from 0.44, 3.45 to 5.24 in the same periods respectively.

Figure 23: SenseCore enables faster AI model development



Source: Company data, CMBIS

Figure 24: SenseCore AI infrastructure

Source: Company data, CMBIS

A base model approach to produce scenario-specific model efficiently

The model layer provides industry-oriented AI model through model factory. The traditional approach in producing AI model is very costly and time-consuming. It demands large volumes of domain-specific training data, not to mention the lengthy training process.

SenseTime model factory uses a two-stage approach such that scenario-specific models can be generated with reduced training effort and the “long-tail” scenarios can be tackled more effectively. Models are first trained on generalized data at large scale, the “knowledge” learned is then fine-tuned to adapt to downstream application.

- Stage 1: Train large base model with massive generalized training data from multiple scenarios.
- Stage 2: Derive a light-weight scenario-specific model that is more suitable for deployment on edge devices

As of 30 Jun 2021, SenseTime has accumulated over 22,000 AI models. In building an AI ecosystem, SenseTime has opened up 3 algorithm platforms including OpenMMLab (perception intelligence), OpenDILab (decision intelligence) and OpenPPL (high-performance inference engines).

Figure 25: Two-stage approach to generate scenario-specific models

Source: Company data, CMBIS

Proprietary deep learning framework to streamline model production process

Deep learning platform comprises the training data platform, SenseParrots training framework, model compression tool and cross-platform deployment tool. This enables effective AI model training, production and deployment.

- **Training data platform** is tailored to the demands of AI R&D with distinct capabilities such as semi-automated data annotation, data simulation and data retrieval etc.
- **SenseParrots training framework** is SenseTime proprietary deep learning framework that enables efficient model production.
- **Model compression tool** is used to transform a trained model into a light-weight one that runs faster on edge devices and consumes less memory while maintain comparable accuracy.
- **Cross-platform deployment tool** helps scale up business as it empower AI models to supports more than 100 chips in the market, and provides unified deployment of cloud services.

Why SenseTime develops its own deep learning framework?

Deep-learning framework is the core training engine of AI models. It includes interfaces, libraries and tools that facilitate the design, training and validation of deep neural network such that programmers do not have to code completely from scratch.

Instead of using open-source framework such as Tensor Flow (Google) or PyTorch (Facebook), SenseTime launched proprietary deep-learning framework SenseParrots in 2015. SenseParrots has below distinctive features that helps streamline AI model production process.

- 1) **AI model training with dynamic computing paths.** Training of certain advanced AI models relies on dynamic change of the underlying computing paths in the training process. SenseParrots built-in just-in-time compiler allows fast compilation of computing paths in real time.
- 2) **Large-scale parallel training.** SenseParrots can scale a training task to thousands of GPUs, which is essential to train large base models. It achieves a high parallel efficiency at 91.5% on 1,024 GPUs, while the efficiency of a mainstream training framework is around 25%.
- 3) **Support of multiple AI training chips.** SenseParrots is devised to support multiple kinds of AI training chips, not just on GPUs.
- 4) **Integration with model production pipeline.** SenseParrots can directly operate on the datasets from the training data platform, the trained models can be directly fed into the deployment tools and hence improving model production efficiency.

Computing infrastructure supports exceptional computing capabilities

SenseCore computing infrastructure comprises AIDC, AI chips and edge devices, sensors and ISP chips.

- **AIDC.** SenseTime has built 23 supercomputing clusters with over 20,000 GPUs with 1.17 exaFLOPS computing capacity as of 30 Jun 2021. The Company is in the process of building AIDC in Shanghai Lingang, which is expected to become one of the largest supercomputers in Asia designed to generate total computing capacity of 3.74 exaFLOPs. On 24 Jan 2022, SenseTime announced that the Shanghai Lingang AIDC has commenced operation. This AIDC will bring SenseTime's total computing capacity to 4.91 exaFLOPs.

Floating point of operations per second (FLOPS) is used to measure supercomputers performance capabilities. To compare, at CVPR 2021, [Tesla](#) unveiled the details of its in-house supercomputer that the company is using to train deep neural networks for autonomous driving. Tesla's cluster uses 5,760 GPUs in total to achieve 1.8 exaFLOPS of performance.

- **AI chips and edge devices.** SenseTime developed first AI inference chip STPU in 2018. As of 30 Jun 2021, the Company has massively produced a total of 11,000 STPU chips. SenseTime has started to develop AI training chips.
- **Sensors and ISP chips.** SenseTime developed AI-embedded CMOS image sensors and is working on AI ISP chips. The IP for the first AI sensor was already delivered in 2021. SenseTime launched development of AI ISP chips in 2021.

Diversified and expanding business use cases

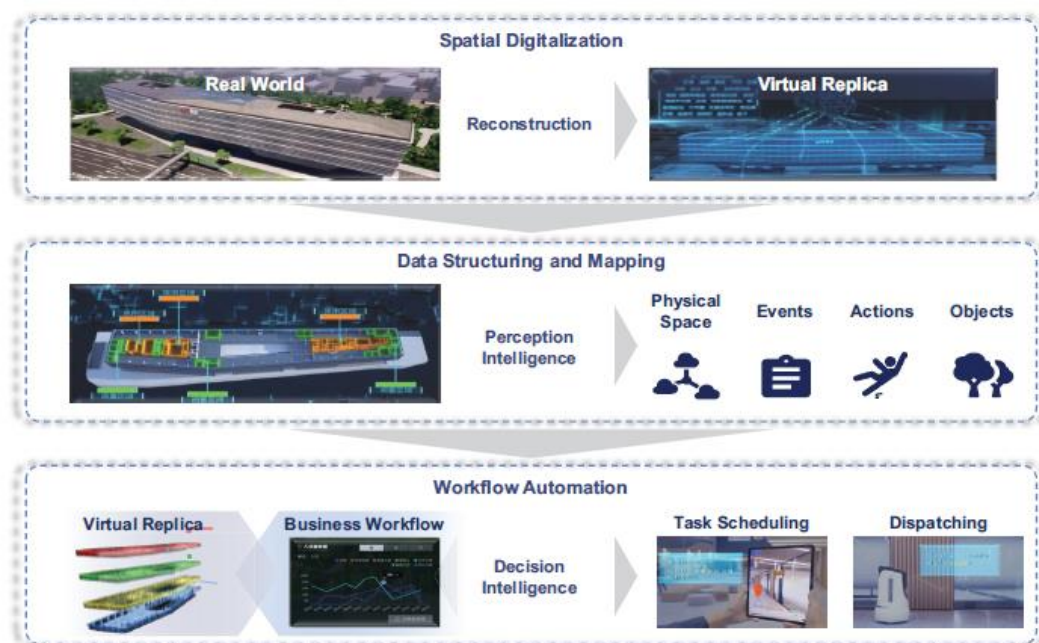
SenseTime has over 22,000 commercialized AI models and has served over 2,400 customers as of 30 Jun 2021. SenseTime has a broad customer base that covers a wide scope of industries such as public sector, property management, manufacturing, transportation, automotive, healthcare, etc. With continuous R&D effort, in addition to AI models, AI-as-a-Service, CMOS sensors, ISP chips, are becoming new revenue stream to the Company.

Smart Business

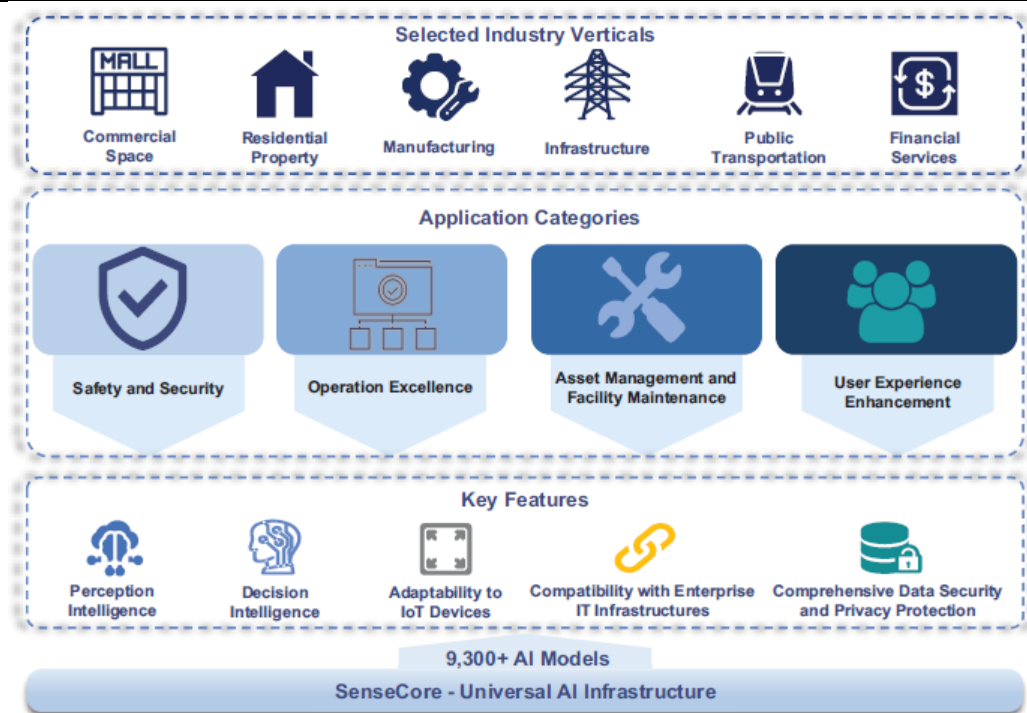
SenseFoundry-Enterprise is the software platform for enterprise customers. As of 30 Jun 2021, SenseFoundry-Enterprise is deployed at 6,000 customer sites, connecting more than 2.5mn IoT devices. It combined 9,300 AI models to facilitate enterprise digital transformation through three steps:

- 1) **Spatial digitalization:** Creates virtual replicas of the physical spaces and projects objects and events in the digital space at corresponding positions.
- 2) **Data structuring and mapping:** Transcribes raw data input from IoT devices into structured data and maps the processed data into virtual replicas.
- 3) **Workflow automation:** Integrates virtual replicas and structured data with existing business workflow. Generates business insights and enhances operation efficiency through AI applications such as incident prediction, emergency alerting, automated task scheduling and re-scheduling, intelligent dispatching and status tracking.

Figure 26: SenseFoundry-Enterprise facilitates enterprise digital transformation



Source: Company data, CMBIS

Figure 27: SenseFoundry-Enterprise platform for smart business

Source: Company data, CMBIS

Commercialization and applications

SenseTime provides enterprise customers with pre-installed AI models for enterprise AI applications and charges licensing fees and software subscription fees to a lesser extent. In addition, SenseTime generates revenue from sales of AI software-embedded hardware products which support the running of software and related services. Major applications include safety and security, operation optimization, asset management and facility maintenance, as well as user experience enhancement.

Figure 28: SenseFoundry-Enterprise applications

Safety and Security	Operation Optimization	Asset Management and Facility Maintenance	User Experience Enhancement
- Construction Site Safety Management - Emergency Alert and Management - Fire Control and Safety Management - Food Safety Management - Production Safety Management - Passenger Access Control - Vehicle Access Control	3D Digital Twin over Factories - Automatic Traffic Efficiency Improvement - Industrial Quality Control - Production Procedure Efficiency Monitoring and Process Automation - Service Operation Quality Enhancement in Property Management - Workflow Automation empowered by OCR in Financial Sectors	- Automatic Inspection Routing Planning and Navigation - Maintenance over High-speed Rail Overhead Line System - Operation Status Inspection over Escalator and Lift - Power Grid Infrastructure Maintenance - Residential Community Infrastructure Maintenance - Utilization Optimization for Commercial Space	- Community Care for the Elderly and Young - Navigation and Shopping Guide in Commercial Space - Smart Working Experience - Digital Personal Assistants in Bank Branches - Smart Security Checks and Ticketing in Metro Stations and Amusement Parks

Source: Company data, CMBIS

Use case illustrations

Commercial space management

SenseTime provides commercial premise managers, retailer tenants, visitors with virtual replica of the space to facilitate management of office and retail units, optimize floor plan settings empower indoor navigation, etc.

For instance, SenseTime provided the Shanghai West Bund management team an asset management platform that cover 6,800 specific commercial assets in the hub area, such as trees, streetlamps, paths and facilities. Through the AI models with decision intelligence, alerts will be triggered upon detection of anomalies such as damages to the facilities and theft.

Figure 29: Comprehensive business and industrial hub management



- (1) Total assets panel: tracks the change in the number of commercial assets under management
- (2) Asset maintenance plan panel: indicates the commercial asset maintenance plan with regular updates
- (3) Asset composition panel: displays the breakdown of various types of commercial assets
- (4) Water level monitoring panel: monitors water level changes and automatically sends alerts when the water level reaches pre-defined thresholds
- (5) Asset incidents panel: monitors the status of commercial assets and displays follow-up measures for incidents in real time
- (6) Anomalies hot spots panel: analyzes and displays hot spots with high incidences of anomalies

Source: Company data, CMBIS

Residential property management

SenseFoundry-Enterprise is also deployed in residential property management industry. AI applications include facilitating contactless and authorized access by residents and vehicles, detecting of anomalous situations such as open fire or smoke recognition, falling objects, unauthorized parking, etc.

