Chapter 13: Artificial Intelligence along the New Silk Road: Competition or Collaboration?

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Abstract

This chapter gives an impression of the development of the relatively young AI and computer science fields in Europe and China and how the current situation has developed over the past 20 years, where European and Chinese researchers are equal colleagues on an international stage and where diplomatic relations between the USA and China on the international stage have consequences felt directly by European AI researchers in their labs.

In what ways are AI researchers in China and Europe competitors with each other, for example in terms of the global shortage of trained AI researchers and practitioners? At the same time, the AI research community collaborates globally, so how can we ensure that the field continues to benefit from open international collaboration?

Chinese AI and Computer Science Research becomes Internationally Competitive

The author of this chapter has more than 35 years' experience working as a computer scientist at the forefront of technology innovation and research, of which more than 25 years have been at the Dutch National Research Center for Mathematics and Computer Science (CWI). She has been actively engaged in reflecting on the field of computer science in her roles within Informatics Europe, an association of European computer science departments, of which she was the president 2016-2017. Since the beginning of 2018 she has been the European director of a joint research lab: the Sino-European Laboratory of Informatics, Automation and Applied Mathematics

(LIAMA). LIAMA was founded in 1997 by the French National Institute for Research in Digital Science and Technology (INRIA) and the Institute of Automation of the Chinese Academy of Sciences (CASIA).

Initially, the LIAMA collaboration could be described as stimulating Chinese colleagues to publish in international venues. This situation drastically changed over the last 20 years, and today it is hard to imagine the relatively insignificant role that China played at the end of the 20th Century in Artificial Intelligence (AI) and Computer Science research when LIAMA was founded. Computer Science is a relatively young discipline; as an object of study, it only came into being around the 1950's, with the Second World War giving a huge impetus to the building of computers and the development of programming independently of the hardware. The field was heavily influenced – dominated even – by the USA, where an ecosystem of academic and commercial research contributed to the globally successful Silicon Valley. International giants such as Amazon, Facebook, Google, and Microsoft are now household names across the globe.

English was, and still is, the *lingua franca* of computing. The most prestigious journals and conferences, in which AI and computer science researchers across the globe publish, are in English.

LIAMA was established at the time when there was little interaction between the Chinese computer science community and the international (English-speaking) community. Where there was interaction, typically, Chinese students would go to the USA, study, and often remain for longer periods to become successful internationally recognised researchers (see Introductory chapter). Research funds were relatively plentiful in the USA – partially because of the investment by large corporations; such as Apple, Google/Alphabet, IBM, and Microsoft; in in-house research labs; and the academic ecosystem – for example through internships and faculty grants.

INRIA, while situated in France, offers an attractive environment to international PhD students because of its open research culture and the use of English. A Chinese PhD student, Songde Ma, obtained his PhD while working at INRIA in the mid-1980's (1983-1986). During his time there, he was inspired by the excellence of the research culture at the institute. After his return to China he became the Director General of CASIA, and initiated the creation of LIAMA between CASIA and INRIA[1]. INRIA, aware of its international role of stimulating excellent research, welcomed the opportunity to encourage collaboration between its researchers and the then relatively closed research community in Beijing.

Figure 1
Signing ceremony of the LIAMA foundation by Bernard Larrouturou (then president of

[1] http://liama.ia.ac.cn/about-about.html

INRIA) and Guangzhao Zhou (then president of CAS), January 1997.

In 2008, the 17th International World Wide Web Conference was held in Beijing[2] – a few months before the Olympic Games. The stadium was almost finished – located a few hundred metres from the conference venue. The research presented at the conference was of the same high quality expected of an international computer science conference. Of the 89 full papers published in the main conference, 15 had at least one author from a Chinese institution. Of these, 8 papers had at least one author from Microsoft Research Asia[3].

This is just one example of an international computer science conference that took place in the mid 2000's in China. Around this time, international computer science conference steering committees started to implement a more inclusive policy of a cycle of USA/Europe/Asia venues, acknowledging that researchers in Asia were significant contributors to the international research community. One of the major international AI conferences, the International Semantic Web Conference (ISWC), had its inaugural Chinese conference in Shanghai in 2010[4]. Another, the International Joint Conference on Artificial Intelligence (IJCAI), held its first conference in Beijing, China in 2013, and its second in Macao in 2019[5].

