IPSunny

How to obtain patents for AI related inventions in China

by Shengping YANG
2019.09.27 Stuttgart

Outline

- Laws, regulations, and policies
- Practices in prosecution
- Practices in litigation
- Interesting statistics
- Summary and advices

Laws, regulations, and policies

Policies:

《Development Plan of the New Generation Artificial Intelligence》, **the Central Government**, 2017.07.08

《Working Guidelines on Construction of the National New Generation AI Open Creation Platform》, **Ministry of Science and Technology**, 2019.08.01

《Guidance of Promoting Technical Creation and Raising AI Industries in Beijing》, **Beijing** municipal government, 2017.12.26

《 Development Plan of the New Generation of Artificial Intelligence in Guangdong》, **Guangdong** provincial government, 2018.07.23

《Implemental Opinions on Promoting Development of New Generation Artificial Intelligence in Shanghai》, **Shanghai** municipal government, 2017.10.26

Laws, regulations, and policies

Laws:

Inventions related to AI often take the form of combination of hardware and software, or purely software. Purely hardware inventions in the field are very rare. Therefore, laws and regulations on computer program related inventions usually apply to AI technologies. The most relevant law article is:

Article 25 of the patent law:

For any of the following, no patent right shall be granted:

……

(2) rules and methods for mental activities;

……

Laws, regulations, and policies

Regulations:

To be consistent with the strategic policy on AI development, the Guidelines on Patent Examination were revised in 2017, where

I. Program module is allowed in a system/device claim implemented completely with computer program(s);

II. A system/device claim is allowed to comprise both hardware technical features and software technical features;

III. Medium + computer program claim is allowed.

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Practices in prosecution

Drafting a patent application:

According to the newly revised *Guidelines on Patent Examination*, the following claim forms are available:

Invention types	Claim forms
Inventions involving hardware devices	System, device, product
Inventions of pure software	method; device with hardware features and software features device/system claim of “program module frame” corresponding to method; Storage medium.

Practices in prosecution

Example: AI + Medical

Utilizing machine vision and AI to analyze medical images to assist doctors in diagnosis is a common application scene of AI in medical field. Such a process usually includes the following phases:

a. Data acquisition phase where pretreatment like denoising is conducted to original images scanned by, e.g., CT to generate an image of a target region by using specific algorithms;

b. Marking phase where medical images used for model training are marked manually my doctors of imaging departments;

c. Model training phase where the system/device is trained based on the manually marked samples. For example, *Convolutional Neural Networks* or other deep learning algorithms are used to analyze, learn, and accumulate characters of a specific disease, to assist diagnosing software to output position, size, and possibility level of the disease;

d. Model application phase where the model is used to give diagnosis assistance to doctors while the model is consistently optimized based on the newly accumulated samples.

If improvement is in the deep learning algorithms, with which training speed and output accuracy are improved, the following claim forms are possible:

Practices in prosecution

Method claim:

A method of assisting diagnosis of ### disease utilizing artificial intelligence including:

a data acquisition step for acquiring marked medical image data as training samples;

a model optimizing step in which *Convolutional Neural Networks* algorithm is used to conduct machine learning based on the acquired samples to obtain optimized diagnosis model after multiple iterations; and

a model application step of analyzing scanned images in real time utilizing the diagnosis model to output indexes as reference to doctors.

Practices in prosecution

Device claim:

A device to assist diagnosis of ### disease utilizing artificial intelligence comprising:

a data acquisition unit for acquiring marked medical image data as training samples;

a model optimizing unit to use *Convolutional Neural Networks* algorithm conduct machine learning based on the acquired samples to obtain optimized diagnosis model after multiple iterations; and

a model application unit for analyzing scanned images in real time utilizing the diagnosis model to output indexes as reference to doctors.

Practices in prosecution

Device claim determined by software features:

A device to assist diagnosis of ### disease utilizing artificial intelligence comprising a processor and a storage unit in which a computer program is stored, wherein the processor executes the computer program to implement the following steps:

a data acquisition step of acquiring marked medical image data as training samples;

a model optimizing step in which *Convolutional Neural Networks* algorithm is used to conduct machine learning based on the acquired samples to obtain optimized diagnosis model after multiple iterations; and

a model application step for analyzing scanned images in real time utilizing the diagnosis model to output indexes as reference to doctors.

Practices in prosecution

Medium claim:

A computer readable storage medium for storing a computer program, wherein the computer program is executed to implement the following steps:

a data acquisition step of acquiring marked medical image data as training samples;

a model optimizing step in which *Convolutional Neural Networks* algorithm is used to conduct machine learning based on the acquired samples to obtain optimized diagnosis model after multiple iterations; and

a model application step for analyzing scanned images in real time utilizing the diagnosis model to output indexes as reference to doctors.

Practices in prosecution

Notice:

For medical inventions, another limit to consider is that methods for diagnosing or treating diseases are not patentable;

An algorithm or model is not deemed as an abstract algorithm or model only when the algorithm or model is combined with specific industrial or life applications. Therefore, in practices, it is required to explain the physical meaning of each equation and parameters, as well as how to use the algorithm, model, and equation to solve specific technical problems.

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Practices in litigation

Interpretation of a claim determined by only computer program modules:

Example: China Patent ZL200780022357.8

Claim 23. Apparatus for use in a method as claimed in any preceding claim and comprising pre-programmed computation means comprising inputs for receiving EEG signals from EEG electrodes, and means for dividing said EEG signals into a sequence of time segments, for each time segment determining whether a pattern of EEG signals is present which is indicative of hypoglycaemia and, where a pattern of EEG signals indicative of hypoglycaemia is determined to be present in a time segment, recording this as an event, integrating the number of events recorded during a selected number of preceding time segments which together constitute a selected time period, determining that the EEG signals are indicative that hypoglycaemia is present when the said integrated number of events exceeds a preset threshold number, and providing an output indicating that said threshold number has been exceeded.

This claim was rejected by SIPO. The rejection was confirmed by the appeal board by:
The claim is determined by software blocks in one-to-one correspondence to the method claim. The scope of this apparatus claim is same to that of the corresponding method claims. While the method claims fall into the subject matters excluded by Article 25 of the Patent Law, this apparatus is also not patentable.

Practices in litigation

Interpretation of a claim determined by only computer program modules:

Example: China Patent ZL200780022357.8

Beijing IP Court reversed the decision of the PRB:

Homology, i.e., one-to-one correspondence between a method claim and an apparatus claim for software related inventions is required by *Patent Examination Guidelines* while their scopes are apparently different, otherwise there is no reason to draft the apparatus claims. Furthermore, article 25 of the patent law does not concern the homology of an apparatus claim and the corresponding method claim. There is no reason to exclude such apparatus claims from patentable subject matters.