For instance, SenseTime provides SenseFoundry-Enterprise solution to Languang Justbon Services (Languang), a property service provider that manages approx. 1,400 residential properties in over 130 cities in China. SenseFoundry-Enterprise is deployed in 50 residential properties managed by Languang. It is able to detect 31 types of incidents and anomalies through connection to more than 8,000 IoT devices, automatically send alerts and dispatch appropriate personnel for in-time response. More than 1,000 alerts are generated every day with a detection rate over 95%. It helps Languang reduced operational costs by 28.6% in 2020 at the residential communities that had adopted SenseTime's software platform.

Figure 30: Residential property management system

- (1) Basic information on the residential community
- (2) Visitors and vehicles traffic statistics
- (3) Digital twins of the community and facilities
- (4) Facility conditions and real-time tracking of maintenance workstreams
- (5) Security alerts along with automated work orders and follow-up evaluation of work efficiency
- (6) Residential service tracker along with automated work orders and follow-up evaluation of work efficiency

Source: Company data, CMBIS

• Industrial quality control

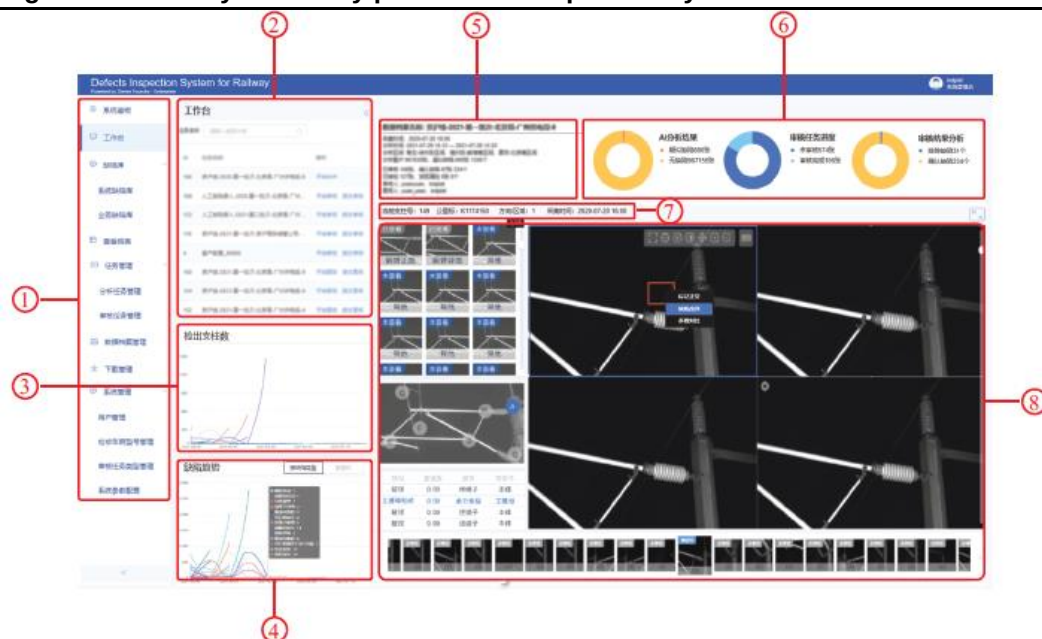
SenseFoundry-Enterprise identifies defects with higher efficiency and accuracy than manual checks. SenseTime leverages the mass production capabilities supported by SenseCore to produce scenario-specific AI models for each type of defects with limited samples.

For instance, China FAW Group adopted SenseFoundry-Enterprise in its metal stamping process. SenseFoundry-Enterprise enables customers to inspect over 34 types of defects within 6-12 seconds with a detection rate of over 99%. The real-time detection helps customer to identify deficiencies in assembly lines immediately, preventing potential disruption to production processes.

• Infrastructure maintenance

SenseFoundry-Enterprise helps asset-heavy industries customers (e.g. public utilities and infrastructure companies) to save maintenance costs through AI models by installing AI-enabled IoT devices around the target assets or on autonomous patrol devices.

For instance, the maintenance of overhead electricity power lines is critical to the daily operation of high-speed trains and passenger safety. HD cameras are installed on customer inspection vehicle to take pictures of the overhead contact system at regular intervals. The HD photos are transmitted to the data center and SenseTime system can automatically detect 2,160 types of defects among 514 components including overhead equipment, supporting structure and suspension gear. Compared to traditional approach that inspects an average of 2.5km of power lines in 1 day, the AI-powered method helped customer inspect an average of 50km power lines in the same period of time.

Figure 31: Railway electricity power lines inspection system


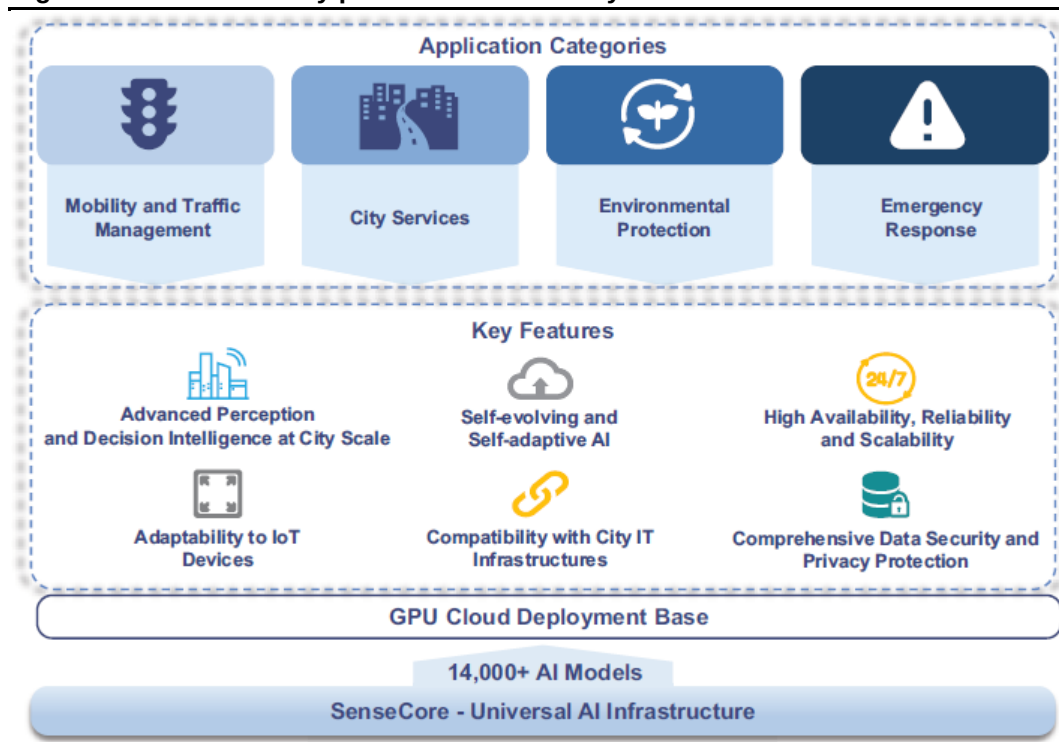
- (1) System management panel which includes different functionalities and enables generation of inspection reports
- (2) System workstation which lists outstanding tasks for follow-up
- (3) The number of poles with defects detected
- (4) Trend analysis on the defects detected
- (5) Summary of the railway section conditions, AI analytical statistics and the latest status of inspection tasks
- (6) Diagrams which show the amount of workload reduced by AI, the working progress of inspection tasks and the number of confirmed defects
- (7) Summary of current detection tasks, such as dispatched vehicles and their direction and positions
- (8) Display of current detection tasks, with indication of poles being inspected, photos shot and defects detected.

Source: Company data, CMBIS

Smart City

SenseFoundry is a unified on-stop AI software platform tailored for city-scale analysis of objects, events and information. Given massive amount of data from public sector applications, SenseFoundry is deployed on cloud-based GPU servers. It combines more than 14,000 AI models and is equipped with online incremental training engine to provide AI-as-a-Service. By frequently feeding in the results of online data processed by original AI models, new AI models with higher accuracy will be automatically generated.

Figure 32: SenseFoundry platform for smart city



Source: Company data, CMBIS

Commercialization and applications

SenseFoundry delivered to public sector customers are primarily deployed on cloud. Similar to SenseFoundry-Enterprise, SenseTime charges through licensing fees, software subscription fees and sales of AI software-embedded hardware. As of 30 Jun 2021, SenseFoundry served 119 cities and connected over millions of IoT devices. SenseTime began overseas Smart City business in 2019. Among the 119 cities, 4 are overseas cities, namely Singapore, Dubai, Riyadh and Kuala Lumpur. SenseFoundry facilitates city management with applications such as mobility and traffic management, city services, environmental protection and emergency response.

Figure 33: SenseFoundry platform for smart city

 Mobility and Traffic Management	 City Services	 Environmental Protection	 Emergency Response
 Traffic Violation Detection - Road and Driving Violations - Unauthorized Parking  Highway Anomaly Warning  Traffic Flow Optimization  Traffic Condition Information Extraction	 Public Safety - Public Security Management - Fire Detection  Public Facility - Emergency Exit Obstruction Detection - Alerts for Incident Handling  Public Health and Social Services - Management of Shared Bikes	 City Landscape Oversight - Plantation Area Decrease Detection - Improper Usage of Land Detection  City Environmental Protection - Waste Disposal Monitoring - Alerts for Littering - Construction Vehicles Identification and Monitoring	 Disaster Detection - Stranded Vehicle Detection - Waterlogging Prediction  Production Safety - Hazardous Chemicals Management  Epidemic Preventive Measures - Contactless Temperature Measurement

Source: Company data, CMBIS

Use case illustrations

- Mobility and traffic management**

SenseFoundry integrates decentralized traffic management system into a one-stop system. Based on real-time data feedback, unified and intelligent decision-making, traffic congestion in cities can be eased. Typical scenarios include traffic violation detection, highway anomaly warning, traffic flow optimization and traffic condition information extraction.

For instance, SenseFoundry traffic management application was deployed in a first-tier city in South China. It enables traffic police to manage traffic violators effectively. Since deployment of SenseFoundry, around 50,000 cases of traffic violations by moped riders have been identified. The number of monthly traffic violations decreased by 56% from 1,800 in Dec 2020 to around 800 in Jan 2021, and the rate of moped riders and passengers wearing helmets substantially increased from 44% to 94% during the same period.

- City services**

Traditional method of city services management is less efficient as it relies heavily on manpower for patrol and dispatch of personnel for execution. SenseFoundry provides city services such as ensuring public safety through analyzing density and flow of crowds, identifying public facilities anomalies, and facilitating public health and social services management.

- Environmental protection**

SenseFoundry achieves automatic detection, warning, analysis and resource dispatch in fields such as public space sanitation and air pollution detection. Typical scenarios include city landscape oversight, real-time analysis of inappropriate actions that cause environmental damage.

- Emergency response**

Through early warning, incident detection and automated incident handling procedures, SenseFoundry assists city administrators to identify and handle emergencies more quickly. Typical scenarios for safety, health and emergency response includes disaster detection, production safety, and epidemic preventive measures.

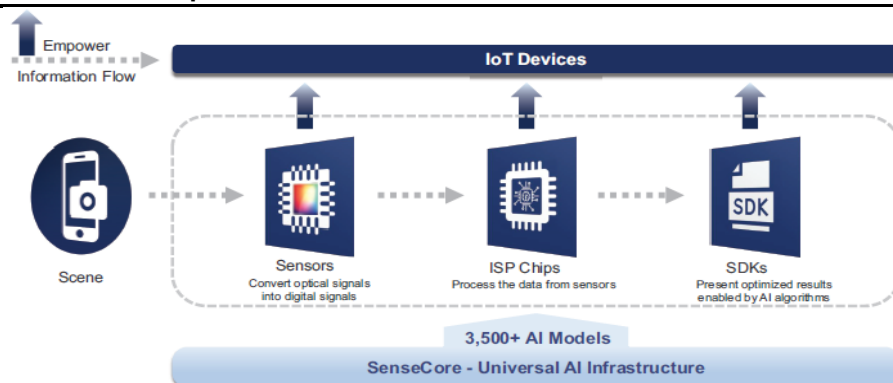
Smart Life

SenseTime Smart Life offerings comprise AI software, sensors and ISP chips. There are three software platforms namely SenseME, SenseMARS and SenseCare that target IoT devices, Metaverse and smart healthcare verticals.

1) SenseME for IoT devices

SenseTime offers full stack of SDKs, AI sensors and ISP chips for IoT device manufacturers. There are over 3,500 AI models on the SenseME platform.

