

IP Analytics newsletter

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IP in Artificial Intelligence

A study of patenting trends in the field of artificial intelligence (AI), looking at filing figures for different areas of AI, top filers and filing jurisdictions.

By Andrew Flaxman

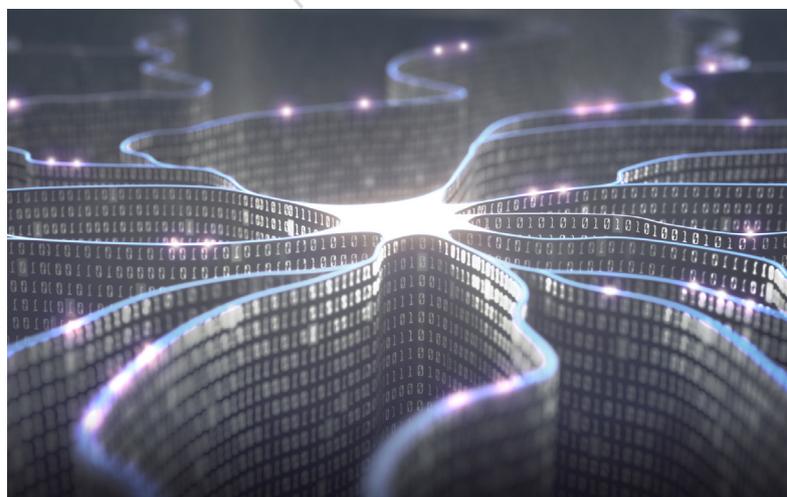
Artificial intelligence, or AI, is a term used to describe an element of intelligence exhibited by computers or machines. One area of AI which has seen significant development since 2012 is machine learning, which involves the development or training of an algorithm or statistical model to enable a computer to perform a particular task without requiring explicit instructions. A trained machine learning model is instead able to rely on pattern recognition and inference to perform the task in respect of which it is trained.

In recent years, machine learning and, more generally, artificial intelligence, has been used for tasks in a wide range of technological fields. Machine learning can be used to train computer models to perform tasks that would otherwise be performed by human operators, and using computers in this way can improve workflows and reduce the workload of their human counterparts. This can be particularly advantageous in fields where human workers are under pressure to perform tasks accurately and quickly.

Depending on the task for which the computer model is to be trained, a machine learning model may be provided with various inputs to achieve the desired output. In the medical field discussed above, data may be provided to the model in the form of text (e.g. medical reports or test results) or images (e.g. imaging scans). For other models, data may be provided in other forms, such as spoken words via a human's voice (e.g. when you speak to a smart speaker).

Patenting Trends in AI

HLK Analytics, the patent searching and analytics function at Haseltine Lake Kempner, has been taking a look at patenting trends in the field of AI. One area of our research has focused on the form in which the training data is provided to the computer model. Worldwide published patent documents (e.g. published patents and published patent applications) in the field of AI were classified into three categories,