Practices in litigation

Infringement proving and determination:

Example: WatchData vs. Hengbao, Beijing IP court, Case 41, 2015

Patent disputed in the case: ZL200510105502.1

Although some steps of the patented method (physical authentication method) are conducted at the end users side, such uses can only follow preset steps and can not participate or change the backstage program. Therefore, in facts, the producer of the device is the implementer of the solution.

If a product on the market does not comprise the software, and the software shall be downloaded and installed from the web by the end user, the producer still bears the liability of infringement.

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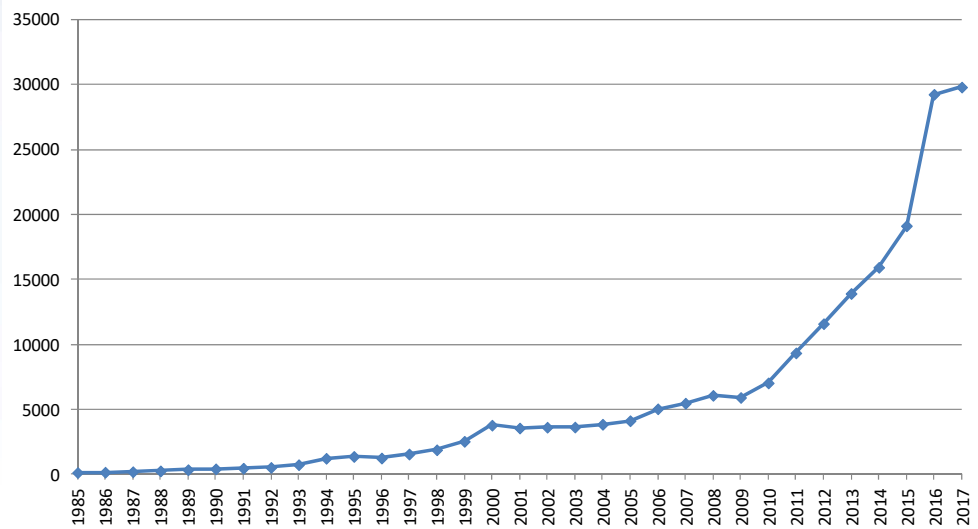
The overall situation of AI related patent protection

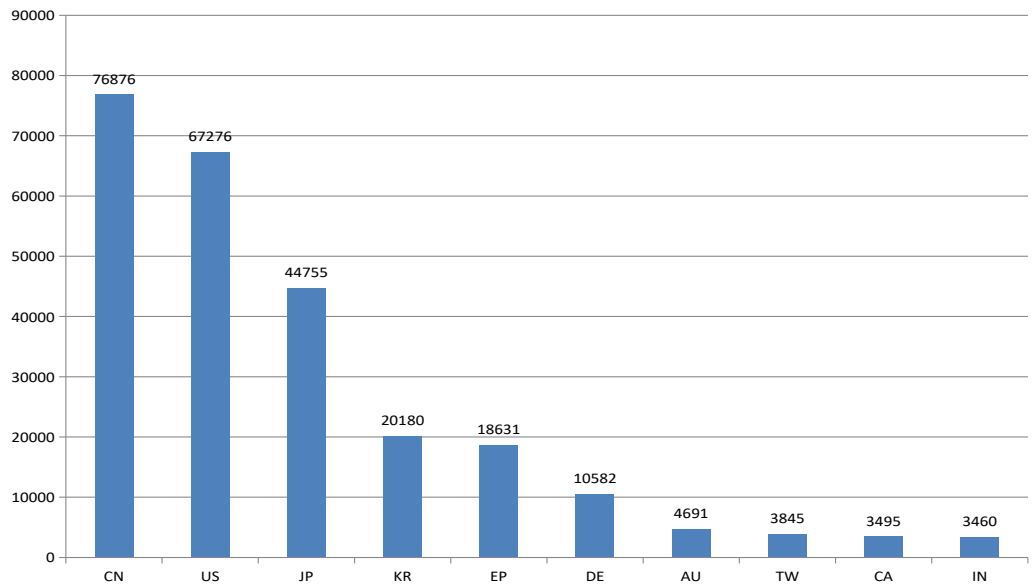
Global filing of AI related patent applications

- The quick growth started in 2009, now still growing.
- It is also found in study that patent filing related to basic technologies is slowing down, while the growth of patent filing related to AI application in industries is still increasing.



The overall situation of AI related patent protection

Top 10 receiving offices

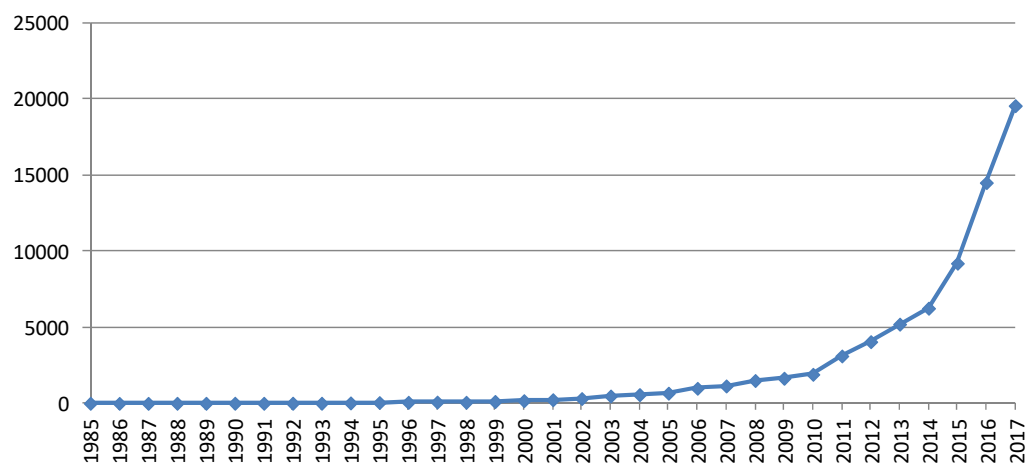


- China, USA, Japan, Korea, Europe as total, Germany, Australia, Taiwan, Canada, and India are the major jurisdictions with high density of AI related technologies;
- China is leading in filing numbers, especially in recent years.