[2] http://wwwconference.org/www2008/

[3] http://wwwconference.org/www2008/papers/Proceedings.html

[4] https://en.wikipedia.org/wiki/International_Semantic_Web_Conference

[5] https://www.ijcai.org/past_conferences

These conferences allowed researchers from outside China to visit the country, connect with peers with similar interests, and visit a country about which very little was published in the West. International CS and AI conferences have been held regularly in China from the 2010's – Chinese Computer Science and AI research was becoming internationally competitive.

The AI Boom

While AI in the West has gone through a series of boom and bust cycles, in terms of funding, since its inception in the mid-1950's, research has been continuous world-wide in various subfields, such as

- computer vision, which allows computers to automatically analyse static or moving images to identify real-world objects, such as cancerous cells or faces;
- natural language processing, which has enabled voice-controlled applications on smart phones;
- knowledge representation and reasoning, which allows computers to reason with human-readable rules and expert-based knowledge;
- robotics, which uses combinations of these techniques to provide physically embodied interaction with users.

A game changer for AI occurred in March 2016. The AlphaGo deep learning system beat one of the world's best Go professionals, 18-time world champion Lee Sedol of South Korea, in a Go match that was followed by more than 60 million viewers in

China alone.[6] Not only did the system beat the human champion, but the Go field learned from a specific move that had not been seen before, leading to speculation within and outside the AI field of creativity in an AI system[7].

Box 1

Neural Networks, Machine Learning and Deep Learning

One of the techniques developed for AI fields such as computer vision, natural language processing, and data analytics is a neural network, which allows patterns to be learned automatically from a large set of examples, such as distinguishing hand-written letters. A neural network is trained by providing examples of hand-written letters, in addition to information about which character each represents, to an untrained neural net. The result is a trained neural network that can recognise which character a new hand-written letter represents that was not included in the original examples used for training.

New hand-written letters, however, can only vary within the bounds of the variations of the letters that were used as training examples. For example, a hand-written letter "F" that is similar to, but not one of, the training examples is likely to be recognised by the trained network as an F. The question is then, what does "similar" mean for any specific trained neural net? Perhaps our neural network was trained with letters written with black ink on white paper. Presenting a handwritten character written in white ink on red paper may or may not produce the desired result.

This process, both of training and use, is never 100% accurate, since the input patterns are all slightly different from the new inputs presented after training. Essentially, the system is dealing with differential probabilities – for example, where the system must "decide" whether a particular hand-written letter is more likely to be, say, an "F" rather than a badly written "E" or a "P".

Neural networks are the basis of what is broadly known as supervised machine learning, one of the foundations of what is commonly known outside the field as AI. Deep learning is a variation of machine learning based on neural networks with multiple levels, a development that has become possible through the availability of low-cost high-performance computing power.

Much of the AI boom in recent years is due to developments in machine learning and, in particular, deep learning.

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[6] https://www.wired.com/2016/03/sadness-beauty-watching-googles-ai-play-go/

[7] https://www.wired.com/2016/03/two-moves-alphago-lee-sedol-redefined-future/

The most significant outcome of this event and the film that documented it,[8] is that the world became aware of the power of "AI". While the term AI has been well known in the academic world for many decades, its usage in mainstream media has come to mean a specific branch of AI, known as machine learning. The term is most often used for techniques based around neural network technology (see Box 1).

The emergence of cheap graphics hardware (graphics processing units, GPU's) designed for the commercial gaming world led to much cheaper and hence more exploration of machine learning techniques. It soon became clear to businesses and governments that this technology would have economic and societal implications of similar proportion to the Industrial Revolution or the development of the Internet and the World Wide Web.

Just over a year after the AlphaGo victory, China was among the first, of now many, nations to develop an AI strategy[9], detailing its intentions for education, research, and most importantly, the implications for Chinese society. China has announced ambitions to become a world leader in AI by 2030 (see CISTP 2018), elevating the phrase "made in China" to a data-driven, hi-tech ecosystem for manufacturing goods and technology. Europe starting developing national and European strategies around 2018, for example establishing the European-wide High-Level Expert Group on

[8] https://www.alphagomovie.com

[9] https://medium.com/politics-ai/an-overview-of-national-ai-strategies-2a70ec6edfd

Artificial Intelligence,[10] which has produced Ethics Guidelines for Trustworthy AI and corresponding Policy and Investment Recommendations towards sustainability, growth, competitiveness, and inclusion (see Craglia et al. 2018) and later publishing a Coordinated Plan on Artificial Intelligence.[11]

China develops its AI strategy

Since 2017, a number of nations have developed their own AI strategies. China was among the first to declare its intentions in its report "China AI Development Report 2018" (see CISTP 2018). This was developed in conjunction with partners representing both academic and commercial interests in the country, overseen by the China Institute for Science and Technology Policy at Tsinghua University.