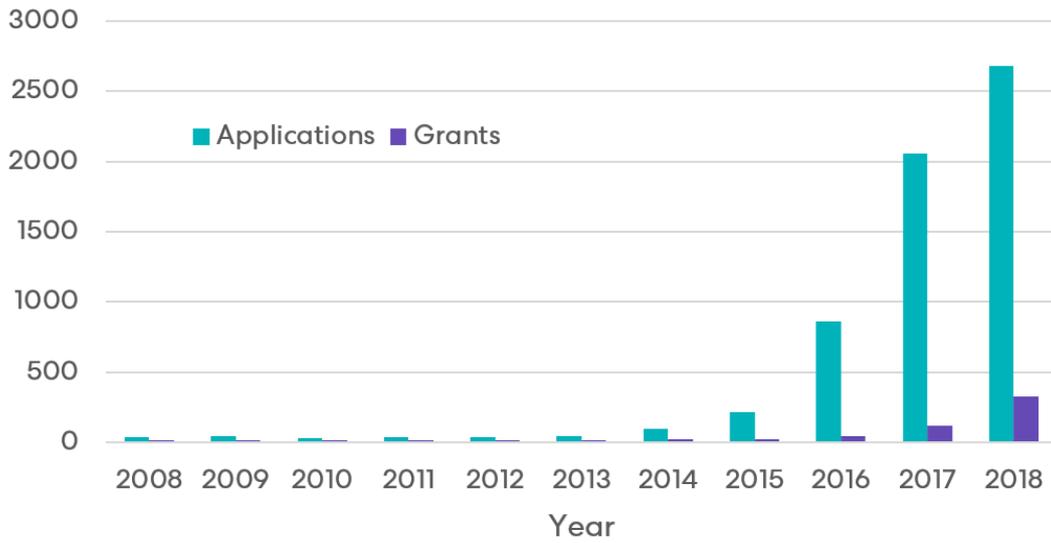


depending on the form of the data used for training the model: images, text or voice. Other types of data used for training models that do not fall within the images, text or voice categories have not been included. Classifying the patent documents in this way corresponds with the European Patent Office's Cooperative Patent Classification (CPC) system used for classifying patent applications on filing.

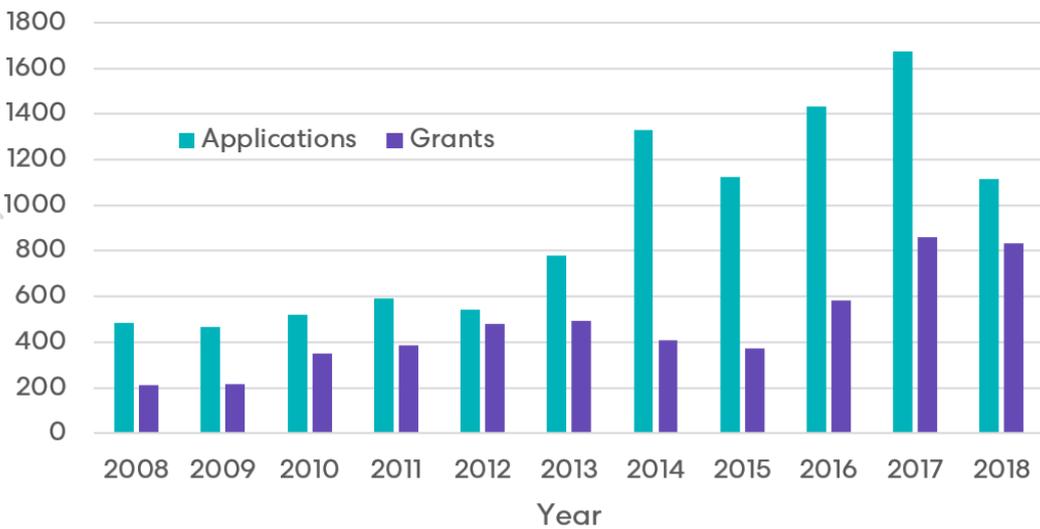
It should be noted that data relating to patent applications filed in 2018 is incomplete, since patent applications typically remain unpublished until 18 months after they are filed. It should also be borne in mind that our research covers a particular set of classification headings, so AI-related applications that are not classified under those headings will not be included in our data.