The overall situation of AI related patent protection

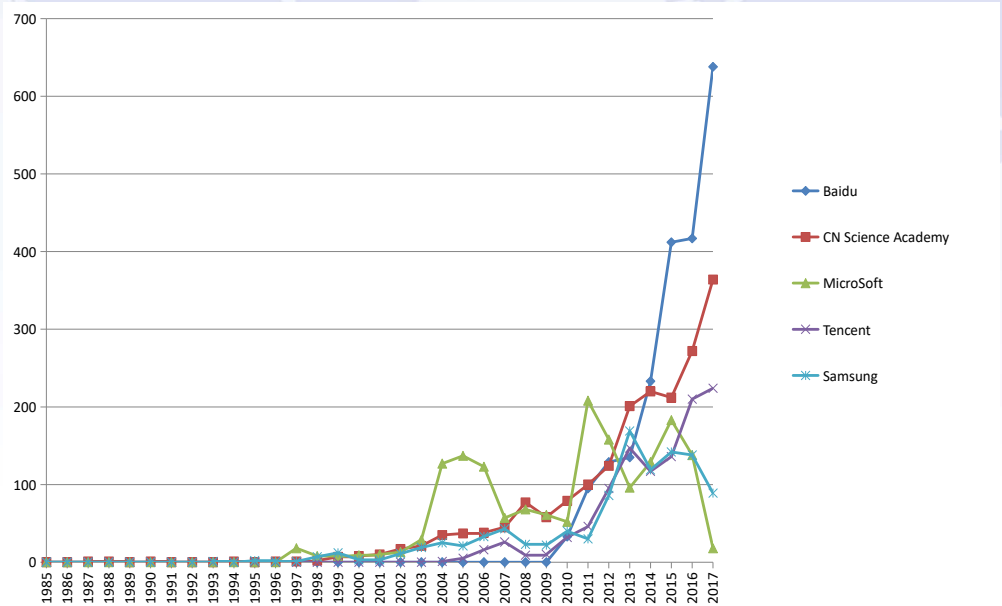
Filings at SIPO

- The Interests of AI related technologies to China started growing significantly in around 2009.
- The growth of filing is still accelating. The major reason is more and more local companies has joined the AI related industries.



The overall situation of AI related patent protection

Top 5 filing entities' filing trend at SIPO

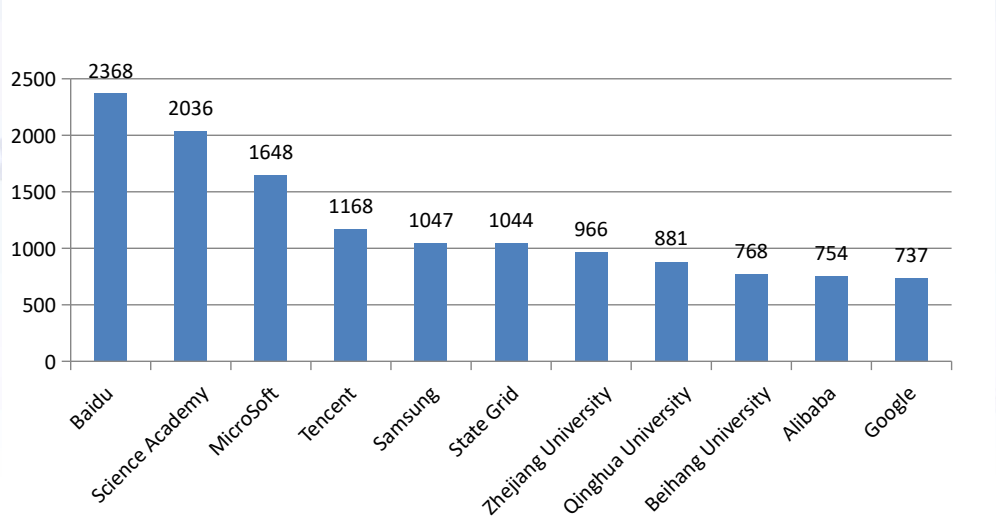


- Most filings at SIPO are from local companies and entities.
- Baidu is far leading the others. One reason is that in 2017, the government issued the *Development Planning of New Generation AI*. Baidu was selected as one of the important entities to support.

The overall situation of AI related patent protection

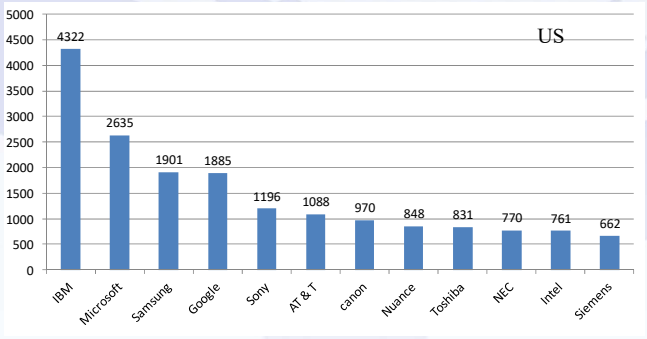
Top 10 filing entities at SIPO

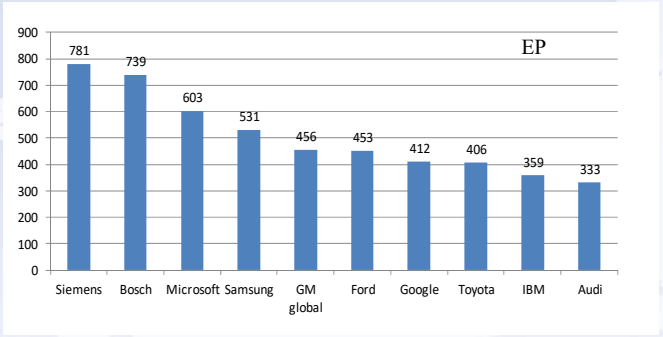
- Most filings are from local Chinese entities.
- Universities and research institutes are active in patent filing.

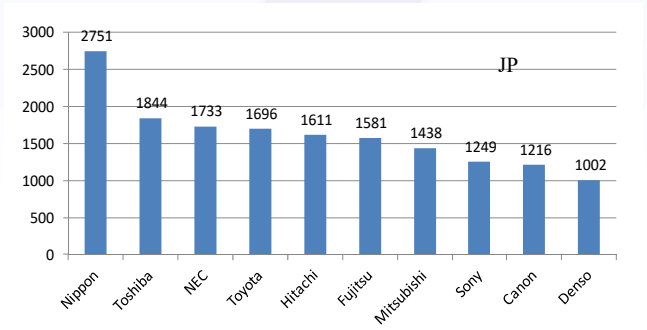


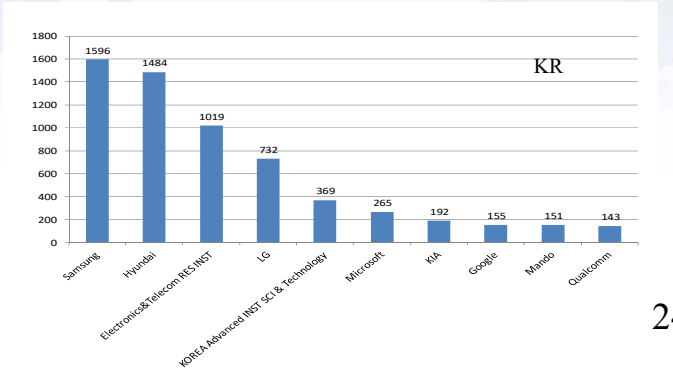
The overall situation of AI related patent protection