Figure 34: SenseME platform for IoT devices



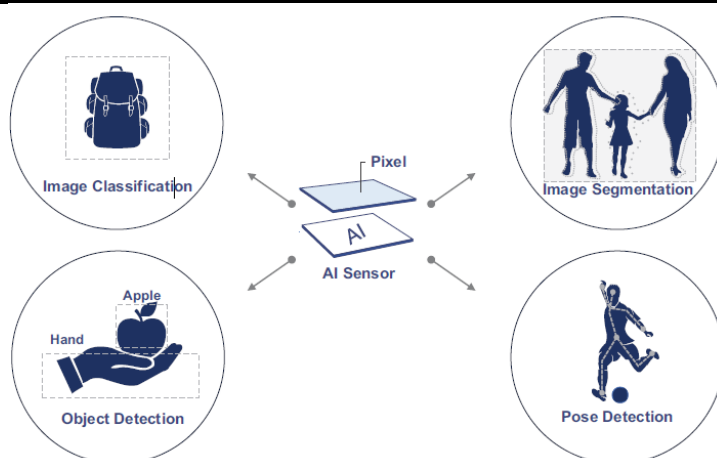
Source: Company data, CMBIS

Why SenseTime develops AI sensors and AI ISP?

AI sensors prevail over traditional CMOS with (i) multi-spectrum imaging, (ii) image and video enhancement under a wide range of light conditions, (iii) high dynamic range imaging, (iv) slow motion capturing, and (v) 3D depth effects on consumer IoT devices.

SenseTime also designs AI ISP chips to process output from AI sensors to maximize sensor performance. AI sensors designed with rich color channels and new sensing patterns require new types of ISP chips to be capable of multi-format data processing, while traditional ISPs cannot fully utilize AI sensor outputs as they only accept standard data format and thus have not been able to preserve critical information.

Figure 35: AI applications achieved through deployment of AI sensors



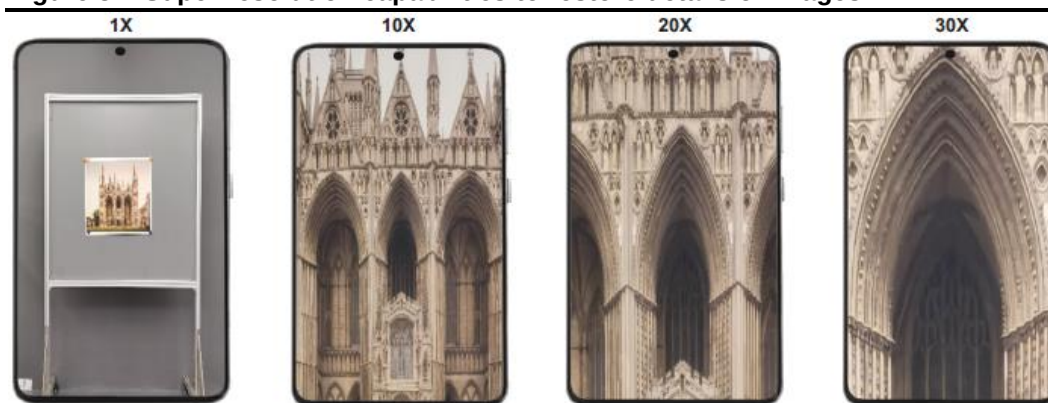
Source: Company data, CMBIS

Figure 36: Visual content enhancement empowered by SenseME

(1) Picture 2 shows the content enhancement capabilities for pictures taken under poor light conditions

(2) Picture 4 shows the bokeh effects to provide aesthetic quality images with blur produced in out-of-focus parts

Source: Company data, CMBIS

Figure 37: Super resolution capabilities to restore details of images

Source: Company data, CMBIS

Commercialization and applications

- **SDKs**

SenseTime charges customers license fee for the use of SDKs on mobile phones and other IoT devices. SenseTime mobile phone customers cover all top 5 Android brands globally and its SDKs had been installed on more than 450mn mobile phones across over 200 models as of 30 Jun 2021. Customers also include smart TV, smart projector and tablet companies. SenseTime was the first in the industry to achieve bokeh effect with a single camera (usually require dual cameras) on mobile phones. Other applications include 3D and AR applications, image categorization for smart album, super resolution and super night photography.

- **AI sensors**

SenseTime charges IP license fee for AI sensors. Such license fee comprises an upfront R&D service fee and ongoing fees based on a % of the AI sensors' revenue. The IP for the first AI sensor was already delivered in 2021.

- **AI ISP chips**

SenseTime AI ISP chip is expected to be launched by end of 2021 with target customers primarily being mobile phone and other IoT device companies.

2) SenseMARS for Metaverse

Metaverse refers to the convergence of physical, augmented and virtual reality in a shared digital space. SenseMARS platform supports an immersive and interactive Metaverse experience through 1) SenseMARS Reconstruction, 2) SenseMARS Avatar and 3) SenseMARS Agent. It is compatible with different applications and IoT devices. As of 30 Jun 2021, SenseMARS provided more than 3,500 AI models.

Figure 38: Typical scene on the Metaverse

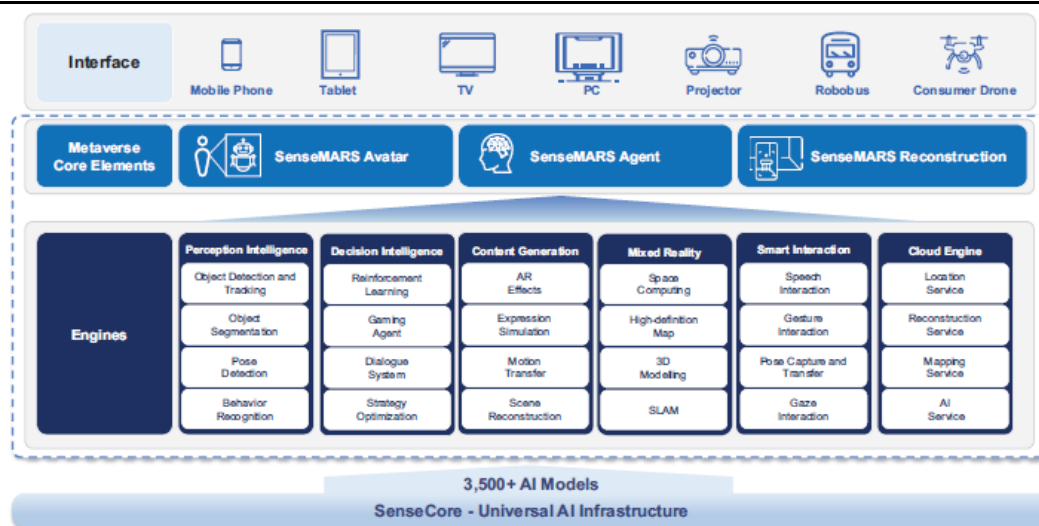


(1) Avatars or software agents

(2) 3D reconstruction of the physical world

Source: Company data, CMBIS

Figure 39: SenseMARS software platform



Source: Company data, CMBIS

Commercialization and applications

- **IoT device companies**

SenseTime charges customers a license fee for the use of SDKs.

- **Mobile app and content providers**

SenseMARS enables over 200 apps, five of which are super apps with over 500mn MAU each. SenseTime charges license fee for the use of SDKs.

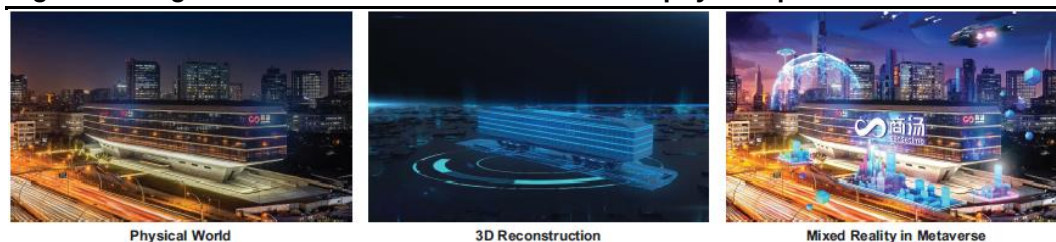
- **Commercial properties**

SenseTime provides commercial property customers, such as stores, museums and airports, a virtual replica of their properties. Applications include AR navigation, AR marketing, AR games, software agents or digital humans that interact with users. In addition to license fee, SenseTime charges fees for use of AI-enabled content generation services on the cloud.

(i) SenseMARS reconstruction

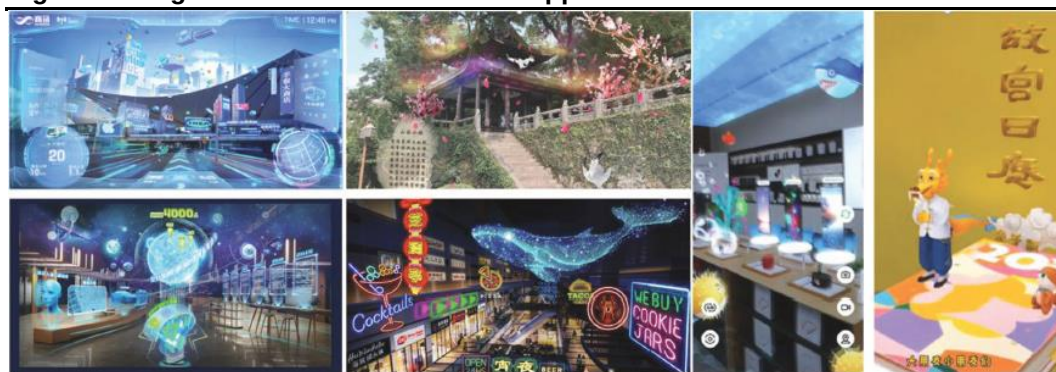
SenseMARS enables users to reconstruct high-precision 3D models of the physical world using consumer devices such as mobile phones, sport cameras and drones. It also enables spatial mapping and localization with accuracy to the centimeter-level. For instance, SenseTime built a virtual experience space for BilibiliWorld 2021 where users can interact with virtual streamers.

Figure 40: Digital reconstruction and MR effect of a physical place



Source: Company data, CMBIS

Figure 41: Digital reconstruction and MR applications



Source: Company data, CMBIS

(ii) SenseMARS Avatar

An Avatar represents the digital identity of an individual in the Metaverse. SenseMARS Avatar enables users to generate their own Avatars easily. For instance, it has supported various mobile apps to generate Avatars of streamers for virtual live-broadcasting.

Figure 42: Digital identify of an individual in the Metaverse



Source: Company data, CMBIS

(iii) SenseMARS Agent

SenseMARS Agent enables intelligent human-machine interactions. SenseMARS Digital Human, a human-like software agent, can serve in various scenarios including shopping malls, exhibitions, tourist attractions and banks when trained with domain-specific knowledge. SenseMARS Agent is also provided to gaming companies to serve as AI-enabled non-player characters or virtual players competing in online games.

Figure 43: Human-like software agent



Source: Company data, CMBIS

Use case illustrations

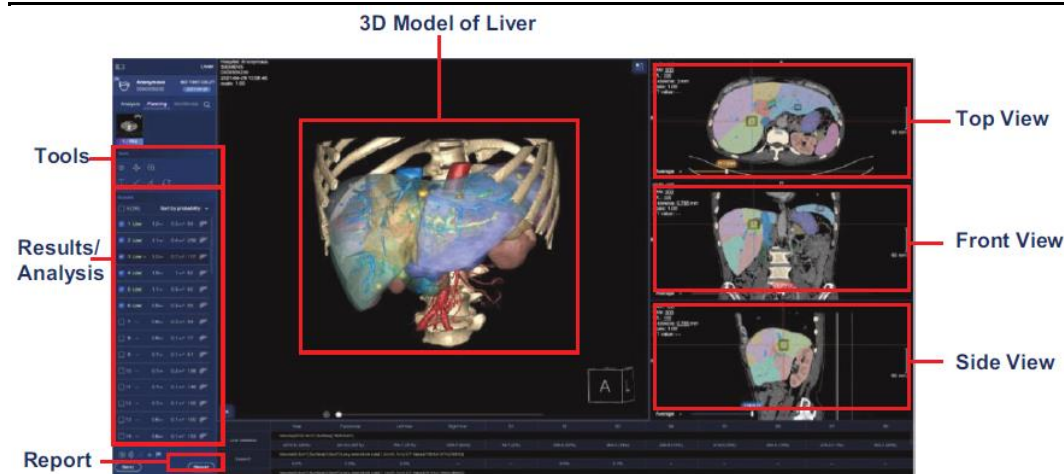
Bilibili runs a leading video community with MAU of more than 200mn. SenseMARS helped Bilibili realize AR contents on live videos, generate personal characters via SenseMARS Avatar and reconstruct a digital world where users can interact with virtual streamers.

