Stylus

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BY: **Zara Stone**

At MIT Technology Review's EmTech Digital conference in San Francisco (March 26-27), speakers explored how advances in artificial intelligence (AI) are reshaping the underlying structure of every industry, in areas ranging from education to retail to law. Spotlights included China's growing domination of AI development, the emergence of cloud-based AI services and man-machine interfacing.

SUMMARY

POCKET POLYGLOTS Advances in deep-learning language translation, combined with the decreasing cost of hardware, are enabling international travellers to understand different languages in real time. "There's a huge demand for multilingual translation," said scientist Hua Wu, who spearheaded the portable pocket translator developed by Baidu, China's largest search engine.

CLOUD DEMOCRACY Cloud-based artificial intelligence (AI) services are going mainstream, with plug-and-play offerings from Google, Amazon and Microsoft. However, it's anyone's game. "The entire engaged space is only 5% of the addressable market," said Jia Li, AI research director for Google Cloud. "The cloud business is at the very beginning."

ROBO-RETAIL Autonomous robots are transforming the retail space. Ambitious start-ups are using robotics to tackle the problems of packing, last-mile delivery and shelf restocking.

AI SPACE RACE With the global AI market projected to reach $36.8bn by 2025 (Tractica, 2016), countries are now vying to lead this space. China has declared its plan for AI domination by 2030, and PwC analysts predict AI will make up 26% of its gross domestic product (GDP) that year.

KEY STATS +

$36.8bn	The global AI market is projected to reach $36.8bn by 2025
26%	AI will make up 26% of China's GDP in 2030
$86.6bn	Last-mile delivery is estimated to account for over 50% of all global delivery costs (around $86.6bn)
23.5m	In the US, 23.5 million people live in food or pharmacy deserts
$31bn	The retail industry of packing and restocking items will be worth $31bn by 2020
200	Today, robots can pick 200 items per hour, up from 25 in 2015
5%	The addition of AI to the solution stack will play a big role in the IT sector's predicted 5% growth
$260bn	The global public cloud services market was forecast to be worth $260bn in 2017
48%	In 2017, 48% of global AI investment went to Chinese companies
$28bn	As of late 2017, Chinese media firm ByteDance's estimated value was $28bn
61%	In 2017, 61% of businesses implemented AI

The Semi-Autonomous Last Mile

Speakers presented how the creation of smart, sidewalk-safe robots could transform last-mile delivery – estimated to account for over 50% of all global delivery costs (around $86.6bn), according to a 2016 report by global management consultancy McKinsey.

- **Next-Gen Drone Drops:** In late 2017, US-based drone delivery service Project Wing – created by X, Google's moonshot company – started running beta tests with pharmacy chain Chemist Warehouse and Mexican restaurant Guzman y Gomez in Australia. Drone drops could provide access to the 23.5 million Americans who live in food or pharmacy deserts. The algorithmic data needed for a clean drop is sourced from satellite data, 3D terrain mapping and human labelling.

  "Our system has to figure out where it's safe to leave a package," said Astro Teller, chief executive of X. He explained that identification is critical: "For example, leaving [a package] on a trampoline is okay; in a pool, not so much." Customer feedback is key to success, as user input is sorted into label data that machine learning uses to create Project Wing's comprehensive delivery mapping.

Last-mile delivery accounts for over 50% of all global delivery costs   Astro Teller, chief executive of X

- **Street Smarts:** Autonomous delivery robots can significantly cut last-mile costs. The latest iteration of the Robby delivery robot – which was designed by US tech firm Robby Technologies and announced in January 2018 – can handle curbs and rain, and can reach speeds of three to six miles an hour. The key to its adoption is in the design, said chief executive Rui Li: "The size of a robot should be small compared to humans, so it's not intimidating. The size of the robot is narrower than half the width of a typical sidewalk, so people and wheelchairs can pass by easily." Partners include US logistics firm Postmates and US reality TV series Top Chef.