Majoy filings entities at US, EP, JP, and KR offices





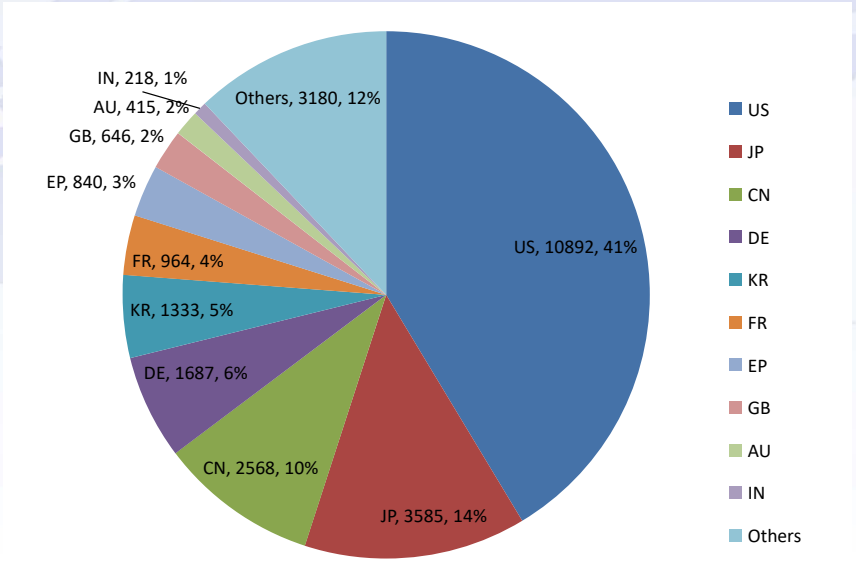




The overall situation of AI related patent protection

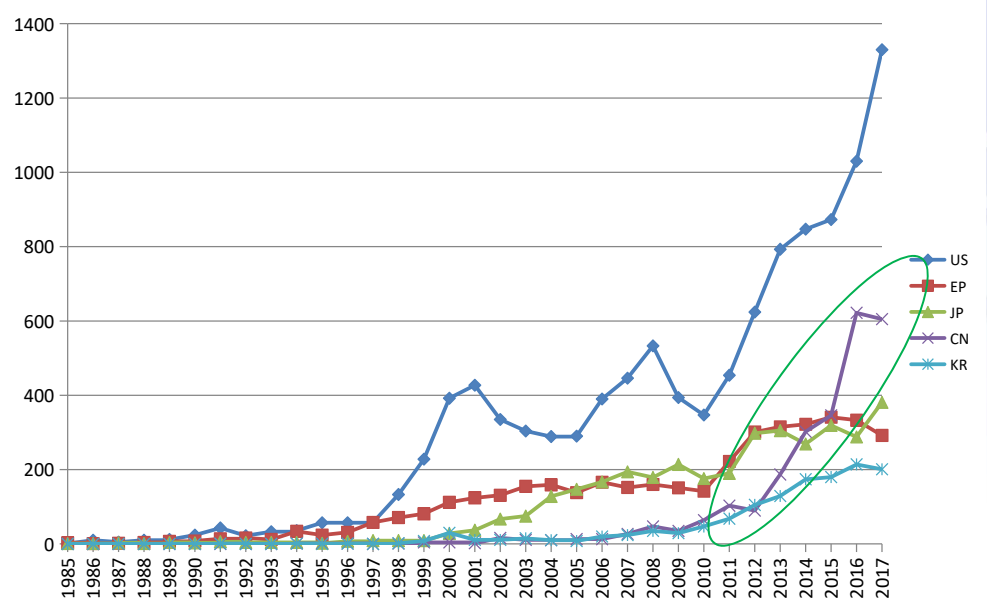
PCT filings

- American companies are most active in international protection.
- Universities and research institutes are active in patent filing.



The overall situation of AI related patent protection

PCT filing trend



- PCT filings from China is growing with accelated speed.
- The interest of Chinese companies to output technologies and to output business is increasing.

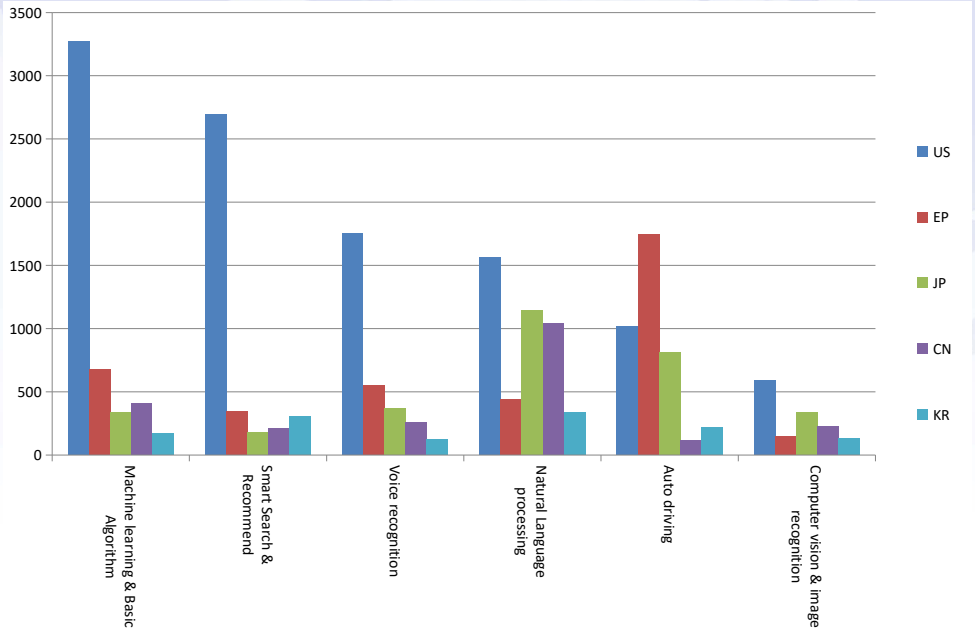
Patent protection in key technical fields

Major technical fields of PCT filings

Technical Fields	PCT Filings
Machine Learning & Basic algorithm	5557
Smart search and recommend	4118
voice recognition	3447
Natural language processing	5366
Auto Driving	4461
Computer vision and image recognition	1664

Patent protection in key technical fields

PCT original countries for major technical fields



- American companies are active in international protection in all technical fields.
- Japan is vstrong in natural language processing and auto driving.
- Europe is strong also strong in all technical fields following USA and leading the world in auto driving.