Figure 44: Illustrations of SenseMARS applications on Bilibili

Source: Company data, CMBIS

3) SenseCare for Smart Healthcare

SenseCare is the AI software platform for smart healthcare. The AI models support diagnosis of conditions covering 13 body parts and organs and offer 3D surgery planning and rehabilitation. SenseCare can be deployed on premise or over the cloud.

Figure 45: Diagnosis interface of a liver screening supported by SenseCare

Source: Company data, CMBIS

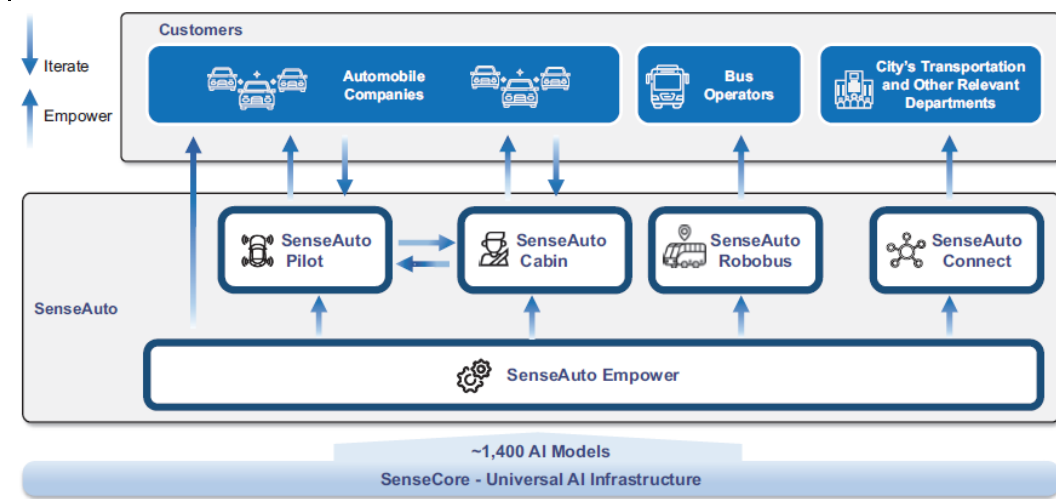
Commercialization and applications

SenseTime charges licensing fees for SenseCare and also R&D fee to some customers. As of 30 Jun 2021, SenseTime had partnered with 16 Class III Grade A hospitals in China. SenseTime also provides AI-as-a-Service to local Health Commissions for the regional hospital network.

Smart Auto

SenseTime started to develop SenseAuto in 2016 and has been a strategic partner with Honda since 2017. SenseAuto comprises 5 products, including SenseAuto Pilot, SenseAuto Cabin, SenseAuto Empower, SenseAuto Robobus and SenseAuto Connect.

Figure 46: SenseAuto platform for smart auto



Source: Company data, CMBIS

1) SenseAuto Pilot

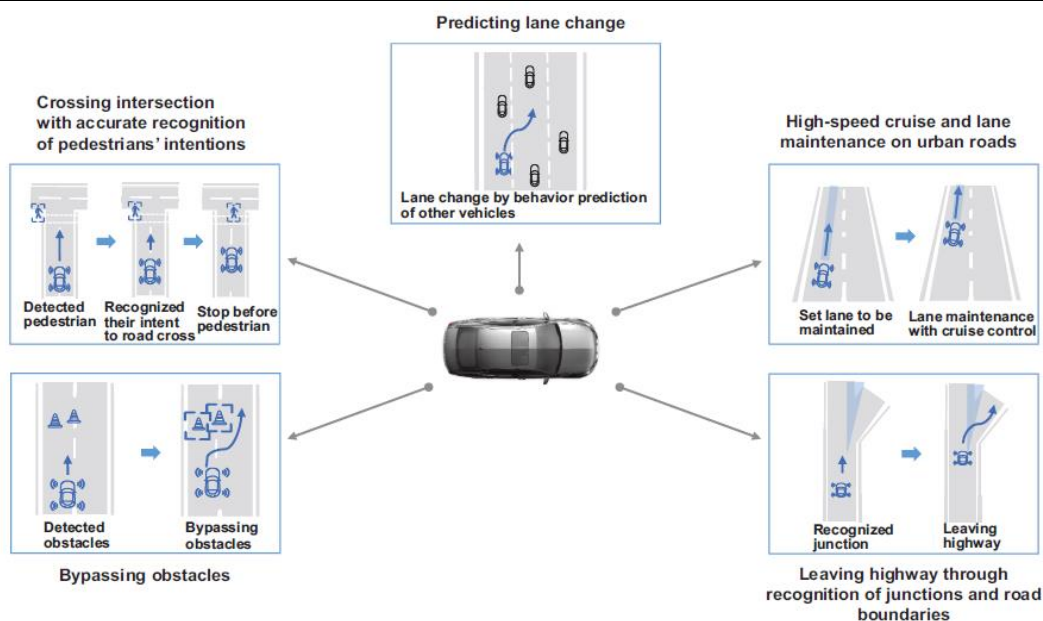
SenseAuto Pilot covers products for ADAS. It provides a cost-efficient vision-based system and multi-sensor fusion system options for both premium and mass market segments. SenseTime is developing L2+ ADAS products for automobile companies and car models pre-installed with its products is expected to be mass produced in 2022. For L4 autonomous driving technologies, SenseTime is in the R&D phase.

- **Vision-based systems**

SenseAuto Pilot vision-based system can detect vehicles at 200 meters and pedestrians at 150 meters. It utilizes Digital Video Recorder (DVR) as perception camera to provide ADAS functions.

- **Multi-sensor fusion system**

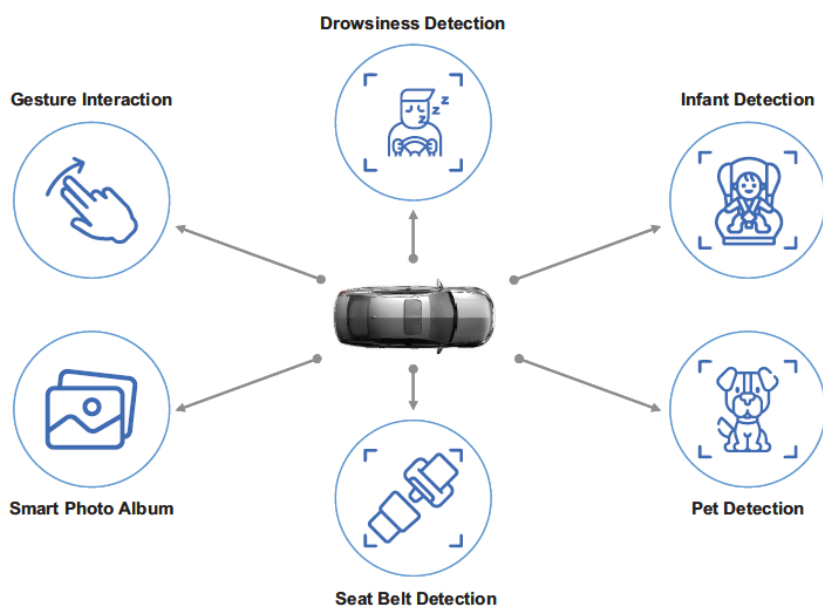
SenseTime also provides multi-sensor fusion system by embedding AI models into sensors including LiDAR, to provide functions such as Adaptive Cruise Control (ACC), Lane Centering Control (LCC), Traffic Jam Assist (TJA) and Navigation on Pilot (NoP).

Figure 47: Typical scenarios perceived by SenseAuto Pilot


Source: Company data, CMBIS

2) SenseAuto Cabin

SenseAuto Cabin comprises driver monitoring system (DMS), occupant monitoring system (OMS) and in-vehicle infotainment (IVI) system.

Figure 48: Capabilities of SenseAuto Cabin product


Source: Company data, CMBIS

3) SenseAuto Empower

SenseAuto Empower is designed to support automobile companies in-house R&D in AI technologies. SenseAuto Empower, powered by around 1,400 AI models, helps automobile companies to effectively diagnose problems, upgrade products and adapt to vehicles with different hardware settings. SenseTime also led joint R&D initiatives and provided computing power supported by AIDC. It helps automobile companies with data processing, monitoring, analysis, compliance and simulation, model training and inference.

4) SenseAuto Robobus

SenseAuto Robobus is an L4 autonomous driving product for autonomous shuttle services for bus operating companies. Deployment location include business parks, tourist attractions and designated autonomous driving pilot zones.

Figure 49: SenseAuto Robobus and its in-cabin settings



Source: Company data, CMBIS

5) SenseAuto Connect

SenseAuto Connect is a platform which enables interactions between vehicle to everything (V2X) applications. It allows vehicles to receive signals and empowers roadside units with sensing ability. SenseAuto Connect provides city transportation and other relevant departments with data analytic tools to enhance traffic management services.

Commercialization

- **Automobile companies**
For SenseAuto Pilot and SenseAuto Cabin, SenseTime charges customers engineering fees for initial deployment and license fees based on actual car shipments with SenseTime's software. For SenseAuto Empower, SenseTime charges R&D service fees for research projects and initiatives and subscription fees for the provision of AI-as-a-Service.
- **Bus operators**
SenseTime generates revenue from sales of SenseAuto Robobus to bus operators for shuttle services.
- **Public sector customers**
SenseTime will provide SenseAuto Connect software offerings in late 2021 to public sector customers. A license fees will be charged, based on the number of AI applications provided.

Financial Analysis

Income statement

Revenue

SenseTime revenue is primarily generated through the sales of AI software platform to companies across Smart Business, Smart City, Smart Life and Smart Auto verticals. SenseTime revenue grew at 36.4% CAGR in FY18 to FY20 to RMB3,446.2mn of which Smart Business and Smart City contributed 43.1% and 39.7% of revenue respectively. For geographical mix, in FY20, SenseTime derived 78% of revenue from Mainland China and 22% from overseas market.

Majority of SenseTime customers are end users of products and services while some are system integrators (mainly related to Smart City business). In 2020, SenseTime had 1,225 customers among which 33.1% were system integrators. Top five customers accounted for 31.4% of FY20 revenue.

We expect SenseTime revenue to grow at 37% CAGR from RMB3,446mn in FY20 to RMB8,825mn in FY23E, driven by:

(i) Smart Business

SenseTime offers SenseFoundry-Enterprise software platform for enterprises and charges through license fee, software subscription fees and sales of AI software-embedded hardware products.

We expect Smart Business revenue to grow at 31% CAGR from RMB1,485mn in FY20 to RMB3,307mn in FY23E, driven by expanding number of customers from 848 in FY20 to 1,180 in FY23E (12% CAGR) and increasing average revenue per customer, from RMB1.75mn in FY20 to RMB2.80mn in FY23E (17% CAGR).

(ii) Smart City

SenseTime delivers packages comprising software, hardware and service to city administrators primarily through system integrators. Similar to Smart Business, SenseTime derives revenue through license fees, software subscription fees and sales of AI software-embedded hardware products.

We expect Smart City revenue to grow at 45% CAGR from RMB1,369mn in FY20 to RMB4,141mn in FY23E on expanding number of cities covered from 94 in FY20 to 165 in FY23E (21% CAGR) and increasing no. of AI modules adopted by each city.

(iii) Smart Life

SenseTime offers SenseME and SenseMARS software to customers including mobile phone manufacturers and internet app and content providers, and mainly charge licensing fees or shipment-based royalties for providing AI software functions. SenseTime also generates revenue by providing R&D services under Smart Life (SenseCare).

We expect Smart Life revenue to grow at 35% CAGR from RMB434mn in FY20 to RMB1,068mn in FY23E mainly driven by SenseME for IoT devices with new products including AI sensor (through IP licensing) and sales of ISP chip. IP

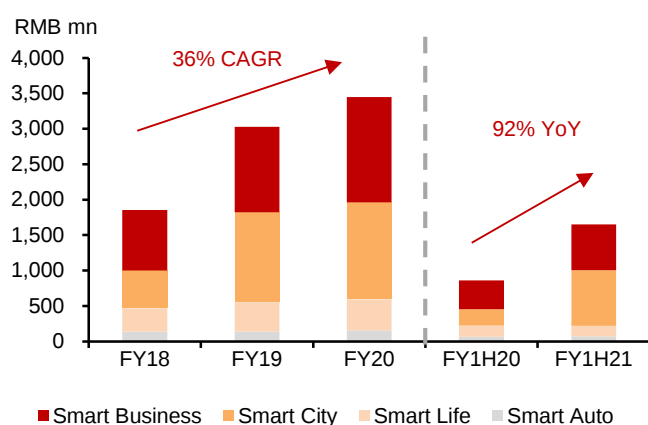
for the first AI sensor was delivered in 2021. SenseTime began development of AI ISP chips in 2021.

(iv) Smart Auto

SenseTime offers SenseAuto as intelligent automotive application infrastructure for customers. SenseTime provides SenseCore capabilities as an AI-as-a-Service offering and charge a service fee. The Company also provides software and AI software-embedded hardware to automobile companies and charge on a shipment basis.

