



The Business School  
for the World®

IN1587

Case Study

## ByteDance Beyond China:

Leveraging Consumer Artificial Intelligence (AI) from  
Toutiao to Musical.ly and TikTok

The logo for ByteDance, consisting of three vertical bars of increasing height (blue, teal, blue) followed by the word "ByteDance" in a blue sans-serif font.



05/2019-6489

This case was written by Jason Davis, Associate Professor of Entrepreneurship and Family Enterprise, Minh H. Vo, PhD student of Entrepreneurship and Family Enterprise, and Anne Yang, Research Associate, all at INSEAD. It is intended to be used as a basis for class discussion rather than to illustrate either effective or ineffective handling of an administrative situation.

To access INSEAD teaching materials, go to [cases.insead.edu](https://cases.insead.edu).

Copyright © 2019 INSEAD

COPIES MAY NOT BE MADE WITHOUT PERMISSION. NO PART OF THIS PUBLICATION MAY BE COPIED, STORED, TRANSMITTED, TRANSLATED, REPRODUCED OR DISTRIBUTED IN ANY FORM OR MEDIUM WHATSOEVER WITHOUT THE PERMISSION OF THE COPYRIGHT OWNER.

*“AI technology touches more aspects of our lives than we are even aware of, from the networked systems that control the flow of traffic through our cities and the algorithms that create our music playlists, to the systems in healthcare and education that run automated diagnostics and recommend online courses to expand our knowledge base. As AI becomes an increasingly integral part of our society, ByteDance believes that we – and our industry peers – have a duty to ensure that we understand and can anticipate the social impact of these new technologies, and manage this impact responsibly.”*

Zhang Yiming, Founder and CEO, ByteDance<sup>1</sup> (December 1, 2017)

## 1. Introduction

ByteDance, the new media firm behind TikTok, a short-form video-sharing app, hit the headlines in 2018 when its valuation jumped to US\$75 billion, surpassing Uber’s \$72 billion to become the world’s most valuable start-up. Along the way it acquired several international services including Musical.ly and News Republic, with an ambitious plan to expand beyond China.

However, its rise to fame was not without missteps. It fell foul of China’s internet censors in April, resulting in its new aggregation unit shutting down for 24 hours and founder Zhang Yiming having to issue a ‘self-reflective’ public apology. He also pledged to expand its vetting team from 6,000 to 10,000 and to ban creators whose content was “against community values”.

Launched by ByteDance in September 2016, TikTok – known as Douyin in China – is a social media app for creating and sharing videos as well as live broadcasting. Within two years it had become a leading short video platform in Asia. Its acquisition of Musical.ly in August 2018 cemented its growing dominance in the US and around the world. In a span of less than three years, its 40,000 global headcount have also grown to surpass Facebook’s 35,600 staff, showing the world yet again, the speed and advantages of scaling in China<sup>2</sup>. However, TikTok hit a roadblock in March 2019 when it was fined a record \$5.7 million by the US Federal Trade Commission for collecting the personal data of children under 13.

Barriers to its global expansion include fierce local competition, government regulations and US-China trade tensions. Yet it established itself as a strong competitor to China’s tech giants and was building to take on US tech giants. Despite losses estimated at \$1.2 billion in 2018, ByteDance was laying the groundwork for an even more ambitious project – a productivity app, Lark, to take on Slack, Microsoft and Google.<sup>3</sup> This case study presents a brief history of AI (Section 2), categorization of AI applications (Section 3), and a comparison of AI in China and the US (Section 4), before the ByteDance story resumes in Section 5.

1 [https://en.prnasia.com/releases/apac/ByteDance\\_Hosts\\_First\\_Global\\_Festival\\_for\\_AI\\_Ideas\\_to\\_Drive\\_Global\\_Dialogue\\_on\\_the\\_Power\\_of\\_AI\\_Technology\\_for\\_Social\\_Good-196079.shtml](https://en.prnasia.com/releases/apac/ByteDance_Hosts_First_Global_Festival_for_AI_Ideas_to_Drive_Global_Dialogue_on_the_Power_of_AI_Technology_for_Social_Good-196079.shtml)

2 <https://www.theinformation.com/articles/the-people-behind-bytedances-app-factory>

3 <https://technode.com/2019/03/07/briefing-ByteDance-planning-a-slack-rival-for-international-markets/>

## 2. A History of Artificial Intelligence (AI)

The term ‘artificial intelligence’ was coined in 1956 at a historic conference at Dartmouth College, by John McCarthy, professor of Mathematics. It is “artificial” in that tasks that usually involve human cognition are performed by computer systems, such as recognizing patterns, predicting outcomes clouded by uncertainty, making complex decisions. AI algorithms are able to perceive and interpret the world around us—and, it is claimed, may eventually be capable of emotion, compassion, and creativity.<sup>4</sup> In basic terms, AI can be broadly defined as a field of computer science whereby machines take on human intelligence or capabilities that exceed it.

The ‘golden years’ of AI (1956-74) which followed the Dartmouth conference was a period of discovery. Numerous programmes were developed – computers were used to solve algebra and word problems, prove geometric theorems and learn languages. However, from 1974-80 the phenomenon failed to live up to the hype and funding dried up, albeit various forms of AI emerged including statistical neural networks. From 1980 to 1987, AI witnessed another boom when ‘expert systems’ – built around deterministic approaches like if-then statements – were adopted by companies and knowledge became the focus of mainstream AI research.<sup>5</sup> These systems dominated the scene until vast data and computational power became available, making new mathematical methods possible.

In the new millennium, statistical neural network applications made a comeback. From 2011, with the advent of new algorithms, big data and artificial general intelligence, scientists such as Geoffrey Hinton<sup>6</sup> leveraged access to so-called ‘big data’, faster computers, and advanced machine-learning techniques to apply statistical AI approaches to various problems. Analysing large quantities of information from a variety of sources using data mining, statistics and modelling, they could predict future outcomes. An entire AI subfield focused on prediction, seeking to fill in missing information by using data that did exist to generate new information based on underlying patterns. As the effectiveness and cost of making predictions fell thanks to better algorithms and processing power, their use expanded across a wide range of human activities and business applications such as fraud detection, and machine-learning applications such as for credit-worthiness (likelihood of loan repayment), health insurance (spending on medical treatments) and inventory management (daily warehouse stock levels).<sup>7</sup> New classes of prediction problems emerged thanks to advances in machine intelligence technology, including object identification, language translation and drug discovery.

However, scientists recognized that even the best AI algorithm could not succeed unless it had practical application to the real world. Efforts focused on improving input data so that predictions could be calibrated. In 2006, Fei Fei Li, a computer science professor at the University of Illinois Urbana-Champaign, built a dataset called ‘ImageNet’ which subsequently evolved into an annual competition to develop algorithms to identify objects in it with the lowest error rate. From the first year of the competition in 2010, predictions improved from an error rate of 28% to better-than-

4 <http://fortune.com/2018/10/22/artificial-intelligence-ai-deep-learning-kai-fu-lee/>

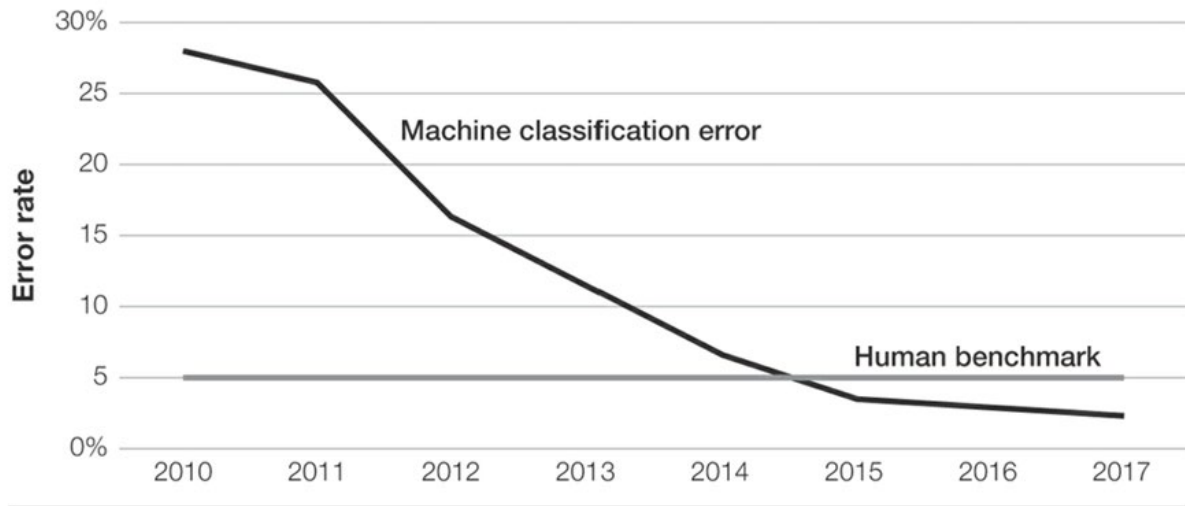
5 [https://en.wikipedia.org/wiki/History\\_of\\_artificial\\_intelligence](https://en.wikipedia.org/wiki/History_of_artificial_intelligence)

6 Geoffrey Everest Hinton, CC FRS FRSC, is an English Canadian cognitive psychologist and computer scientist, most noted for his work on artificial neural networks. With David E. Rumelhart and Ronald J. Williams, Hinton was co-author of a highly cited paper that applied the backpropagation algorithm (developed by Seppo Linnainmaa, 1970) to multi-layer neural networks.

