

# ARTIFICIAL INTELLIGENCE: DISRUPTION IN PROGRESS

[2019] SAL Prac 33

Rapid advances in artificial intelligence (or “AI”) are opening up new applications in financial technology and across many other industries. This article will look at the evolving patent landscape and how intellectual property offices in Singapore and elsewhere are responding to this disruption. In particular, we look at the Accelerated Initiative for AI launched by the Intellectual Property Office of Singapore in April 2019 to help businesses stay ahead in this environment.

Danny **YAP**\*

*BSc (National University of Singapore), MSc (National University of Singapore), MSc (Financial Engineering) (Nanyang Technological University), GCIP Law (National University of Singapore); Patent Examiner, Intellectual Property Office of Singapore International, Singapore.*

Judia **KOK**\*

*BSc (Nanyang Technological University); Manager, Intellectual Property Office of Singapore.*

## I. Introduction

1 Artificial intelligence (“AI”) is rapidly transforming industries ranging from healthcare to transportation. Improved machine learning techniques in speech recognition, natural language processing and image recognition are finding new applications in areas as diverse as cancer diagnosis, autonomous vehicles and smart buildings. The financial technology

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(or “fintech”) industry<sup>1</sup> is no exception, with AI enabling financial applications such as round-the-clock financial assistants, improved fraud detection for payment transactions and the automatic settlement of insurance claims.<sup>2</sup>

2 Potential AI uses are being found even in nascent fintech technology areas. For example, blockchain-enabled smart contract applications are just starting to emerge in financial trading, real estate and insurance.<sup>3</sup> Smart contracts, particularly when integrated with payment mechanisms, programmatically track contractual obligations and effect payments between transacting parties, resulting in a reduction or elimination of transaction costs.<sup>4</sup> It is envisaged that AI may be able to play key roles in smart contracts, such as the use of natural language processing to parse “human” contracts for contract analysis and in drafting for contract generation.<sup>5</sup>

3 The net result of the confluence of these new AI-driven developments is further disruption, leading to greater speed, efficiency and security in the provision of goods and services. Going hand in hand with this is the need for a patent regime that

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- 1 Chung Ka Yee & Wong Chee Leong, “Fintech Innovations: Forging Ahead” [2018] SAL Prac 9.
  - 2 See, for example, Bank of America, “Erica® by the Numbers” (May 2019) <[https://newsroom.bankofamerica.com/system/files/Erica\\_by\\_the\\_Numbers\\_Infographic\\_%28May\\_2019%29.pdf](https://newsroom.bankofamerica.com/system/files/Erica_by_the_Numbers_Infographic_%28May_2019%29.pdf)> (accessed 4 December 2019); Karthik Ramanathan, “How AI is Transforming the Payments Experience” (31 January 2019); and Adam Najberg, “China Car Owners Use AI-Powered App to File Damage Claims” (15 May 2018).
  - 3 For example, R3 website, “Corda Enterprise selected by SIX Digital Exchange” (6 March 2019); Propy White Paper, “Global Property Store with Decentralized Title Registry” (2017); and Fabrizio Lamberti *et al*, “Blockchains Can Work for Car Insurance: Using Smart Contracts and Sensors to Provide On-Demand Coverage” (2018) 7(4) *IEEE Consumer Electronics Magazine* 72.
  - 4 Henry Kim & Marek Laskowski, “A Perspective on Blockchain Smart Contracts: Reducing Uncertainty and Complexity in Value Exchange” 26th International Conference on Computer Communication and Networks (ICCCN) (2017) at pp 1–6.
  - 5 Huu Nguyen & Scott Bailey, “Use of Artificial Intelligence for Smart Contracts and Blockchains” (2018) 20(2) *Fintech Law Report* 1.

keeps up with these advances while encouraging businesses and innovators to continue to find and develop new and useful AI applications that benefit the public at large.

