

A Pebble in the AI Race

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Abstract

Bhutan is sometimes described as “a pebble between two boulders”, a small country caught between the two most populous nations on earth: India and China. This pebble is, however, about to be caught up in a vortex: the transformation of our economic, political and social orders by new technologies like Artificial Intelligence. What can a small nation like Bhutan hope to do in the face of such change? What should the nation do, not just to weather this storm, but to become a better place in which to live?

1 Introduction

There is little doubt that Artificial Intelligence (AI) is transforming the current economic, political and societal landscape. A study by PwC in 2017 estimated that global GDP could be up to 14% higher in 2030 as a result of AI – the equivalent of an additional \$15.7 trillion in inflation adjusted terms [RV17]. This would likely make it the largest commercial opportunity in today’s fast changing economy. We also see AI disrupting political and societal structures, from AI powered face recognition software being used to surveil populations in China, to DeepFake videos being used to win over voters in India [Jee20].

While the disruption will be great, change will not be evenly spread. The PwC study estimated that the GDP of China might grow by over 25%, that of the US by around 15%, but developing countries in Asia and elsewhere might see growth in their GDP of just 5%. In addition to economic growth, there might be significant impact on employment as AI and automation take over more tasks. A famous (and somewhat disputed) 2013 study from the University of Oxford estimated that 47% of jobs in the US were at risk of automation [FO13]. In October 2016, Jim Long Kim, the President of the World Bank, cited research predicting 69% of jobs in India at risk, 77% in China and 85% in Ethiopia [FHO16]. Jobs that were recently outsourced to the developing world might, for instance, return to robots and softbots in the developed world. What then can a small, developing nation like Bhutan do in the face of such immense forces?

2 What is AI?

It helps to understand a little better what AI is, and where it came from. In this way, a better understanding might emerge of where it might take us. Artificial Intelligence started proper in 1956 when one of its founding fathers, John McCarthy proposed the name for the now famous Dartmouth Conference in New Hampshire that brought together many of the founding fathers¹ of the field. However, the history of Artificial Intelligence goes much further back than 1956 when McCarthy coined the name for the subject. It goes back before even the invention of the

¹AI has been plagued by gender inequality since the very beginning. There are no records of any female scientists participating in the Dartmouth meeting.

computer. Humankind has been thinking about machines that might think, and how we might model (human) thinking for centuries. You can trace back the intellectual roots of AI to the 3rd century BC when Aristotle founded the field of formal logic. Without logic, we would not have the modern digital computer. And logic has often and continues to be seen as a model for thinking, a means to make precise how we reason and form arguments. You can also find echoes in the Lie Zi text, an ancient volume of stories from China written sometime in the 4th century BC. One of the stories is of an amazing automata, a human like “robot” that could sing built by Yan Shi around 1000 BC and demonstrated to the fifth king of the Chinese Zhou Dynasty, King Mu.

It took the invention of the digital computer in the 1950s to turn some of these ideas into reality. Since then, driven by advances in computing, Artificial Intelligence has started to make significant progress at automating tasks that only humans previously could do: perceiving the world, understanding language and speech, reasoning about the world, and acting in that world. One of the misconceptions about AI is that it is one thing. Perhaps in some distant future, we will build an all powerful AI system like we see in Hollywood movies. But today, AI is a collection of tools and technologies that let computers perceive the world, learn from data, reason and act. And these technologies work poorly together. We can build AI systems that work at human or super-human level, but only in narrow domains such as reading X-rays, playing the ancient game of Go, or transcribing spoken Mandarin into written English.

Another misconception is that AI is synonymous with machine learning (ML). In reality, machine learning is just one, albeit important, part of AI. Learning is an important part of our human intelligence. Many of the intelligent skills you have today, you learnt. You learnt to read, to write, to do mathematics. But just as learning is only one aspect of human intelligence, machine learning is only one aspect of machine intelligence. Beyond machine learning, they are other capabilities like understanding language, reasoning and planning that make up AI.