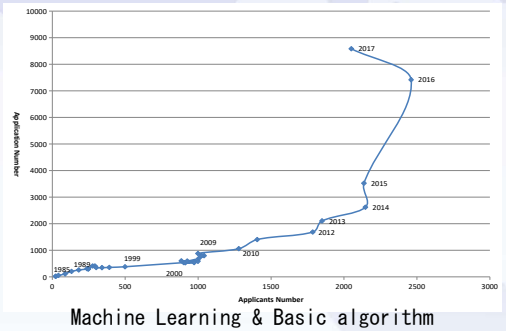
Patent protection in key technical fields

Global and China filings of major technical fields

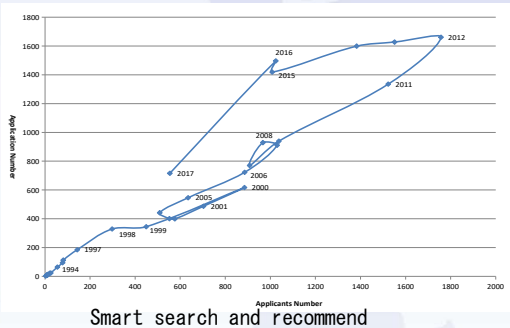
Technical Field	Global Patent Application	China Patent Application
Machine Learning & Basic algorithm	40992	29744
Smart search and recommend	18390	12878
voice recognition	26791	16273
Natural language processing	54211	20592
Auto Driving	22537	6885
Computer vision and image recognition	43397	19856

Patent protection in key technical fields

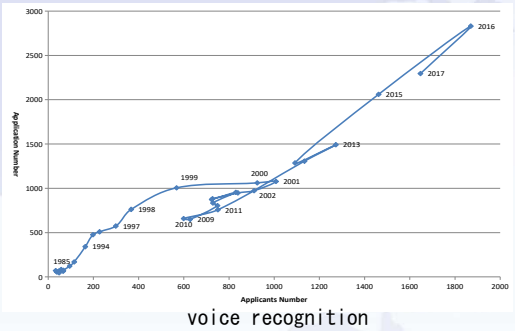
Lifecycle of major technical fields



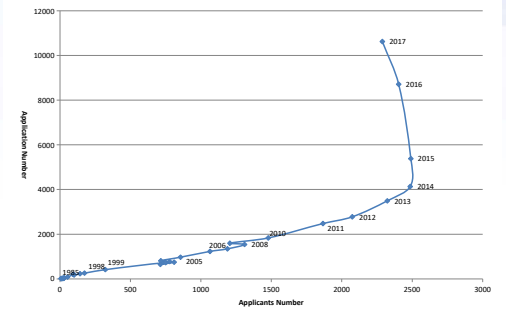
Machine Learning & Basic algorithm



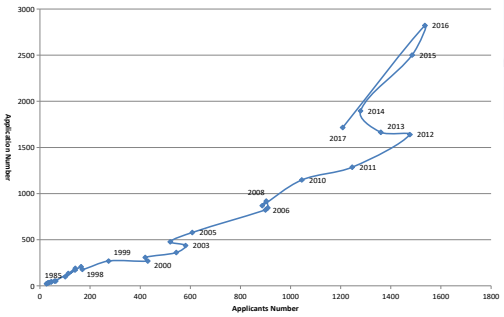
Smart search and recommend



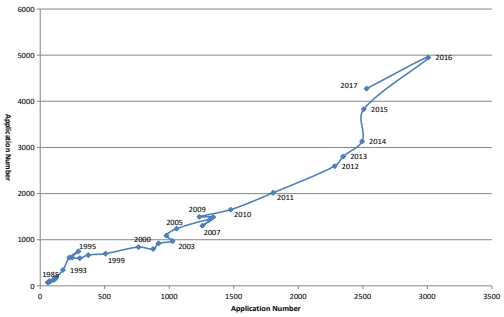
voice recognition



Natural language processing



Auto
Driving



Computer vision and image recognition

Patent protection in key technical fields

Lifecycle of major technical fields:

Machine Learning & Basic algorithm: Quick growth started in around 2009 when both number ofcants and number of applications significantly increased. From 2016, the number of applicants droped around 20%, indicating that this technology is entering the maturation stage.

Smart search & Recommend: The peak time for both number of applications and number of applicants was 2012. This fields is experiencing a big tech-neck now.

Voice Recognition: The most recent growing period started in around 2010, now still continues.

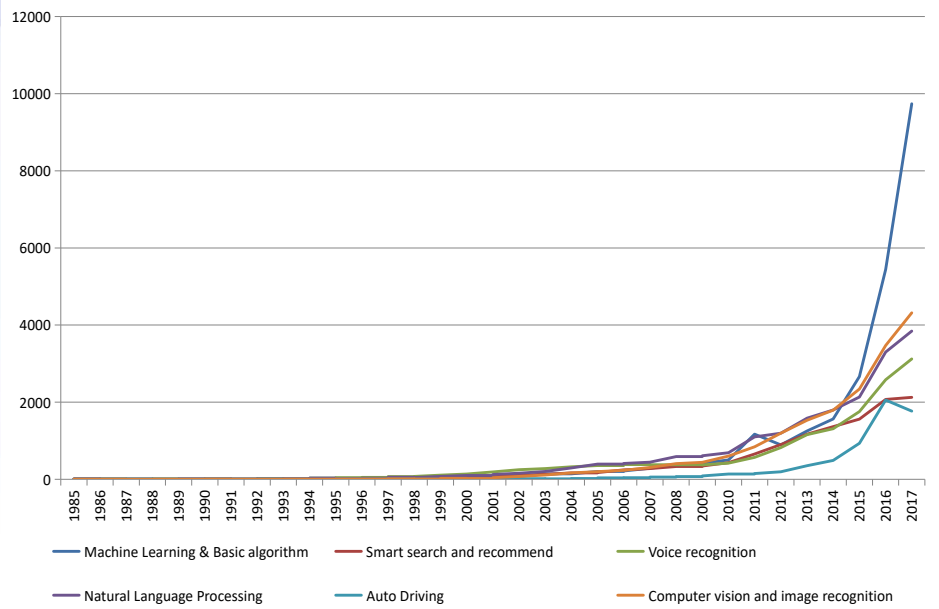
Natural language processing: In maturation stage now. The number of applicants droped a bit, but number of applications is growing steadily.

Auto driving: In a new growing period. Both the number of applicants and the number of applications are growing quickly. The reason of drop in 2017 might be that most applications were not yet published.

Computer vision and image recognition: From 2009 to 2016, the number of applicants increased 2.3 times, while the number of applicants increased 1.5 times, which indicates the field is in the quick growing stage.

