Research Prospectus

How National Differences Influence Artificial General Intelligence in the Private & Public Sectors: A Case Study of China and the United States.

Introduction:

Artificial General Intelligence is one of, if not the most important technological developments of the late 20th early 21st century.[1] The following excerpt is a description of AGI by one of the world's leading Artificial Intelligence scientists, Ben Goertzel;

"A system need not possess infinite generality, adaptability and flexibility to count as "AGI". Informally, AGI may be thought of as aimed at bridging the gap between current AI programs, which are narrow in scope, and the types of AGI systems commonly seen in fiction – robots like R2D2, C3PO, HAL 9000, Wall-E and so forth; but also general intelligences taking nonrobotic form, such as the generally intelligent chat-bots depicted in numerous SF novels and films. And some researchers construe AGI much more broadly than even the common science fictional interpretations of AI would suggest, interpreting it to encompass the full gamut of possible synthetic minds"[2] This 'gamut' of AGI being: cognitive architecture, brain emulation, human-level AI and superintelligence.[3]

Therefore, it is no surprise that companies are rushing to pilot and adopt Artificial General Intelligence (AGI) into their planning, manufacturing and automation processes in order to edge out competitors. China is currently the global leader in investment, research and industry adaptation of AGI with the United States following behind in a relatively distant second place.[4]

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[1] Clancey, William J., Stephen W. Smoliar, and Mark J. Stefik. Contemplating Minds: A Forum for Artificial Intelligence. Cambridge, MA: MIT Press, 1994.
[2] 2019. Goertzel.Org. Accessed September 6 2019. https://goertzel.org/AGI_survey_early_draft.pdf.
[3] Bostrom, Nick. Superintelligence: Paths, Dangers, Strategies. Oxford University Press, 2017.
[4] "How China's Artificial Intelligence Strategy Stacks Up Against U.S. Investments". 2019. Wbur.Org. Accessed May 9 2019. https://www.wbur.org/hereandnow/2019/02/25/china-artificial-intelligence.

A prime example in the United States being the Defense Advanced Research Projects Agency (DARPA), who are spending roughly $5 billion over 5 years in AGI research, whilst Shanghai-a Chinese city government-is planning to spend $15 billion over the next 10 years.[5]

However, a problem for all countries involved in pursuing AGI related fields is not specifically the lack of funds or innovation opportunities, but rather the hurdles involved in the innovating and piloting of new AGI initiatives. These being: no one is naturally gifted in understanding AI; therefore, the problems include (1) a lack of educational/ training opportunities that incite interest in the fields of AGI, (2) the socio-cultural circumstances of a workplace (differences on views), and (3) the prioritization of goals versus profit at each institution (government/ company). With China and the United States becoming equal global hegemons alongside the importance of AGI capabilities in an increasingly globalized and technological world, the domain of AGI will become a crucial competitive landscape for China and the United States to joust in. How to compete then?

Research Question:

The main concept this research builds upon is that of global economic competition between institutions (governments/ companies). The main question derived from this being: **How the differences in institutional context (private and public sectors of China and the United States) effect the development of AGI?**

> "To me it seems that our current research is not hampered significantly by the lack of accurate data, but rather by an inability to explain in a satisfactory way data that are hardly in question." (Noam Chomsky, *Language and Mind*, 1968)

[5] "How China's Artificial Intelligence Strategy Stacks Up Against U.S. Investments". 2019. Wbur.Org. Accessed May 9 2019. https://www.wbur.org/hereandnow/2019/02/25/china-artificial-intelligence.

Theoretically, AGI would help in every conceivable domain, therefore it is the crux on which the future could be built. How to get to the future of an AGI world then?

Broad strategy and policy[6] related questions include; In what domains is AGI most utilized in. Why?[7] Where do China and the US want to increase the use of AGI? How are they going to accomplish this task? What do these business environments look like where these pursuits are taking place?

As for the implementation and practicality of these institutions', questions are as follows; if enough capable human capital, then AGI stagnation is a top-down problem? (Management and Implementation problem). If not enough capable human capital, then AGI stagnation is a bottom-up problem? (Human capital and Education problem). If not enough capable human capital, then invest in education/ training? Whenever investing, then invest in high populous areas? Whenever investing in high populous areas, then invest in primary through higher education schools/ institutions? (In order to ensure capability).[8] If not enough capable native human capital, then partner and scalp top foreign talent? Whenever partnering, then ensure lopsided agreement towards home party (China/ USA)? If enough capable human capital, then accelerate tech innovation cycle? Whenever accelerating the tech innovation cycle, then invest in management?

