

Chapter II

Regional Comparison:
USA, UK, Canada, EU, Asia

Introduction

The present chapter delivers an overview of the global landscape of AI for Drug Discovery and performs a comparative analysis of the USA, EU, UK, Canada, Canada, Asia regions for the following categories:

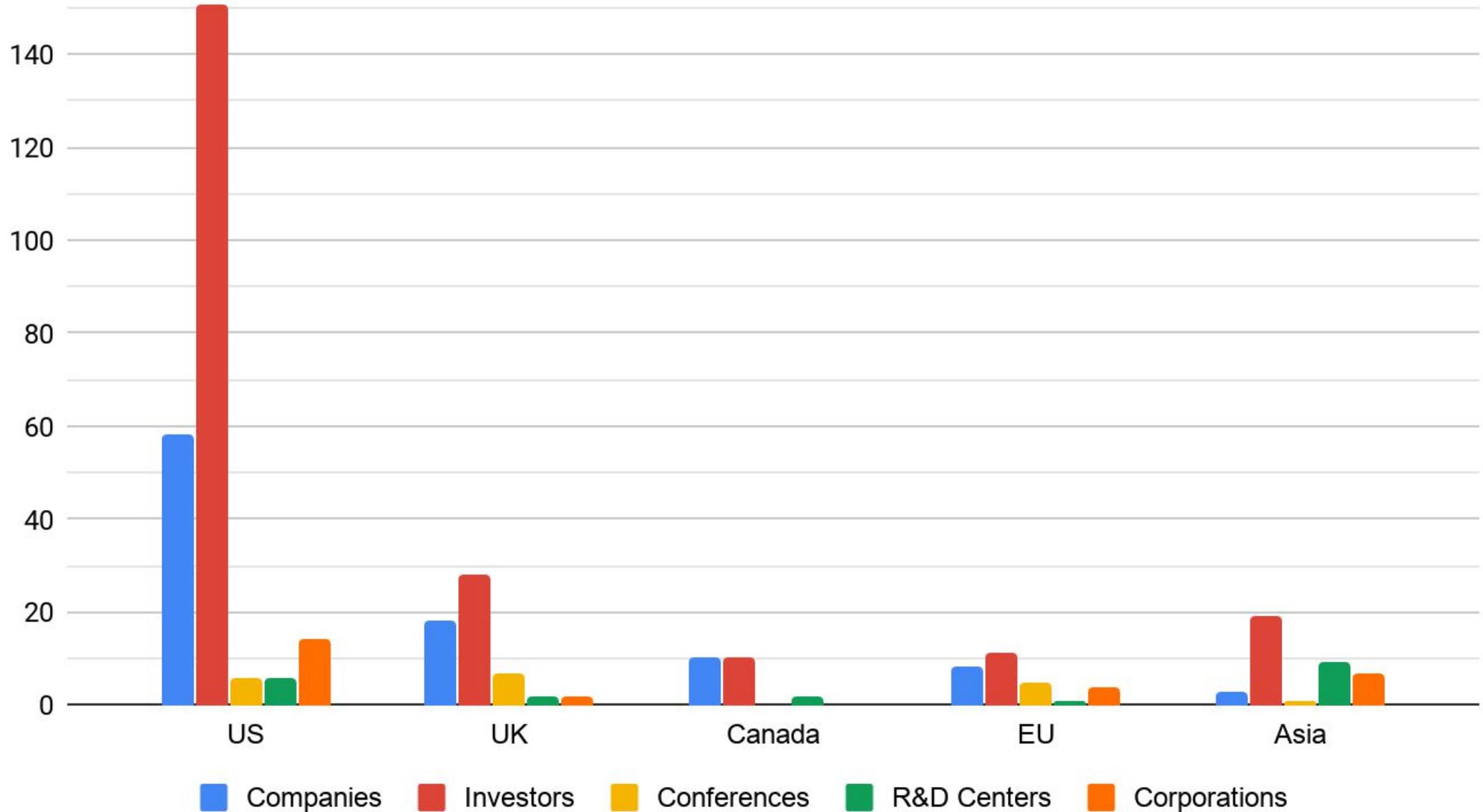
- AI Companies
- Investors
- R&D centers
- Conferences
- Corporations applying advanced AI for Healthcare and Drug Discovery

By comparing a number of key variables, we can gain a deeper understanding of the overall dynamic of development occurring in the AI for Drug Discovery industry in different regions.