Patent protection in key technical fields

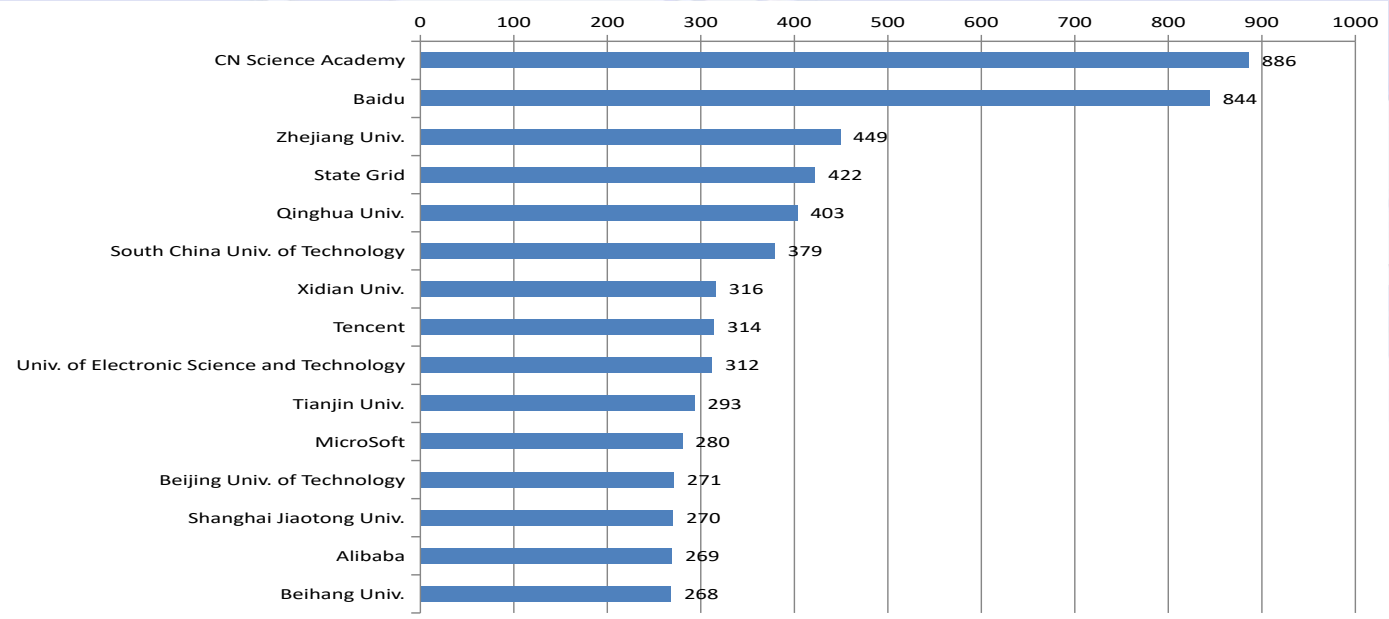
Filing trend of major technical fields in China



- From around 2000, filings in all tech. fields have been growing steadily. After 2014, the growth significantly accelerated.
- Filing in machine learning & basic algorithm is outstanding. One reason might be that Science Academy participated and bears the most basic work;
- Auto driving is also growing faster than other fields.