- **Drudge Report:** Advancements in robotic grasping could free up the retail grunt work of packing and restocking items – an industry that's projected to grow to $31bn by 2020 (Statista, 2018). Ken Goldberg, a robotics professor at University of California, Berkeley, has been working on developing the speed at which robots can grasp and pack items, using the metric 'picks per hour' (PPH). In 2015, robots could achieve 25 PPH. Today, they're at 200 per hour (for reference, humans can do between 400 and 600 PPH). Goldberg trains the robots using 3D object models combined with deep-learning data. These datasets are free for developers to access and build upon via Dex-Net 4.0.

For more on how innovative companies are automating the 'last mile', see Shoptalk 2018: Retail's Fluid Future and NRF 2018, Retail's Big Show: Tech-Driven Retail.

Robby delivery robot

Cloud Nomad

There's an uptick in the cloud-based artificial intelligence (AI) services that internet companies are offering, which give their users everything from vision to language processing. "Cloud AI is not sexy, but it's important," said Oren Etzioni, chief executive of the Allen Institute for Artificial Intelligence in the US. "Some say it will democratise AI." The addition of AI to the solution stack will play a big role in the IT sector's predicted 5% growth (CompTIA, 2018).

- **Out-of-the-Box Cloud AI:** Open-sourcing cloud AI could help address the severe shortage of engineers, said Jia Li, AI research director for Google Cloud. "Of the 21 million developers in the world, less than one million have a data science background and [only] a few thousand have deep-learning expertise."

  In January 2018, Google launched Cloud AutoML, a cloud-based machine-learning platform. Its first offering is vision-focused, using transfer learning and neural search technologies to simplify the process of image recognition. Businesses using the technology manipulate a drag-and-drop interface that can be deployed directly to the cloud. In two months, Google has had more than 14,000 customers. Its platform is used by Disney for product recommendations. In the UK, the Zoological Society of London uses AutoML to label images of wild animals and track wildlife distribution.

- **Real-Time Cloud:** Instantaneous AI can improve employee efficiency. In late 2017, Walmart started testing this in its stores, deploying over 50 Bossa Nova robots to autonomously roll through the aisles. The robot automatically scans shelves for spaces that need replenishing, using its on-board AI to sort through RGB colour, data and 3D information. They're 50% more productive than humans and three times as fast.

  "It's around a three-minute journey from the shelf to the robot to Walmart's cloud and then back to the shop floor," said chief business officer Martin Hitch. "In a retail store, that's real time." Hitch said Bossa Nova has scanned more than 117,000 aisles and 395 million images, with 6,320 hours of autonomous navigation. See also Transformative Tech: Wired Retail 2017.

- **Revenue Raiser:** Harnessing cloud AI could provide a big boost for businesses. In late 2017, Amazon SageMaker AI was added to Amazon's machine-learning offerings, giving companies a streamlined way to integrate machine learning into their data science teams. It's already showing dividends in customer revenue and retention, according to Matt Wood, director of deep learning at Amazon Web Services (AWS). Travel booking website Expedia used this to train its machine-learning models to identify and highlight the most attractive hotel images in its dataset, which led to an increase in click-through and purchases, Wood said.

  Wood explained that there are multiple channels for implementation. US financial software company Intuit uses AWS machine learning for "almost real-time fraud analysis", while US shopping service Instacart applies machine learning to optimise in-store product selection, equating to thousands of hours of savings on manpower. The global public cloud services market was forecast to be worth $260bn in 2017 (Gartner, 2017). Rajen Sheth, Google Cloud's senior director of product management, told MIT Technology Review that adding AI could double this number.
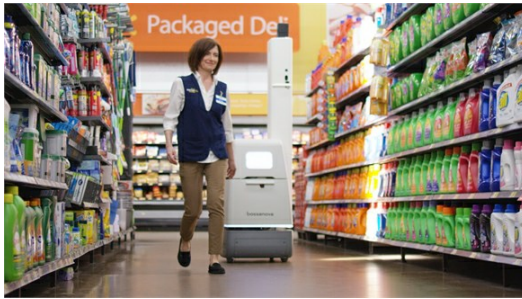
Bossa Nova robot in Walmart store

Travel booking website Expedia uses Amazon SageMaker AI

China's AI Revolution

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We believe that content creation is really the next frontier.