The report provided a comprehensive overview of the development of AI in China, considering existing regional, national, and foreign AI policy documents. Among its goals are to increase public awareness, promote the development of AI industry (to retail, agriculture, logistics, finance and reshaping production for example) and act as a reference for policy makers. Societal goals for the use of AI are helping with an ageing population, supporting sustainable development and helping the country transform economically – towards a China which is a hi-tech developer and supplier, rather than consumer.

[10] https://ec.europa.eu/digital-single-market/en/high-level-expert-group-artificial-intelligence

[11] https://ec.europa.eu/knowledge4policy/publication/coordinated-plan-artificial-intelligence-com2018-795-final_en

Three areas of AI where Chinese companies tend to specialize are voice recognition, computer vision, and natural language processing. This is also supported by the research publication analysis in the Elsevier AI report which shows that of Chinese AI publications in 2017, around 40% were in computer vision (Elsevier 2018, 42). These fields cause concern among European politicians and citizens because of their potential application to monitoring segments of the Chinese population that are deemed a security threat.

The CISTP report also observes that the priorities of the USA are economic growth, technological development, and national security (see CISTP 2018, 5), whereas the concerns of Europe are the ethical risks caused by AI in fields such as security, privacy, and human dignity (see CISTP 2018, 5). These different regional policies seem aligned with underlying cultural differences among the regions.

The report is realistic about the Chinese context, stating "*Even recognized domestic AI giants such as Baidu, Alibaba and Tencent (BAT) don't have an impressive performance in AI talent, papers and patents, while their U.S. competitors like IBM, Microsoft and Google lead AI companies worldwide in all indicators.*" (see CISTP 2018, 6)

The executive summary concludes with "*Currently, China's AI policy has emphasized on promoting AI technological development and industrial applications and hasn't given due attention to such issues as ethics and security regulation.*" (CISTP 2018, 7)

What do the numbers say?

The Elsevier AI report (see Elsevier 2018) provides an analysis of publications in AI in China, Europe, and the USA between 1998-2017. The report's authors used machine-learning techniques to identify sub-fields of AI based on a comprehensive set of publications from both well-known and lesser known journals and conferences. The report shows the clear and rapid increase of China's influence in the field. For example, between 1998 and 2002, Chinese publications constituted 9% of the global total; EU 35%, USA 25% (see Figure 2). By around 2015, this had increased to 24%, more than 2.5 times more at the same time that the total global output was increasingly rapidly.

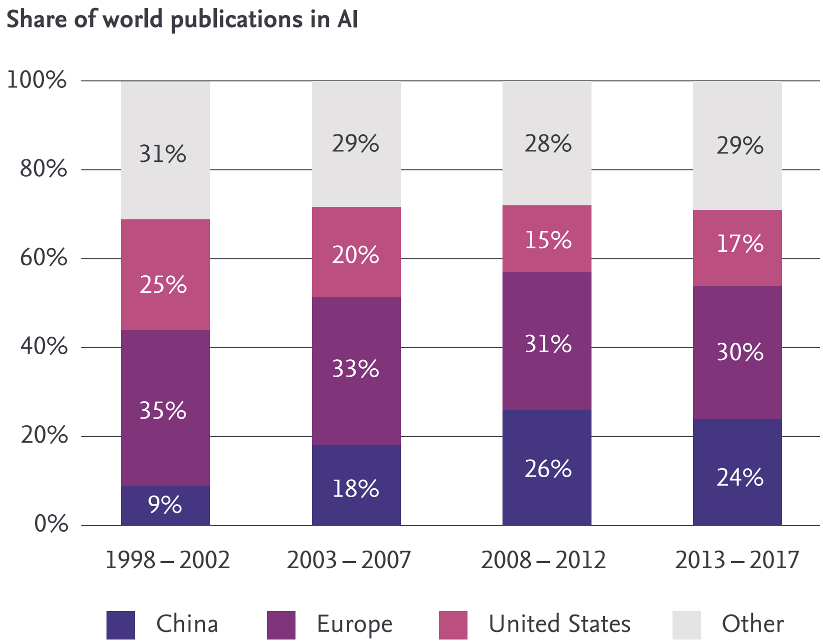

Figure 2
Share of global publication output in AI, 1998-2017(all document types; source: Scopus) (Elsevier 2018).