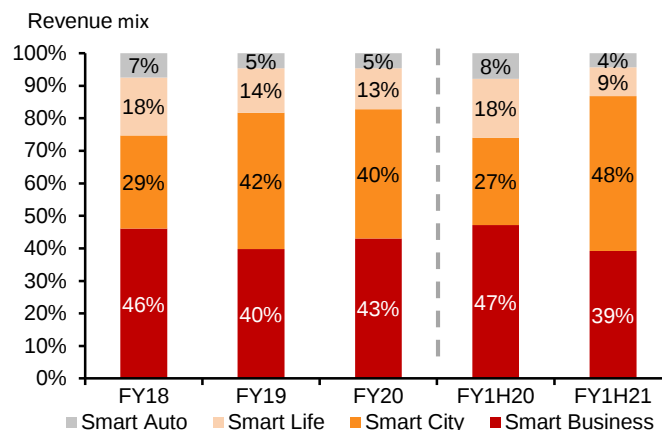
We expect SmartAuto revenue to grow at 25% CAGR from RMB158mn in FY20 to RMB310mn in FY23E, on the basis of increasing ADAS penetration, higher software spending per automobile and expanding revenue from AI-as-a-Service.

Figure 50: Revenue



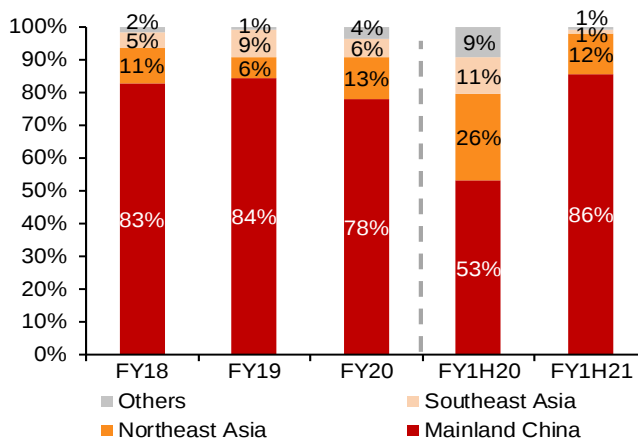
Source: Company data, CMBIS

Figure 51: Revenue mix (business segment)



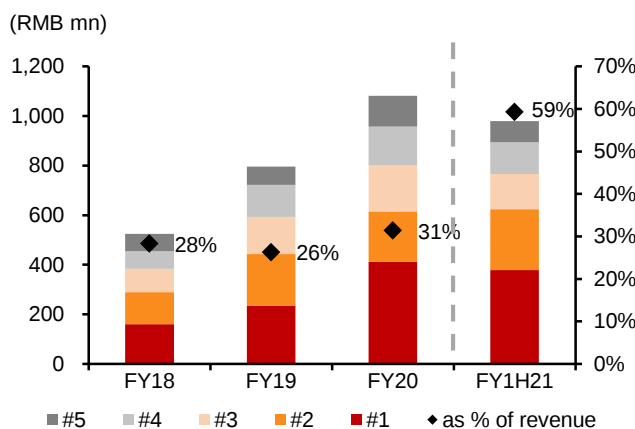
Source: Company data, CMBIS

Figure 52: Revenue mix (geographical mix)



Source: Company data, CMBIS

Figure 53: Top 5 customers



Source: Company data, CMBIS

Revenue model

We identified three types of revenue model that SenseTime is adopting:

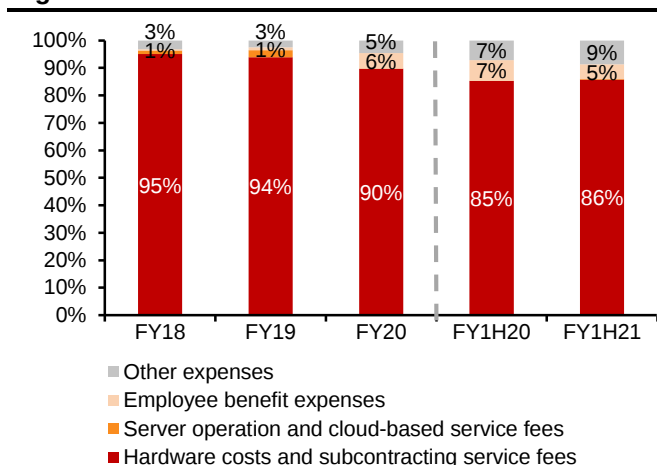
- (i) **Software:** a license model that SenseTime provides the software platform through SDK.
- (ii) **AI-embedded hardware:** SenseTime designs the AI hardware and outsource the manufacturing process to third parties.
- (iii) **AI-as-a-Service:** a recurring model that leverages on SenseTime AIDC. Customers can subscribe to pre-trained AI models, customize model production with their own data and co-develop customized AI models with SenseTime.

Cost structure

SenseTime cost of sales primarily consists of hardware costs and subcontracting service fees. It accounted for 89.7% of FY20 cost of sales. Hardware costs are related to servers, components and semiconductors. Subcontracting service fees are mainly fees paid for outsourcing certain basic installation and maintenance service to third parties. SenseTime procures the hardware, some of which designed by SenseTime with production outsourced to contract manufacturers, to be embedded with the Company's AI software.

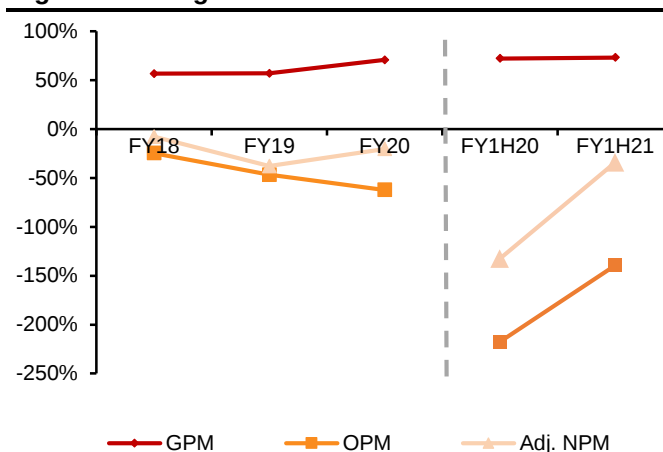
SenseTime gross margin improved from 56.5% in FY18 to 70.6% in FY20. We expect gross margin to decrease to 65.9% in FY23E given increasing hardware sales (such as ISP chip, Robobus) that have lower margin.

Figure 54: Cost of sales mix



Source: Company data, CMBIS

Figure 55: Margins



Source: Company data, CMBIS

Opex

SenseTime opex ratio increased from 81.3% in FY18 to 132.9% in FY20, mainly driven by higher spending on R&D, share compensation expenses and expanding sales and marketing team. Excluding share based compensation, opex ratio was at 107.2% in FY20.

(i) R&D

SenseTime spent RMB2,453.9mn on R&D (71.3% of revenue) in FY20 and we expect R&D ratio to come down to 55.4% in FY23E as business scales up. All R&D expenditure are expensed when incurred. As of 30 Jun 2021, SenseTime has 5,286 staff of which 3,593 (68%) are R&D related.

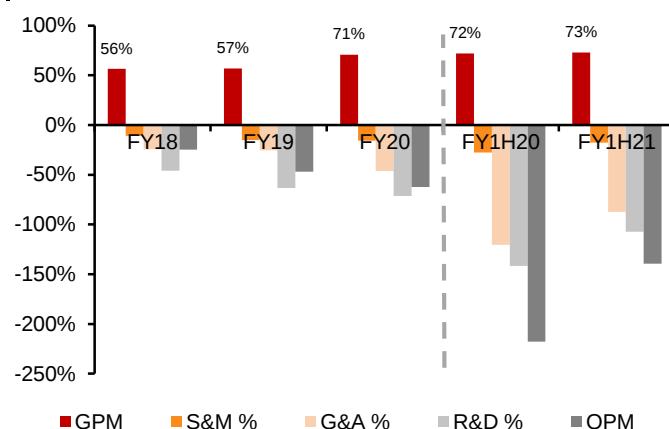
(ii) Sales & marketing

SenseTime spent RMB536.5mn on sales and marketing (15.6% of revenue) in FY20 and we expect such ratio to decrease to 13.1% in FY23E. SenseTime primarily adopts a direct sales model with a sales team size of 900 employees as of 30 Jun 2021.

(iii) Administrative expense

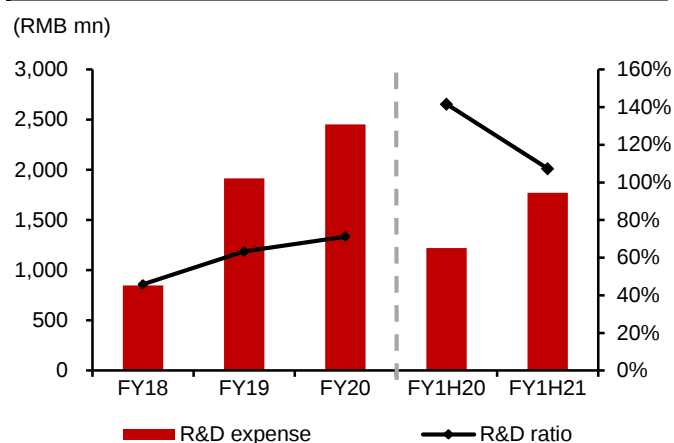
SenseTime spent RMB1,589.5mn on administrative expense (46.1% of revenue) in FY20 and we expect such ratio to decrease to 24.5% in FY23E. Excluding share based compensation, administrative expense to sales ratio was at 29.6% in FY20.

Figure 56: Opex ratio



Source: Company data, CMBIS

Figure 57: R&D



Source: Company data, CMBIS

Non-operating items and tax credit

SenseTime recurring non-operating items mainly include net impairment losses on financial assets, government grants and foreign exchange losses/ gains.

Net impairment losses are related to credit risk of financial assets (mainly trade receivables and other receivables). SenseTime trade receivable days was 293 in FY20.

Government grants include financial subsidies and value-added-tax (VAT) refund. VAT refund policy applies to self-developed software products. For these products, VAT is first applied at 13% and the portion exceeding 3% of revenue will be refunded.

Fair value losses of preferred shares is related to the increase in Company's valuation but is not recurring in nature.

SenseTime recorded tax credit as the Company was in net loss in FY20.

Adjusted EBITDA and net profit

SenseTime net loss widened from RMB4,967.7mn in FY19 to RMB12,158.3mn in FY20, mainly attributable to fair value losses of preferred shares and other financial liabilities, as a result of increasing valuation of the Company. On an adjusted basis, SenseTime net loss has narrowed from RMB1,155.2mn in FY19 to RMB707.7mn in FY20. As SenseTime is still in a fast-growing stage that operating leverage is not obvious, we estimate SenseTime adj. EBITDA to turn positive at RMB567mn in FY23E. However, for bottom line, we expect the Company will remain in adjusted net loss position in FY21-23E.

Figure 58: Non-operating items, tax credit, adjusted EBITDA and adjusted net profit

RMB mn	FY18	FY19	FY20	FY21E	FY22E	FY23E
Non-operating items						
Net impairment losses on financial assets	(61)	(278)	(522)	(638)	(249)	(277)
Other income	207	253	353	480	486	564
Other gains/ (losses) - net	(26)	(166)	505	323	221	350
Finance income	105	268	175	240	210	170
Finance expense	(29)	(150)	(113)	(58)	(60)	(55)
Share of losses	(11)	(3)	(6)	(7)	(5)	(6)
Fair value losses of pref. shares and other financial liabilities	(3,182)	(3,682)	(10,564)	(29,000)	-	-
Total	(2,997)	(3,757)	(10,171)	(28,660)	603	746
Other income						
Government grants	207	249	353	480	486	564
- Financial subsidies	173	213	323	410	390	410
-Tax refund	33	35	30	70	96	154
Dividend received	-	3	-	-	-	-
Total	207	252	353	480	486	564
Other gains/ (losses) - net						
Net foreign exchange (losses)/gains	(39)	(17)	408	153	181	247
Others	13	(149)	98	170	40	103
Total	(26)	(166)	505	323	221	350
Tax credit	23	205	161	(11)	168	99
Net profit/ (loss)	(3,428)	(4,963)	(12,158)	(32,489)	(1,812)	(1,547)
Adj. net profit/ (loss) *	(150)	(1,155)	(708)	(2,072)	(1,306)	(975)
+Finance income, net	(76)	(118)	(62)	(181)	(151)	(115)
+Depre & Amortization	159	378	570	685	1,125	1,756
+Tax	(23)	(205)	(161)	11	(168)	(99)
Adj. EBITDA	(90)	(1,101)	(361)	(1,558)	(499)	567

Source: Company data, CMBIS estimates *Adjusted net loss is defined as net loss for the period adjusted by adding back fair value losses of preferred shares and other financial liabilities, fair value (gains)/ losses on financial assets at fair value through profit or loss and share-based compensation expenses.