WEI-YING MA, VICE-PRESIDENT & HEAD OF AI LABS, BYTEDANCE

China has made significant inroads into the AI sphere, thanks in part to a 2017 government-funded initiative to become an AI world leader by 2030. Forty-eight per cent of global AI investment in 2017 went to Chinese companies (CB Insights, 2018). "More than half of [AI research papers] are authored in China," said Li of Google Cloud. "We need to bridge the research across countries and advance the AI field together."

- **Smart News Machine:** Over 20 million pieces of content are uploaded daily to Toutiao, the flagship news app of Beijing-based media firm ByteDance. To create a personalised experience for its 120 million users, ByteDance's AI sifts through the content, highlighting key posts. "We call this AI-assisted content creation and AI-assisted content consumption," said Wei-Ying Ma, vice-president and head of AI Labs at ByteDance.

  Human writers and editors create content tailored by AI input, which is then directed to users who express a preference for this type of news. Automated content is the next step for the Chinese firm, which already has an AI writer composing daily briefs on finance, sports and real estate. "There's only a small amount of this on our platform, but it generates real revenue," said Ma. As of late 2017, the company's estimated value was $28bn. For more on how the TV, film, music and publishing landscape is being transformed by technology, see State of Media: The Fan-First Revolution.

At ByteDance in China, human writers and editors create content tailored by AI input

- **Vocal AI:** Advances in speech processing are enabling global translation and augmenting real-time comprehension. Baidu, China's largest search engine, released its portable pocket translator in December 2017. The device, which is smaller than the palm of a hand, uses deep learning to translate human speech into a target language in real time. Users talk to the device and press a button in its centre at the same time. Then, the device repeats back the translation in another language via audio.

  The translator is connected to the internet through an embedded SIM card that can work in more than 80 countries and regions. In so doing, the device enables users to have bilingual conversations (English, Chinese and Japanese only, for now). The company is currently deploying this as a rental service in travel agencies and airports. The translator is the end result of Baidu's work on a scalable neural machine-translation system, said Hua Wu, Baidu's chief scientist of natural language processing.

  Its competitor, Chinese tech firm iFlytek's Xiaoyi Translation Machine, launched in March 2017, uses a neural network to create two-way voice translation of Chinese to English, Japanese, Korean, French or Spanish.

- **Internet of AI:** The next stage of the Internet of Things is the Internet of AI revolution, with the technology embedded in medical, educational and legal enterprises. China's iFlytek is testing the legal integration in partnership with the Shanghai High People's Court to give judges assistive sentencing technology. "[We have] a 97.2% accuracy," said Shipeng Li, iFlytek's technical adviser.

  In schools, the use of iFlytek's AI for homework analysis and teacher behaviour has "led to a 30% increase in efficiency for teachers and a 40% reduction of repetitive homework for the student", Li said. Currently, its educational platform is integrated into 12,000 schools across 30 provinces.

Baidu's portable pocket translator

FUTURE INSIGHTS

AI LEGISLATION MUST BE PROACTIVE Speakers suggested that businesses' fast adoption of AI advances may be breaching current laws. As legislators scramble to keep up, advance planning and documentation is crucial.

DEVELOP ARTICULATE AI The growing sophistication of language translation technologies can be parlayed into a larger subset of customers. Future-proofing web design and payment systems will increase the chances of taking the lead here.

ALLAY WORKERS' CONCERNS "There's less than one robot per human worker today," said University of California, Berkeley robotics professor Ken Goldberg, underscoring that this won't shift for decades. Emphasising this to employees will help integration and allay concerns.

INVEST IN AI In 2017, 61% of businesses implemented AI (Narrative Science, 2018), so investment strategy should be a priority for 2018. "We can't afford to slow down lest other countries overtake us," said Oren Etzioni, chief executive of the Allen Institute for Artificial Intelligence.

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Stylus

Stylus Media Group
London | New York
T +44 (0) 203 837 8300 (UK)
T +1 (646) 665 3501 (US)
E innovation@stylus.com

@Stylus_LIVE

instagram.com/wearestylus

bit.ly/stylusgroup

stylus.com/rss.xml

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