7 Prediction Machines: The Simple Economics of Artificial Intelligence Hardcover – April 17, 2018, by Ajay Agrawal (Author), Joshua Gans (Author), Avi Goldfarb

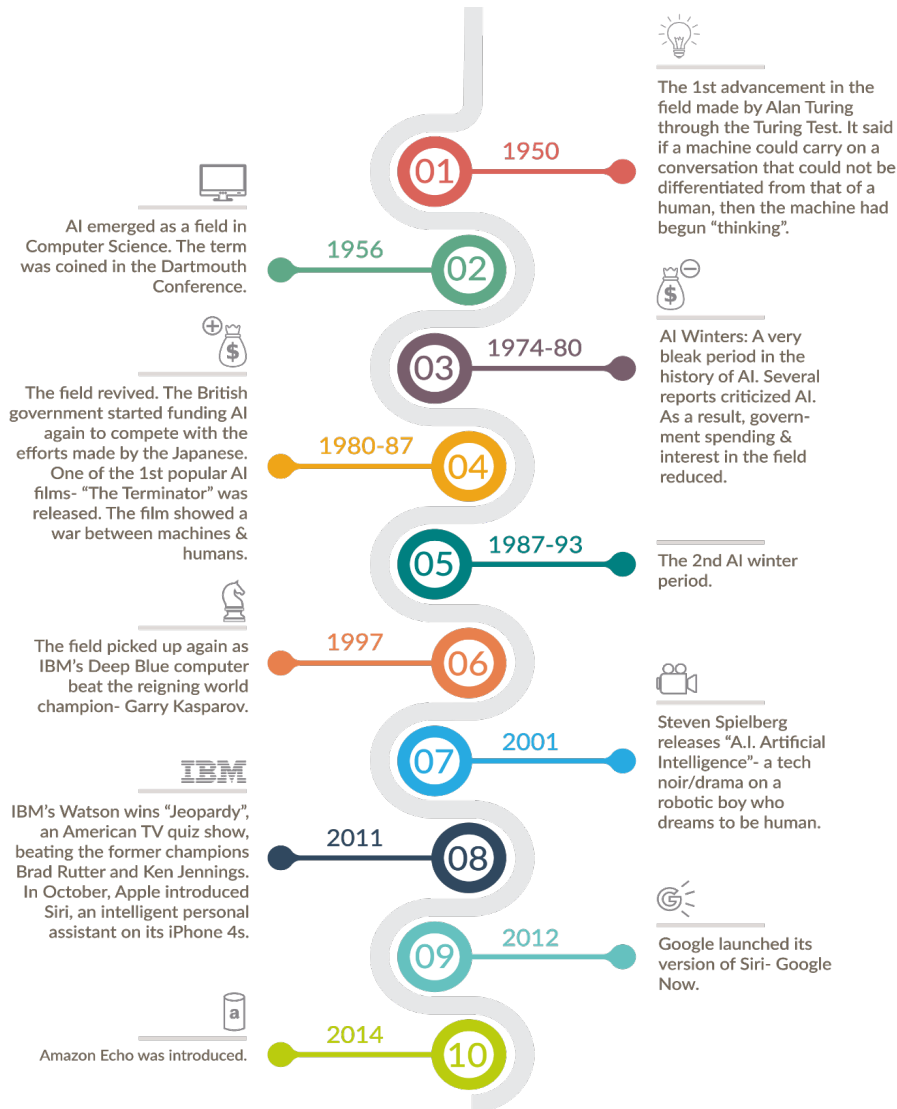
human benchmarks by 2015 (see Figure 1). In less than 70 years, many milestones were passed (see Figure 2).

Figure 1: Image Classification Error over Time



Source: Prediction Machines: The Simple Economics of Artificial Intelligence– April 17, 2018 by Ajay Agrawal, Joshua Gans and Avi Goldfarb

Figure 2: Timeline and Milestones in AI



Source: <http://deckard.se/really-great-introduction-to-ai/>

AI vs. human opponents was a prominent example of its application to games, with checkers, chess and Go. In 2016, Google's AlphaGo system was pitted against Lee Sedol in a historic game of Go. The machine won the best-of-five series, only losing once – the first time a machine had beaten a human opponent playing the complex game. Lee said afterwards, *"If you look at the way the game was played, I admit, it was a very clear loss on my part. From the very beginning of the game, there was not a moment in time when I felt that I was leading."*<sup>8</sup>

Engineers at Google originally taught AlphaGo to use a deep neural network to play the ancient game – a network of hardware and software that mimic the human brain. Invented by Geoffrey

8 <https://www.wired.com/2016/03/two-moves-alphago-lee-sedol-redefined-future/>

Hinton and colleagues, deep learning systems are neural network representations of learning in which multiple layers correspond to different layers of abstraction in a hierarchy of concepts. Indeed deep learning algorithms already supported online services at Google, Facebook and Twitter, helping to identify faces in photos, recognize commands given to smartphones, and drive search engines. The team set up countless matches in which (slightly) different versions of AlphaGo played each other using a second AI technology called reinforcement learning. As AlphaGo played against itself, the system tracked which movements brought most territory, essentially teaching itself to identify new strategies by playing millions of games with its own neural network.<sup>9</sup>

The first AI applications remained in the background of daily life or were used by large organizations to solve complex problems – e.g., innovative ways of tackling major issues related to healthcare, traffic and the environment. More recent applications directly impact the consumer experience, for example managing daily schedules, replying to emails, searching for photos and watching videos.

Technology titans like Google, Amazon and Apple incorporated AI into their technology and apps – e.g., facial-recognition systems, personal assistants, user-preference learning. Indeed Amazon built its empire on a machine-learning system without which Amazon.com could not grow its business, improve customer experience and selection, or optimize its logistics speed and quality. Google AI aimed to “create smarter, more useful technology and help as many people as possible”, from translation to healthcare to making smartphones even smarter. Facebook AI research was committed to “advancing the field of machine intelligence and creating new technologies to give people better ways to communicate.”<sup>10</sup>

### 3. Categorization of AI Applications

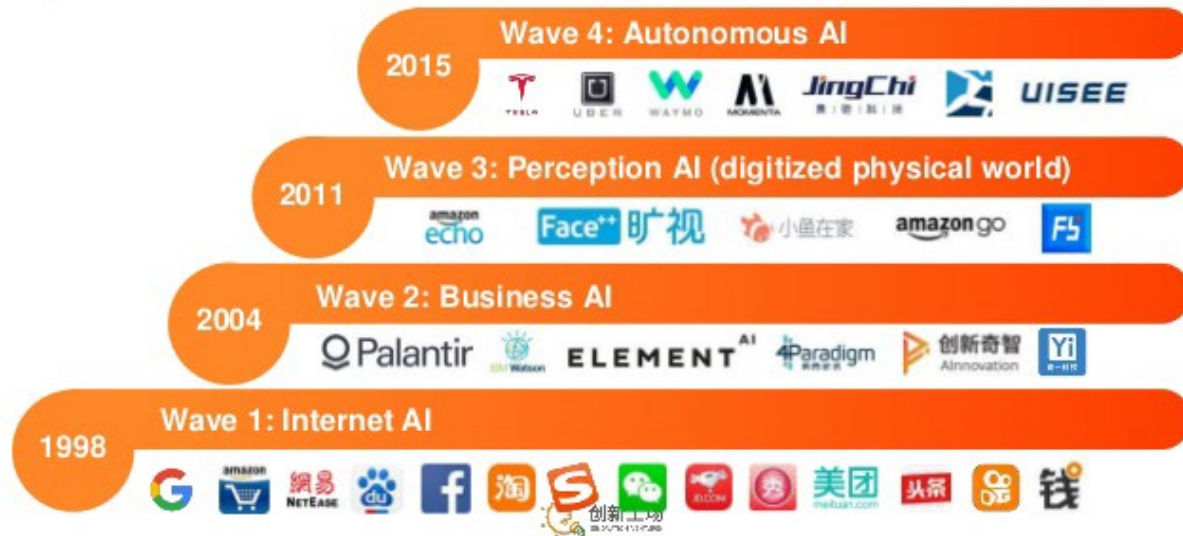
AI, particularly deep machine learning, has had a revolutionary effect on daily life in the form of services such as voice assistants, language translation, GPS optimisation, and credit card fraud alerts. Kai-Fu Lee’s *AI Superpowers* offers a framework to analyse AI capabilities, dividing them into four categories that have unfolded over time (see Figure 3).