Balance sheet

Working capital

SenseTime trade receivable days was long at 293 in FY20, as the Company derived 40% of revenue from Smart City (public sector), which typically features a long payment cycle.

Other receivables include mainly payments made on behalf of customers. When SenseTime delivers software products, the Company sometimes purchase additional products and services on behalf of customers and receive reimbursement. Other receivable days was shorter at 167 in FY20. Other receivable absolute amount decreased from RMB2,084mn in FY19 to RMB1,074mn in FY20 as the Company strategically limits such purchases and customers are fulfilling the payment obligations.

Inventories primarily consist of servers, AI software-embedded hardware products, components and semiconductors. Inventory days increased from 76 in FY19 to 206 in FY20 as the Company increased purchase of inventories in anticipation of supply chain disruption due to COVID-19 and for expected growth in purchase from Smart City customers under the "New Infrastructure" policy. We expect inventory days to shorten to 130 in FY23E.

Trade and other payables primarily include payments due for the purchase of hardware and services, accrued staff salaries and welfare and payments due for the purchase of property plant and equipment. Trade payable days lengthened from 152 in FY19 to 228 in FY20 due to longer credit term granted by suppliers. Other payables significantly reduced from RMB938mn in FY19 to RMB588mn in FY20 as SenseTime settled the payment for the office building in Shanghai.

Figure 59: Working capital breakdown

RMB mn	FY18	FY19	FY20	FY21E	FY22E	FY23E
Trade receivable days	157	219	293	380	342	308
Other receivable days	22	132	167	105	95	70
Inventories days	31	76	206	127	133	130
Trade payable days	92	152	228	188	206	195
Other payable days	45	145	275	199	225	202
Trade, other receivables and prepayments	1,467	4,678	4,584	6,528	8,140	9,759
Account receivables - Trade, net	1,230	2,403	3,139	4,871	5,995	7,442
Other receivables, net	111	2,084	1,074	1,344	1,669	1,693
Prepayments	69	114	119	150	211	287
Others	58	77	252	163	264	336
Trade and other payables	887	3,103	1,724	2,897	4,377	5,667
Account payables - Trade	359	732	534	796	1,208	1,607
Other payables	99	938	588	843	1,321	1,661
Others	428	1,433	602	1,258	1,849	2,398
Inventories	117	430	716	538	782	1,073

Source: Company data, CMBIS estimates

Gearing

SenseTime was in net cash position if we adjusted for preferred shares. The Company has little bank borrowing at only RMB1,017mn in FY20. We expect the Company to remain at net cash position in FY21-23E.

Figure 60: Net debt

RMB mn	FY18	FY19	FY20	FY21E	FY22E	FY23E
Restricted cash	2,139	4,284	493	493	493	493
Term deposits	1,408	1,286	5,890	5,890	5,890	5,890
Structured deposits	-	-	-	-	-	-
Cash and cash equivalents	7,227	6,673	11,428	10,994	8,482	6,674
Total cash	10,774	12,243	17,811	17,377	14,866	13,058
Short-term borrowing	1,557	3,357	594	430	394	363
Long-term borrowing	-	-	423	647	592	546
Total debt (excl. preferred shares liabilities)	2,283	3,783	1,324	1,385	1,294	1,217
Net debt	net cash	net cash	net cash	net cash	net cash	net cash
Preferred Shares liabilities	18,506	27,106	50,186	-	-	-

Source: Company data, CMBIS estimates

Cash flow

Capex

SenseTime capex largely consists of property, plant and equipment (mainly servers). We expect total capex to increase at 9% CAGR from RMB1,305.6mn in FY20 to RMB1,704.4mn in FY23E as SenseTime is in the process of building Shanghai Lingang AIDC.

Figure 61: Capex breakdown

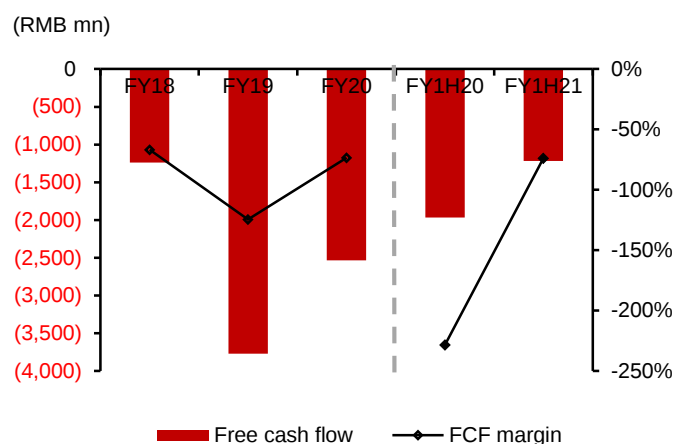
RMB mn	FY18	FY19	FY20	FY21E	FY22E	FY23E
PPE	478	777	1,210	2,433	1,408	1,412
Intangible assets	10	122	28	70	77	85
Land use right	-	-	68	-	-	-
Total	488	899	1,306	2,503	1,484	1,497
as % of revenue	26%	30%	38%	54%	23%	17%

Source: Company data, CMBIS estimates

Free cash flow

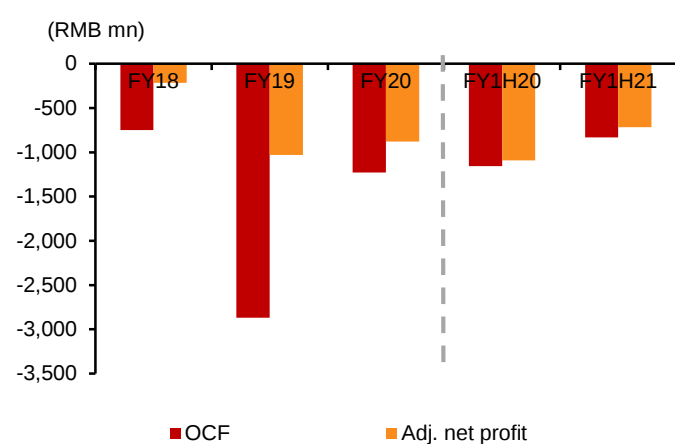
SenseTime has negative free cash flow during FY18-20. We expect such position to continue as SenseTime expands into new verticals and remains in net loss.

Figure 62: Operating cash flow and adj. net profit



Source: Company data, CMBIS

Figure 63: Free cash flow



Source: Company data, CMBIS

Figure 64: Revenue and cost of sales breakdown

RMB mn	FY18	FY19	FY20	FY21E	FY22E	FY23E
Revenue breakdown						
Smart Business	854	1,203	1,485	1,977	2,500	3,307
Smart City	530	1,271	1,369	2,139	3,131	4,141
Smart Life	330	414	434	396	572	1,068
Smart Auto	139	139	158	167	195	310
Total	1,853	3,027	3,446	4,678	6,399	8,825
Revenue mix						
Smart Business	46%	40%	43%	42%	39%	37%
Smart City	29%	42%	40%	46%	49%	47%
Smart Life	18%	14%	13%	8%	9%	12%
Smart Auto	7%	5%	5%	4%	3%	4%
Revenue YoY						
Smart Business		41%	23%	33%	27%	32%
Smart City		140%	8%	56%	46%	32%
Smart Life		25%	5%	-9%	44%	87%
Smart Auto		0%	14%	5%	17%	59%
Total		63%	14%	36%	37%	38%
Cost of sales breakdown						
Hardware costs and subcontracting service fees	767	1,228	910	1,404	1,958	2,768
Server operation and cloud-based service fees	10	32	1	2	2	3
Employee benefit expenses	4	14	57	77	101	132
Other expenses	25	33	46	61	80	105
Total	807	1,307	1,014	1,544	2,141	3,008
Cost of sales mix						
Hardware costs and subcontracting service fees	95%	94%	90%	91%	91%	92%
Server operation and cloud-based service fees	1%	2%	0%	0%	0%	0%
Employee benefit expenses	1%	1%	6%	5%	5%	4%
Other expenses	3%	3%	5%	4%	4%	3%

Source: Company data, CMBIS estimates

Figure 65: Operating model

RMB mn	FY18	FY19	FY20	FY21E	FY22E	FY23E
Revenues	1,853	3,027	3,446	4,678	6,399	8,825
Cost of sales	(807)	(1,307)	(1,014)	(1,544)	(2,141)	(3,008)
Gross Profit	1,047	1,719	2,432	3,134	4,258	5,818
<i>Gross margin</i>	<i>56.5%</i>	<i>56.8%</i>	<i>70.6%</i>	<i>67.0%</i>	<i>66.5%</i>	<i>65.9%</i>
Selling & marketing expense	(205)	(453)	(537)	(906)	(893)	(1,158)
Administrative expense	(452)	(766)	(1,590)	(2,290)	(1,889)	(2,167)
Research & development expense	(849)	(1,916)	(2,454)	(3,755)	(4,060)	(4,886)
Operating Income	(459)	(1,416)	(2,148)	(3,818)	(2,584)	(2,392)
<i>Operating margin</i>	<i>-24.8%</i>	<i>-46.8%</i>	<i>-62.3%</i>	<i>-81.6%</i>	<i>-40.4%</i>	<i>-27.1%</i>
Non-Operating Income	(2,997)	(3,757)	(10,171)	(28,660)	603	746
Profit Before Tax	(3,456)	(5,173)	(12,319)	(32,478)	(1,981)	(1,646)
Income tax (expense) gain	23	205	161	(11)	168	99
Minorities	(5)	(5)	(0)	(0)	(0)	(0)
Net Income to Shareholders	(3,428)	(4,963)	(12,158)	(32,489)	(1,812)	(1,547)
<i>Net margin</i>	<i>-184.9%</i>	<i>-164.0%</i>	<i>-352.8%</i>	<i>-694.4%</i>	<i>-28.3%</i>	<i>-17.5%</i>
Net profit/ (losses)						
+Fair value losses of preferred shares and other financial liabilities	3,182	3,682	10,564	29,000	-	-
+Share-based compensation expenses	15	131	887	1,502	507	573
+Share-based compensation to a preferred shareholder	86	-	-	-	-	-
Adj. net profit	(150)	(1,155)	(708)	(2,072)	(1,306)	(975)
<i>Adj. net margin</i>	<i>-8.1%</i>	<i>-38.2%</i>	<i>-20.5%</i>	<i>-44.3%</i>	<i>-20.4%</i>	<i>-11.0%</i>

Source: Company data, CMBIS

Figure 66: Balance sheet

RMB mn	FY18	FY19	FY20	FY21E	FY22E	FY23E
Current Assets						
Cash and Equivalents	7,227	6,673	11,428	10,994	8,482	6,674
Inventories	117	430	716	538	782	1,073
Trade, other receivables and prepayments	1,467	4,678	4,584	6,528	8,140	9,759
Restricted cash	2,139	4,284	493	493	493	493
Term deposits	1,408	1,286	5,890	5,890	5,890	5,890
Others	1,396	880	8,616	22	22	22
Total Current Assets	13,755	18,231	31,726	24,466	23,810	23,912
Non-current Assets						
Property Plant & Equipment	585	1,894	1,906	3,728	4,097	3,853
Total Intangible Assets	40	140	108	105	95	80
Right-of-use assets	455	404	336	336	336	336
Financial assets at FV through P&L	1,851	2,901	3,739	3,739	3,739	3,739
Others	262	378	664	664	664	664
Total Assets	16,948	23,948	38,479	33,037	32,740	32,583
Current Liabilities						
Trade and other payables	887	3,103	1,724	2,897	4,377	5,667
Contract liabilities	70	153	244	331	453	625
Borrowings	1,557	3,357	594	430	394	363
Preferred share liabilities	-	-	1,898	-	-	-
Others	633	243	5,363	157	157	157
Total Current Liabilities	3,148	6,856	9,822	3,816	5,381	6,811
Non-Current Liabilities						
Lease liabilities	335	296	184	184	184	184
Borrowings	-	-	423	647	592	546
Contract liabilities	-	-	9	13	17	24
Preferred share liabilities	18,506	27,106	48,288	-	-	-
Others	324	345	684	684	684	684
Total Liabilities	22,313	34,602	59,411	5,344	6,859	8,250
Stockholder Equity						
Share capital	0.002	0.002	0.002	0.002	0.002	0.002
Reserves	(580)	(873)	(433)	80,682	80,682	80,682
Currency translation reserves	(192)	(360)	1,078	1,078	1,078	1,078
Accumulated losses	(4,596)	(9,557)	(21,713)	(54,202)	(56,014)	(57,562)
Non-controlling interests	4	136	136	135	135	135
Total Equity	(5,365)	(10,654)	(20,933)	27,693	25,881	24,334