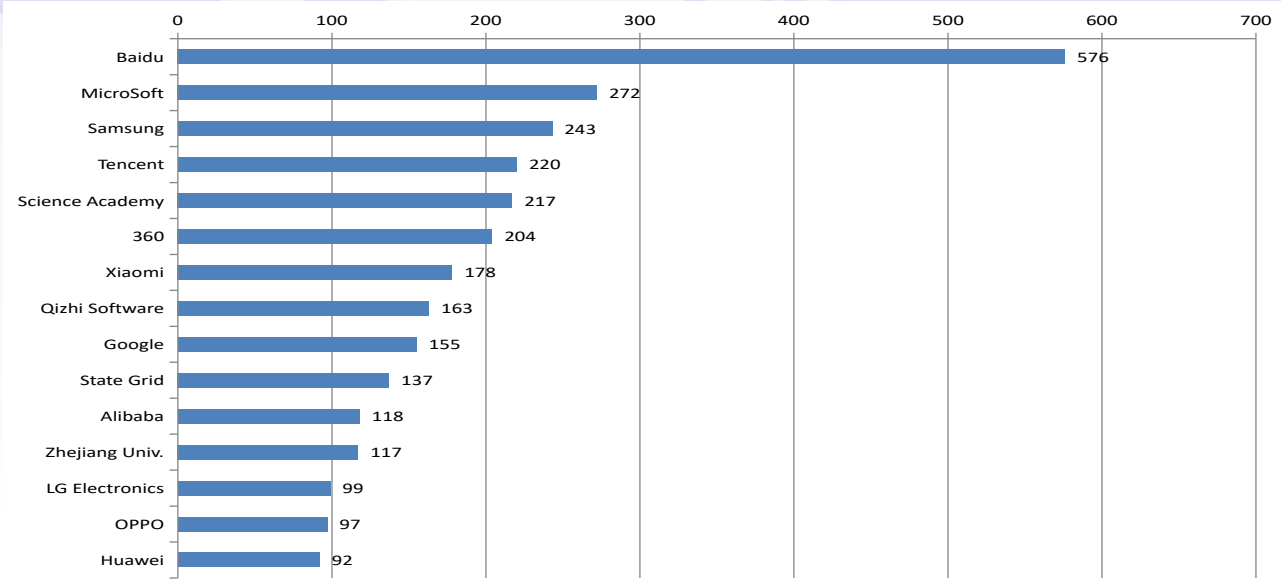
Most active applicants

Machine Learning & Basic algorithm



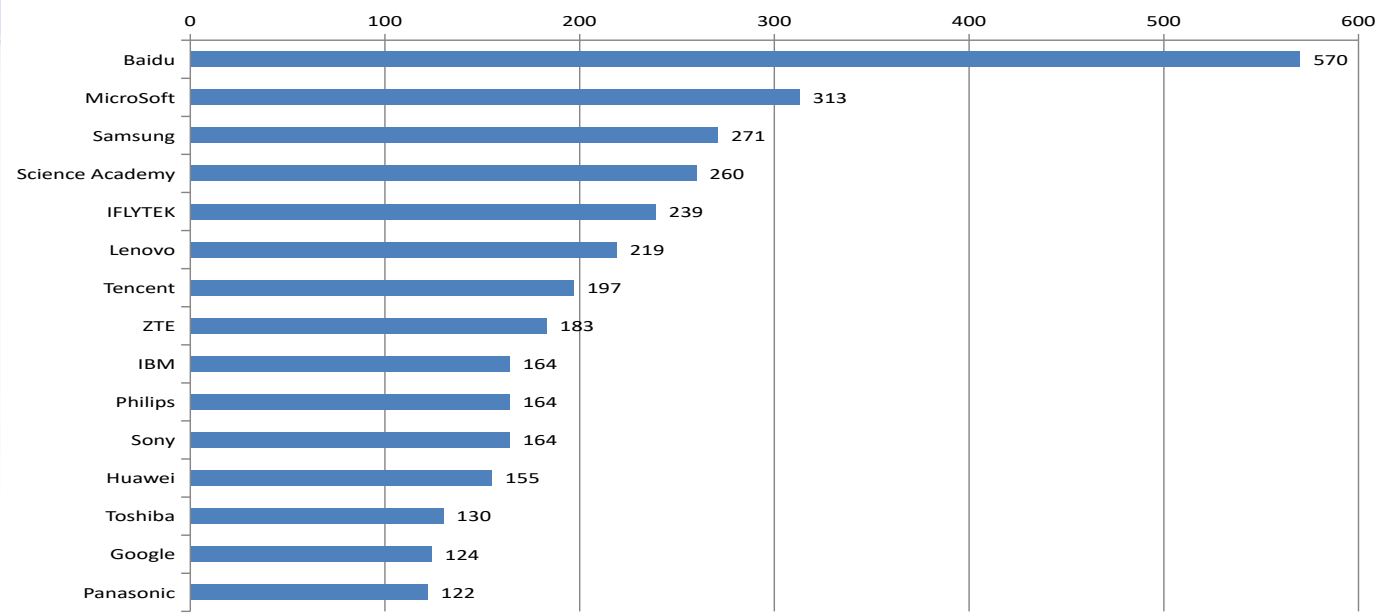
Most active applicants

Smart search and recommend



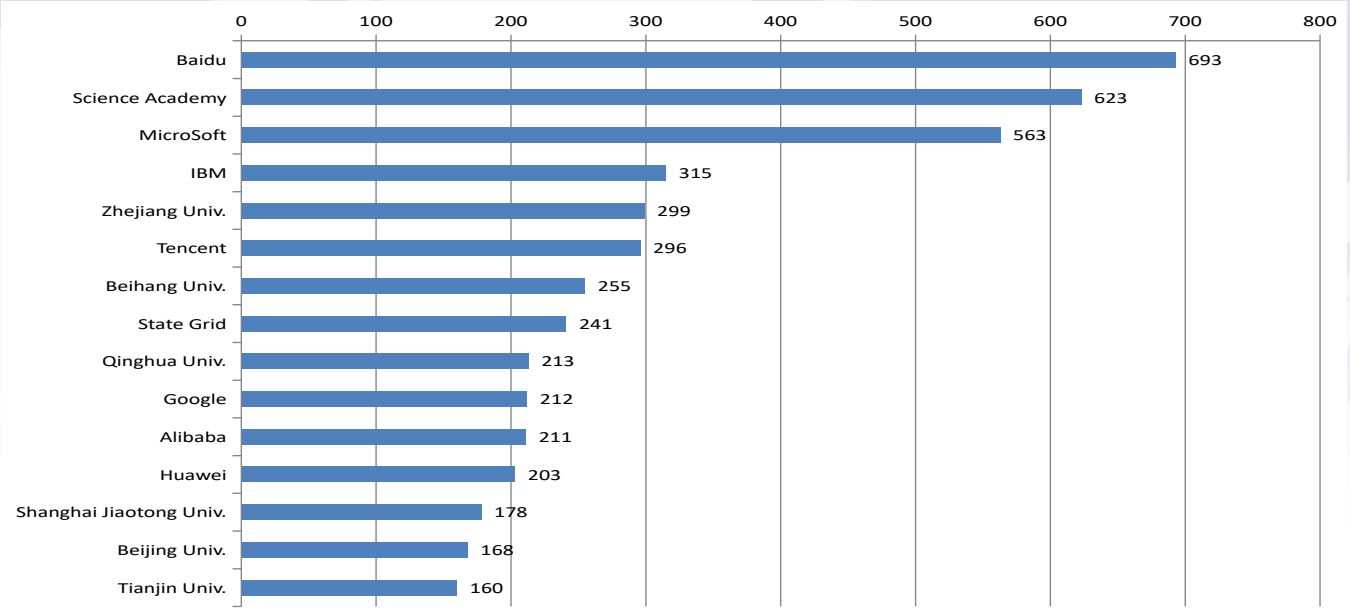
Most active applicants

Voice recognition



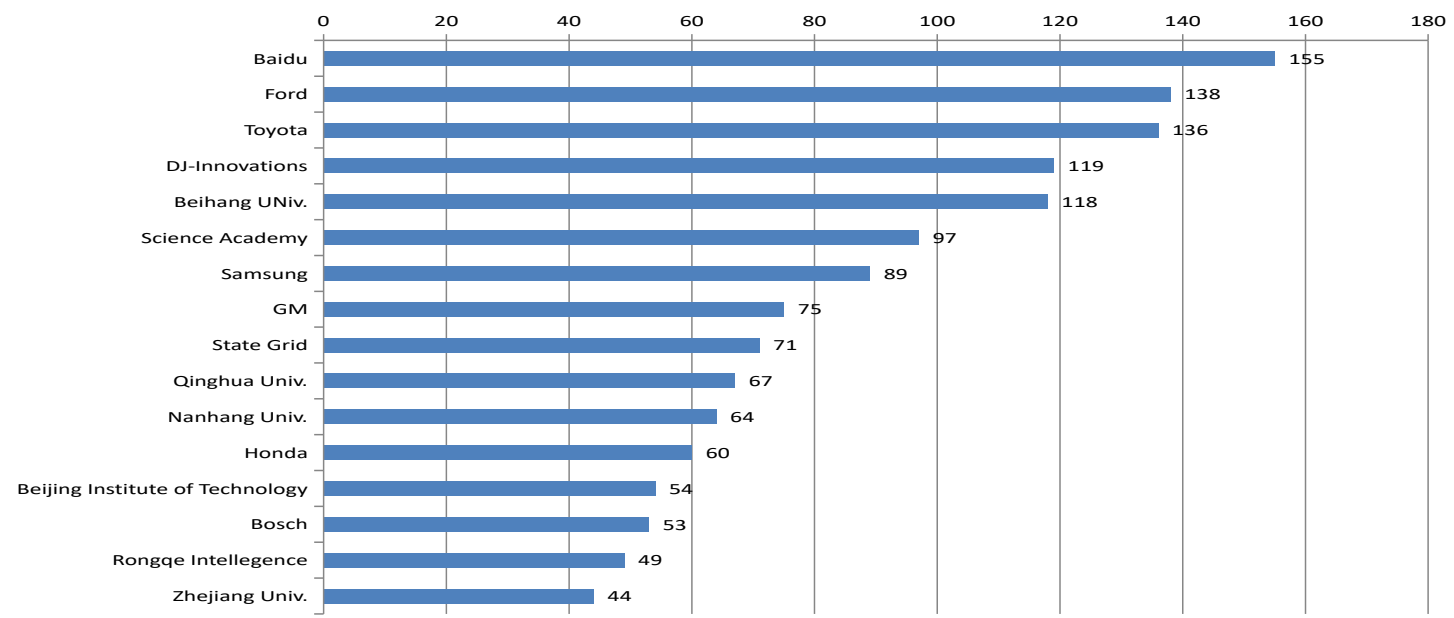
Most active applicants

Natural language processing



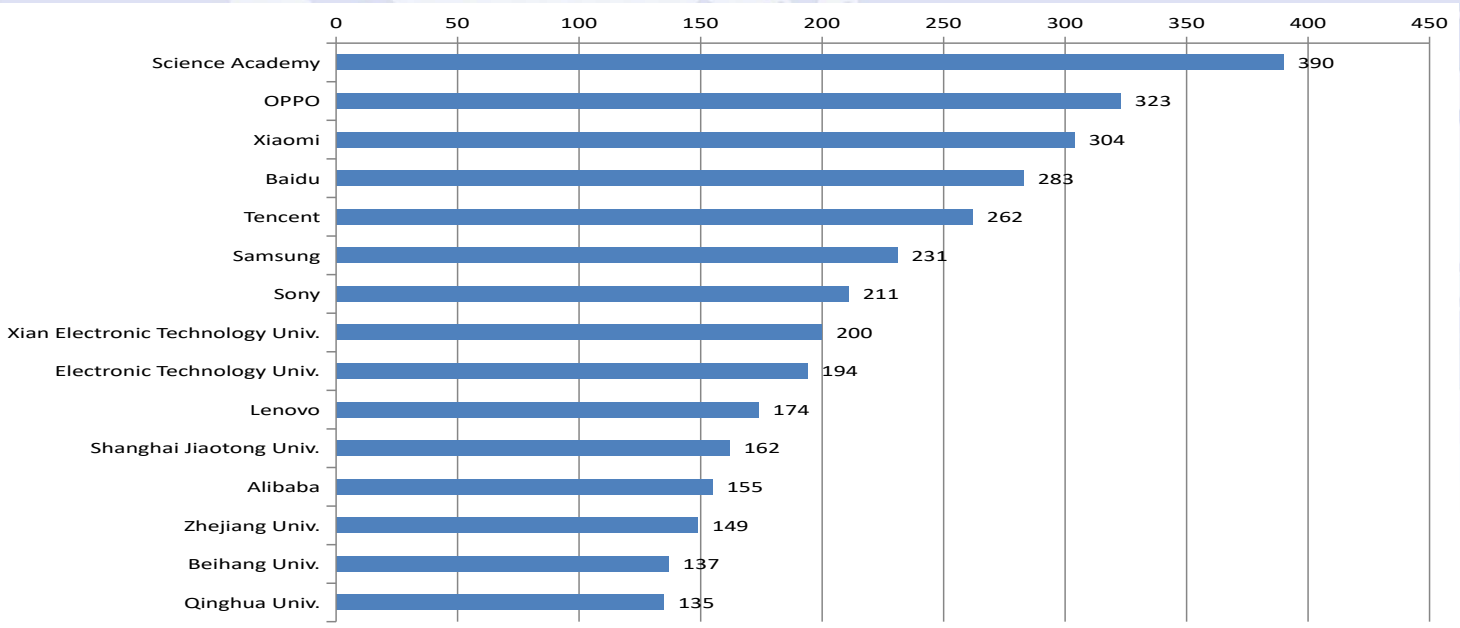
Most active applicants

Auto Driving



Most active applicants

Computer vision and image recognition



Most active applicants

Major applicants in different technical fields:

China Science Academy: Most active in basic tech fields like machine learning and basic algrithm, Computer vision and image recognition, and natural language processing etc. This is the national research institute. They often take the basic research work that is requires big investment and long time, but not immediately very profitable.

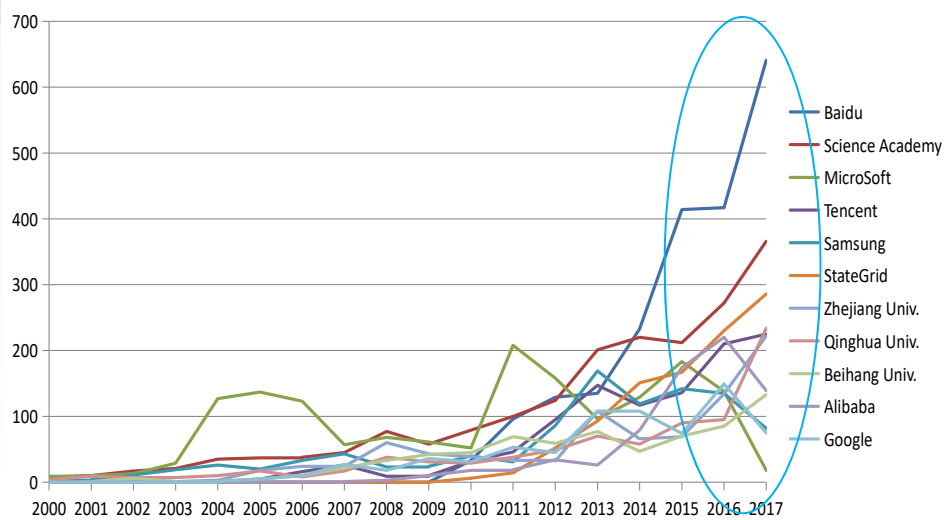
Baidu: In 2017, the government issued a policy paper *Development planning of new generation of Artificial Intellegence*, confirmed the strategic position of AI. Some companies are selected as major paticipants to implement this strategy. Baidu is one of them.

Universities: Universities do research by individual professors or project groups. Usually their research tends to be academic or theoretical, less linked to industrial application.

Foreign Applicants: Filings are closer to immediate application in industry and business.

Most active applicants

Trend of major applicants in China



- To get governmental subsidy quickly, Chinese applicants often request early publication and expedited examination. This exposes their research directions and give their competetors ortunity to take a short cut.

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Summary & Advices

Machine Learning & Basic algorithm and Natural language processing have been the hotest technical fields. Natural language processing is entering the maturation stage. More attention should be focused on it's application in industry.

Computer vision and image recognition is in the fast growing stage and is expected to be the important technical developing field.

Take advantage of the national strategy and policy to build up your robust portfolio.

Pay attention to those early published applications to identify the front edge of the technology and avoid repeated research.

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Thank you!