Global output for AI in 1998 was around 20,000 publications (see Figure 3). (For those of arithmetic prowess, this gives us around 2,000 for China, 7,000 for the EU, and 5,000 for the USA.)

In 2013-2017, Chinese publications constituted 24% of the global total; the EU 30%, and the USA 17%. The total global publication output for AI in 2017 was around 120,000 publications – a factor 6 increase in 19 years (see Figure 3). This gives around 30,000 for China, 35,000 for the EU, and 20,000 for the USA. The growth in China alone is almost a factor of 16.

These numbers show a similar trend to the numbers reported in (CISTP 2018), although the absolute numbers reported are different. Figure 4 indicates around 1,400 Chinese AI publications in 1998, about 4% of the global total of 30,000, and in 2017 nearly 40,000 publications, 28% of the global total. This represents a 30-fold increase in the output of Chinese AI publications over 20 years.

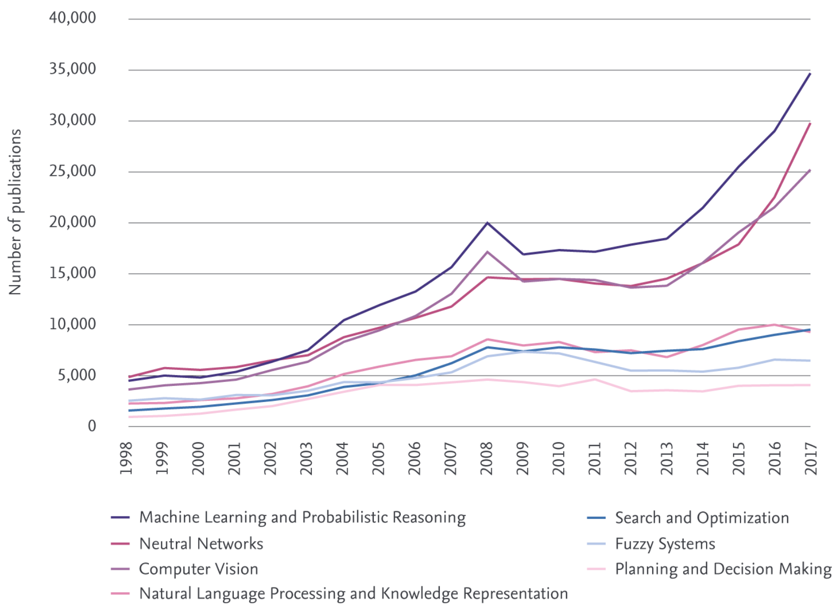

Figure 3
Annual number of AI publications 1998-2017 (all document types; sources: Scopus and Elsevier) (Elsevier 2018).

The top contributors in the three regions differ in terms of industrial contributions. The top Chinese contributor, the Chinese Academy of Sciences, is an unfair comparison, since it consists of more than 100 research institutes in different fields. The other most prolific Chinese contributors are all academic institutions. This is similar to the situation in Europe, but differs from the USA, which has two companies in the top 5 positions (see Figure 5).

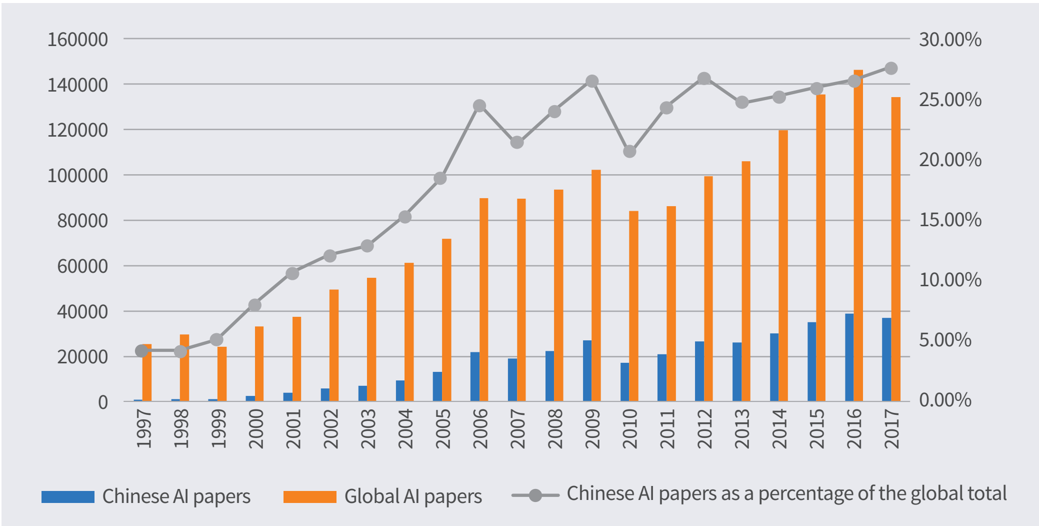

Figure 4
China's AI paper output and as a percentage of the global total 1997 - 2017 (see CISTP 2018, 14)