[6] "Policy Publications - Foresight Institute". 2019. Foresight Institute. Accessed September 6 2019. https://foresight.org/about-us/policy-publications/.
[7] 2019. Www2.Deloitte.Com. Accessed September 8 2019. https://www2.deloitte.com/content/dam/Deloitte/cn/Documents/innovation/deloitte-cn-innovation-ai-whitepaper-zh-181126.pdf.
[8] "China's AI Dream Stymied By Global Shortage Of Geeks And Nerds". 2017. South China Morning Post. Accessed May 9 2019. https://www.scmp.com/tech/innovation/article/2122488/chinas-ai-dreams-stymied-shortage-talent-us-home-lions-share-experts.

Theoretical framework:

The first part of my analysis will build on institutional theory and will outline global economic competition and geopolitical struggles as it relates to China[9] and the US[10] within the realm of AGI. I will do this by utilizing case studies of specific institutions and companies from a dataset of the 45 worlds' known AGI R&D projects compiled by the Global Catastrophic Risk Institute.[11] This data set will aid in connecting the international partnerships of countries through AGI research. Where are party lines drawn if there are any? Who is funding/aiding in the research? Where are the location of AGI research labs of China and the United States throughout the world? Why are they there?

Next, I will conduct scoping quantitative research on the available humans capable of developing and piloting AGI related projects and their general locations throughout the world. In comparison to demand for human capital, is there a shortage? I will test this through, how much AGI can be implemented into the job market today. Pair this with a comparison on number of humans capable of achieving such tasks as well as a projected graduation rate of humans with these capabilities each year. Where do graduates enter into the AGI field? This will give an idea of the institutional paths developed to train and recruit new talent in both the public and private sectors of AGI.[12]

Following this logic, I will conduct literature reviews on AGI policy (public, private) in China and the US.

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[9] Bruton, Garry D, and David Ahlstrom. 2003. "An Institutional View Of China's Venture Capital Industry". Journal Of Business Venturing 18 (2): 233-259. Elsevier BV. doi:10.1016/s0883-9026(02)00079-4.
[10] 2019. Personal.Utdallas.Edu. Accessed September 8 2019. https://personal.utdallas.edu/~mikepeng/documents/LinPengYangSunUSAPRCMA0810SMJR3_000.pdf.
[11] Baum, Seth, A Survey of Artificial General Intelligence Projects for Ethics, Risk, and Policy (November 12, 2017). Global Catastrophic Risk Institute Working Paper 17-1 . Available at SSRN: https://ssrn.com/abstract=3070741 or http://dx.doi.org/10.2139/ssrn.3070741
[12] https://www.imd.org/research-knowledge/articles/the-chinese-AI-innovation-chasm/

How does public (National, Military) interest factor into the development of capable human capital. Assuming public interest is goal driven and looking to constantly progress and achieve milestones, what are these policy goals/ milestones described by China[13] and the US? How are these goals formed and implemented? (incentives scholarships etc.) New programs/ institutions, and/or revamping of 'old' programs? Which programs and why? (this will give insight into roles geopolitics/ capital funds play).

Alongside public policy and research, private (company, institution) interest needs to be addressed. Assuming private interest is profit driven and for personal gain, how do private companies hire and retain highly skilled employees?[14] Are these employees mostly citizens, foreigners or foreign-born nationals? What developmental paths do private institutions use to train and form employees? Do they lend employees and/or leaders to public institutions? (will give insight into public-private sector politics).

Methodology:

China Vs. USA:

New fields of conflict are emerging daily within every facet of life. Traditional competition is in a phoenix like resurrection, being replaced by tech driven research and development in both public and private sectors alike. While sparring on multiple fronts, China and the USA are both moving to culture multifaceted technological entities in the form of AGI. However, there is enormous risk in regards to the development of AGI. A description of why the institutional context of AGI development in China, the US and the world is of the utmost importance is stated in the following excerpt from the Global Catastrophic Risk Institute.