---

9 *Ibid.*

10 *Ibid.*

Figure 3: Four Waves of Artificial Intelligence Applications



Source: Dr Kai-Fu Lee, CEO of Sinovation Ventures, “The 4 Waves of Artificial Intelligence Application” in <https://www.youtube.com/watch?v=VHuNWDDcEHY>

**Wave 1 - Internet AI:** Powered by the huge amount of data flowing through the web, internet AI leverages the fact that users automatically ‘label’ data as they browse (buying vs. not buying, clicking vs. not clicking). Cascades of labelled data build a detailed profile of their personalities, habits, demands, and desires: a perfect recipe for tailored content to keep them on a given platform and thus maximize its revenues or profits.<sup>11</sup> American “big tech” companies like Google pioneered internet AI, and Chinese companies like Baidu later embraced it. For example, Toutiao (ByteDance’s first success and the Chinese equivalent of BuzzFeed) automatically curates and recommends content based on user preferences and habits.

**Wave 2 - Business AI:** Algorithms are trained on proprietary datasets ranging from customer purchases and machine maintenance records to complex business processes—ultimately leading to improved decision-making. For example, an algorithm can study thousands of bank loans and repayment rates and ‘learn’ if a certain type of borrower has a hidden risk for default (or alternatively, a surprisingly good but overlooked lending prospect). By spotting hidden correlations that escape linear cause-and-effect logic, business AI can outperform a (human) expert.<sup>12</sup> For example, Smart Finance, a Chinese financial services company built an AI-powered app for microfinance that depends almost exclusively on algorithms to make millions of micro-loans. It launched a ‘smart customer service’ system in 2015 that enables automated customer calls to purchase airline tickets and book hotels – surpassing its human counterparts in terms of customer satisfaction.<sup>13</sup>

**Wave 3 - Perception AI** gets an upgrade with eyes, ears and other senses collecting new data that has never been captured and uses it to create new applications. Sensors and smart devices

11 <http://fortune.com/2018/10/22/artificial-intelligence-ai-deep-learning-kai-fu-lee/>

12 *Ibid.*

13 <http://global.chinadaily.com.cn/a/201801/24/WS5a684639a3106e7dcc13657c.html>



include speech interfaces (like Amazon’s Alexa and Apple’s Siri) as well as computer-vision applications—from facial recognition to manufacturing quality inspection.<sup>14</sup> One KFC restaurant in China teamed up with Alipay (Alibaba’s mobile payments platform) to pioneer a ‘pay-with-your-face’ feature.

**Wave 4 - Autonomous AI** is the most monumental but also the most difficult. Integrating all previous waves, autonomous AI gives machines the ability to sense and respond to the world around them, to move intuitively, and manipulate objects as easily as a human. An example of this are the autonomous vehicles developed by Google, Tesla and Baidu that can ‘see’ and respond to the environment in real time.

Another popular classification used in the industry is the distinction between Artificial Narrow Intelligence, Artificial General Intelligence, and Artificial Super Intelligence.

**Artificial Narrow Intelligence (ANI)**, also known as ‘weak AI’, is programmed to perform a single task by pulling information from a specific dataset. It operates within a pre-determined, pre-defined range of data. Examples include checking the weather, playing chess, and analysing raw data to write articles that are embedded in products like Siri, Alexa and Google Assistant. They are classified as ANI as they are not conscious machines – they lack the self-awareness, consciousness and genuine intelligence to match human intelligence. The ubiquitous ‘weak AI’ does not have the fluidity nor flexibility to think like us. Even self-driving cars would be classified as weak AI, albeit they consist of multiple ANI systems.<sup>15</sup>

**Artificial General intelligence (AGI)** or ‘strong AI’ refers to machines that exhibit human intelligence, i.e., the machine’s intellectual capability and/or behaviour is functionally equal to that of a human. For example, K, one of the world’s fastest supercomputers, processes neural activity, though at much slower rates than humans (40 minutes vs 1 second of neural activity).<sup>16</sup>

**Artificial Super Intelligence (ASI)**, is when AI surpasses human intelligence and/or behaviour. Tech titans Elon Musk (Tesla) and Mark Zuckerberg (Facebook) disagree on whether ASI could prove to be dangerous. Musk has claimed that “these can be weapons of terror... once this Pandora’s box is opened, it will be hard to close”,<sup>17</sup> while Zuckerberg believes the positives outweigh the potential negatives.<sup>18</sup>

## 4. Comparing AI in China and the US

A war for leadership – in government as well as the private sector – of AI and machine learning is underway between the US and China. Although the US began with a clear advantage in AI science and discovery, its lead has diminished. The Chinese government is committed to being global leader by 2020;<sup>19</sup> the US government is struggling to secure support at top levels to advance its AI agenda.

14 <http://fortune.com/2018/10/22/artificial-intelligence-ai-deep-learning-kai-fu-lee/>

15 <https://medium.com/@tjajal/distinguishing-between-narrow-ai-general-ai-and-super-ai-a4bc44172e22>

16 <https://codebots.com/ai-powered-bots/the-3-types-of-ai-is-the-third-even-possible>

17 <https://www.weforum.org/agenda/2018/04/keep-calm-and-make-ai-ethical/>

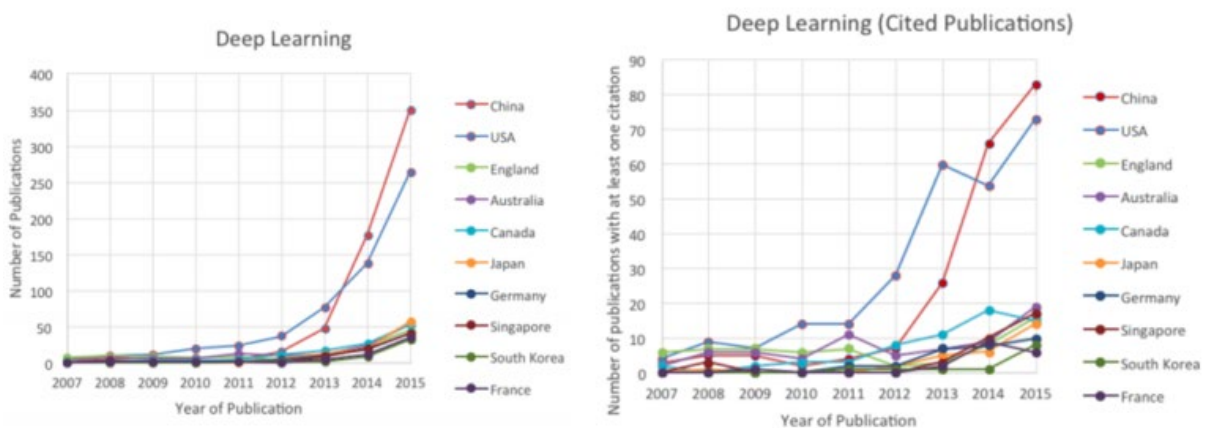
18 <https://codebots.com/ai-powered-bots/the-3-types-of-ai-is-the-third-even-possible>

19 <https://thenextweb.com/artificial-intelligence/2018/07/30/china-set-to-leapfrog-us-in-the-ai-race/>



In addition to allocating billions of dollars towards infrastructure to house AI businesses in designated industrial parks, entrepreneurial activity around AI has exploded in China in the past 10 years. Decades of research and billions of investments put the US ahead. Firms such as Google and Microsoft attracted top AI researchers from around the globe. China benefits from the many returnees from US technology companies, and a large population of STEM-educated (science, tech, engineering, maths) local talent. By some measures, China has taken the lead in number of AI research publications (see Figure 4). If quantity does not necessarily equate to quality, the surge in AI research in recent years has demonstrated the eagerness of the Chinese government to dominate the field.<sup>20</sup>

Figure 4: Global Publications on Deep Learning Research



Source: <http://discoverchina.asia/2019/01/watch-out-america-chinas-a-i-is-getting-smarter/>

To build an AI model requires enormous amount of data for the model to learn – and in this China has the upper hand. With a population of 1.4 billion, 730 million internet users, and a more permissive data-collection regime, China is a data haven for AI firms. As many mobile apps are inter-connected with WeChat or Alipay, Chinese mobile users are comfortable with sharing private data, in sharp contrast with western countries that enforce strict regulations. Access to these hundreds of millions of users allows Chinese AI researchers to work at a faster pace and intensity.<sup>21</sup> Many Chinese AI firms engage in overseas collaboration and expansion, for example, Tencent and Baidu have set up AI research labs in Silicon Valley. They rotate Chinese staff to their US offices as part of their knowledge acquisition strategy.