3 What is the opportunity?

In the last decade, exponential improvements in computing, data and algorithms have helped propel AI forward. Computer performance has been doubling every two years. Data, which is powering machine learning, has also been doubling every two years. And even the performance of many algorithms has been improving exponentially. For instance, error rates on one of AI’s standard benchmarks, the ImageNet database have been halving every two years. Funding of AI has also been increasing exponentially. In the public sector, the UK has an £1 billion AI plan, France has an €1.5 billion AI plan, and Germany has an €3 billion AI plan. The European Commission has called for €20 billion in investment in AI R&D from public and private sources. The US and China are making similar sized investments. Even India has a national AI strategy with plans to invest around \$500 million to improve agriculture, healthcare, education, the environment and national security.

In 2017, I was tasked by the Chief Scientist of Australia at the request of the Department of Prime Minister and Cabinet to co-chair a panel of experts from the various learned academies to undertake a horizon scanning exercise. We looked a decade or so out on how AI is going to impact society. Our goal was to identify how the Australian government might respond to the opportunities and challenges that AI offers. Our report [LW19] looked beyond the usual economic concerns. It argued that AI offers an opportunity to improve our well being: economic, environmental and societal. The economic opportunity is, of course, to improve productivity, reduce labour costs, promote health and safety, etc. But AI should not be seen just for this. It is also an opportunity to make society more inclusive. These are the very technologies that will give hearing to the deaf, sight to the blind, mobility to those with disabilities, etc. And these are also the technologies to help us act more sustainably, to heat and cool homes more efficiently, to feed populations more economically, to protect ecosystems and wildlife, etc. AI

offers Bhutan these same opportunities as it does Australia. These are technologies to improve your economic, societal and environmental well being.

This is perhaps best seen in the burgeoning research area using AI to tackle the UN’s seventeen Sustainable Development Goals (SDGs). Organizations like the “AI for Good” Foundation are applying AI to help solve social, economic, and environmental problems. The Foundations promotes a common vision for the AI research community, provides fora in which researchers, practitioners, policy-makers, and the public can come together, and offers incentives and funding for AI research outside traditional areas like defense and advertising and towards socially beneficial ends.

4 How do you win the AI race?

AI is often described as a race. And with giants like the US and China investing billions of dollars in winning that race, it’s hard to imagine that a small country like Australia, or an even smaller one like Bhutan has any chance in winning. Indeed, Kai-Fu Lee, an AI expert and former executive at Apple, Microsoft and Google has suggested that Europe isn’t even in the race for third place [Lee18]. It is, however, wrong to think of this as a race with a single winner. There is, of course, a scientific race to build AI. And as with any scientific race, only the first get the credit. But the race to apply and develop AI is one that the whole planet can win.

A good analogy is the race one hundred or so years ago to develop and apply electricity. It is true that people like Edison and Westinghouse received the initial patents. And it was their companies that initially gained many of the economic benefits. But today, electricity is used by companies and individuals around the world. It is all of us that share the benefit. AI will be similar. It will be a pervasive technology like electricity: in every home, office and factory. And all of can share the benefits. Finland’s AI plan is a fine case in point. As a small country, Finland doesn’t have the resources to compete with the US and China and win the scientific race to build AI. But the Finnish AI plan sets out the more realistic goal of being a winner in the race to apply AI [APL17].

5 What are the risks?

It would be irresponsible not to identify the risks that AI pose alongside the opportunities. These risks break down into economic, political and societal.

Economic risks: Concerns about the economic impact of AI have often focused on issues like employment and inequality in developed nations. Will robots take over many middle-class jobs? Will AI increase the inequality that is already fracturing these countries? There has been less analysis on the economic risks for developing nations. For example, will automation replace the outsourcing of work to developing nations? Will AI and other important and topical issues like climate change have a disproportionate impact on developing nations? More work is needed to understand the risks. However, it is already clear that doing nothing is not an option. AI is coming, and developing and developed nations alike need to prepare economically.