[13] 2019. Fhi.Ox.Ac.Uk. Accessed September 7 2019. https://www.fhi.ox.ac.uk/wp-content/uploads/Deciphering_Chinas_AI-Dream.pdf.
[14] http://www.sppm.tsinghua.edu.cn/eWebEditor/UploadFile/China_AI_development_report_2018.pdf

"One common concern is that competing projects will race to launch AGI first, with potentially catastrophic consequences.[15] Desire to win the AGI race may be especially strong due to perceptions that AGI could be so powerful that it would lock in an extreme first-mover advantage. This creates a collective action problem: it is in the group's interest for each project to maintain a high safety standard, but it is each project's individual interest to skimp on safety in order to win the race. Present game theoretic analysis of the AGI race scenario, finding that the risk increases if (a) there are more R&D projects, (b) the projects have stronger preference for their own AGI relative to others', making them less likely to invest in time-consuming safety measures, and (c) the projects have similar capability to build AGI, bringing them more relative advantage when they skimp on safety."[16] Therefore, with such a powerful first mover advantage predicted, it is necessary to engross the whole of Chinese and United States AGI developments in comparison. As these competing global superpowers will be affiliated if not the primary creators of the future of the world through their current and near future research and developments in AGI.

This thesis will primarily rely on existing data and comparative case studies of both the private and public sector in China and the US. Beginning with a literature review on governmental policies and their influence on the education/ training of humans and startup of tech companies in regards to AGI. This will allow a large scoping look into how China and the United States government both view AGI and its importance. Will also give examples of different 'motivational' tactics and developmental paths given by the government to attract more people to the AGI domain. The differences or similarities of these cases will show how these two

[15] Dewey D, 2015. Long-term strategies for ending existential risk from fast takeoff. In Müller VC (Ed), Risks of Artificial Intelligence. Boca Raton: CRC, pp. 243-266.
[16] Armstrong S, Bostrom N, Shulman C, 2016. Racing to the precipice: A model of artificial intelligence development. AI & Society, 31(2), 201-206.

countries views, at a base level, are similar or different in regards to pursuit of AGI (AI) ventures in private and public sector.

Next will be a study on capital investment.[17] Will show where multinational companies are investing their money (party lines). How 'private' companies in China and the United States to cultivate and attract future talent. What companies are investing and how much? Chinese companies in China and US companies in US? Will give a view into the 'private' sectors of each country and their personal stake in the advancement of AGI. Minimal quantitative data is available regarding more secretive public and private projects, meaning there could be a smoke and mirrors effect on the statistical data that is made public because of the importance of AGI to these different institutions.

Finally, the latter part of this thesis will be qualitative. This includes effects of policy, investment and geopolitics on the implementation of AGI not described in quantitative measures. Like the livelihood of employees and the subjective reality of institutional context on AGI startups and institutions.

Data sources:

The Global Risk Institute report will be a basis for case study selection and research as it houses all of the worlds (45) publicly known AGI projects. The sources of data are based from governmental agencies in both the China and the United States. These agencies are going to be a vital source for literature analysis on policies and the implementation of them throughout time. The implementation statistics may be skewed to a more favorable view; however, this is always one of the risks of using governmental information.

[17] "2019中国人工智能商业落地研究报告-亿欧智库-亿欧>". 2019. Iyiou.Com. Accessed September 8 2019. https://www.iyiou.com/intelligence/report651.html.

Alongside this the other set of data will be collected from scholastic institutions and private tech companies. These two types of data should be very reliable as they are both being payed for their analysis. However, this could depend based on the company or scholastic institution being studied.

Analysis:

The methods of analysis for this project will include quantitative methods of describing broad correlations and/or statistical inferences between data sets as well as case studies. Alongside these calculations will be a literature review of policy and case studies to compare public and private fields in China and the US respectively. In the final section, qualitative measures will be used to expound upon and connect the actualities of the findings in both the quantitative and literature review sections.

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https://www.imd.org/research-knowledge/articles/the-chinese-AI-innovation-chasm/

Dewey D, 2015. Long-term strategies for ending existential risk from fast takeoff. In Müller VC (Ed), Risks of Artificial Intelligence. Boca Raton: CRC, pp. 243-266.

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