The field-weighted citation impact of the publications, shown to the right of Figure 5, indicates that publications from the USA (authors working at these institutions) are much more highly cited than either their European or Chinese counterparts. Whether this is because the USA publications are of higher quality, published in more highly cited venues, or whether AI researchers suffer from biased citation practices as a community cannot be determined from only this view of the data.

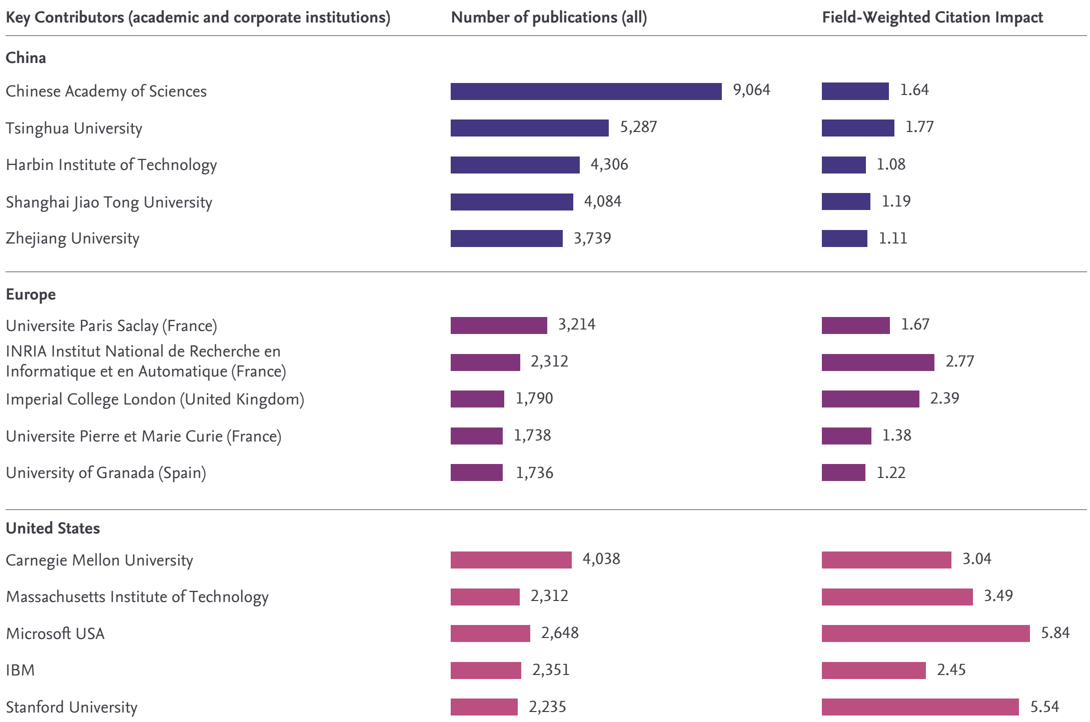

Figure 5
Top 5 institutional contributors per region by number of AI publications, 2013-2017 (Elsevier 2018).

It is clear from these analyses that China is increasing its internationally published AI research output. The influence of this output, however, tends to be national rather than global (Elsevier 2018, 11).

Where do we go from here?

The political climate in the USA under the Trump administration, since early 2017, is not supportive of cooperation with China, to say the least. This reduction in "elan" is leading to closer cooperation between China and Europe (see Introductory chapter), with Chinese AI companies becoming keener to work more closely with European researchers. Given the relatively small amount of research funding in European countries and from the European Union, the welcome addition of funds from abroad would seem like a golden opportunity. But things are not always as easy as they may appear. Firstly – do European AI researchers want to work with Chinese colleagues? Secondly – do European academic institutions want to be funded by Chinese companies?