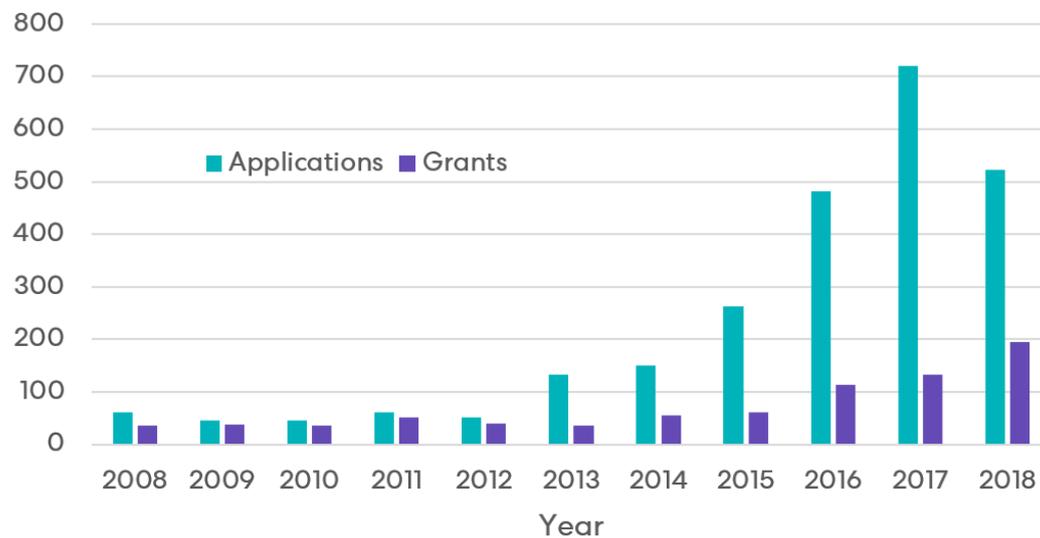
Learning Inputs - Images



Learning Inputs - Text



Learning Inputs - Voice



The charts above show that the number of patent applications that have been filed relating to machine learning in general has, perhaps unsurprisingly, seen rapid growth since around 2014. Numbers of filings and grants of cases relating to the use of text data for training were relatively consistent and not insignificant between 2008 and 2013; these applications are likely to relate to text analysis technologies such as optical character recognition (OCR) and natural language processing (NLP). In contrast, the numbers of

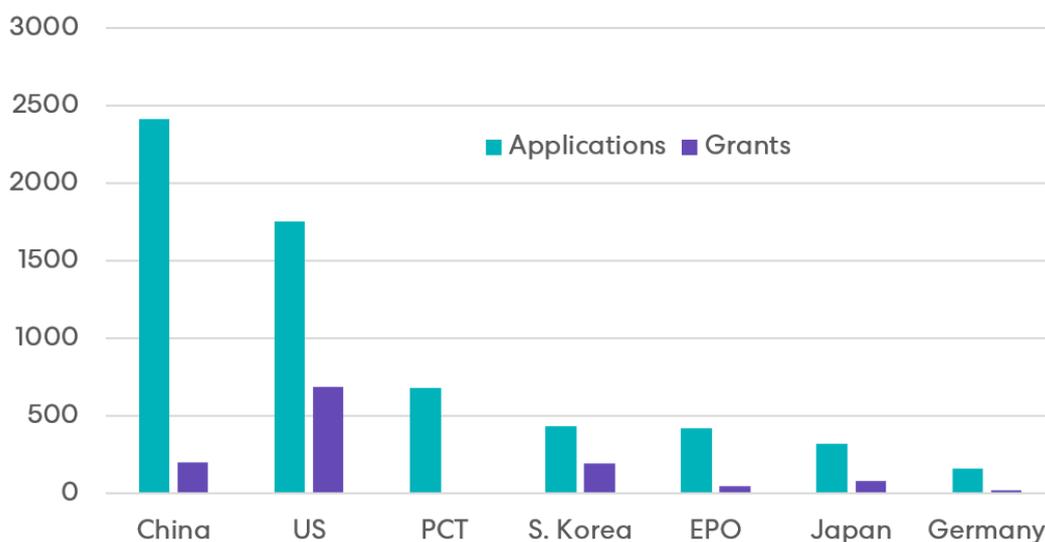
“[T]he US and China appear to be particularly significant based on the number of applications filed.”

patent applications for image and voice data inputs were much lower until around 2014. The number of patent applications filed in which voice input data is used for training has seen growth since around 2014 - incidentally, that’s around the time Amazon launched their voice-controlled smart speaker, the Amazon Echo.