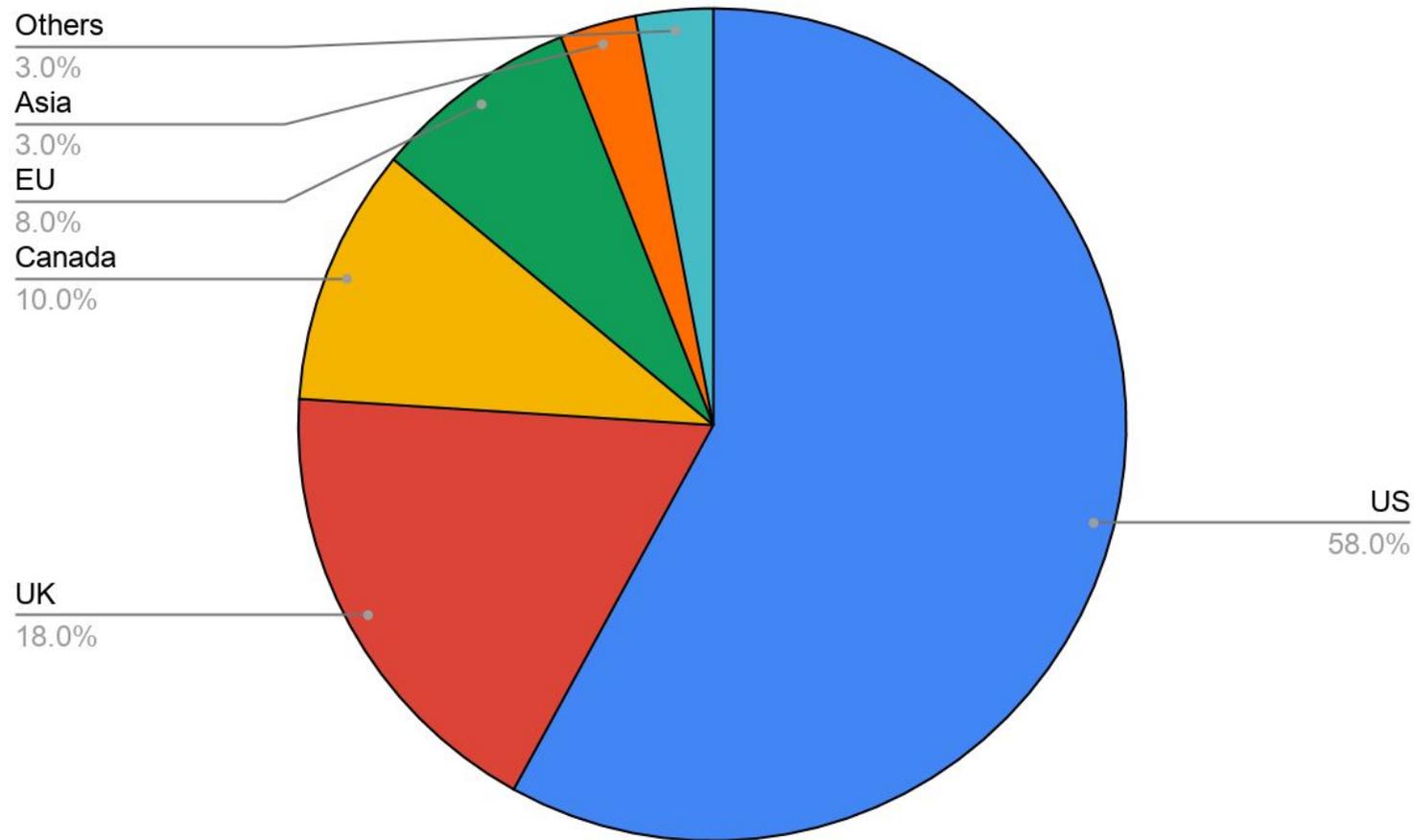
The following slides show a number of notable trends and insights, including the fact that the US is by far the global leader in terms of AI for Drug Discovery companies, and the leader in investments in this sphere by a truly staggering degree.

