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T [021]2030 5888    F [021]2030 5999

A 58 Floor, New Bund Center, NO.555 West Haiyang Road/588 Dongyu Road, Pudong New Area, Shanghai
上海市浦东新区海阳西路 555 号/东育路 588 号前滩中心第 58 层，邮编：200126

**Rosefinch Research | 2024 Series # 5**

## The Flying Wheel of AI



This round of technological innovation led by AI is a breakthrough from "0 to 1." First, there was an innovation in theoretical paradigms from the original rule-based expert systems to the current self-deep learning. Traditional AI was more based on rule-based expert systems, that is, human experts in relevant fields would write rules and knowledge graphs into software systems, using the written logical rules to teach computers how to think and execute. This time, the artificial intelligence is similar to the human brain's deep learning that lets the system use the input data to train itself to identify the association between data and expected results.

Another innovation comes from the interaction between humans and machines: ChatGPT answers questions not by searching for answers, but by automatic completing words based on the appearance probability, so there is more creativity. Secondly, humans do not need to learn instruction codes, but can directly communicate with machines through natural language which greatly reduces the threshold for use. Thirdly, after adding videos and voices to the model, AI has greatly increased its ability to actively perceive the real world beyond just passive text information.

Compared with Internet's platform effect, AI has two more prominent features: one is the scale effect and the other is the emerging capability.

The scale effect refers to the fact that the performance of AI models will increase with the growth of model scale, including parameter quantity and data quantity. Emerging capacity refers to the fact that when the model is large enough and the data is large enough, the model itself will emerge with new capabilities.

It's like cramming for an exam by doing many practice questions – eventually, things start to gel and you gain new insights.

In summary, big models have allowed the market to see the potential for global productivity growth. Artificial intelligence is very likely to become a market much larger than PCs, mobiles, and the Internet. Artificial intelligence is the next general technology to stimulate economic production and even promote social organizational change.

**The scale effect and emerging capability of AI**
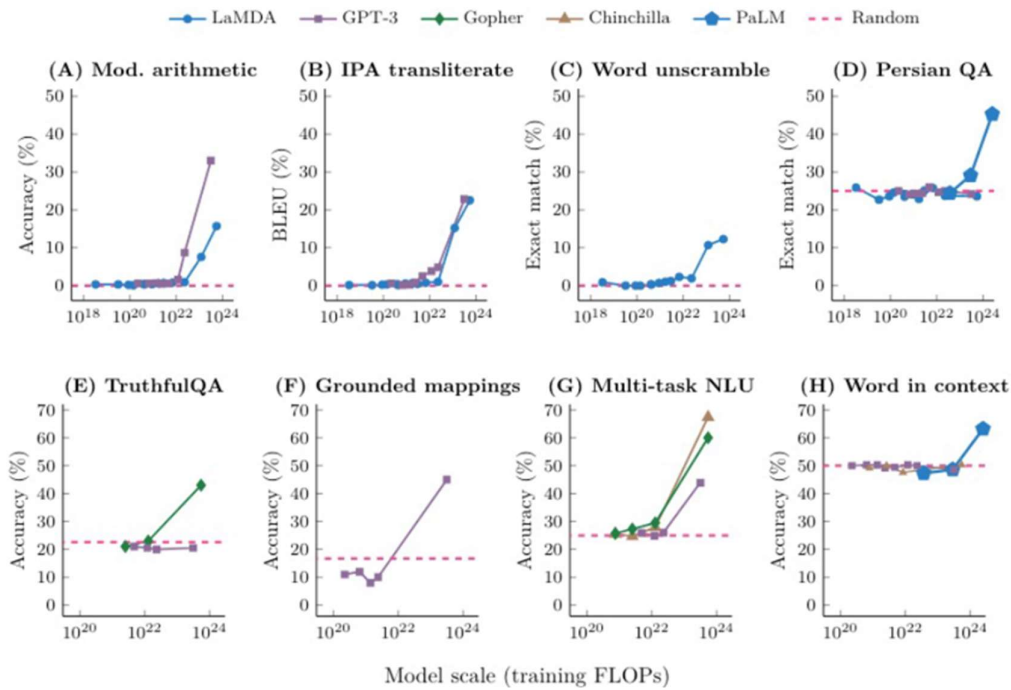


Data source: Stanford University, Rosefinch.