Source: Company data, CMBIS

Figure 67: Cash flow

RMB mn	FY18	FY19	FY20	FY21E	FY22E	FY23E
Operating Activities						
Profit before tax	(3,456)	(5,173)	(12,319)	(32,478)	(1,981)	(1,646)
Finance costs	29	150	113	58	60	55
Interest income	-	-	-	-	-	-
Depreciation & Amortisation	159	378	570	685	1,125	1,756
Change in working capital	(666)	(2,176)	(1,290)	(503)	(250)	(442)
Income tax paid	(2)	(1)	(13)	(11)	168	99
Others	3,186	3,953	11,711	28,760	(210)	(170)
Net cash flows from operating activities	(750)	(2,869)	(1,229)	(3,489)	(1,087)	(349)
Investing Activities						
Purchases of PP&E	(478)	(777)	(1,210)	(2,433)	(1,408)	(1,412)
Purchases of intangible assets	(10)	(122)	(28)	(70)	(77)	(85)
Purchase of land use right	-	-	(68)	-	-	-
Investment in term deposits	(1,242)	207	(5,013)	-	-	-
Others	(1,379)	(936)	(752)	240	210	170
Net cash flows used in investing activities	(3,108)	(1,628)	(7,070)	(2,263)	(1,274)	(1,327)
Financing Activities						
Proceeds from equity financing	-	-	-	5,316	-	-
Proceeds from borrowings, net	1,603	3,227	1,129	60	(91)	(77)
Proceeds from issuance of preferred share liabilities	10,991	5,535	6,847	-	-	-
Others	(3,796)	(4,989)	5,209	(58)	(60)	(55)
Net cash flows used in financing activities	8,799	3,773	13,186	5,318	(150)	(132)
Net Change In Cash	4,941	(725)	4,886	(434)	(2,512)	(1,808)
Cash and Cash Equivalents (Beg of Period)	1,861	7,227	6,673	11,428	10,994	8,482
Cash and Cash Equivalents (End of Period)	7,227	6,673	11,428	10,994	8,482	6,674

Source: Company data, CMBIS

Valuation

Initiate at BUY with target price of HK\$8.08

We initiate coverage on SenseTime with BUY recommendation and target price of HK\$8.08, based on 34x FY22E EV/sales. We use EV/sales as valuation methodology as AI deployment is still in an early stage that short term earnings are distorted by high R&D, marketing expense and depreciation related to heavy capex for computing infrastructure.

Our target multiple is derived from 20% premium to Cambricon. We think Cambricon, leading AI chip design company in China, is the closest comparable to SenseTime. Both SenseTime and Cambricon are national champions in emerging technology. We apply premium to Cambricon valuation to reflect SenseTime larger business scale. Our target multiple also takes into account the AI company scarcity and free float.

Figure 68: Valuation

EV/sales	FY22E
Target price (HK\$)	8.08
Target EV/sales	34x
Enterprise value (RMB mn)	217,555
+ net cash	7,188
- minority interest	(0)
Equity value (RMB mn)	224,743
Shares outstanding (mn)	33,507

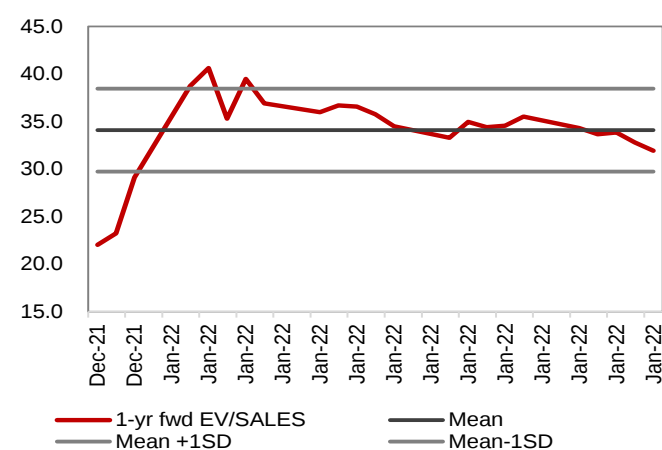
Source: Company data, CMBIS *CNY/HKD: 0.83

Figure 69: Peers comparison

			Market Cap	Price	EV/sales (x)		P/S		Sales CAGR	EPS CAGR	GPM	FCF margin
Company	Ticker	Rating	(US\$ mn)	(LC)	FY21E	FY22E	FY21E	FY22E	FY20-23E	FY20-23E	FY20	FY20
Global AI companies												
Palantir	PLTR US	NR	25,481	12.71	15.2	11.7	16.7	12.8	33%	52%	68%	-28%
UiPath	PATH US	NR	17,558	33.43	17.8	13.4	19.8	14.9	52%	n.a.	82%	3%
C3.ai	AI US	NR	2,451	23.33	8.2	6.0	13.5	9.8	29%	n.a.	75%	-41%
Nvidia	NVDA US	NR	571,000	228.40	34.2	21.1	34.6	21.4	43%	55%	62%	39%
Ambarella	AMBA US	NR	4,792	129.50	19.8	13.1	21.9	14.4	21%	43%	58%	16%
				Mean	19.0	13.0	21.3	14.7	35%	50%	69%	-2%
				Median	17.8	13.1	19.8	14.4	33%	52%	68%	3%
China AI companies												
Cambricon	688256 CH	NR	4,955	78.78	40.6	28.4	45.9	32.2	45%	n.a.	65%	-55%
Arcsoft	688088 CH	NR	2,459	38.53	20.9	14.7	24.3	17.1	24%	12%	90%	11%
				Mean	30.7	21.5	35.1	24.6	35%	12%	77%	-22%
				Median	30.7	21.5	35.1	24.6	35%	12%	77%	-22%
Global SaaS												
Microsoft	MSFT US	NR	2,310,984	308.26	13.6	11.4	13.9	11.7	17%	24%	68%	32%
Adobe	ADBE US	NR	244,416	518.16	15.4	13.5	15.5	13.6	17%	18%	87%	41%
Autodesk	ADSK US	NR	52,692	239.54	14.3	12.3	14.0	12.1	16%	35%	90%	42%
Salesforce	CRM US	NR	218,798	222.13	10.6	8.5	10.4	8.3	23%	18%	75%	22%
Atlassian	TEAM US	NR	80,905	319.17	39.5	30.2	39.4	30.0	27%	22%	83%	33%
Datadog	DDOG US	NR	42,734	136.96	42.3	29.8	43.0	30.2	47%	70%	78%	14%
Docusign	DOCU US	NR	23,209	117.29	16.3	11.2	16.3	11.1	39%	106%	75%	4%
Intuit	INTU US	NR	151,443	534.82	16.1	12.1	16.1	12.2	23%	24%	82%	30%
Okta	OKTA US	NR	28,657	184.24	34.3	22.1	34.8	22.4	44%	n.a.	73%	7%
ServiceNow	NOW US	NR	111,655	561.08	18.8	14.9	19.0	15.1	27%	27%	78%	30%
Shopify	SHOP US	NR	110,340	872.23	22.7	17.2	24.1	18.2	41%	37%	53%	13%
Workday	WDAY US	NR	59,545	238.18	13.5	11.3	13.8	11.6	19%	26%	71%	17%
Veeva System	VEEV US	NR	34,557	224.74	22.3	17.5	23.9	18.7	25%	22%	73%	39%
				Mean	21.5	16.3	21.9	16.6	28%	36%	76%	25%
				Median	16.3	13.5	16.3	13.6	25%	25%	75%	30%

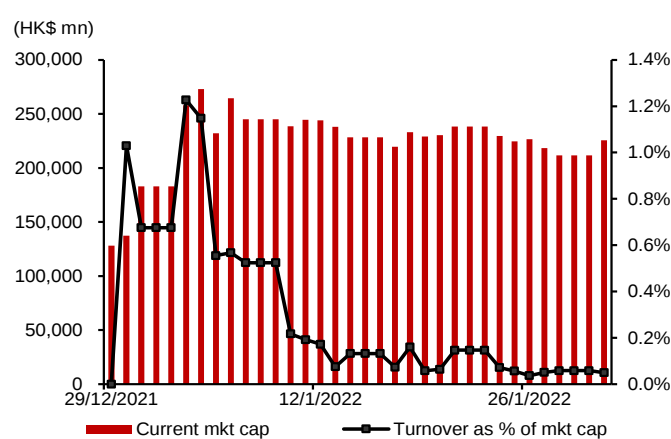
Source: Bloomberg, CMBIS, closing price as of 31 Jan 2022

Figure 70: SenseTime forward EV/sales



Source: Bloomberg, CMBIS

Figure 71: SenseTime trading volume vs. mkt cap



Source: Bloomberg, CMBIS

Investment risks

Evolving data privacy regulations

SenseTime faces complex and evolving laws, regulations and governmental policies regarding privacy and data protection. Any failure to comply with related laws could damage Company's reputation and affect customers' willingness to use SenseTime's products and services. SenseTime may also face legal, financial and operational consequences.

Tightening U.S. restrictions

One of SenseTime's subsidiaries, Beijing SenseTime, was added to the U.S. Entity List by the BIS in Oct 2019, which restricts its ability to purchase or access certain goods, software and technology. Although we find no material adverse impact from current U.S. restrictions to SenseTime business, we cannot rule out the possibility that the U.S. government may place tighter control in the future. See P.12 for detailed discussion.

Customer concentration

For the years ended 31 Dec 2018, 2019, 2020 and the six months ended 30 Jun 2021, largest customer revenue contribution amounted to 8.7%, 7.7%, 11.9% and 22.9% respectively, while the top five largest customers revenue contribution was 28.4%, 26.3%, 31.4% and 59.3%. Trade receivables and liquidity could be affected if SenseTime is unable to find new customers with similar attributable revenue within a reasonable period of time.

Substantial portion of revenue depends on sales to public sector

SenseTime derived 28.6%, 41.9%, 39.7% and 47.6% of revenue from Smart City business in 2018, 2019, 2020 and the six months ended 30 Jun 2021. Uncertainties and changes in government policies and spending on AI-related products and services could affect SenseTime's business negatively.

Increasing capex on AIDC

SenseTime is expected to incur significant capex as the Company is in the process of building Shanghai Lingang AIDC to enhance AI infrastructure and AI model mass production capabilities.

Working capital management

SenseTime net cash used in operating activities decreased by 57.2% YoY in 2020 to RMB1,228.8mn. SenseTime has long trade receivables turnover days (293 days as of 31 Dec 2020) as a significant portion of revenue is derived from the public sector that features a long payment cycle. Working capital could deteriorate with lengthening trade receivables turnover days.

Recruiting and retaining AI talents

SenseTime may face competition from new entrants who may offer lower prices or new technologies and products. If SenseTime is unable to recruit and retain top AI scientists and talents, the Company may not be able to compete successfully and hence affect financial conditions materially.

Appendix 1: Company profile

Key milestones

Figure 72: Key milestones

Year	Event
2014	SenseTime was incorporated
2015	- Started R&D on deep learning training framework SenseParrots, which lies at the heart of SenseCore, is one of the earliest self-developed deep learning frameworks in China. - Won the first place in ImageNet Large Scale Visual Recognition Challenge, with the world's largest AI model at that time.
2016	- Launched SenseME and SenseMARS software platforms for Smart Life, which have empowered over 450mn smart phones and over 200 mobile apps over the years, and has become one of the biggest Metaverse enabling platforms - Started R&D on autonomous driving for Smart Auto and broke the world record in pedestrian and vehicle detection on KITTI 2016, one of the largest international autonomous driving datasets
2017	- Started R&D on SenseFoundry for Smart City, which has supported city management in 11 megacities with over 10mn population over the years - Began R&D collaboration with Honda Motor Company Ltd. for autonomous driving technologies.
2018	- Designated as the National Open Innovation Platform for Next Generation AI on Intelligent Vision - Started R&D on specialized AI chip
2019	- Co-founded China Augmented Reality Core Technology Industry Alliance - Started R&D on AI sensors - Became the first company to provide face payment technology integrated to subways ticketing systems in megacities with over 10mn population to support contactless swift subway entry
2020	- Completed the tape-out of first specialized AI chip STPU - Commenced construction of Shanghai Lingang AIDC, which is expected to become one of the largest supercomputers in Asia designed to generate total computing capacity of 3.74 exaFLOPs - Became the first AI company to receive all three ISO/IEC certifications for Privacy Information Management System, Information Security Management and Personally Identifiable Information Protection
2021	- Became the only AI company in Asia to have Code of Ethics for AI Sustainable Development selected by the United Nations as one of the key publication references in the United Nations Resource Guide on AI Strategies published in Jun 2021 - Built the world's largest computer vision model with over 30bn parameters - Number of commercialized AI models reached over 22,000, patent and patent applications reached over 8,000. - Listed on HKEx