And while the UK has maintained its second-place leadership position after the US, it is notable that EU and Asia, but China especially, are increasing their dynamic of progress in this sphere as well. Additionally, Canada is also becoming increasingly active in the field.

Regional Comparison of AI for Drug Discovery Companies/Investors/R&D Centers

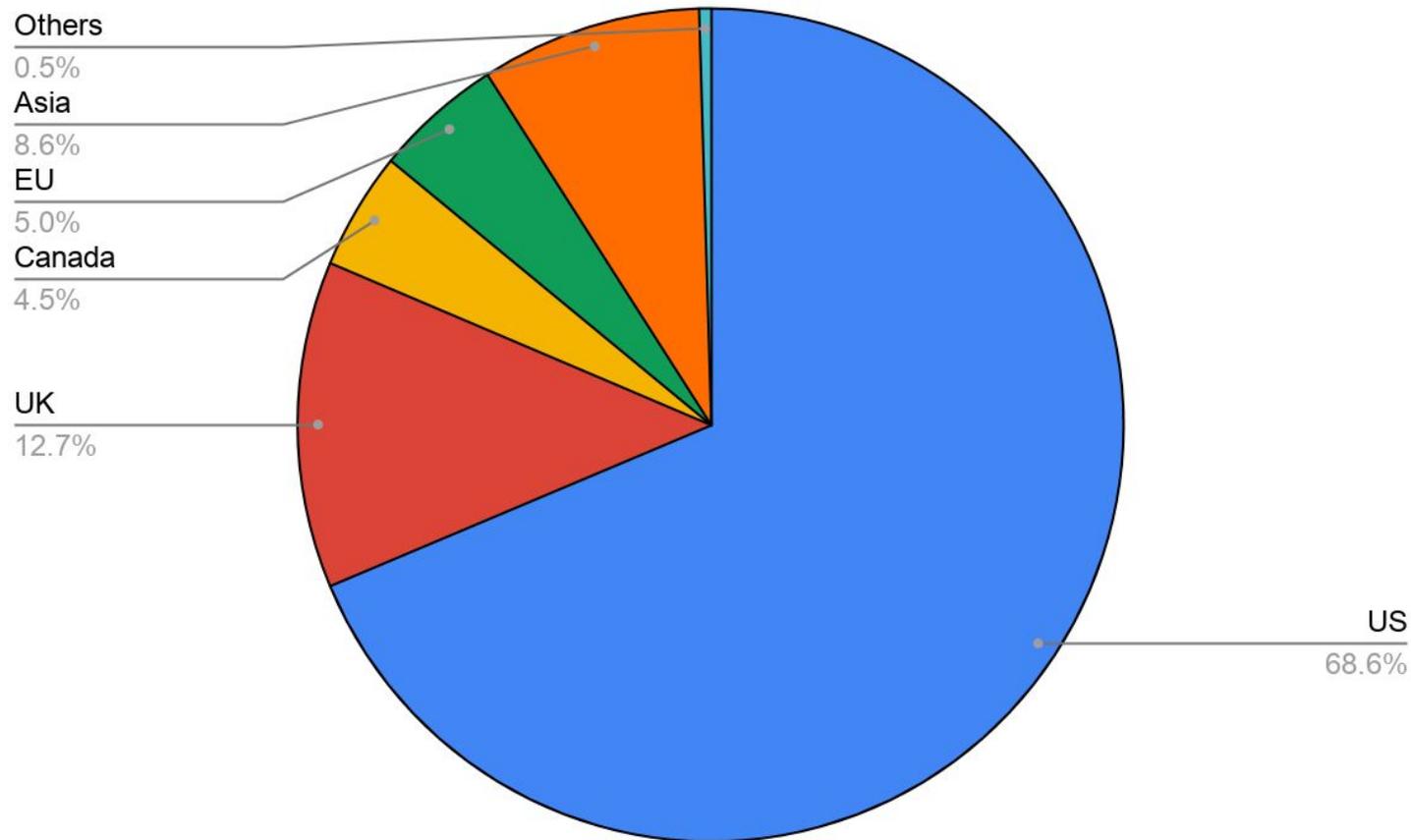


100 AI Companies: Regional Proportion



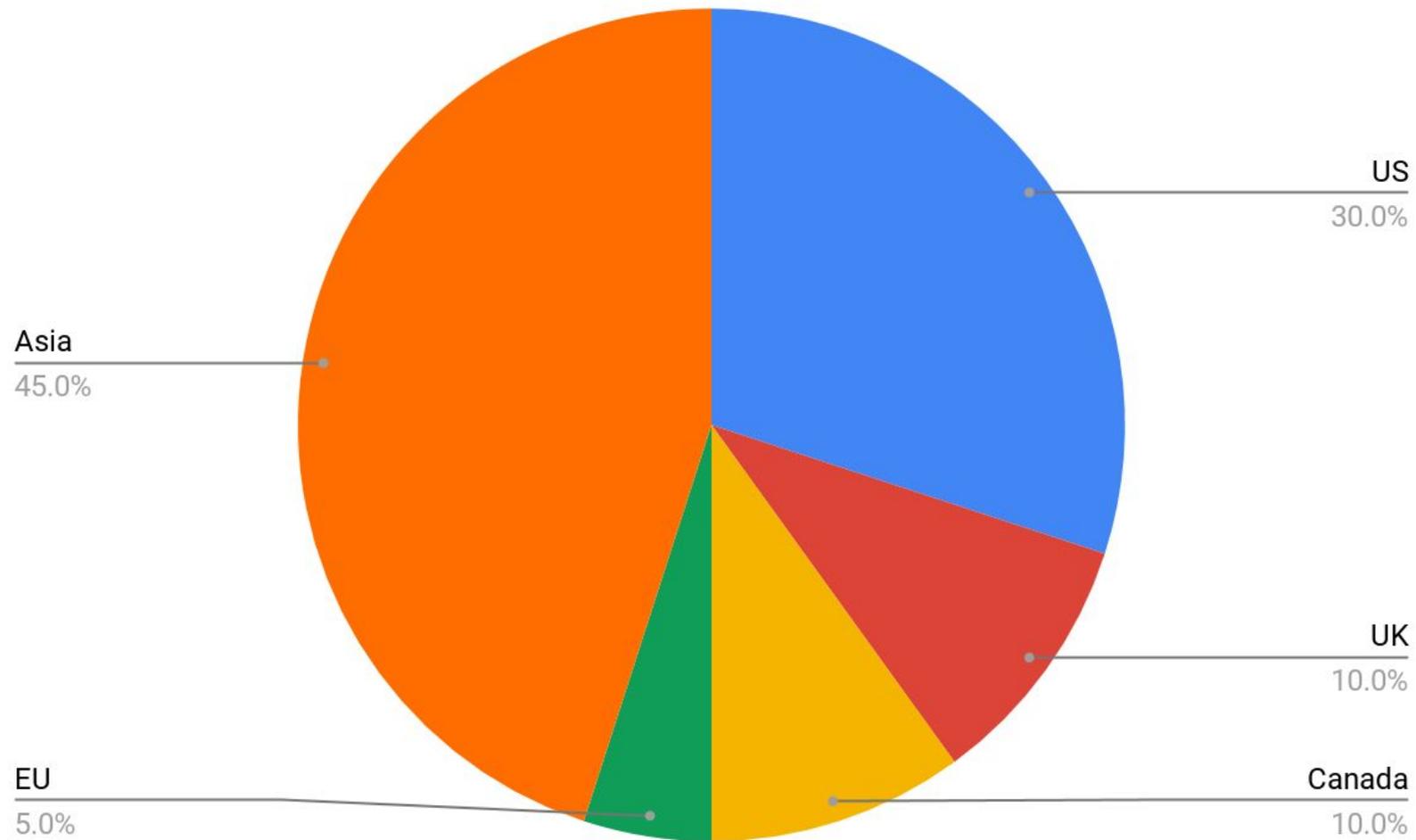
The US is still firmly in the lead in terms of its proportion of AI for Drug Discovery companies. Interestingly, Asia currently has the fifth-lowest proportion of AI for Drug Discovery companies. The Asia-Pacific region has, however, begin to aggressively increase their activity in the space in terms of investments into foreign companies (largely US-based companies), and we can expect to see an increase in the number of AI for Drug Discovery Companies located in the Asia-Pacific region generally, and in China particularly.