Working with AI colleagues from China

There are two problems when European (top) researchers consider working with Chinese colleagues. The first is the perceived quality of their new colleagues. While the figures clearly demonstrate that the Chinese are becoming more prolific in the number of publications, the opinion of the quality of these by senior European researchers is often based on their experience as young and upcoming researchers 20^{+} years ago: Chinese research was often perceived as being good at replicating known techniques in new contexts, or good at taking a known technique and improving it by a measurable, but small, amount. This also provides a convenient explanation of why the work of authors based in China is less well cited.

Just as with the price of shares, or indeed with any ill-chosen application of machine learning, the trends of the past are not able to predict the future. What cannot – yet – be seen in historical data is the influence of the significant increase in the return to China of an established generation of influential researchers who developed their careers abroad (see Introductory chapter). Similarly, the influence of current opportunities for younger Chinese researchers trained in Europe or the USA to establish their careers in China cannot yet be measured (see Introductory chapter). Both generations of researchers bring with them the competitive, individualistic risk-driven culture learned abroad. Just as in winning in top sport – be it gymnastics, football, or table tennis – two things are essential: individuals with intrinsic potential and motivation, and an environment that polishes and hones the required internationally competitive skills. A characteristic of the successful Western research culture is questioning received wisdom, which goes against the grain of Chinese and many other Asian cultures.

Based solely on the number of inhabitants, the number of potentially excellent AI researchers in China is simply larger. Having received research training in top schools outside China and given the ability of the Chinese educational system to rapidly adapt, the up and coming generation of young Chinese AI researchers will be internationally competitive. Now is the time for AI researchers across the globe to become familiar with each other's cultures – for the benefit of the research community as a whole.

The second problem is: who is using the research? Here, fields such as facial recognition and natural language processing are examples of the most problematic because this is the technology the West perceives the Chinese state would use to control specific minority groups. While science is often perceived as free of political considerations, the crux of the problem is discussed in this volume as the European perception of the role of the Chinese state (see Introductory chapter, chapter by Van der Wende, and Marginson & Yang).

Consequently, European AI researchers do not want to work with Chinese colleagues on topics that are likely to aid the Chinese state in actions that do not conform to European civil rights & values. That there is a cultural difference in the desirability ascribed to the trade-offs between privacy and security for those living in China and Europe, discussed at the end of the chapter by Van der Wende, is hard to understand in and of itself and even harder when Europeans are not familiar with the Chinese culture. AI researchers are not the most knowledgeable of global cultural differences, nor do many European researchers spend extended periods of time in China to learn first-hand.

European academic institutions accepting AI research funding from Chinese companies

From the perspective of individual AI researchers, there is insufficient national and European funding to make an academic career attractive to prospective PhD students or indeed more established researchers. The attraction of substantially larger salaries and the relatively interesting work available at large companies such as Amazon, Facebook, Google/Alphabet, and Microsoft, together with rapidly increasing student numbers in AI, means that funding research projects from external sources, such as Chinese companies, is attractive to European academics.

Understanding the motivations of AI researchers is one part of the equation, the other is their employers. European universities and research institutions have different priorities and, while research funding for one of their top AI researchers is a "nice to have", it doesn't add a large percentage to the total annual budget. A much larger impact would be felt when the press “finds out” that the organisation has received funding from a company directly connected to the Chinese state. The role of universities, embedded in law, is that they can carry out research independent of any political influence. To what extent, thus, should unsubstantiated claims about Chinese companies willing to fund European AI research be subject to scrutiny by anyone other than the researchers themselves? Which mechanisms[12] and codes[13] should researchers be aware of beyond their own codes of conduct for research integrity? AI researchers need access to reliable information sources that allow them to seek advice on the context and potential partners for the research they wish to conduct[14]. In China, as much as anywhere else, universities should be able to carry out research independently. Academic freedom can conflict with national security, so researchers “can’t be naïve” either. Various governments are developing guidelines for universities.

Transferability of AI and Computer Science Results

In AI, and indeed in computer science, applying results from one domain to another is relatively easy. No large physical infrastructure needs to be created, and with commercial cloud services everyone has access to as much computing power as they

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[12] For instance; the European Commission recently raised screening for foreign direct investment, see, https://ec.europa.eu/commission/presscorner/detail/en/IP_19_2088

[13] European Commission also developed an AI ethics code: “Ethics Guidelines for Trustworthy Artificial Intelligence”, see, https://ec.europa.eu/futurium/en/ai-alliance-consultation/guidelines#Top

[14] Especially in case of potential “dual-use technology”, defence related research, or researchers and universities with a relationship to the PLA (Chinese army). For instance such as the recently developed “China defense university tracker”, see, https://unitracker.aspi.org.au/topics/

can afford. In the field of computer vision, for example, techniques exist that help radiologists identify cancerous cells more reliably and faster than without digital aids. These same techniques can be applied to other domains, such as identifying facial features, which in turn can be used to distinguish the ethnic origin of citizens[15]. The former is, from a European perspective, desirable, the latter not.