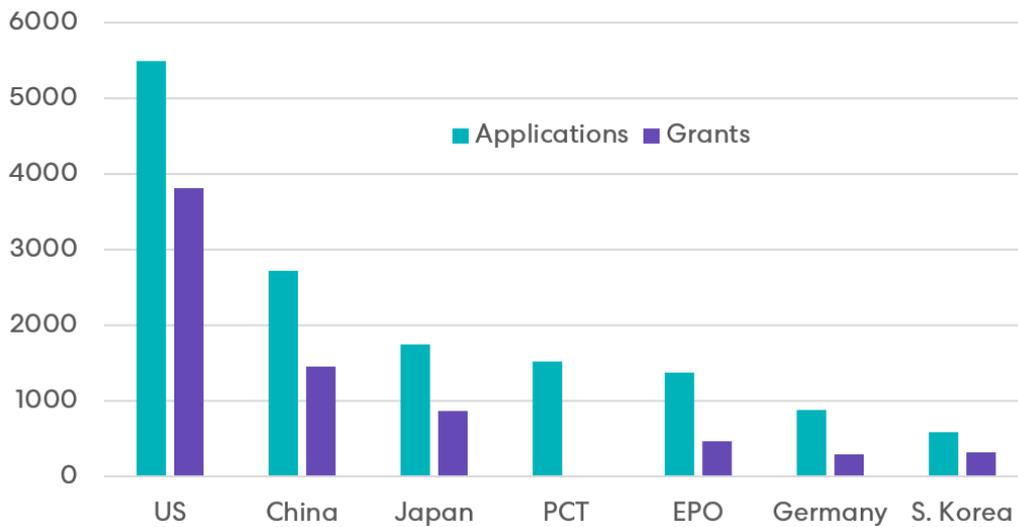
Notably, in most of the categories, the number of patent filings far exceeds the number of patents granted, but to a lesser extent with text data cases. While there will inevitably be a proportion of patents that are still being examined by patent offices, or that will intentionally never proceed to grant (e.g. through abandonment), this disparity might imply that it has become harder to get patents granted by patent offices for inventions using training data which isn’t text data.



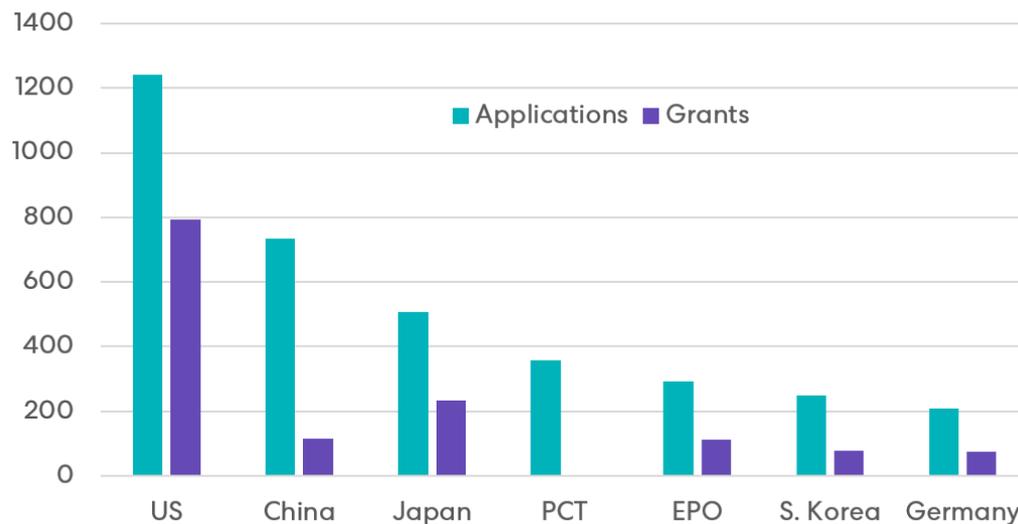
Top Filing Jurisdictions - Image Input Data