## II. Patent landscape

4 By one count, we are currently in the midst of a third AI wave, having already endured two AI “winters” since the birth of AI in 1956.<sup>6</sup> The current AI wave has been mainly attributed to increases in computing power and the availability of big data. In the US alone, venture capital funding for AI-related companies in 2018 was US\$9.33bn, a 72% jump from 2017 and a 128% jump from 2016.<sup>7</sup> By the first half of 2019, this number had already reached US\$7.6bn and is second only to funding for fintech.<sup>8</sup> In Singapore, the National Research Foundation has, since 2016, collectively allocated \$900m to research and development in AI, robotics and supercomputers.<sup>9</sup> A separate study estimates that, in a baseline scenario, integrating AI into Singapore’s economic processes could create US\$215bn (or 40.7% more) in gross value added across 11 industries by 2035.<sup>10</sup>

5 Globally, patent filings in AI have been rising rapidly, with total AI patents since 2013 making up more than half of all AI patents. The US is the most popular country to file an AI

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6 See World Intellectual Property Organization, “The Story of AI in Patents”. However, see also Defense Advanced Research Projects Agency, “DARPA perspective on AI”.

7 PwC and CB Insights, “Q4 2018 Moneytree Report” at p 20 <<https://www.cbinsights.com/research/report/venture-capital-q4-2018/>> (accessed 17 October 2019).

8 PwC and CB Insights, “Q2 2019 Moneytree Report” at pp 47–50 <<https://www.cbinsights.com/research/report/venture-capital-q2-2019/>> (accessed 17 October 2019). For an overview of the fintech patent landscape, see Chung Ka Yee & Wong Chee Leong, “Fintech Innovations: Forging Ahead” [2018] SAL Prac 9 at paras 2–3.

9 Irene Tham, “\$540m boost for digital research and innovation” *The Straits Times* (27 March 2019).

10 Allison Kennedy, “Unleashing AI Power in Singapore” *Accenture* (December 2017) <<https://www.accenture.com/sg-en/insight-ai-industry-growth>> (accessed 17 October 2019).

patent in, followed closely by China and then Japan, the three countries accounting for more than 78% of all AI patent filings. IBM and Microsoft are the top two patent applicants; however, Japanese companies dominate the top 20. The top three applications for AI are in transportation, telecommunications and the life and medical sciences.<sup>11</sup>

6 In tandem with this growth, the Intellectual Property Office of Singapore (“IPOS”) has also observed a steady increase in the number of AI patents being lodged in Singapore. According to “Trends in Patenting for Artificial Intelligence”<sup>12</sup> and additional data gathered by IPOS, the number of published AI patents in 2018 is almost double that in 2017. Between 2013 and 2018, AI patent filings in Singapore were led by companies such as Beijing DIDI, Microsoft, MasterCard, Google, Ping An Technology and Visa. The top area for AI in Singapore is the life and medical sciences, which differs slightly from its placing in the global trend. The other main AI areas are in digital computing or data processing, IT methods for business administration and management and e-commerce. Of the AI patent applications filed in Singapore in this period, those specifically directed to fintech are mostly from MasterCard and Visa and mainly relate to various aspects of payment transaction processing such as analysing transaction data in order to identify consumer trends and the use of biometrics for customer verification.

### **III. Initiatives by patent offices**

7 Patent offices in major jurisdictions have responded to the surge in AI patent filings by revising their guidelines to clarify the patentability requirements for AI applications and rolling out new initiatives to encourage AI innovation. In March

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11 World Intellectual Property Organization, “WIPO Technology Trends 2019: Artificial Intelligence” (2019).

12 Intellectual Property Office of Singapore, “Trends in Patenting for Artificial Intelligence” (2018) <<https://www.ipos.gov.sg/docs/default-source/PDF-Files/ai-infographic.pdf>> (accessed 17 October 2019).