220 Investors: Regional Proportion



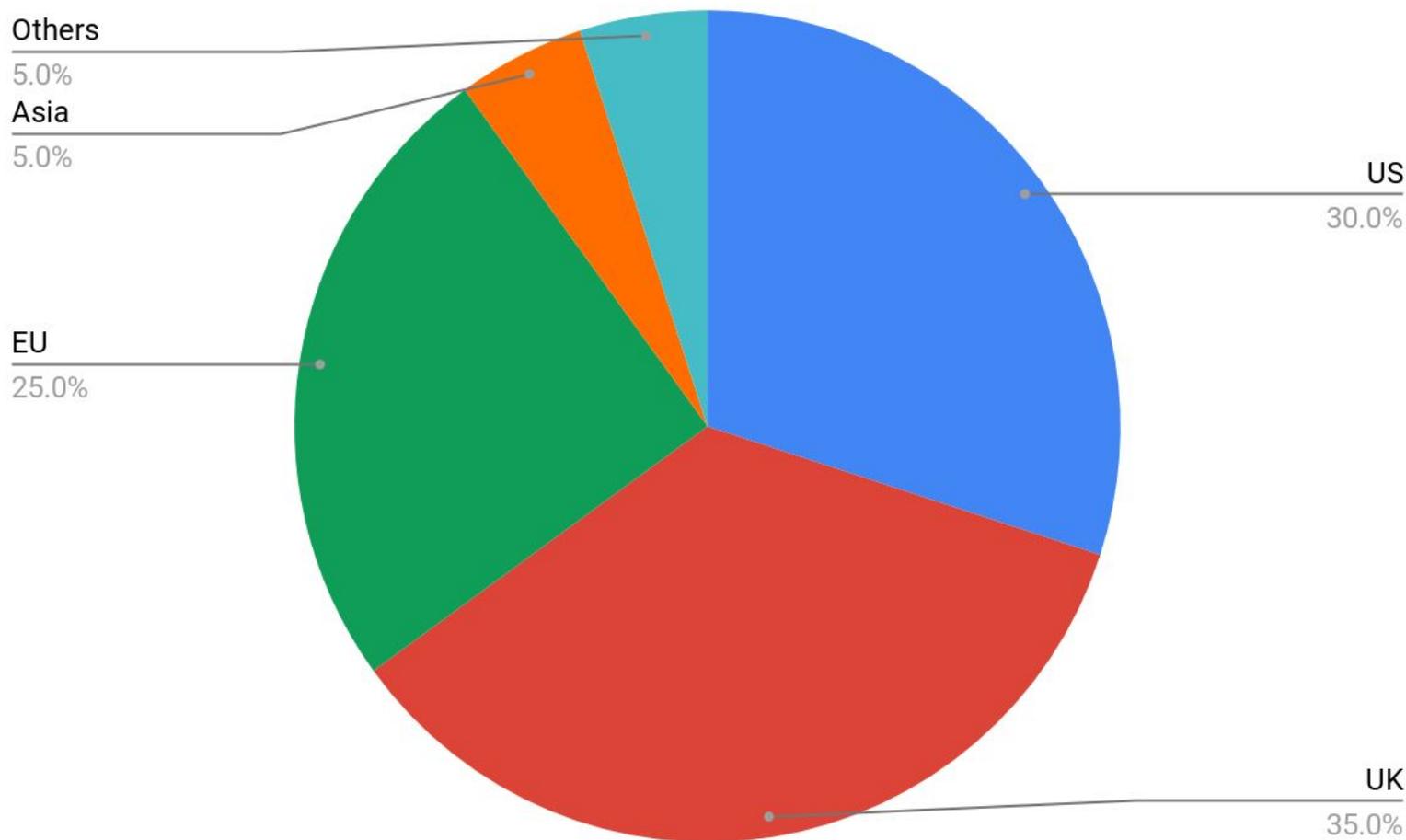
The US still leads the rest of the world in the proportion of AI for Drug Discovery Investors. This is sensible given that they also have the largest proportion of AI for Drug Discovery companies. However, it is interesting to note that, while the UK is home to the second-largest proportion of investors in this space, Asia has now overtaken the EU is rapidly advancing to acquire the #2 position. This past year has seen a substantial increase in the number of Asian investors, as well as Asian Tech & IT corporations, entering the AI for drug discovery industry.