The implication is that even if European researchers do not collaborate directly with Chinese colleagues, the free availability of publications – an integral part of the European science policy – and the desire for reproducibility, means that taking existing programming code and repurposing it is easy for anyone knowledgeable in the field. The tradition of science is to share knowledge and to remain independent of political considerations (see Van der Wende). The field of AI can perhaps learn from the cyber-security field, where it is deemed important to share system vulnerability information internationally. Wide publication is delayed according to an agreed-upon protocol to allow those directly affected to take counter measures.[16] The assumption is that "non-desirable" parties will have access to this information anyway, and "desirable" parties can make use of this information for developing counter measures.

Competition

[15] https://ancestry.ai

[16] https://www.enisa.europa.eu/news/member-states/coordinated-vulnerability-disclosure-guidelines-published-by-ncsc

As stated by the EU with respect to their partnership with China, the regions are economic competitors (see Introductory chapter). This applies both to the attraction of AI talent and to commercial competition.

The global AI talent pool

AI application areas include many that affect societal well-being in substantial ways, such as energy, health and transport. For society to enjoy the benefits of these technologies, we need highly educated AI practitioners to put them into practice. There is a global shortage of AI (including machine learning and data analytics) talent to take on these challenges. All parts of the globe are looking to educate their own talent and to attract excellent talent from abroad. This requires investment in a number of ways. Increasing the number of academic staff able to teach these topics, and increasing the efficiency of teaching. At the academic level, tenure positions are attractive because of the opportunity to carry out research. This requires extended research funding, requiring either a larger slice of the available national (or European) funding or attracting more funding from industries. Industries across the globe are acutely aware of their shortage of talent, and are willing to invest in academic research funding to maintain an active base of researchers and teachers in academia. Excellent researchers attract excellent young talent and, given the English-language foundation of the AI and the computer science fields, the same talent can be attracted to China, Europe, or the USA.

There are, however, differences in the willingness of students to leave their continent to seek their fortune. It is likely that Chinese AI & computer science students will study for some time abroad before returning to China where research resources are currently plentiful. On the other hand, the attraction of the European work-life balance may play a factor. European students are much less familiar with Chinese cultures and language than Chinese students are with the English language, and American and European cultures. This creates a larger barrier to move to a region where the currently perceived academic benefits are low. This is independent of the political information about China published in Western media. This may change as awareness of the technological speed of change and available research resources in China increases, creating a stronger pull for both European and American students.

The American dream?

The field of computer science has created a number of corporate giants who dominate the international landscape. Names such as Amazon, Apple, Facebook, Google/Alphabet, Microsoft, and Netflix have created their wealth because what they sell can be transported across the planet at next to zero cost. These giants come from the start-up world in the USA and are seen as shining examples to which all entrepreneurs aspire. The Chinese market has seen the emergence of Alibaba, Baidu, and Tencent, originally with few international markets but this is changing rapidly.

These are the current giants, but what of the new entrepreneurs, particularly those creating the AI apps of the future? Just as the USA has always been successful at turning (research) ideas into successful products and services, China is a more than competitive partner for both the USA and Europe. Kai-Fu Lee explains in (Lee 2018) how the "rules of engagement" of Silicon Valley start-ups have been rewritten in the cut-throat start-up cultures such as those in Zhongguancun,[17] Beijing, and Shenzhen[18] in the Guangdong province. As he states in an interview in December 2018 "*Europe isn't even in the running for bronze AI medal*."[19]

China is still criticized for the "uneven playing field" and technology transfer from foreign sources, thus undermining WTO rules regarding market access and IPR, blaming it for 'innovation mercantilism' (see chapter by van der Wende).
China may be viewed as acting unfairly in this global competition. The state is providing a large amount of support for companies through favourable economic and regulatory conditions, acting "*as strategic investor, consumer of digital technologies, and provider of access to key data*" (Craglia et al. 2019, 45) Whether competition in AI innovation ecosystem is fair, or not, the Chinese are accelerating ahead.