2017, the Japan Patent Office (“JPO”) published its guidelines on Internet of Things or IOT-related inventions. AI was seen as playing the key role of processing big data retrieved from networked IOT devices. The JPO issued further guidelines in January 2019 laying out a series of case examples directed specifically to AI inventions.<sup>13</sup> In April 2018, the Korean Intellectual Property Office launched an accelerated examination program for industry 4.0 patent applications, identifying AI as one of seven core technologies of the Fourth Industrial Revolution that would be eligible for prioritised examination.<sup>14</sup>

8 AI inventions face particular hurdles when a patent claim appears to be solely directed to a mathematical method. The European Patent Office (“EPO”), in revised guidelines issued in November 2019, noted that AI concepts such as classification and neural networks are *per se* of an abstract mathematical nature and that claims directed to such subject matter would thus potentially be deemed non-technical and hence non-patentable.<sup>15</sup> The United States Patent Office (“USPTO”) also issued revised guidelines in January 2019, specifically identifying “mathematical concepts” as one of three groups of subject matter along with “certain methods of organizing human activity” and “mental processes” as falling under the US judicial exception of abstract ideas. Notably, in order to prevent drafting efforts designed to monopolise a mathematical concept, a claim would be deemed to be directed to an abstract idea if it recites a judicial exception that is not integrated into a practical application.<sup>16</sup>

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13 Japan Patent Office, “Examination Guidelines pertinent to IoT Related Technologies” (March 2017); Japan Patent Office, “Newly Added Case Examples for AI-Related Technologies” (30 January 2019).

14 European Patent Office, “Korea: KIPO to introduce accelerated examination for industry 4.0 related patents” (5 April 2018).

15 European Patent Office, *Guidelines for Examination in the European Patent Office* (2019) at Pt G, ch II, s 3.3.1 <<https://www.epo.org/law-practice/legal-texts/guidelines.html>> (accessed 16 December 2019).

16 United States Patent Office, “Revised Patent Subject Matter Eligibility Guidance” (2019) 84(4) *Federal Register* 50 (7 January 2019) <<https://www.federalregister.gov/documents/2019/01/07/2019-01-07-revised-patent-subject-matter-eligibility-guidance>> (cont'd on the next page)

9 The revised patent examination guidelines from the EPO and the USPTO provide greater clarity on where the boundary lies between what would or would not be allowed in these jurisdictions in the face of increasing AI patent filings. To be sure, the exclusion of mathematical methods from patentability is not new. There is a common, longstanding understanding in these and many other jurisdictions that mathematical methods are not patentable and should not be monopolised.<sup>17</sup>

10 In April 2019, IPOS also issued revised examination guidelines reiterating that mathematical methods such as AI algorithms, in themselves, are not considered to be inventions under s 13(1) of the Singapore Patents Act.<sup>18</sup> However, a patent claim may be considered to go beyond the underlying mathematical method if it is functionally limited to solve a specific (as opposed to a generic) problem. This distinction seeks to prevent mathematical methods from being inadvertently claimed in abstraction. The revised guidelines also note the potential breadth of AI applications, and that care should be taken when the actual contribution of the claims also falls within other subject matter not considered to be inventions, such as business methods.

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[govinfo.gov/content/pkg/FR-2019-01-07/pdf/2018-28282.pdf](http://govinfo.gov/content/pkg/FR-2019-01-07/pdf/2018-28282.pdf)> (accessed 17 October 2019).