20 Leading R&D Centers: Regional Proportion



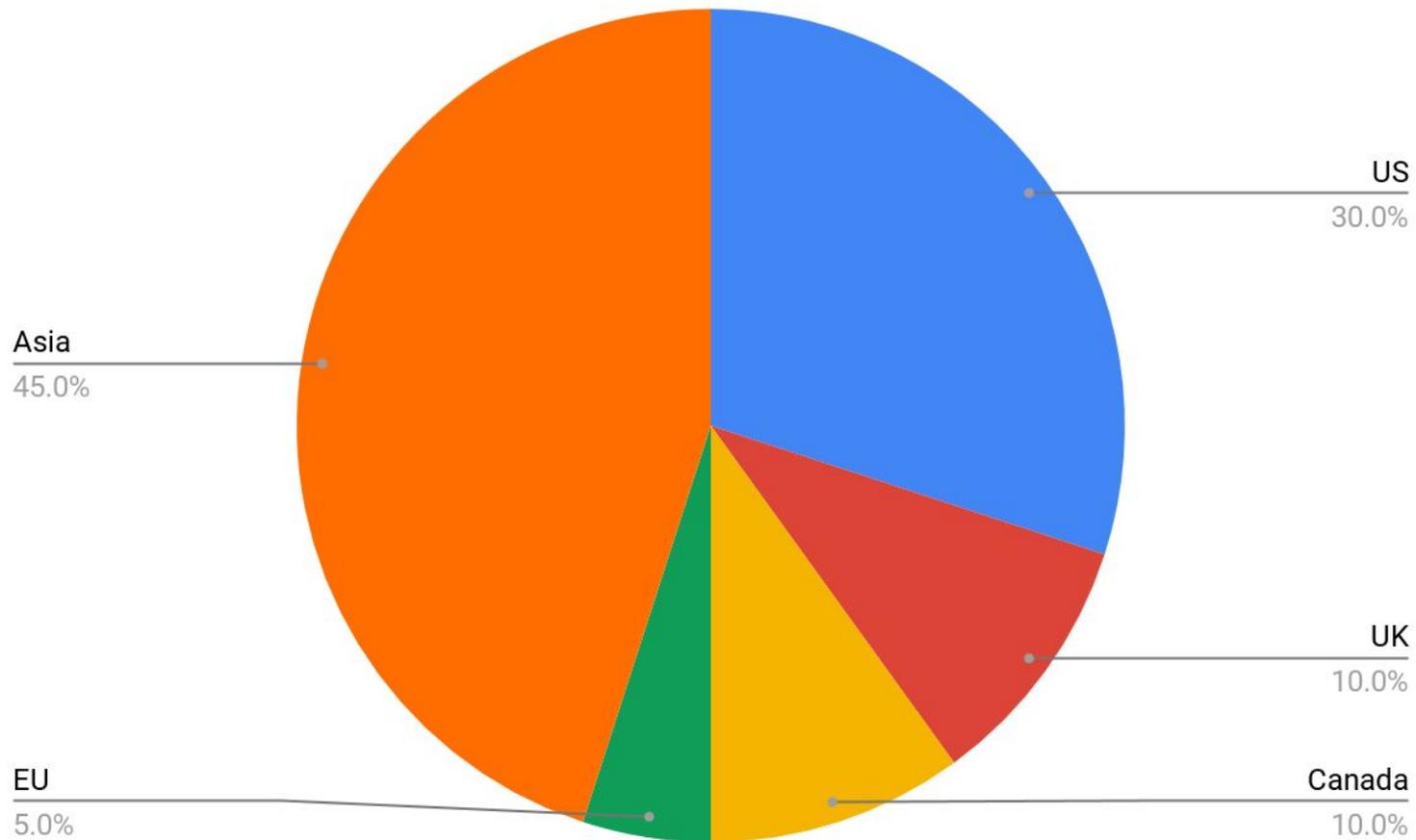
The figure above shows that while the US leads the world in terms of the number of R&D Centers focused on AI for Drug Discovery, China is rapidly catching up. This makes sense within the context of the recent increase in the number of Chinese investors entering the AI for Drug Discovery space, and the Chinese government's recent commitment to lead the world in AI by the year 2030.