Collaboration

In addition to being an economic competitor, the EU and China have closely aligned objectives, particularly in areas such as climate change and the health and well-being of their citizens (see Van der Wende). The implications for research and development in AI reflect aspects of both competition and collaboration. In order to catch up with the competition, the EU is investing 1.5 billion euros in AI for the period 2018-2020, aiming to develop a European approach to AI, while ensuring an appropriate ethical

[17] https://en.wikipedia.org/wiki/Zhongguancun

[18] https://en.wikipedia.org/wiki/Shenzhen

[19] https://sifted.eu/articles/interview-google-kaifu-lee-ai-artificial-intelligence/

and legal framework in line with (among others) The General Data Protection Regulation (GDPR)[20] (see chapter by van Deursen and Kummeling).
Selecting applications of mutual benefit, such as health, energy, and transport would be areas where collaboration from research through to innovation could be stimulated. In addition, many in China also share the "European" interest in ethics[21].

The European Commission established a European wide High-Level Expert Group on Artificial Intelligence[22] in 2018 to provide advice on ethical, legal, and societal issues occurring as a result of implementing their AI policies. About half the group have technical expertise in some field of AI, with other experts from areas such as law, philosophy, and labor/workforce. While AI has a history of interdisciplinary collaboration with other fields, such as cognitive science or philosophy, AI researchers are not specifically trained in communication about their field to other disciplines – let alone politicians. The rapid uptake of and interest in the field has meant that many AI researchers are taking on a broader role in their – already busy – schedules, becoming consultants to other fields to explain the technologies in a way that others can understand and, perhaps more importantly, understand the limitations of what AI is capable of; not just at this moment but the fundamental limitations of the current approaches. The report published jointly by Informatics Europe and the ACM Europe Council – influential bodies in the field of AI and computer science in Europe – "When Computers Decide: Recommendations on Machine-Learned

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[20] https://ec.europa.eu/digital-single-market/en/artificial-intelligence#A-European-approach-to-Artificial-Intelligence

[21] https://www.technologyreview.com/s/613610/why-does-china-suddenly-care-about-ai-ethics-and-privacy/; https://www.baai.ac.cn/blog/beijing-ai-principles; http://ceur-ws.org/Vol-2301/paper_15.pdf

[22] https://ec.europa.eu/digital-single-market/en/high-level-expert-group-artificial-intelligence

Automated Decision Making” is an example of this (Larus et al. 2018). Joint initiatives with Chinese colleagues could provide fruitful future collaborations.

Conclusion

The balance in the world of AI research has changed unrecognisably in the past 20 years. A new equilibrium is being established as China directs huge resources into educating talent that will contribute to international research and national innovation. China has already caught up with Europe and the USA, and is accelerating ahead. Europe has centuries-old excellent higher education systems but needs to scale up capacity to produce its own AI research and development talent pool. While this is likely to succeed, the entrepreneurial “gap” between Europe and the USA still exists and China is likely to surpass the achievements of both. Where China needs to devote effort is in the stimulation of creativity and critiquing methods to further develop their own talent.

In the grand scheme of things, Europe and China have the same goals for AI research and development – to provide personal wealth and public services to their citizens. Devoting resources to energy, health, and transport is for the benefit of all. While China is attractive to young hi-tech talent, working weeks are long and there is little opportunity to spend time with family and friends. In Europe, it is not just one’s standard of living that is important but also one’s quality of life. Development of AI technologies provides hope that both can be achieved through more efficient use of the limited resources available.

The AI research community is a global one, and Chinese and European students and graduates have always been drawn to the USA. Encouraging European researchers to spend longer periods of time visiting colleagues in China would accelerate the field's progress. Exchange programs could be set up to stimulate collaboration; minors in Mandarin could be offered within AI programs.

AI is a generic technology that can be applied to a variety of application domains such as security, facial recognition, and natural language understanding. Deciding when to, and when not to, collaborate poses a difficult choice for which AI researchers are neither trained nor sufficiently informed. Both Chinese and European AI researchers need guidance from their politicians and security agencies to inform decisions on whether or not they should collaborate with international colleagues or companies. This should not limit their independence to choose which research to carry out, but give access to information relevant to an informed decision. Politicians, on the other hand, should not be overly influenced by wavering public opinion, or short-term economic benefit, but should rather consider longer-term perspectives in international relations.

AI research and innovation is already taking place along the New Silk Road. Europe and China can benefit from each other's perspectives – something that our AI systems are not yet able to do for us.

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