- 17 These jurisdictions include the UK, Australia, China, Japan and Korea. See, respectively, UK Patents Act 1977 (c 37) s 1(2); *Grant v Commissioner of Patents* [2006] FCAFC 120 at [47]; State Intellectual Property Office of the People's Republic of China, "Guidelines for Patent Examination" (1 March 2010) at Pt 2, ch 1, s 4.2 <<http://english.cnipa.gov.cn/docs/20180131104843547234.pdf>> (accessed 4 December 2019); Japan Patent Office, "Examination Guidelines for Patent and Utility Model in Japan (Provisional Translation)" (effective date 9 June 2018) at Pt III ch 1 s 2.1.4 <[https://www.jpo.go.jp/e/system/laws/rule/guideline/patent/tukujitu\\_kijun/document/index/all\\_e.pdf](https://www.jpo.go.jp/e/system/laws/rule/guideline/patent/tukujitu_kijun/document/index/all_e.pdf)> (accessed 4 December 2019); and Korean Intellectual Property Office, "Patent Examination Guidelines (English Edition)" (December 2017) at Pt III ch 1 s 4.1.4 <[https://www.kipo.go.kr/upload/en/download/patent\\_examination\\_guidelines\\_2018\\_01.pdf](https://www.kipo.go.kr/upload/en/download/patent_examination_guidelines_2018_01.pdf)> (accessed 17 October 2019).
- 18 Cap 221, 2005 Rev Ed. See also Intellectual Property Office of Singapore, "Examination Guidelines for Patent Applications at IPOS" (April 2019) at paras 8.22–8.27.

11 In conjunction with the release of the revised patent examination guidelines, IPOS also launched<sup>19</sup> its Accelerated Initiative for AI (“AI<sup>2</sup>”). AI<sup>2</sup> follows a similar programme called Fintech Fast Track (“FTFT”) which was launched in April 2018 for accelerating fintech inventions.<sup>20</sup> AI<sup>2</sup> offers applicants filing an AI-related invention a significantly reduced timeline to grant, potentially as short as six months or less, without any additional fees.<sup>21</sup> This compares to the usual timeline of two to four years to grant for a typical patent application. The shorter timeline is achieved by prioritising eligible patent applications for first as well as subsequent office actions – they essentially float to the top of the pile – but are otherwise subject to the same examination rigour accorded to all incoming patent applications.

12 Examples of AI-enabled fintech patents in Singapore that have been filed under the FTFT or AI<sup>2</sup> initiatives include the use of image recognition to authenticate documents as well as transaction verification for fraud detection. These applications tend to be computer-implemented methods directed to specific payment transaction processes. In many cases, what is claimed is a system or method that improves some aspect of transaction security which is considered as going beyond a pure method for doing business and thus to be patent eligible according to the examination guidelines issued by IPOS.<sup>22</sup>

13 Patent prosecution beyond Singapore may also be fast-tracked by leveraging AI<sup>2</sup> in conjunction with the other work-

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19 Intellectual Property Office of Singapore, “Accelerated Initiative for Artificial Intelligence” Circular No 2/2019 (26 April 2019) <[https://www.ipos.gov.sg/docs/default-source/resources-library/patents/circulars/\(2019\)-circular-no-2---ai2-initiative\\_final.pdf](https://www.ipos.gov.sg/docs/default-source/resources-library/patents/circulars/(2019)-circular-no-2---ai2-initiative_final.pdf)> (accessed 17 October 2019).

20 Intellectual Property Office of Singapore, “Launch of Fintech Fast Track Initiative” Circular No 3/2018 (2018) <[https://www.ipos.gov.sg/docs/default-source/resources-library/patents/circulars/\(2018\)-circular-no-3--launch-of-fintech-fast-track-initiative.pdf](https://www.ipos.gov.sg/docs/default-source/resources-library/patents/circulars/(2018)-circular-no-3--launch-of-fintech-fast-track-initiative.pdf)> (accessed 17 October 2019).

21 The first patent granted under the Accelerated Initiative for Artificial Intelligence, SG10201905273V from Alibaba Group Holding Ltd, was granted in under three months.

22 Intellectual Property Office of Singapore, “Examination Guidelines for Patent Applications at IPOS” (April 2019) at para 8.7.

sharing programmes that Singapore is part of, namely the Global Patent Prosecution Highway, the bilateral PPHs and the ASEAN Patent Examination Co-operation. Thus, a patent application, originally filed in Singapore and accelerated under AI<sup>2</sup>, would potentially have a shorter, total time for prosecution when the application is subsequently filed in countries covered by these programmes. AI<sup>2</sup> complements Singapore's shift towards a digital economy by supporting the local innovation community looking to commercialise innovative AI solutions. Aside from IPOS, Singapore government ministries and their related agencies are also taking the lead in AI, with AI use for service delivery and policy-making being made a key performance indicator.<sup>23</sup> According to at least one report, Singapore is already in the lead, ahead of both the UK and Germany, in government readiness to use AI in the delivery of public services.<sup>24</sup>