Political risks: Democratic institutions around the world are under siege. Trust in politicians and the political process is at an all time low. And technologies like AI appear to be amplifying these changes. We see AI, for instance, being used to micro-target voters as well as to generate deepfakes of audio and video that never took place. Technology companies are unsurprisingly under increasing pressure to address misinformation and polarization on their platforms.

Societal risks: Novelists like Orwell and Huxely have painted pictures of dystopian futures that it is becoming apparent technologies like AI could take us towards. AI driven face recognition software can, for example, be used to surveil and oppress populations on an unprecedented scale. AI could impact on many other human rights, even the right to life if we see AI being used on the battlefield to decide who lives and who dies. Even when restricted to large technology companies, we see AI driving societal outcomes that are highly undesirable such as filter bubbles and radicalism.

6 What can a pebble do?

No nation can sit on its hands and ignore the coming changes. There are perhaps half a dozen actions that a nation like Bhutan could take today that would ensure the AI revolution improves the well being of all of its citizens. Indeed, with the guidance and trust in institutions like the Royal Family, Bhutan is arguably better placed than many to take advantage of these changes.

Education: Finland is aiming to teach 20% of its population (1 million out of a population of just over 5 million) about the basics of AI with an online course, “Elements of AI”. In its first year, they have already reached 1% of the population. If Bhutan wants its citizens to profit from the coming AI revolution, it should have a similar ambition to equip them with the necessary skills. This could, for instance, be included as part of Gyalsung (National Service). In addition to lifting skills broadly, strategic investment in (overseas) postgraduate scholarships could help provide valuable technical expertise to government. It is not well known that there are only around 10,000 PhDs in AI worldwide. A modest investment could therefore have significant returns.

Government: Perhaps the institution best placed to profit from AI is government. It has the challenging job of delivering services efficiently and effectively to its citizens on a scale that is larger than any commercial operation. It collects more data than any almost any other institution and often is more trusted by citizens than any other institution. Applying AI to deliver better services such as health care, education and welfare starts with data. In fact, with universal health care and education, Bhutan is better placed than many developing nations to collect the data that will drive better delivery of these services. First and foremost should be a data plan. After this, the Bhutanese government needs to adopt an agile, rapid prototype and iterate software cycle to ensure its AI projects succeed. It may help to assemble a “tiger team” with strong skills in AI and outside the conventional departmental structures.

Regulation: Nations and supranational bodies like the EU are starting to regulate the use of AI. It is not enough to let the market decide how technologies like AI impact on our lives. We can already see problems starting to develop. Every nation state needs to consider where it might usefully regulate these technologies. For instance, most countries have strict rules on the use of conventional media like TV for political purposes, especially in the run up to elections. Social media is arguably even more persuasive, and yet is much less regulated. Most countries hold soap adverts on TV to higher standards than the political messages distributed by social media. Perhaps micro-targeting of political adverts should be banned? If you have a political message, you can target voters just on age (are they old enough to vote?) and location (are they in my voting district?). This would maintain freedom of speech, yet might help prevent the polarization we see today.

Diplomacy: The two nations bordering Bhutan, China and India have ambitious plans to exploit AI. But perhaps the most challenging area in which they plan to develop AI is on the battlefield. Thirty nations have so far called for a pre-emptive ban on the use of fully autonomous weapons at the United Nations. Bhutan, with its Buddhist traditions of

non-violence, would be well placed to take moral leadership on this issue and help ensure the region's security is not destabilized by the introduction of such weapons. The world will be a very unsafe place if such weapons turned up on the Indian, Pakistan, Kashmir or Chinese borders. Now is the time to raise the alarm.

7 Conclusions

Bhutan is a little gem within South Asia. His Majesty King Jigme Singye, The Fourth Druk Gyalpo, The King Father of Bhutan was far sighted in putting the improvement of the well being of the citizens of Bhutan at the centre of their government. In addition, by investing in technologies like the Chukha Hydropower Project, the King helped provide the economic wealth the achieve this goal. His Majesty King Jigme Khesar Namgyel Wangchuck has the opportunity to continue this foresighted intervention by embracing technologies like AI that can continue to improve their well being.

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