AI innovation further promotes innovation in the interaction between humans and machines in three aspects of perception, decision-making and execution.

Specifically in research, we divide the artificial intelligence industry chain into four links: algorithms, computing power, data, and applications. Models and applications will generate user usage data, which will be accumulated and become inputs for next iteration of model. This forms a virtuous cycle of a "application-data-model" flywheel effect. In this process, computing power support is indispensable at the bottom.
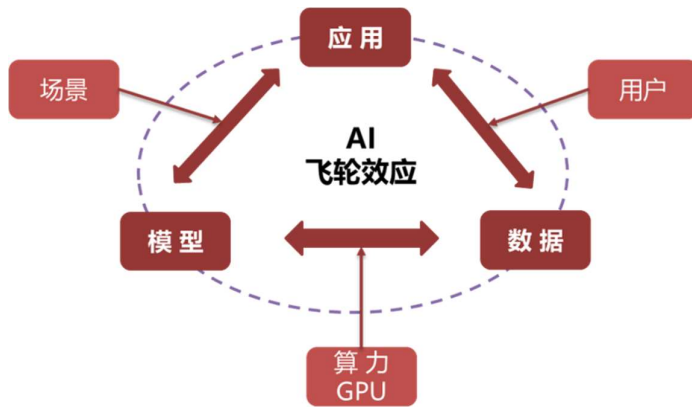
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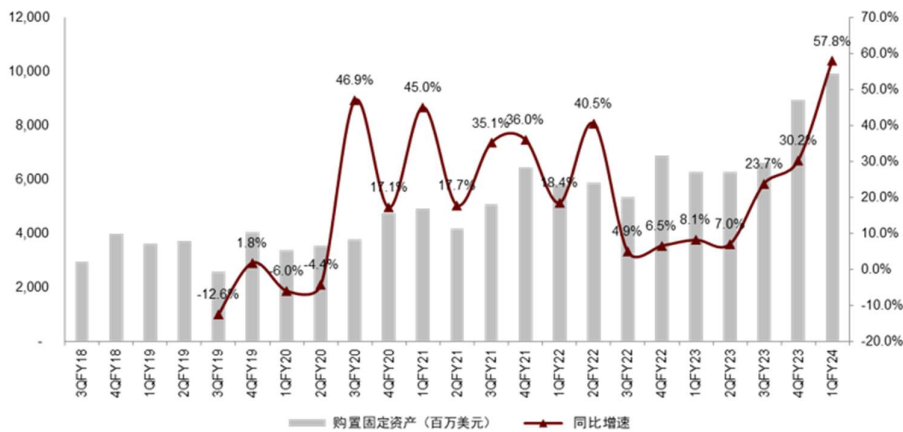
Chart source: Rosefinch.

AI is a capital-intensive, talent-intensive, and data-intensive industry. How to kick-start the "application-data-model" flywheel effect is one of the key factors for the success of AI enterprises.

## 1. Increase demand in infrastructural computing power

From the medium-term perspective, the focus is currently on three links of the industrial chain. The first is computing power, computing power is the basic infrastructure of AI, and demand benefits from the increase in capital expenditure of cloud service providers.

Looking at overseas cloud service providers, Microsoft is a leader in this round of AI technology wave. Microsoft's capital spending has maintained high growth for three consecutive quarters, and the quarterly growth rate has also been improving quarterly. In Q3 23, its capital expenditure grew nearly 60% year-on-year. Google's capital expenditure has also shown signs of inflection, with year-on-year growth of 11% in the third quarter of 23.

**Microsoft's capital expenditures and year-on-year growth rate**

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Data source: Microsoft financial reports, Rosefinch.

At the same time, looking at domestic cloud service providers' capital expenditures, it recovered to near 20% growth in the second quarter. The direction of capital expenditure of domestic internet cloud service providers is mainly the construction of servers and data centers to boost reserves for AI computing power.

**Domestic cloud spending recovers**



中国云基础设施服务支出总规模（百万美元）　　中国云基础设施服务支出同比增速

Data source: Company financial reports, Rosefinch.

Therefore, on the demand side, growth is likely to be certain, while continuing to pay attention to the performance improvement and localization of domestic GPUs as overseas GPU exports upgrade restrictions.