#### **IV. Patents, open source licensing and trade secrets**

14 The ready availability of open source platforms is changing the way software inventions are being protected without relying solely on patent protection. Businesses using open source platforms to develop their own applications may, at the outset, choose to use a careful combination of patents, open source licensing and trade secrets to protect their inventions in a way that suits their business strategies.

15 Open source platforms in fintech are already being widely used for developing financial applications ranging from mobile banking and stock trading to interbank clearing and settlement systems. The current AI wave is also seeing a similar reliance on open source platforms for developing AI software applications.<sup>25</sup>

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23 Smart Nation Digital Government Group, "Digital Government Blueprint" (June 2018) at p 31.

24 Oxford Insights & the International Development Research Centre, "Government Artificial Intelligence Readiness Index 2019" (2019) <[www.oxfordinsights.com/ai-readiness2019](http://www.oxfordinsights.com/ai-readiness2019)> (accessed 17 October 2019).

25 See, for example, banking platform Mifos X <<https://mifos.org/mifos-initiative/common-platform>> (accessed 4 December 2019) and stock trading platform Marketcetera. For a central bank study, see Monetary Authority of

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By making available ready to use software libraries to develop commercial applications, open source software does away with the need to start from the ground up, encourages widespread adoption of the application and engages a strong community that essentially crowdsources its development, support and maintenance. Careful use of open source software together with trade secret protection allows developers to take advantage of these benefits while retaining their competitive advantage by holding on to proprietary data or algorithms that are not released into open source software libraries.<sup>26</sup> For businesses developing applications based on open source platforms, a patent may still protect against competitors from patenting the same invention or from copying the invention and then licensing it under a proprietary licence.<sup>27</sup> It may also serve to retain the right to bring litigation against users who do not comply with the terms of these open source platforms.<sup>28</sup>

## V. Conclusion

16 The rapid pace of AI development is driving new applications in fintech and other industries, as seen in the corresponding growth of investments and patent filings both globally and in Singapore. Patent offices have responded to these developments by introducing specific initiatives to encourage patent protection for innovators and businesses engaged in these

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Singapore, “Project Ubin: Central Bank Digital Money using Distributed Ledger Technology”. Popular open source platforms in artificial intelligence include Microsoft’s CNTK and Google’s Tensorflow. See also case examples of TensorFlow from Airbnb: Shijing Yao, Qiang Zhu & Phillippe Siclait, “Categorizing Listing Photos at Airbnb” *Medium* (3 May 2018); and CocaCola: “How Machine Learning with TensorFlow Enabled Mobile Proof-Of-Purchase at Coca-Cola” *Google Developers Blog* (21 September 2017).

- 26 Gideon Myles, “Balancing Open Source and Proprietary IP – They Can Co-exist” *Dropbox* (13 December 2017); Wayne Cunningham, “What Every Engineer Should Know About Open Source Software Licenses and IP” *Uber Engineering* (18 June 2018).
- 27 James Gatto & Hean Koo, “Patent Issues with Open Source Software (OSS)” *Thomson Reuters Westlaw* (5 June 2018).
- 28 Laura A Majerus, “Patent Rights and Open Source – Can They Co-exist?” *Fenwick & West LLP* (2006).

disruptive technology areas. In Singapore, following FTFT, a fast-track initiative launched in April 2018 to encourage fintech innovation, IPOS launched AI<sup>2</sup> in April 2019, a similar initiative for accelerating AI patent applications – both initiatives received encouraging responses. Continual disruption driven by emerging technologies appears to have become the norm and intellectual property offices now, more than ever, are acutely aware of the corresponding need to be alert and nimble in anticipating and responding to these developments.