Top-20 Conferences on AI for R&D and Drug Discovery 2018-2019: Regional Proportion



As can be seen in the figure above, whereas previously the US has dominated the AI for Drug Discovery conference landscape (which follows naturally from the fact that it also leads in terms of the total number of AI for Drug Discovery conferences and investors), we have seen a significant increase in the number of AI for Drug Discovery conferences located in the UK and EU.

30 Corporations Applying Advanced AI in Healthcare and Drug Discovery



Does 2018 Signal the Rise of China as a New Epicenter of AI for Drug Discovery Activity?

In terms of whether it is the USA, EU, UK or Asia region that comes out on top will remain to be seen. There are however, some factors that could play out to the advantage of the Asia region generally, and China in particular, in the coming years that may be worth noting. China currently is low on the list of the top countries competing in the Pharma industry. It falls significantly behind its Western competitors, due chiefly to the fact that it has focused on selling drugs that were innovated elsewhere, and lags behind in terms of actual pharma innovation. But, we have seen an influx of Chinese investors into life sciences industries over the past several years. For instance, The entry of Chinese investors into the broader biotech and drug industry landscape also mounted significantly in 2018, rising to \$1.4 billion into US-based biotech and drug firms compared to just \$125.5 million during the same period the previous year.

Furthermore, the Chinese government has recently shown significant interests in building up their AI industry, and in prioritizing AI in healthcare in particular. In an AI Strategic Plan released in July 2017, they outlined their intentions to catch up in the AI race by 2020, make major breakthroughs by 2025 and become a world leader in AI by 2030. But, in order to excel within the BioPharma industry they will need to reformulate their IP regulations, which are currently not tight enough to retain proprietary control over novel pharma innovations that they might develop in the coming years. There are two additional advantages that China could possibly use in the coming AI for Drug Discovery race. Firstly, they have shown success in generating a massive amount of real-time medical data from their enormous population of citizens, made possibly by their sheer population size, as well as their current flexible privacy laws. Since AI in general (and machine learning and deep learning in particular) feed on data, this could potentially be used to the nation's benefit. Secondly, they have the raw materials needed for the most scarce resource in the industry: namely, a large quantity of Data scientists and AI specialists. If the Chinese government were to commit substantial resources to the training of additional AI and data scientists, they could potentially grow to surpass their Western competitors over the next 3-5 years. In the West, players in the AI for Drug Discovery race will suffer a severe scarcity of AI specialists in the coming years because the majority of them have been acquired by the IT and Tech industry for other purposes. China has the potential to leapfrog this issue.

Could UK, EU or Asia Government Initiatives be the Key to Overtaking the US in the AI for Drug Discovery Race?

The US has led the AI for Drug Discovery race in terms of both total investments and the number of US-based companies focusing on AI for Drug Discovery. The USA is also home to the largest pharma corporations in the world, putting it in an excellent position to grow its AI for Drug Discovery industry if, as recent trends seem to indicate, the BioPharma industry continues to build up their internal AI for Drug Discovery resources and increase their number of AI for Drug Discovery startup acquisitions.

With that being said, there is also mounting interest in the AI for Drug Discovery sector from the EU, UK and Asia region as well. While the USA leads the pharma race generally, as we have discussed elsewhere in this and earlier reports, the AI for Drug Discovery sector is poised to become the central factor that will determine who is the winner of the drug discovery race in the years to come.

If the EU, UK or China proves more willing to grow their AI for Drug Discovery industry, especially through something akin to a national development strategy, whereby a significant amount of government funds are earmarked for such a purpose, then it is possible that the US could be overtaken in terms of its current leadership position in the pharmaceutical industry. It all depends on the actions and commitments taken by the US government, as well as by the current US-based leaders of the BioPharma Industry, and by US-based IT-corporations.