While many Chinese apps are subject to severe censorship requirements at home, ByteDance prevented that from undermining its popularity overseas by releasing different versions of the app known as Douyin at home – called TikTok overseas. The *Financial Times* sees ByteDance's strategy as a possible 'road map' (paywall) for other Chinese tech firms trying to go global.<sup>22</sup> By 2019, its global footprint included China, Japan, South Korea, India, Europe, Brazil, North America and Southeast Asia.<sup>23</sup>

<sup>20</sup> <http://discoverchina.asia/2019/01/watch-out-america-chinas-a-i-is-getting-smarter/>

<sup>21</sup> <http://discoverchina.asia/2019/01/watch-out-america-chinas-a-i-is-getting-smarter/>

<sup>22</sup> <https://qz.com/1564270/ByteDance-video-app-tiktok-rival-to-facebook-reached-1-billion-downloads/>

<sup>23</sup> <https://www.forbes.com/sites/bernardmarr/2018/12/05/ai-in-china-how-buzzfeed-rival-ByteDance-uses-machine-learning-to-revolutionize-the-news/#4a67cd7940db>

## Rise of Artificial Intelligence Consumer Apps in China

### AI Applications at “BAT”: Baidu, Alibaba & Tencent

With China’s internet censorship – or “the Great Firewall” – its big three tech companies Baidu, Alibaba and Tencent (BAT) dominate the country’s technology landscape. The trio collectively shape daily life in China: Baidu shapes what people see; Alibaba shapes what/where people buy, and Tencent shapes how they communicate (via the popular WeChat service).

For China’s AI efforts, Baidu led the charge by recruiting Andrew Ng from Google to be its Chief Scientist in 2014. Ng ramped up Baidu’s research over the next three years and launched several key AI projects for Baidu, including its autonomous driving and conversational AI platforms.<sup>24</sup>

In 2016, Tencent and Alibaba jumped on the AI bandwagon. Alibaba announced a smart city project in collaboration with the government in Hang Zhou province in China, followed by one in Macau and another with the Malaysian government.<sup>25</sup> Although a relative latecomer to the AI game, Tencent stated with the release of its Q4’16 results that AI is a core technology across all their different products.<sup>26</sup>

From 2014 to April 2018, Baidu, Alibaba and Tencent participated in 39 equity deals to invest in start-ups building AI software and AI chips.<sup>27</sup> Tencent participated in the greatest number of AI deals, while Baidu invested in the most diverse portfolio, backing companies in 11 categories including news & media, healthcare and advertising.<sup>28</sup> Auto-tech and cross-industry applications dominated their investments. News, media and entertainment drew little interest from the trio<sup>29</sup> (see Figure 5).

Figure 5: BAT-backed AI Equity Deals by Category, 2014- April 2018

---

24 <https://www.cbinsights.com/research/china-baidu-alibaba-tencent-artificial-intelligence-dominance/#startups>

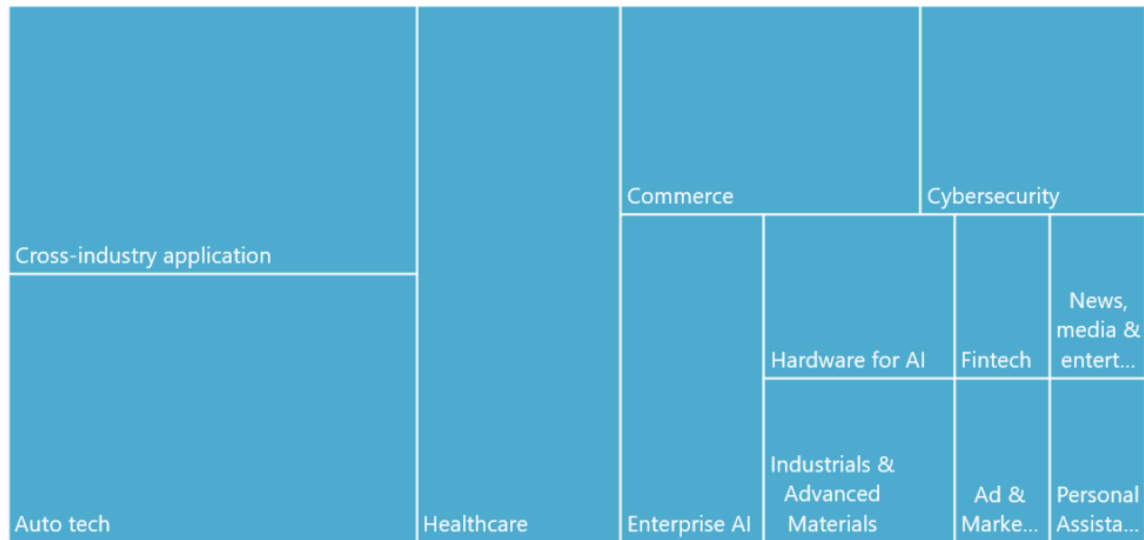
25 *Ibid.*

26 *Ibid.*

27 *Ibid.*

28 *Ibid.*

29 *Ibid.*



Source: <https://www.cbinsights.com/research/china-baidu-alibaba-tencent-artificial-intelligence-dominance/#startups>

The BAT trio were so dominant in China that nobody expected a new tech start-up to penetrate the 'Great Wall' they had erected. Yet ByteDance defied conventional wisdom, taking on BAT with its AI-based products – news aggregator Jinri Toutiao and short video-sharing product Douyin (TikTok outside China). Using advanced algorithms, ByteDance quickly drew users from Baidu by recommending content and videos based on the user's reading and viewing histories.

## 5. The ByteDance Story: Founding an AI Technology Company

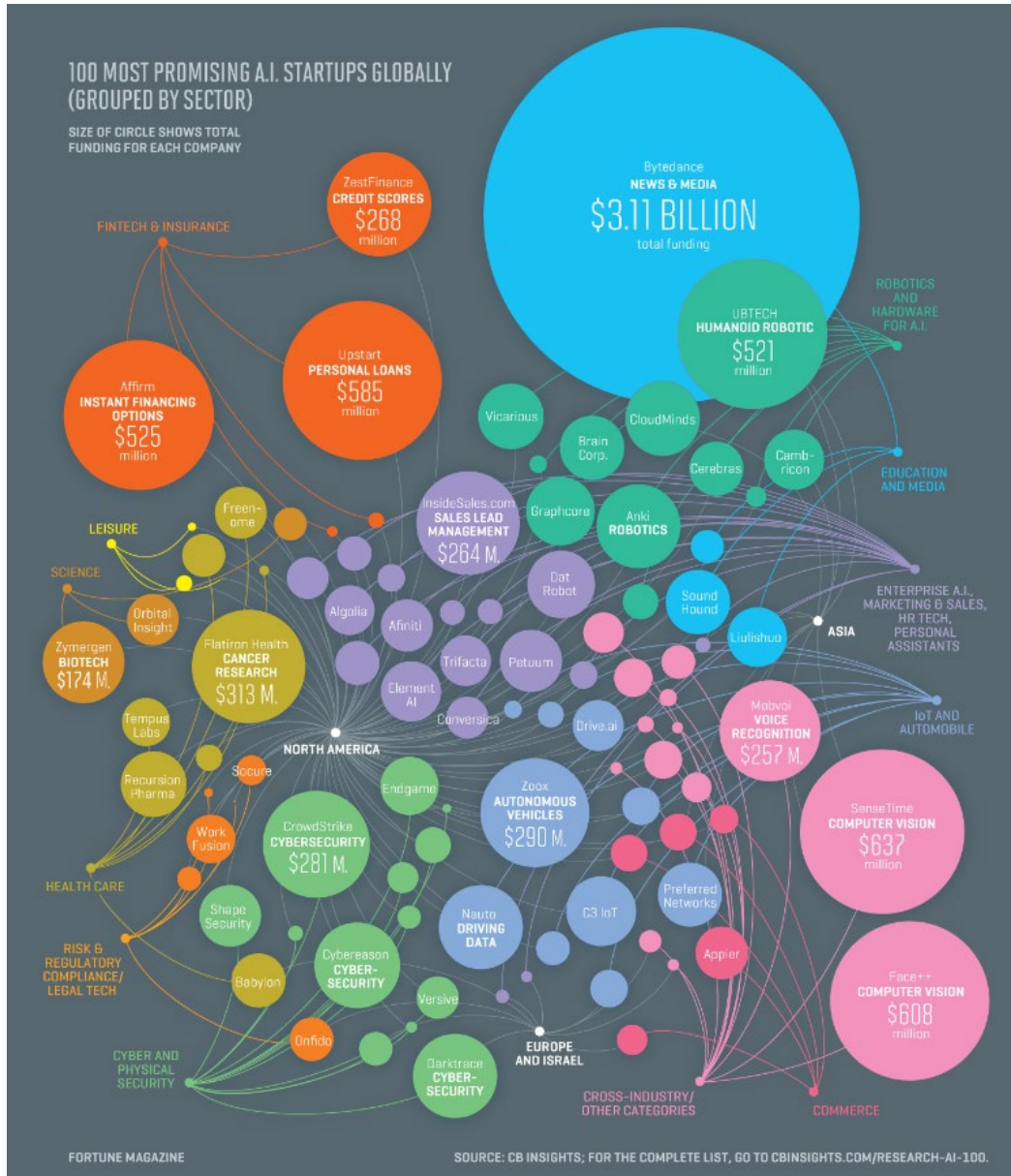
Back in 2012, ByteDance was founded by 29-year-old Zhang Yiming, who predicted mobile devices was the key to the way information would be consumed in the future. Investors were sceptical that a news aggregator app could compete profitably against existing news apps. Defying all expectations, ByteDance became a world-leader in apps that leveraged its AI capabilities. Its success was largely attributed to its artificial intelligence and machine learning algorithms that delivered customized content feeds to users of all of its products. Initially, ByteDance's differentiator lay in its use of proprietary technology to cut out 'content search'. Unlike Amazon and its counterparts that used collaborative technology (user characteristics and similar user profiles), ByteDance used content-based technology that took into account user behaviour (reading, clicking, liking) to predict their preferences.