## 2. Industrial value creation shifting towards applications

The second link in the industrial chain is the application link. With the open sourcing of algorithms and the improvement of computing infrastructure foundations, the value of the industrial chain will gradually shift from computing power and algorithms to the application link.

We focus on the leaders in software and various segment leaders, because these companies have clear competitive advantage and strong client stickiness. Traditional businesses provide a good value foundation, some companies will increase subscription rate and ARPU value through adding AI functions. Microsoft Office is quite typical, with traditional annual subscription fees of about US$30, now nearly doubled in pricing after adding AI functions.

In the future, there will be two aspects that need to be further explored: One is the "new native AI applications" where the overseas ecology is relatively more mature, while domestic products are still at the iteration level.

Looking at the number of AI financing projects from overseas, PE/VC prefer sectors like AI software and robotics. From the perspective of overseas industrial application ecology, text generation, code generation, image generation, etc. are relatively mature, with initial product forms and commercial models with fees. In video generation and 3D content production, there have also been many entrepreneurial attempts. In China, it is expected that relatively mature products will be launched in the near future.
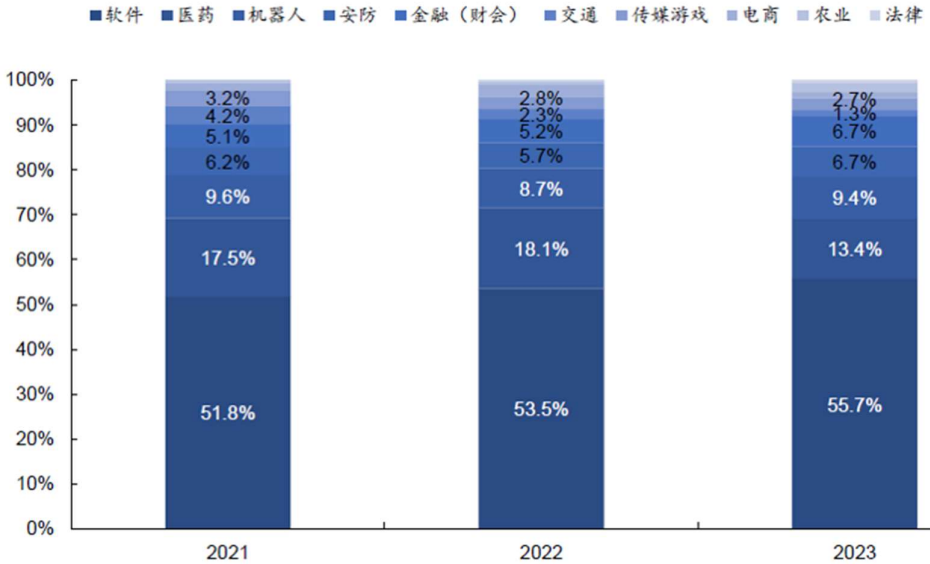


Data source: Crunchbase database, Rosefinch.

Another aspect worth exploring is the "New-Tech-New-Way" which focuses on the iteration of new hardware carriers such as intelligent vehicles and robots.

## 3. Industrial applications of X + AI

The third link in the industrial chain focuses on exploring the field of "industrial intelligence". This is because after experiencing informationization and Internetization, AI now enhances the competitiveness of these enterprises in their respective fragmented fields.

First, for the culture and tourism industry, the emergence of interactive dialogue can help consumers realize trip recommendations and one-click booking of travel products, which is a good tool for guiding traffic and improving unit price for tourism destinations.

Second, for IP content creation industries such as films, television and games, multi-modal AI algorithms such as text generation, image generation and video generation are conducive to solving bottlenecks in previously long and costly IP adaptation cycles, and improving the probability of IP blockbusters.

Third, for the industrial software industry, CAE simulation software can empower original innovation and forward R&D in manufacturing. For example, in the new product development of aircraft and automobiles,

Email ir@rosefinch.cn

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a large number of fluid and material experiments need to be done during the design of the shape. Now it can first be run on CAE simulation software, greatly shortening the development time of new products, and improving the success rate.

In summary, the artificial intelligence or industrial intelligence enterprises that we focus on have one characteristic: their traditional businesses are already very competitive and have certain growth potential. At the same time, in various fields of AI, these companies are also champions in fragmented fields, with the combined capabilities of scenarios, data, computing power and algorithms. With the gradual implementation of AI, there is the possibility of further improving fundamentals.

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