AI Superpowers: China, Silicon Valley, and the New World Order

Kai-Fu Lee

Contents

I. Book Synopsis (For chapter-by-chapter summaries, refer to Appendix I)

Kai-Fu Lee uses a remarkable storytelling technique in *AI Superpowers*; one that elucidates the success of the Chinese AI evolution through the eyes of central characters in each chapter.

The book gives a good introduction to deep learning as well as the four building blocks that would allow China to thrive in the new world order – abundant data, tenacious entrepreneurs, well-trained AI scientists, and a supportive policy environment.

From Chapters 2 to 6, Lee contrasts the differences in internet ecosystems/cultures *(chapter 2)*, opportunities *(chapter 3)*, approaches *(chapter 4)*, AI waves *(chapter 5)*, and future outlook *(chapter 6)* between the US and China. Lee then shares a heartfelt personal story in Chapter 7 which serves as a transition to Chapters 8 and 9 where he provides his recommendations and approach to AI based on the lessons learnt in Chapter 7 – primarily the emotional capacity that machines are unable to replicate.

The book touches on many ideas, but I would like to focus on the key driving factors in the new world order and draw examples throughout the book:

Abundant Data

In Chapter 4, we learnt that AI research in America is facilitated by openness and speed. Openness refers to the willingness to share information within the community; speed, as a result of technological advancements, allows data to be shared instantly. This is a similar phenomenon in China. In addition, Chinese researchers are voracious readers; and since the English language is a mandatory subject in Chinese public schools, they possess an additional edge over the Americans – the ability to access information from both English and Chinese-speaking AI communities (two of world's biggest). This might be a contributing reason to why China possesses the most data in the world *(chapter 2)*.

Chapter 5 briefly touched on "**structured data**", citing that this type of data optimizes Business AI (second wave of AI). This accounts for the United States' strong lead in business AI since major American corporations already collect large volumes of data stored in well-structured formats prior to the second wave.

Well-trained AI Scientists

In Chapter 4, Lee argues for quantity over quality in AI implementation since it does not only require a handful of elite researchers but an army of engineers, working with entrepreneurs, to convert discoveries into problem-solving companies. China's biggest advantage is no longer cheap labor *(chapter 5)* but unparalleled flexibility of the supply chains and armies of skilled industrial engineers.

Supportive policy Environment

In Chapter 3, Lee describes the Chinese culture as having a "tendency toward conformity" and "deference toward authority figures". Therefore, China would not have undergone a technological revolution without the endorsement from the Chinese leadership. The role of the government cannot be undermined when we analyze factors contributing to China's success in AI. Furthermore, the Chinese government pours in massive investments to fuel growth (throwing money and people at every problem), justifying "overpaying in the short term" by the monumental long-term upside. China's techno-utilitarian political culture *(chapter 4)* also meant that revolutionizing technologies could be deployed at faster pace.

Food for Thought: Disrupting the New World Order

Lee mentioned that a breakthrough similar to deep learning in scale will tip the balance of power as it returns everyone to an age of discovery. Hence, while this is unlikely, the final chapter of the New World Order is yet to be written.

II. Analysis of AI Superpowers

Succeeding with Big Data and IOT

We learnt that one of the most important strategies in Big data is coexistence. The ability for Big Data and AI technologies to coexist with existing technologies and platforms determines the success of many tech implementations. In his book, Lee illustrated many examples where the Chinese really embraced the **coexistence** strategy. In Chapter 5, Lee described how the Chinese built infrastructure and new cities around its autonomous AI vehicles. Whereas Mobikes in Chapter 3 integrated "solar-powered GPS, accelerators, Bluetooth, and near-field communications capabilities that can be activated by a smartphone" (Lee, p.78). The Mobikes example also exemplifies the power of **Fog Computing** as the sensors on the bikes were able to generate 20 Tb of data per day and feed it back to the cloud servers.

"If you build it, they will come."