Source: Company data, CMBIS

Management background

Figure 73: Management background

Name	Position	Age	Background
Dr. Xu Li (徐立)	Co-founder, Executive Director, Chairman and Chief Executive Officer	39	Dr. Xu is a co-founder of the Group and has been an adjunct professor at Shanghai Jiao Tong University since Dec 2018. Prior to joining the Group, Dr. Xu Li was a research scientist at Lenovo Group Ltd. from Aug 2013 to Mar 2015, and a postdoctoral fellow at the Chinese University of Hong Kong from Oct 2010 to Jul 2013. Dr. Xu Li obtained his bachelor's degree in computer science and engineering in Jul 2004 and his master's degree in computer engineering in Mar 2007 from Shanghai Jiao Tong University, and his Ph. D. degree in computer science and engineering in Dec 2010 from the Chinese University of Hong Kong.
Prof. Tang Xiao'ou (湯曉鵬)	Co-founder and Executive Director	53	Prof. Tang is the founder of the Group. Prof. Tang has been a professor at the Department of Information Engineering at the Chinese University of Hong Kong since Jan 1998, an associate director of the Shenzhen Institute of Advanced Technology of the Chinese Academy of Science since Jan 2009, a director of HKAI Lab since May 2018, the head of the Shanghai Artificial Intelligence Innovation Center since Aug 2020, and a board member of Khazanah Nasional Berhad from Jun 2019 to Apr 2020 and Hong Kong Science and Technology Parks Corporation from Jul 2018 to Mar 2021. Prof. Tang obtained a Bachelor of Science degree from the University of Science and Technology of China in Jul 1990, a Master of Science degree from the University of Rochester in Oct 1991, and a Ph.D. degree from the Massachusetts Institute of Technology in Jun 1996.
Dr. Wang Xiaogang (王曉剛)	Co-founder, Executive Director and Chief Scientist	44	Dr. Wang is a co-founder of the Group. Dr. Wang joined the Department of Electronic Engineering at the Chinese University of Hong Kong as an assistant professor in Aug 2009 and has been a professor since Aug 2020. Dr. Wang has been the Chairman of China Augmented Reality Core Technology Industry Alliance since Jun 2019. Dr. Wang obtained his bachelor's degree in electronic engineering and information science from the Special Class of Gifted Young at the University of Science and Technology of China in Jul 2001, an MPhil degree from the Chinese University of Hong Kong in Dec 2003, and a Ph.D. degree in computer science from the Massachusetts Institute of Technology in Jun 2009.
Mr. Xu Bing (徐冰)	Co-founder, Executive Director and Board Secretary	31	Mr. Xu is a co-founder of the Group. Mr. Xu was a Ph.D. candidate at the Multimedia Lab of the Chinese University of Hong Kong since Aug 2012. Mr. Xu obtained his dual bachelor's degrees in information engineering and mathematics from the Chinese University of Hong Kong in Nov 2012.
Mr. Wang Zheng (王征)	Chief Financial Officer	44	Mr. Wang joined the Group in May 2019. Prior to joining, Mr. Wang worked as a managing director and head of Greater China at Silver Lake from May 2008 to Dec 2018, vice president at General Atlantic from May 2005 to Apr 2008, a senior business analyst at McKinsey & Company from 2003 to May 2005, a financial analyst at Morgan Stanley from Nov 2002 to Aug 2003, and at Credit Suisse First Boston from Jul 2001 to Oct 2002. Mr. Wang obtained a bachelor's degree, summa cum laude, in computer science and economics from Yale College in May 2001.
Mr. Yang Fan (楊帆)	Co-founder and Vice President	38	Mr. Yang is a co-founder of the Group. Mr. Yang has been serving as an industry expert at the Shenzhen Stock Exchange from Jun 2020 and the vice president of the Strategic Cooperation and Development Committee of the Institute for AI International Governance of Tsinghua University from Apr 2021. Prior to joining, Mr. Yang was the research software development engineer at Microsoft (China) Co., Ltd. from Jul 2006 to Nov 2014. Mr. Yang obtained a bachelor's and a master's degree in electronic engineering from Tsinghua University in Jul 2003 and Jul 2006, respectively.

Source: Company data

Shareholding structure

SenseTime is listed on Hong Kong Stock Exchange since 30 Dec 2021. Among the 1,500mn base offering shares, 67.7% was taken up by 9 cornerstone investors. Stabilization period ended on 22 Jan 2022. Additional 225mn new Class B shares were issued under over-allotment option. Free float before the 6-months lock-up period end is 691.7mn (2.1% of outstanding share capital).

IPO offering details

- IPO price: HK\$3.85
- Offer size:
 - Base offering: 1,500mn Class B shares
 - Over-allotment option: 225mn Class B shares
- Lock up:
 - Company: 6 months
 - All Class A (shares with super-voting rights): 12 months
 - All Class B (Pre-IPO investors and ESOP): 6 months
 - Cornerstone investors: 6 months
- Cornerstone:
 - 9 cornerstone investors committed for 68.9% of the base deal size
- Net proceeds: HK\$6,405mn (RMB5,316mn*)
 - Base offering: HK\$5,552mn
 - Over-allotment option: HK\$853.2mn

Figure 74: SenseTime IPO details

Items	Details
Offer price (HK\$)	3.85
Net proceeds (HK\$ mn) (incl. over-allotment)	6,405
Net proceeds (RMB mn) (incl. over-allotment)	5,316*
Lock-up period	
- Class A	12 months
- Class B	6 months
Shares before IPO	31,782.4
New Shares issued (Class B)	1,500.0
Over allotment shares (Class B)	225.0
Total shares outstanding	33,507.4

Source: Company data, CMBIS *CNY/HKD 0.83

Figure 75: SenseTime IPO cornerstone investors

Companies	Subscription amount (US\$mn)	No. of shares (mn)	% of offer shares*	% of share capital post-IPO (after over-allotment)
Mixed-Ownership Reform Fund	200.0	405.2	27.01%	1.21%
Xuhui Capital	150.0	300.9	20.06%	0.90%
Shanghai Guosheng Group	72.5	146.9	9.79%	0.44%
Shanghai AI Fund	6.0	12.2	0.81%	0.04%
SAIC Motor	30.0	60.8	4.05%	0.18%
Guotai Junan Investments	38.0	77.0	5.13%	0.23%
HKSTP Venture Fund	5.0	10.1	0.68%	0.03%
C-MER	5.0	10.1	0.68%	0.03%
Taizhou Culture & Tourism	5.1	10.3	0.69%	0.03%

Source: Company data, CMBIS *excluding over-allotment shares

Figure 76: Shareholding structure post IPO

Shareholders	No. of Class A shares (mn)	No. of Class B shares (mn)	Shareholding % pre-IPO	Shareholding % post-IPO (after over-allotment)
Prof. Tang	6,906.1	1,891.8	27.7%	26.3%
Dr. Xu Li	286.3	565.4	2.7%	2.5%
Dr. Wang	232.2	302.1	1.7%	1.6%
Mr. Xu Bing	104.2	252.2	1.1%	1.1%
Softbank		4,730.5	14.9%	14.1%
ESOP		2,749.5	8.7%	8.2%
Alibaba		2,411.0	7.6%	7.2%
Others		11,351.0	35.7%	33.9%
Total outstanding shares pre-IPO (mn)	31,782.4			
- Ordinary shares	11,717.3			
- Preferred shares	20,065.1			
New shares issued (incl. over-allotment)	1,725.0			
- Cornerstone investors	1,033.3			3.1%
- Rest of IPO investors	691.7			2.1%
Total outstanding shares post-IPO (mn)	33,507.4			

Source: Company data, CMBIS

Financial Summary

Income statement

YE 31 Dec (RMB mn)	FY19A	FY20A	FY21E	FY22E	FY23E
Revenue	3,027	3,446	4,678	6,399	8,825
Cost of sales	(1,307)	(1,014)	(1,544)	(2,141)	(3,008)
Gross profit	1,719	2,432	3,134	4,258	5,818
S&M	(453)	(537)	(906)	(893)	(1,158)
G&A	(766)	(1,590)	(2,290)	(1,889)	(2,167)
R&D	(1,916)	(2,454)	(3,755)	(4,060)	(4,886)
Adj. op. profit/ (loss)	(1,416)	(2,148)	(3,818)	(2,584)	(2,392)
Finance income	268	175	240	210	170
Finance expense	(150)	(113)	(58)	(60)	(55)
Other non-ops	(3,875)	(10,234)	(28,842)	452	631
Profit before tax	(5,173)	(12,319)	(32,478)	(1,981)	(1,646)
Income tax	205	161	(11)	168	99
Profit after tax	(4,968)	(12,158)	(32,489)	(1,812)	(1,547)
Non controlling Interest	(5)	(0)	(0)	(0)	(0)
Net profit	(4,963)	(12,158)	(32,489)	(1,812)	(1,547)
Adj. net profit	(1,150)	(708)	(2,072)	(1,306)	(975)

Cash flow summary

YE 31 Dec (RMB mn)	FY19A	FY20A	FY21E	FY22E	FY23E
Net Income	(5,173)	(12,319)	(32,478)	(1,981)	(1,646)
Depre. and amortization	378	570	685	1,125	1,756
Change In working capital	(2,176)	(1,290)	(503)	(250)	(442)
Others	4,102	11,810	28,808	18	(17)
Net cash from operating act.	(2,869)	(1,229)	(3,489)	(1,087)	(349)
Capex	(899)	(1,306)	(2,503)	(1,484)	(1,497)
Others	(729)	(5,765)	240	210	170
Net cash from investing act.	(1,628)	(7,070)	(2,263)	(1,274)	(1,327)
Equity financing	-	-	5,316	-	-
Change of debts	3,897	13,327	60	(91)	(77)
Dividend paid	-	-	-	-	-
Others	(125)	(141)	(58)	(60)	(55)
Net cash from financing act.	3,773	13,186	5,318	(150)	(132)
Net change in cash	(725)	4,886	(434)	(2,512)	(1,808)
Cash at the beg. of the year	7,227	6,673	11,428	10,994	8,482
Cash at the end of the year	6,673	11,428	10,994	8,482	6,674

Balance sheet

YE 31 Dec (RMB mn)	FY19A	FY20A	FY21E	FY22E	FY23E
Non-current assets	5,717	6,753	8,571	8,930	8,671
PPE, net	1,894	1,906	3,728	4,097	3,853
Intangible assets	140	108	105	95	80
Right-of-use assets	404	336	336	336	336
Others	3,279	4,402	4,402	4,402	4,402
Current assets	18,231	31,726	24,466	23,810	23,912
Cash & equivalents	6,673	11,428	10,994	8,482	6,674
Trade and other receivables	4,678	4,584	6,528	8,140	9,759
Inventories	430	716	538	782	1,073
Financial investments	-	-	-	-	-
Contract assets	1	22	22	22	22
Others	6,449	14,977	6,384	6,384	6,384
Current liabilities	6,856	9,822	3,816	5,381	6,811
Trade and other payables	3,103	1,724	2,897	4,377	5,667
Contract liabilities	153	244	331	453	625
Lease liabilities	123	110	110	110	110
Others	3,477	7,744	477	441	410
Non-current liabilities	27,747	49,589	1,528	1,478	1,438
Lease liabilities	296	184	184	184	184
Deferred tax liabilities	6	8	8	8	8
Contract liabilities	-	9	13	17	24
Others	27,445	49,388	1,323	1,269	1,223
Share capital	0	0	0	0	0
Reserves	(873)	(433)	80,682	80,682	80,682
Accumulated losses	(9,557)	(21,713)	(54,202)	(56,014)	(57,562)
Others	(224)	1,214	1,213	1,213	1,213
Total equity	(10,654)	(20,933)	27,693	25,881	24,334

Key ratios

YE 31 Dec	FY19A	FY20A	FY21E	FY22E	FY23E
Sales mix (%)					
Smart Business	40%	43%	42%	39%	37%
Smart City	42%	40%	46%	49%	47%
Smart Life	14%	13%	8%	9%	12%
Smart Auto	5%	5%	4%	3%	4%
Total	100%	100%	100%	100%	100%
Growth (YoY)					
Revenue	63%	14%	36%	37%	38%
Gross profit	64%	41%	29%	36%	37%
Operating profit	n.a.	n.a.	n.a.	n.a.	n.a.
Net profit	n.a.	n.a.	n.a.	n.a.	n.a.
Adj. net profit	n.a.	n.a.	n.a.	n.a.	n.a.
Margins					
Gross margin	57%	71%	67%	67%	66%
Adj. Operating margin	-47%	-62%	-82%	-40%	-27%
Net profit margin	-164%	-353%	-694%	-28%	-18%
Adj. net profit margin	-38%	-21%	-44%	-20%	-11%
Balance sheet ratio					
Net debt / equity ratio (%)	net cash	net cash	net cash	net cash	net cash
Current ratio	2.7	3.2	6.4	4.4	3.5
Returns (%)					
ROE	n.a.	n.a.	n.a.	n.a.	n.a.
ROIC	n.a.	n.a.	n.a.	n.a.	n.a.
Per share					
EPS (RMB)	(0.56)	(1.33)	(0.97)	(0.05)	(0.05)
BVPS (RMB)	(1.20)	(2.29)	0.83	0.77	0.73

Source: Company data, CMBIS estimates

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