Following success with texts in Toutiao (the news reading app), it applied its technology to all ByteDance products including Douyin (and TikTok) which used AI and machine learning to deliver preferred content, using algorithms in computer vision and natural language-processing technology to understand and analyse written content, images and videos, and then delivered customized content. As users interacted with the content (by taps, swipes, time spent on each article, comments) ByteDance's large-scale machine learning and deep learning algorithms learnt more about their preferences to refine content delivery. This resulted in a high-quality content feed based on individual preferences and interests. The more content the system accumulated, the better the algorithms to enhance the content experience.



Among the many accolades received, ByteDance was named a top AI innovator by CBInsight on its 2018 AI 100 List, and by Fast Company on its “most innovative companies” list. In January 2018, with \$3.8 billion in funding, ByteDance topped the list of most promising global AI start-ups (see Figure 6).

Figure 6: 100 Most Promising AI Start Up Globally



Source: <https://www.cbinsights.com/research/artificial-intelligence-top-startups/>

As the underlying technology that powered ByteDance's systems was not limited by linguistic or cultural barriers, the company easily expanded beyond China. While a relative latecomer to China's tech scene, ByteDance embarked on a globalization strategy with a series of mergers and acquisitions. It thus accumulated a vast amount of content and social media created by people and rich engagement data across all their various products. Fed into machine-learning algorithms, this further refined the quality of content feed and enhanced the content experience (which in turn encouraged further engagement and generated more data) – in a virtuous cycle that optimizes every stage of the 'content lifecycle'—creation, moderation, curation, recommendation and interaction.

In January 2018, ByteDance and BuzzFeed signed a partnership whereby ByteDance was licensed to distribute BuzzFeed's entertainment content in China (excluding news). In 2019, ByteDance and US chipmaker Intel announced a collaboration for another AI innovation lab to develop AI applications, blending Intel's software and hardware expertise with ByteDance's data-processing capabilities as well as providing for its massive computing and storage needs.<sup>30</sup> As part of its global expansion, ByteDance showed an interest in buying US news and discussion aggregator Reddit, in 2016, but the latter's shareholders were reluctant to sell to a Chinese company. However, in February 2019, Chinese tech giant Tencent was rumoured to have invested \$150 million in Reddit's Series D funding, partly to counter the challenge from ByteDance products both in China and globally.<sup>31</sup>

## 6. ByteDance Apps: Strategic Evolution Across an AI Product Portfolio

### Jinri Toutiao (Toutiao)

Launched by ByteDance in 2012, the mobile app Toutiao was one of the first Chinese algorithm-driven news apps to become a staple among Chinese users. Translated as 'headline', Toutiao had an average 120 million daily users, daily readership of 1.3 billion articles, and average consumption of 73 minutes a day – making it one of the stickiest apps online – double that of Snapchat.<sup>32 33</sup>

With foreign news portals and social network sites banned in China, Chinese consumers' appetite for content went unmet. Toutiao used AI to source and curate daily news and articles for users via 4,000 partner sites. Through the app's machine-learning algorithm, Toutiao understood and personalized content for each user, creating a unique experience based on their taps, wipes, page views, location etc. Using an advertising-based business model, its AI capability also enabled advertisers to target consumers accurately.

With its eye-catching, sensational content, Toutiao captured the attention of the younger generation, avid consumers of entertainment news.<sup>34</sup> Like BuzzFeed, the app got traffic from funny

30 <https://www.forbes.com/sites/bernardmarr/2018/12/05/ai-in-china-how-buzzfeed-rival-ByteDance-uses-machine-learning-to-revolutionize-the-news/#4a67cd7940db>

31 <https://technode.com/2019/02/11/tencent-reddit-ByteDance/>

32 <https://medium.com/@chewweichun/a-look-at-toutiao-chinas-artificial-intelligence-powered-news-platform-4eef3c23b79a>

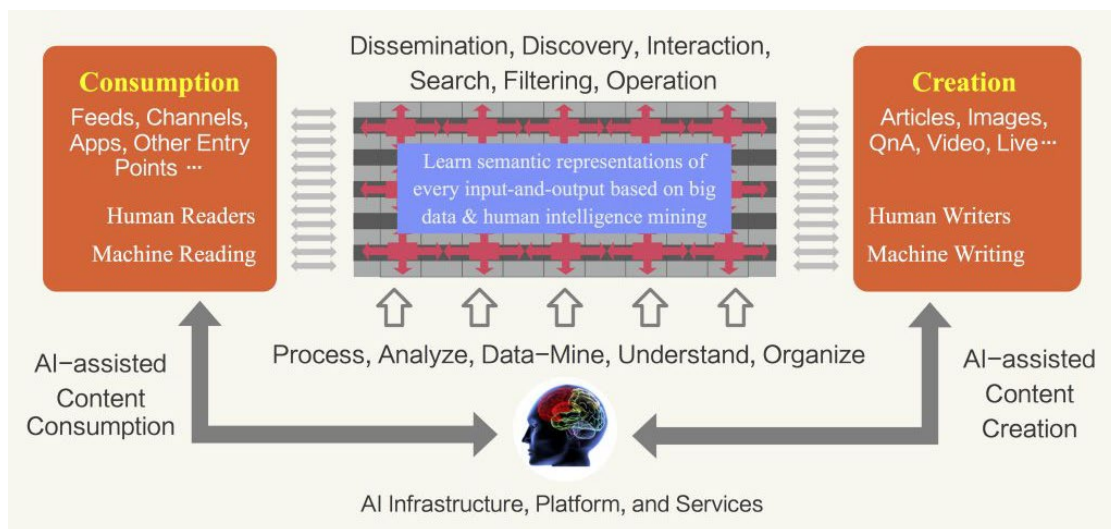
33 <https://www.techinasia.com/bytedance-overseas-expansion-strategy-break-down>

34 <http://discoverchina.asia/2019/01/a-look-at-toutiao-chinas-artificial-intelligence-news-platform/>



gifs, short video clips and jokes; unlike BuzzFeed its sophisticated AI algorithm personalized content to each user. Success relied on learning effects, network effects and stickiness, particularly in the first year when it rapidly gained market share and thus could collect more data and refine the AI algorithm to improve its product and user experience.<sup>35</sup> It enjoyed network effects, with users on one side and content creators on the other,<sup>36</sup> creating a virtuous cycle (more users attract more content creators, which attract more users) that propelled it to market leadership in news and information content in China. Personalized news recommendations increased the time users spent on the app, and therefore its appeal to advertisers<sup>37</sup> (see Figure 7).

Figure 7: Toutiao’s AI-Powered Information/Content Platform



Source: <https://digit.hbs.org/submission/toutiao-an-ai-powered-news-platform/>

## Douyin

ByteDance launched Douyin in September 2016 as a media app for creating and sharing short videos. At a time when the BAT trio were fighting over video streaming services and copyright, Douyin emerged with unique content that was generated mainly from China’s third- and fourth-tier cities. The 15-second video-sharing model was not only new but also satisfied the young generation who preferred snippets to lengthy in-depth content. The funky videos created by ‘ordinary’ app users connected with a segment that was previously under-represented online. Active users reached 150 million on June 12, 2018, quadrupling in half a year – remarkable for an app that was less than two years old (see Figure 8).