In Chapter 2, Lee cites that American companies were quick to blame governmental protectionism for their failure in the Chinese market. However, these companies' main problem was resistance to localization. In order to build a product where "they" (i.e. customers) will come, American companies have to tailor their products to Chinese users' needs; or build them from scratch to meet the market's demands. The concept of customization applies to all products, including **Knowledge Management tools.** KM engineers must do their due diligence (e.g. conduct **KM audits** such as user interviews) before building a KM product that is welcomed by users.

Business AI Algorithms

In Chapter 5, we are introduced to Business AI which mines databases for hidden correlations in a business environment. Chapter 6 and 7 also illustrate how machines, using digital algorithms, can gather insights that would otherwise go unobserved. The importance of this cannot be undermined; this is evident in Chapter 7 when Lee was explaining how stages in cancer are ranked based on simple characteristics by what humans consider as "strong features". However, humans are not capable of discerning correlations between variables. Therefore, algorithms such as "**unobserved components**" (in my time series analysis DM project) allow us to uncover variables that have indirect effects, while **unsupervised learning such as feature selection** allows us to determine which attributes are highly correlated (and could be combined together) when there are many attributes in a dataset.

Organizational Culture

In Knowledge Management, it is important to have a strong culture that retains **tacit (and explicit) knowledge** to mitigate the problems of a brain drain. In Chapter 4, Lee explains that "team members leave to found their own AI startups…some groups like Microsoft Research, Facebook AI Research…publish articles on their most meaningful contributions". While business intelligence or data mined would still stay with a company during a brain drain; if knowledge is not captured, stored, and managed, the ability/know-how to utilize the data would be lost.

Overall, an amazing read! This book does a great job in dissecting the ongoing AI race between the US and China.

Appendix I – Chapter Summaries

Chapter 1: China Sputnik Moment	Central Character: Ke Jie A professional Go player who played against AlphaGo (AI) in 2017 Central Organization: Alpha Go Highlights: - Alpha Go was "systematically dismantling" Ke Jie, a world champion. - Google bought Alpha Go from British AI Startup DeepMind. By doing so, they did not only buy a product, but acquired knowledge and valuable talent. - Alpha Go runs on deep learning. - Alpha Go motivated the Chinese investment in AI. - Lee saw fear (pg.5: mass unemployment) and hope (pg.6: how humans find work and meaning in age of AI). - Lee introduced machine learning and AI views: (i) Rule-based camp (symbolic/expert systems) (ii) Neural Networks camp - Neural Networks require: 1. Computing Power; and 2. Data - Deep Learning = Multiplying power of old neural networks. Only really took off after 2012. AKA "Narrow AI". Best applied in fields on page 10 (bottom). - Deep learning algorithms "train itself to recognize deeply buried patterns and correlations…many of which invisible or irrelevant to human observers". - Success in Deep Learning depends on: (1) Massive Amounts of relevant data (2) Strong Algorithm. (3) Narrow Domain (4) Concrete goal. - China no longer a copycat + Global shift - Age of implementation (no longer discovery) - Age of Data (data is main driving factor for AI growth, not experts) - Real threat from AI in the new world order is the "unprecedented concentration of wealth

	in the hands of a few companies in China and the United States". China's differentiating factors: - 4 Building Blocks: abundant data, tenacious entrepreneurs, well-trained AI scientists, and supportive policy environment
Chapter 2: Copycats in the Coliseum "But I saw early copycats like Wang Xing's Twitter knockoff not as stumbling blocks but as building blocks."	Central Character: Wang Xing "The Cloner" Highlights: - Contrasting cultures (Silicon Valley VS China's internet ecosystems) - You can find copycats of any kinds of products. - First act of copying was a necessary stepping stone. - Alibaba thrive on a freemium model VS eBay that charges for every activity. - US companies see Chinese government protectionist as a problem. In reality, it is their resistance to localization (tailoring products for Chinese users or building from scratch to meet market demands). - Silicon Valley's work ethic pales in comparison to China's maniacal work ethic. - The Lean startup model resonates with Chinese startups more. - Wang Xing exemplifies "tenacious entrepreneur".
Chapter 3: China's Alternate Internet Universe "It had the leapfrog technology, the funding, the facilities, the talent, and the environment. The table was set to create internet companies that were new, valuable, and uniquely Chinese"	Central Character: Guo Hong Chinese Government Official / Entrepreneur / Technologist Central Organization: WeChat "Digital Swiss Army Knife" / "Remote Control for Life" Highlights: - Zhongguancun as China's Silicon Valley - Copycat Era to an Era of Innovation (2013) - WeChat evolving into a "Digital Swiss Army Knife" rather than a mere copycat and known by another American shorthand (e.g. "the Facebook of China"). - China being the "Saudi Arabia" of Data - Google's departure + China's Mobile Leapfrog