The Chinese government, for instance, does appear to be committed to prioritizing Artificial Intelligence industry. In an AI Strategic Plan released in July 2017, they outlined their intentions to catch up in the AI race by 2020, make major breakthroughs by 2025 and become the world leader in AI by 2030. In a parliamentary meeting held around the same time as the report's release, China science and technology minister Wan Gang noted that government finance will lead the way in AI research, including the development of supercomputers, and high performance semiconductor chips, software and the hiring of key talent to lead the field. If they remain true to their commitment, they could succeed in building up the necessary resources in order to dominate the AI for Drug Discovery space.

Could UK, EU or Asia-Pacific Government Initiatives be the Key to Overtaking the US in the AI for Drug Discovery Race?

The UK has also had a recent increase in governmental support for AI generally, as well as for AI in healthcare in particular. In April 2018, the UK government confirmed its commitment to keep up with other countries in the AI race through a very large government initiative worth £1 billion. Titled the AI Sector Deal, the deal between government and industry (involving over 50 leading UK tech companies) was announced by Business Secretary Greg Clark and Digital Secretary Matt Hancock, and will involve more than £300 million in new private sector investment, as well as 1000 new government-funded AI PhDs.

In a press release on the topic of the initiative, the UK government noted that "The deal will help establish the UK as a research hotspot, with measures to ensure the innovators and tech entrepreneurs of tomorrow are based in the UK, with investment in the high-level post-graduate skills needed to capitalise on technology's huge potential. It includes money for training for 8,000 specialist computer science teachers, 1,000 government-funded AI PhDs by 2025 and a commitment to develop a prestigious global Turing Fellowship programme to attract and retain the best research talent in AI to the UK."

This new initiative builds upon the commitment already made by the UK government in its Industrial Strategy and AI grand challenge, which put AI's use in healthcare at the forefront of their commitment. Coinciding with the recent £1 billion pact between industry and government to put the UK on the forefront of the global AI race, the government also commissioned an independent review to assess the need of NHS staff to be trained in AI in order to equip them with the skills required to keep abreast of the latest developments in healthcare. The review was announced in April 2018 by Jeremy Hunt, Secretary of State for Health and Social Care. UK Business Secretary Greg Clark recently announced £103m in funding for a new institute that will aim to utilize AI for Drug Discovery. The Rosalind Franklin institute will utilize AI to create new drugs, diagnostics and treatments. Founded as part of the UK's AI and Data Grand Challenge, it will be built upon the UK Government's modern Industrial Strategy and aim to keep the UK on the forefront of the pharma and life sciences industry. Remarkably and ambitiously, its stated aim is to "generate new drugs for clinical testing within a few weeks."

Conclusions

Generally speaking, our analysis has revealed the continuation and intensification of several trends identified in our previous report, AI for Drug Discovery & Advanced R&D Q1 2018, as well as the emergence of several new trends.

Namely:

- The US continues to lead investments in AI for Drug Discovery companies from a total-landscape perspective
- The UK remains the home of the highest-valuated Drug Discovery company, Benevolent AI, which recently raised an additional \$115 million at a \$2 billion valuation.
- The industry is seeing an increasing influx of investors from the Asia-Pacific region, and most particularly from China and Singapore. The Chinese IT-corporation Tencent, for instance, led a \$155 million round of funding was held by AI in healthcare company iCarbonX. Tencent also recently co-invested in a \$15 million round held by AI for Drug Discovery company XtalPi with Google and Sequoia China. Chinese IT-corporation Alibaba has also entered the AI for healthcare space with the launch of what they refer to as "ET Medical Brain", a platform that leverages Alibaba's formidable computational resources in order to generate new AI medical applications. In June 2018 prominent Chinese pharma company Wuxi AppTec invested in AI for Drug Discovery company Insilico Medicine alongside Pavilion Capital (a VC firm owned by the Singaporean government), as well as several Western VC firms including BOLD Capital Partners and Juvenescence Limited.
- 2018 has seen increased governmental support for AI in healthcare from both the UK and Chinese government. Large-scale government initiatives could prove to be the key for certain nations to overtake the US in the AI for Drug Discovery race.
- The general trend of IT & Tech corporations entering the AI for healthcare space continues to spread, previously applying most particularly to US-based entities, but now including prominent Chinese IT and Tech corporations, including Tencent and Alibaba.