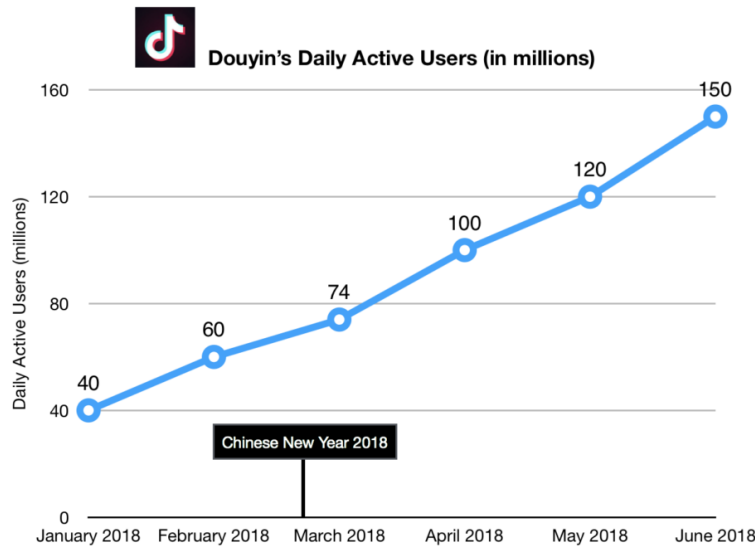
Figure 8: 100 Most Promising AI Start-Ups Globally

35 <https://digit.hbs.org/submission/toutiao-an-ai-powered-news-platform/>

36 *Ibid.*

37 *Ibid.*





Source: 36Kr, QuestMobile

Source: <https://technode.com/2018/06/15/8-lessons-douyin/>

Unlike existing video apps, Douyin offered neither a 'play' nor 'pause' button; the moment a user opened the app, the 15-second videos automatically (and endlessly) start playing – without the user having to think. This meant that many users watched Douyin videos all day (and night) whenever they had downtime – an average of 82 per day. In fact, Douyin rolled out an 'anti-addiction' system in April 2018 to remind users when they spent too much time on the app.<sup>38</sup>

Initially, Douyin curated its content using artists (and influencers) by reaching out to art and music schools to provide high-quality content and working with agencies in China which specialized in grooming ordinary citizens for internet stardom. One of its most popular content creators (with no special skills) gained more than 10 million followers within 30 days, was a client of the Yang Cong agency.<sup>39</sup> Another strategy was to treat top influencers as part of the company – actively promoting and subsidizing their traffic. Douyin videos were also popular for 'life hacks', such as the one involving 'Hai Di Lao' in which users uploaded videos of their own DIY dishes at the restaurant, inspiring others to do similar hacks. The hack became so popular that waiters instantly brought raw eggs and tofu balls if anyone asked for the 'Douyin Dish'<sup>40</sup>. Douyin also launched hashtags as a theme to create videos, some of which went viral like the 'Seaweed Dance.' What set it apart from other video apps was that it allowed creators to embed product links into their videos, for seamless commercial linkage. A Douyin influencer who created his own food product line, for example, had a shopping cart on the right-hand side of the screen that allowed users to purchase with one click as they watch the videos.<sup>41</sup> Such features were made possible by the AI capability which ByteDance had built across all its products.

The founders of ByteDance and its overseas counterpart Musical.ly had known each other for years. ByteDance admired Musical.ly's innovative short-form video app and its grasp of Western

<sup>38</sup> <https://technode.com/2018/06/15/8-lessons-douyin/>

<sup>39</sup> *Ibid.*

<sup>40</sup> *Ibid.*

<sup>41</sup> *Ibid.*



users' needs and tastes; Musical.ly was impressed with the AI technology behind ByteDance's app, its monetization ability and global expansion plans.<sup>42</sup> With the encouragement of GGV Capital, a venture capital company that had invested in Musical.ly, the two announced an agreement to merge in November 2017.

## TikTok

ByteDance launched TikTok for overseas markets in September 2017, a year after introducing the product in China. With more than 500 active users, over 150 markets and 75 languages, it was one of the most popular global apps downloaded in 2018. Based on Douyin, the TikTok app focused on users outside of China and offered easy-to-use special effects so that anyone could make fun videos anywhere, anytime. The videos were tall (rather than square) and instead of tapping or swiping, users scrolled up and down. Special effects included shaking and shivering with hip-hop and electronic music, hair-dyeing, 3D stickers, props, and a vast music library. By enabling young users to easily make unique short videos to share with friends all over the world, the app set a new cultural benchmark for global online content creators. ByteDance created hashtags around various challenges, jokes or other content for comedy and daily-life videos. Its closest competitor globally, Musical.ly, was limited to user-created videos based on music, gestures, dance, and imitating singers.

TikTok differed from apps such as Instagram and Twitter in its recommendations of both what its users should watch and what they should post, effectively minimizing the 'thinking' required. The concept was akin to Instagram's 'Explore' tab, Twitter's 'trending topics' and tweets, and Facebook filling a user feed before members 'friended' anyone.<sup>43</sup> A landing page called 'For You' automatically opened the moment a user opened the app, an AI capability applied from Toutiao as well as Musical.ly which fed an endless stream of videos based on their profile (i.e., clicks, time spent, etc.) rather than asking what users want to watch based on their searches or friends' feeds. Using algorithmic observations and inferences, the app constantly fine-tuned its learning over time, so that the stream of videos was personalized to each user.

In all ByteDance apps, and particularly TikTok, AI would become the product itself. TikTok leveraged the confluence of AI research, drawing on it to shape the product and using profiles and reactions from users to instantly customize content to their preferences. On TikTok, users did not provide input, content, nor a social profile; the AI technology predicted their interests and inclinations (from their taps, swipes, time spent on each article, time read, delays, remarks, loathes, top picks, and so on). The outcome was a customized, brilliant feed made explicitly for each user every time they opened the app.

In November 2017, ByteDance acquired Musical.ly, which was valued at \$1 billion, as part of its plan to acquire new users and content. US-based Musical.ly allowed users to post video content of them and their favourite songs. The acquisition increased ByteDance's global reach, allowing Musical.ly to harness the AI technology behind Toutiao to improve its platform.<sup>44</sup> Less than a year later, in August 2018, Musical.ly was rebranded TikTok to increase the platform's focus on developing AI-based technologies combined with localization in each market where it operated. TikTok also incorporated the most popular elements of both apps with a feed that highlighted the

42 <https://hans.vc/bytedance-musical-ly-merger/>

43 <https://www.nytimes.com/2019/03/10/style/what-is-tik-tok.html?action=click&module=Editors%20Picks&pgtype=Homepage>

44 <http://discoverchina.asia/2019/01/a-look-at-toutiao-chinas-artificial-intelligence-news-platform/>

user community. The 'For You' feed served personalized video recommendations based on viewing preferences. Ironically, Facebook's decision in 2013 to block its competitors including Twitter-owned Vine<sup>45</sup>'s access to data created a space which possibly enabled TikTok's expansion both in the US and globally<sup>46</sup>.

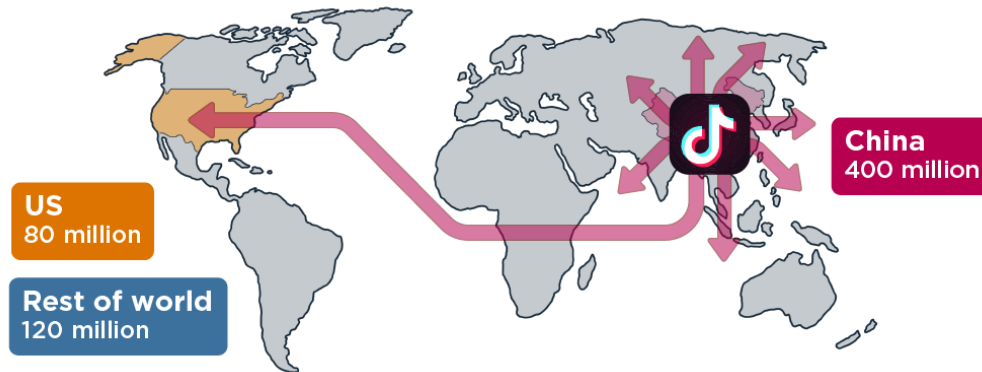
By the end of 2018, TikTok had more than 500 million monthly active users, over 40% of them outside China. It had firmly established itself as the short video platform of choice in the US, India and other countries through its AI learning machine, which tailored content to diverse local audiences (see Figure 9).

---

45 Vine is a short-form-video-hosting service, owned by Twitter, on which users shared six-second-long video clips. On October 2016, Twitter announced that it would disable all new uploads.

46 <https://www.businessinsider.sg/facebook-documents-mark-zuckerberg-restricted-vine-data-access-2018-12/?r=US&IR=T>

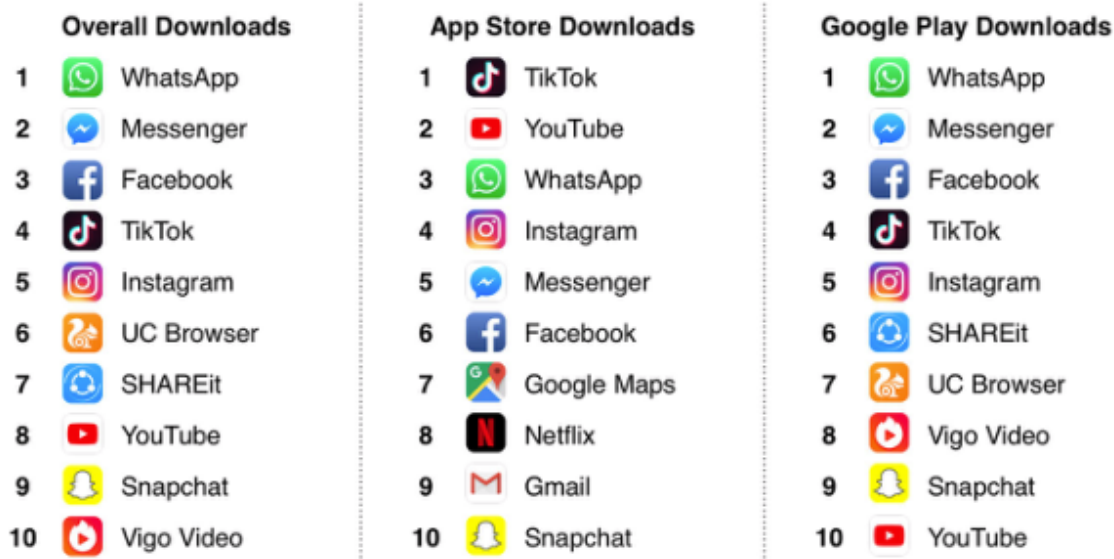
Figure 9: TikTok Global Reach (Estimated)



Source: ByteDance, The Guardian

According to app analytics service SensorTower, TikTok’s overseas version was the world’s most downloaded non-game app in the iOS App Store and among ByteDance’s most successful products, with over 1 billion downloads. In 2018, it had 663 million downloads compared with 711 million for Facebook and 444 million for Instagram).<sup>47</sup> Users could register and share content on other social media giants such as Weibo and WeChat, allowing Toutiao to increase its reach<sup>48</sup> (see Figures 10 & 11).