Top Filing Jurisdictions - Text Input Data



Top Filing Jurisdictions - Voice Input Data



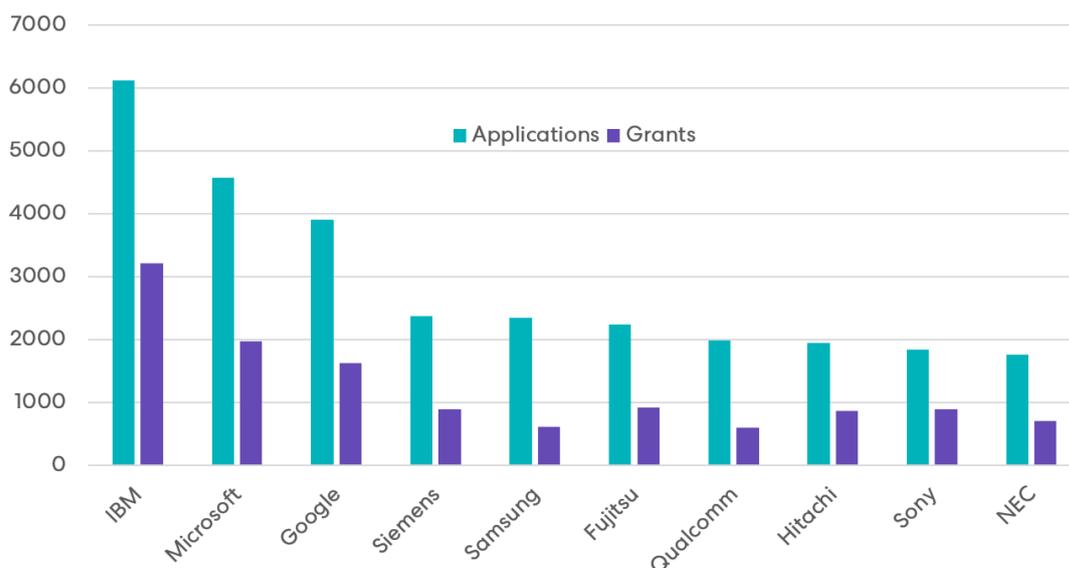
The graphs above show where in the world patent applications for AI inventions have been filed during the past 10 years. For most input data types, the US and China appear to be particularly significant based on the number of applications filed. For most jurisdictions, the number of patents granted in each area tends to be around half of the number of patent applications filed¹. One notable difference is the case where *images* are used as input data which, in general, shows very few granted patents compared to the number of applications filed. This disparity seems to be consistent with the apparent

recent surge in new applications being filed for this type of input data.

So who is responsible for filing all these AI patent applications? The chart below shows the number of filed patent applications and granted patents for each of the 10 largest filers in the field of AI.

1. The World Intellectual Property Office (WIPO) processes international (PCT) applications, but does not issue granted patents - international applications are entered into a national or regional phase, during which they are handled by a national or region patent office in a jurisdiction in which protection is sought.

Top Applicants



Our data shows that IBM appear to be leading the field in AI patent filings with over 40% more AI applications filed than the next biggest filer, Microsoft. Google are close behind Microsoft in third place according to our data, with Siemens, Fujitsu, Samsung, Qualcomm, Sony, Hitachi and NEC each having roughly the same number of AI applications.

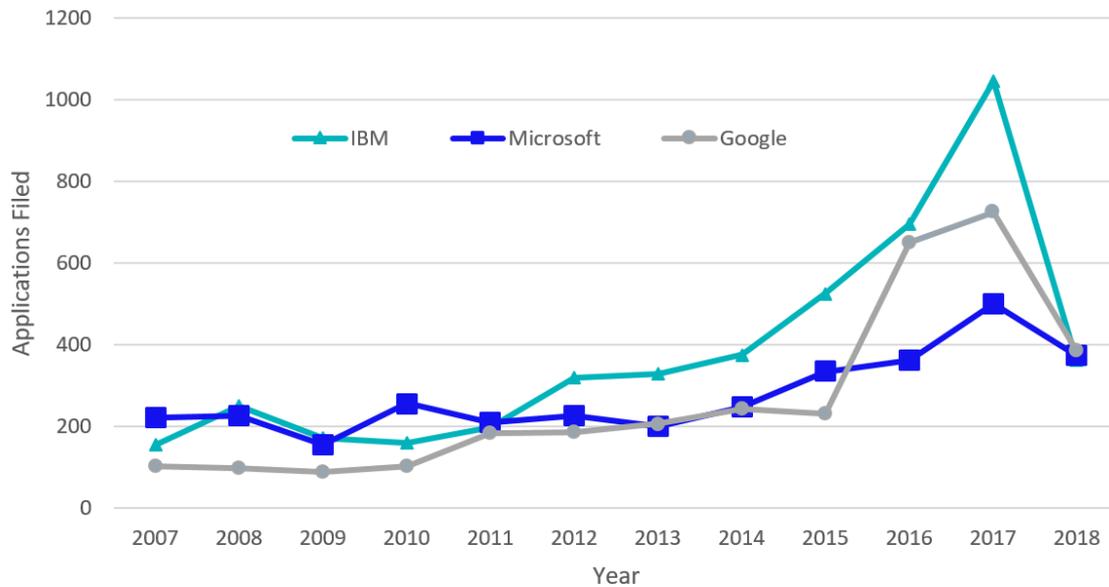
There appears to be approximate parity in the numbers of patents granted relative to the number filed across the applicants. It seems that around half of the patents filed by each applicant have been granted, suggesting that none of the big players is finding it easier than the others to get patents granted in this area.