	- WeChat VS Alibaba (pearl harbor of mobile payments) China's differentiating factors: (i) AI Expertise; (ii) Government Support - Engineering Prowess + Raw Manpower, i.e. "willingness to get one's hands dirty" / "grunt work" - Scale + Spending + Efficiency - China amassing data from the real world VS Silicon Valley's data from activities online. - "If you build it, they will come", i.e. Zhongguancun, Beijing to nation-wide. - Chinese central government laid out goals, implementation left to local officials. - Chinese government's heavy spending and explicit endorsement of internet (revolutionizing culture). - Bringing O2O (online-to-offline) to every single aspect of life. - Heavyweight China VS Silicon Valley with a light touch - Low barriers to entry + going cashless - Amassing AI data from mobile transactions and IoT (e.g. Mobikes).
Chapter 4: A Tale of Two Countries "Utilitarian (China) government systems and rights-based (USA) approaches both have their blind spots and downsides."	Central Organizations: Seven Giants of the AI age Google, Facebook, Amazon, Microsoft, Baidu, Alibaba, and Tencent Highlights: - Lee's first encounter with China's most important AI company founder at the University of Science and Technology of China in Hefei. - World's most important AI conference's organizers starts to value the participation of Chinese researchers (2017's Chinese New Year conference conflict). - Percentage of AI journals/papers by authors with Chinese names doubled from 23.2% to 42.8% from 2006-2015 - Introduction to the Seven Giants of the AI age: Google, Facebook, Amazon, Microsoft, Baidu, Alibaba, and Tencent. Almost evenly split between 2 countries. - AI breakthrough threatens balance of power.

	- Google has best shot at the "next deep learning" given its enormous spending spree. - Power Grid giants VS Battery-powered startups in China (building AI products for each specific use-case). - Chinese hopes to disrupt the chip industry. China's differentiating factors: - China's techno-utilitarian political culture "paving way for faster deployment of game-changing technologies" and "rewards proactive investment and adoption" VS America's combative political system that "aggressively punishes missteps or waste in funding technological upgrades" but unparalleled in "personal freedom and technological achievement". - AI era rewards "quantity of solid AI engineers" over "quality of elite researchers". - Army of engineers working with entrepreneurs to convert discoveries into problem-solving companies. - Open research culture + rich connectivity within China's AI community - Building unrivaled chip capabilities - Task-focused Chinese AI plan VS American AI plan (by Obama). - Chinese local officials willingness to take risks VS US government's risk-averse approach after 2008.
Chapter 5: The Four Waves of AI "Not surprisingly, Chinese and American tech companies are taking very different approaches to global markets: while America's global juggernauts seek to conquer these markets for themselves, China is instead arming the local startup insurgents."	Central Character: Liu Qingfeng Founder of iFlyTek Central Organization: iFlyTek Cutting-edge capabilities in speech recognition, translation, and synthesis Highlights: 1. Internet AI - Largely using AI algorithms as recommendation engines - Leverages internet users' automatic labelling data - Divided 50-50 lead between US and China today, China leading 60-40 in 5 years.