Figure 10: Top Non-game Apps by Worldwide Downloads (2018)



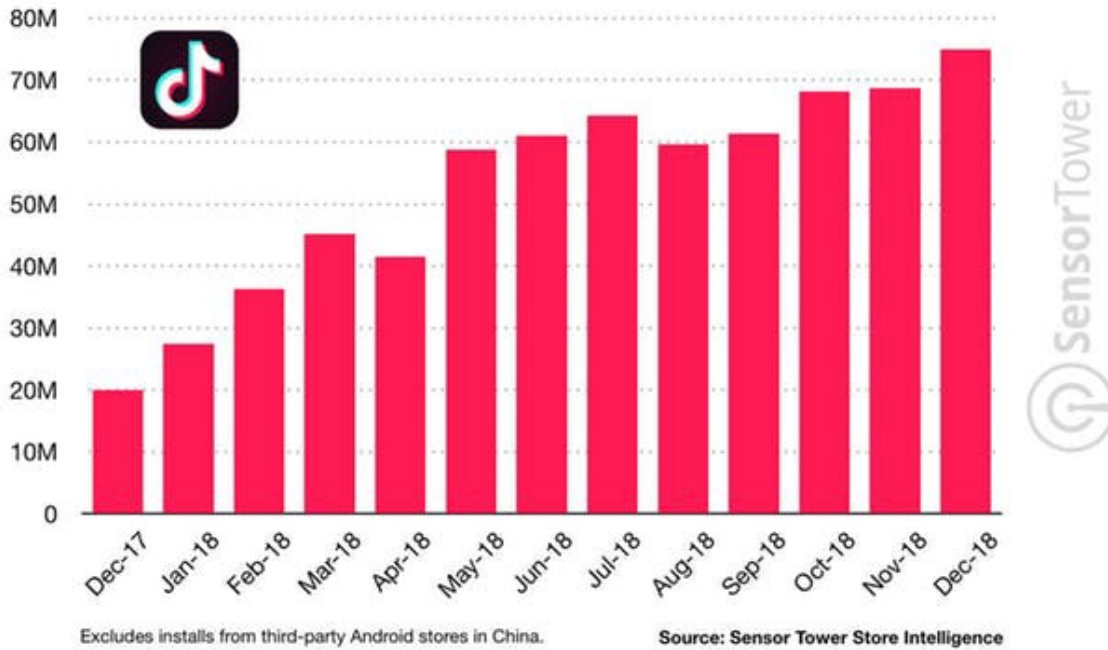
Note: Google Play downloads do not include pre-installed apps.

Source: SensorTower

Figure 11: TikTok New Installs By Month (2018)

47 <https://qz.com/1564270/ByteDance-video-app-tiktok-rival-to-facebook-reached-1-billion-downloads/>  
 48 <http://discoverchina.asia/2019/01/a-look-at-toutiao-chinas-artificial-intelligence-news-platform/>

**TikTok New Installs By Month (Worldwide)**



 **SensorTower** Data That Drives App Growth sensortower.com

Source: SensorTower

TikTok was particularly successful in India, which accounted for 39% of its 500 million global users. From February 2018 to January 2019, average daily users (DAU) of the app increased by 1,912%, reaching 9 million, with an average 31 minutes spent per user.<sup>49</sup> Cheap data availability as well as the absence of text boosted its appeal across geographies and generations. Like its China version, Douyin, TikTok’s user base in India included large numbers of rural and small-town users, a segment largely untapped by other popular apps (see Figure 12).

49 <https://www.thequint.com/tech-and-auto/tech-news/tik-tok-user-video-streaming-india-hate-speech-control-needed>

Figure 12: India TikTok App Users



Source: <https://www.thequint.com/tech-and-auto/tech-news/tik-tok-user-video-streaming-india-hate-speech-control-needed>

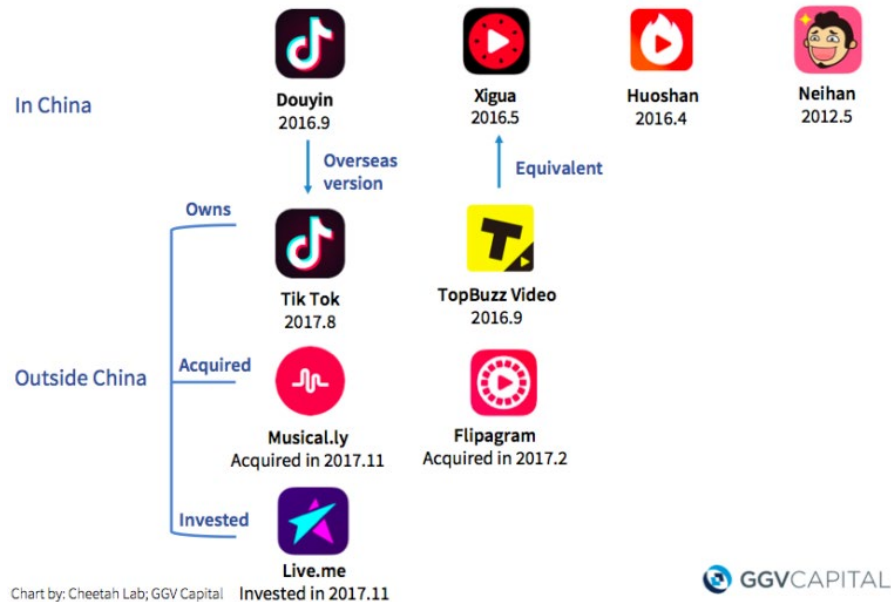
TikTok regularly hosted challenges in which fans imitate certain moves, actions or songs. The '1 Million Audition', its first global online short-video creator contest was successfully launched in 2017 in the US, Brazil, Portugal, India, Thailand, Indonesia, Japan. A TikTok press release in India announced:

*Creators are already excited about the challenge and are showing off their immaculate artistic skills. The audition has seen a tremendous response and has received close to a million videos ever since its first edition! The first two days of the fifth edition of the 1 Million Audition has seen over 100K videos being posted on the app. The audition has included categories like fashion and art for the first time given the popularity of these categories among India creators. Hashtags like #1MFashionIn and #1MArtIn are already trending on the app.<sup>50</sup>*

In addition to expanding its business lines to include mini-programmes and mobile apps to challenge Tencent, such as DuoShan, a messaging app to fight head-to-head with WeChat (owned by Tencent), Toutiao acquired US-based video-creation app Flipagram, once considered a strong rival to Instagram, in February 2017. Henceforth, ByteDance held a portfolio of content platforms that enabled people to connect with, consume, and create content through AI technology, including Xigua Video, TikTok, Musical.ly, Vigo Video and News Republic (see Figure 13).

50 <https://www.how2shout.com/lifestyle/tiktok-organizes-fifth-edition-of-the-1-million-audition-to-find-talent.html>

Figure 13: ByteDance's Global Short-Video Apps



Source: <https://medium.com/@hanstung/ByteDance-musical-ly-merger-ushers-in-new-age-for-content-companies-460d15f5a660>

Despite ByteDance's apps global popularity, the company made a loss of \$1.2 billion in 2018, in part due to the high cost of launching TikTok globally.<sup>51</sup> Undeterred, it was reportedly preparing to launch Lark – a work collaboration and productivity app with instant messaging, document editing and calendars – in the US and other overseas markets in a move which would take on US 'Big Tech' companies such as Slack, Microsoft, and Google.<sup>52</sup>

## 7. Conclusion

AI technology was at the heart of all ByteDance's content platforms, intelligent machines that can understand and analyse texts, images and videos using natural language-processing and computer vision technology. Its AI capabilities facilitated effortless content discovery by using large-scale machine learning and deep learning algorithms to serve users with preferred content. Its founder Zhang Yiming shared his aspirations for the company<sup>53</sup>:

*We must work harder, we must also be more perfectionist. Just like there was international division of labour in the industrial age, in today's information age there's also an international division of labour. Chinese entrepreneurs must also improve their own capabilities as they go global. Google is a company without borders. I hope Toutiao will be as border-less as Google. Personally, I hope to do things that are interesting and meaningful to society.*

51 <https://www.techinasia.com/ByteDance-slack-rival>

52 *Ibid.*

53 <https://hans.vc/toutiao/>



It continued to invest in and acquire other global content providers, including Dailyhunt (India), Babe (Indonesia) TopBuzz (US), and News Republic (US), with plans to integrate its AI expertise into these acquisitions to personalize them for each end-user. ByteDance recruited tech leaders away from its rivals with attractive remuneration packages. Despite stiff competition from BAT, it continued to leverage its machine-learning platform for content to sustain its growth, in the face of intensifying government oversight and a looming US-China trade war.