Looking a little closer at some published applications of the largest filer, we see that IBM are exploring the use of AI in a range of projects. IBM's Project Debater is an AI-based system capable of holding a debate with humans on complex topics. Another project involves the use of AI to study vertical temperature profiles and gradients in bodies of water to understand factors affecting marine life. IBM are also

leading a project in which AI is used to analyse conversation patterns between two parties in order to identify an attempt by one party to deceive the other. Such technology could be used to prevent security threats.

IBM seem to be devoting huge amounts of their R&D resources to developing AI technologies and, from our next graph, it seems they are showing a consistent increase in their AI patent filing numbers.

Top 3 Filers - Filing Trends



The graph above shows the AI patent filing trends for our top 3 applicants (IBM, Microsoft and Google) since 2007. As expected, the data shows that, in general, the number of AI patent applications filed by each of the companies tends to be on the rise. However, it seems as though, while IBM appears to be showing steady growth in recent years, the growth in the number of applications filed by Microsoft has been far less extreme.

It is thought that some patent applicants who filed relatively large numbers of AI patent applications in the early years of the technology may have reduced their filing numbers in view of difficulties faced in getting AI patent applications through to grant in some jurisdictions. There is still uncertainty among national and regional patent offices about how AI-type inventions will be assessed from a patent point of view. Of course, the manner in which patent offices ultimately decide to assess AI inventions will have a bearing on how many patents get granted in the future and, consequently, also on the number of patent applications that get filed. While patent offices are keen for companies to file patent applications

for their inventions rather than keeping them as trade secrets, if companies believe that there is little chance of success for patent applications in the field of AI, then we might see fewer applications being filed, and more instances of inventions being kept confidential as trade secrets.

Fortunately, some of the major patent offices are taking action to clarify the boundaries of what can and cannot be patented in this field. Towards the end of 2018, the EPO issued guidance regarding patentability of AI inventions, along with examples of the types of inventions that are likely to pass the test of patentability, and further guidance was issued towards the end of 2019. In general, AI inventions will be assessed in accordance with existing requirements relating to computer-implemented inventions, namely that the contribution made by the invention must be “technical”. Such guidance makes it easier for patent applicants - and patent attorneys drafting patent applications - to form a view on whether an invention is likely to be patentable, and to draft the patent application in an appropriate way to avoid possible non-technicality issues.

Our research has shown that artificial intelligence is a burgeoning area of technology and that the number of patent applications filed in this area has seen a rapid increase, and continues to rise. Some learning types in the AI field seem to fare better than others in terms of patent grant rates, but in such a dynamic area - both in terms of technology and law - this will be an interesting area to monitor.

With regard to AI, another topic which provokes lengthy discussion and debate is ownership of inventions created by an AI algorithm or model. Such

considerations are beyond the scope of this paper, but it will be interesting to see where the hammer falls, and whether such AI engines can be considered to be inventors or owners of intellectual property rights in the future.

For future developments on AI in the world of IP, keep an eye on www.hlk-ip.com, and if you have any questions about anything raised in this paper, please contact your HLK contact.

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If you require a search in respect of any IP matter, or if you would like more information on any service provided by HLK, please get in touch with your usual HLK contact.

Haseltine Lake's Merger with Kempner & Partners

On 1 May 2019, Haseltine Lake merged with the Leeds-based boutique IP law firm Kempner & Partners to create Haseltine Lake Kempner. The merger has brought together two leading firms in their respective fields, and the resulting firm is a full-service firm that offers IP services to assist clients from the conception of their IP through to enforcement of IP rights.



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