	2. Business AI - Mines databases for hidden correlations. - US leading 90-10, 70-30 in 5 years. 3. Perception AI - Revolutionizing visual and audio files. - Digitalizing physical world through sensors and smart devices. - From O2O to OMO (online-merge-offline) - China leading 60-40, 80-20 in 5 years. 4. Autonomous AI - Integration and culmination of the first 3 waves - Rise of Swarm Intelligence - Google (perfectionist) VS Tesla (fast to deploy) approach - China's "tesla" approach but better: deployment offers accumulation of real-world data to improve safety, done in a controlled setting. China also building infrastructure and even new cities around autonomous AI (such as highways specifically for autonomous vehicles and environmentally sustainable cities). - In terms of core autonomous technology, China is behind US by 2-3 years since US still has the best engineers in (4). - US leading 90-10 today, but China will catch up with 50-50 power balance in 5 years. - (1) and (2) already around us and reshapes the digital and financial worlds. - (3) now digitizing our physical world. - (4) "will come last but will have the deepest impact on our lives". - China in strong position to lead (1) and (3), catching up with US on (4). US maintains clear leadership in (2) with 90-10 lead over China. - Silicon valley - world champion of software innovation, Shenzhen - champion of hardware.
Chapter 6: Utopia, Dystopia, and the Real AI Crisis "Massive productivity gains will come from the automation of profit-generating tasks, but they will also eliminate jobs for huge numbers of workers."	Highlights: - Artificial General Intelligence (AIG) - AI adoption accelerated by three catalysts: (i) Digital Algorithms; (ii) VC Funding; (iii) China - Risk of Replacement graphs - "AI naturally gravitates toward monopolies. Its reliance on data for improvement creates a

	self-perpetuating cycle: better products lead to more users, those users lead to more data, and that data leads to even better products, and thus more users and data." Utopian Views: - Full Merger of humans and machines - AGI allows us to rapidly decode mysteries of the physical universe. Dystopian Views: - Power of a super intelligent agent, much greater than that of humans, could wipe us out if we are not careful.
Chapter 7: The Wisdom of Cancer	Central Character: Kai-fu Lee The author. Had many accomplishments. Diagnosed with stage IV lymphoma cancer in 2013. Highlights: - Recounting wife's labor where he was deliberating the pros and cons of being present for the labor or his important meeting with John Sculley. Lee realized that it was a manifestation of the machine-like mentality that had dominated his life for years. - From Master Hsing Yun, he learnt about disposition, "a way of understanding oneself and encountering the world that didn't boil down to inputs, outputs, and optimizations". - In cancer, ranking stages based on simple characteristics of a complex disease is how humans consider basing decisions on "strong features", but we are very limited in our ability to discern correlations between variables. - It will not be long until AI algorithms can perform many of the diagnostic functions of medical professionals.
Chapter 8: A Blueprint for Human Coexistence with AI "If we hope to write a new social contract for the age of AI, we will need to pull on the levers of public policy."	Highlights: - Machines are capable of many things, but do not (yet) have emotional capabilities. - Building societies in AI era requires significant changes to our economy as well as a shift in culture and values. - Three most popular policies for adapting to AI economy are: "technical fixes", tweaks to

	policy and business models that seek to smooth transition but not shift culture. - Right now, Chinese tech elites believe technology always lead to more jobs and greater prosperity for all (Utopian view). - Three R's to mitigate AI-induced job losses: Reduce work hours, retrain workers (and promote lifelong learning), and redistribute income (having a universal basic income). - Human-AI coexistence in the labor market model on page 211 provides a solution to the replacement graphs in chapter 6. - Big changes need to be driven by the full force of governmental power. - Lee's proposed alternative to UBI is social investment stipend (salary for work done in promoting a "kind, compassionate, and creative society".
Chapter 9: Our Global AI Story "Let us choose to let machines be machines and let humans be humans."	Highlights: - Steve Jobs' quote about connecting the dots looking backwards resonates with Lee because his experience moving and transitioning between two different cultures has impressed on him the value of shared progress and need for mutual understanding across national borders. - Not engaging in a "race" because it is not a conquest. - Countries need to look to each other for support and inspiration. - Education systems can be revamped by learning from other countries (e.g. South Korea). - Learning from different cultures. - Government cooperation in ethical issues and evaluation of tradeoffs. - AI has its limitations, we should use it as a tool to discover deeper meanings without forgetting about interpersonal relationships.