ByteDance had been publically feuding with WeChat since 2018, when the CEO accused Tencent of copying Douyin with its release of Hapi, a short-video app focused on comic clips, jokes and memes. In January 2019, ByteDance launched its own social networking app, Duoshan, in an effort to attract WeChat users. WeChat quickly blocked links to the app, along with two others released on the same day. Notwithstanding, Duoshan had since been downloaded 1 million times and was already among the top-ranking free apps in Apple's China App Store.<sup>54</sup> On January 25, 2019, WeChat blocked new Chinese users from registering with Douyin, citing alleged misuse of WeChat user data by Douyin.<sup>55</sup>

Other clashes seemed to be in store with Microsoft and Google if ByteDance decided to launch Lark, which could drain the company's resources and threaten its growth plans.

In mid-January 2019, China's new internet guidelines stipulated that apps were responsible for the content which their users post. The guidelines, which continued to be reviewed and expanded upon, banned 100 themes ranging from 'money worship' to Taiwanese independence.<sup>56</sup> In fact, in order to comply with the guidelines, by April 2019, one quarter of ByteDance's headcount (10,000 of 40,000 employees) is tasked with "monitoring" content<sup>57</sup>. The proportion of content monitors at ByteDance is significant; it has the same proportion of staff for ad sales, and twice as many software engineers<sup>58</sup>.

Further bad news followed in February 2019, with a record \$5.3 million fine for ByteDance's collection of data from minors in the US. Several investigative reports also claimed that the platforms were being hijacked for predatory activity.<sup>59</sup> In April 2019, Indian lawmakers issued a directive to the tech companies instructing them to remove TikTok from the Apple's App Store and the Android's Play Store, citing the posting of sexually explicit content which spread 'cultural degradation' among teens, as well as cases of cyberbullying which were reported to have led to suicide. Responding to these concerns, TikTok planned to hire a chief nodal office in India to "better coordinate with law enforcement agencies" as well as launching an internet safety campaign in India to teach users what constitutes criminal behaviour, and how to ensure their privacy on the platform.<sup>60</sup> Although the Supreme court has put a stay on the ban, it remains to be determined if TikTok would be allowed to remain in India - one of its biggest markets which accounts for 39% of its 500 million users.<sup>61</sup> Another option is to build a large team of censors specialized for the Indian population. There is some evidence that ByteDance is doing that in

---

54 <https://technode.com/2019/01/25/wechat-blocks-douyin-registration/>

55 *Ibid.*

56 <https://www.engadget.com/2019/01/13/china-will-blame-tiktok-like-video-apps-for-their-users-content/>

57 <https://www.theinformation.com/articles/the-people-behind-bytedances-app-factory>

58 <https://www.theinformation.com/articles/the-people-behind-bytedances-app-factory>

59 <https://technode.com/2018/10/08/ByteDances-teen-protection-problem/>

60 *Ibid.*

61 <https://thenextweb.com/tnw2019/2019/04/16/house-of-talent-tnw2019/>



Indonesia, for example.<sup>62</sup> TikTok faced a similar ban in Indonesia in July 2018 but it was quickly overturned, so it is likely that ByteDance is hoping for a similar outcome in India.<sup>63</sup> Whatever the solution, ByteDance's commitment to the region remains strong, with a reported commitment of \$1Billion dollars future spending in India made after the ban.<sup>64</sup>

Other governments were also concerned about the implications of AI's popularity. In April 2018, a UK government report entitled '*AI in the UK: ready, willing and able?*' set out five core principles designed to guide the ethical use of AI. Along the same lines, the Singapore government released a framework for AI governance in January 2019, establishing two core principles – that decisions made with the help of AI be explainable, transparent and fair to consumers, and that AI solutions be human-centric.

Prior to China's New Year celebrations in February 2019, founder Zhang Yiming, announced that the traditional 'red packet' bonus for employees would be drastically cut, implying a challenging year ahead.<sup>65</sup> Talk of lay-offs and a hiring freeze signalled that a "tech winter" might be approaching. Although tech funding and investment had declined amid a slowdown of the world's second-largest economy and talk of a trade war with the US,<sup>66</sup> many still felt that TikTok and ByteDance were showing the way in the application of AI to consumer activities – both in China and the rest of world.

How would ByteDance compete against Tencent in China, Google in the US, and startups everywhere? What new applications would ByteDance find for its AI capabilities, including areas as disparate as gaming and productivity? Which ones would benefit most from its unique user base and capabilities in international consumer AI? How might other companies apply the ByteDance AI formula in their own industries?

## Case Study Questions

1. What role does AI play in ByteDance's Toutiao and TikTok products? Is it different? How does AI create value for consumers of these products?
2. How difficult is it for competitors to imitate the success of Toutiao and TikTok? Which companies are most likely to compete and how?
3. What new applications should ByteDance build using its AI capabilities? What value does AI provide in these cases?

62 <https://www.firstpost.com/tech/news-analysis/tiktok-ban-in-india-a-timeline-of-events-that-led-to-the-apps-ban-in-the-country-6484781.html>

63 <https://www.reuters.com/article/us-indonesia-bytedance/indonesia-overtuns-ban-on-chinese-video-app-tik-tok-idUSKBN1K10A0>

64 <https://economictimes.indiatimes.com/tech/internet/tiktoks-parent-bytedance-plans-usd-1-billion-investment-in-india-in-next-3-years/articleshow/68953617.cms>

65 <https://www.scmp.com/tech/start-ups/article/2184365/worlds-most-valuable-start-ByteDance-slashes-lucky-money-year-pig>

66 <https://www.scmp.com/tech/start-ups/article/2184365/worlds-most-valuable-start-ByteDance-slashes-lucky-money-year-pig>

4. What should ByteDance/TikTok do in the face of increasing fines and bans by governments? Would ByteDance be able to find a way to censor its content to the various governments' satisfactions? What other solutions are possible?

## Appendix

### *TikTok's Top Teens Have More Followers than Ariana Grande and Bruno Mars*

#### Turning short videos into music careers

##### 4. Lisa and Lena - 32.2 million followers

Lisa and Lena Mantler, 16-year-old identical twins from Stuttgart, Germany, were the most-followed TikTok as of February 5. The duo's rise to fame began on Musical.ly where they created lip-sync video and synchronized dancing clips. They've become so popular that they've expanded their posts on TikTok to include comedy and general vlogs about everyday things like cooking and skateboarding. They've since used their online fame to start the clothing line, [J1MO71](#) and have even released a song, [Not My Fault](#), to promote the brand in 2017. They have slightly more followers on TikTok than [Ariana Grande](#) has on YouTube.

##### 3. Loren Gray - 30 million followers

Loren Gray Beech is a 16-year-old living in Pottstown, Pennsylvania, who used her massive following to sign a deal with [Virgin Records](#) in March of last year. Her newfound music career began when she joined Musical.ly in 2015 and has since released three of her own singles. Her most recent song, "[Queen](#)," has garnered 4.5 million views on YouTube and was covered by [Billboard](#) and [MTV](#). She has more followers on TikTok than [Bruno Mars](#) has on YouTube.

##### 2. Baby Ariel - 29.3 million followers

Ariel Rebecca Martin is 18-year-old, based out of South Florida, and has used her Musical.ly and TikTok following to begin a music career, much like Beech. She first began posting videos on Musical.ly in 2015.

##### 1. Jacob Sartorius - 19.9 million followers

Rolf Jacob Sartorius a 16-year-old who, living in Tulsa, Oklahoma, jumped into the spotlight in 2015. By 2016 he had released his debut single "Sweatshirt" that now has 53 million views on YouTube and reached the Hot 100 Charts in the United States and Canada that year. He released his EP "Better With You" in November of 2018, which didn't gain as much traction as his previous work but still clocked 3 million views on YouTube. Sartorius has more than double the amount of followers than Gordon Ramsay has on Twitter.

Source: Media via [Sensor Tower](#), Lisa and Lena, Loren Gray, Baby Ariel, Jacob Sartorius, TikTok, Danny Paez, <https://www.inverse.com/article/53052-TikTok-most-popular-influencers>



Image credit: GGV Capital

Jin Niu, a 26-year-old from a mountain village in Sichuan province, who makes a living by live streaming his rural life on Hypstar (火山小视频), one of Toutiao's short video apps. He accumulated over 86,000 fans and earned RMB 80,000 (\$12,000) on the platform within six months. The company has been encouraging good content by subsidizing virtual gifts to influencers like him.

Source: <https://hans.vc/toutiao/>