AI and Strategy

Outline of Remarks

I. Strategic Applications

   Strategic concepts; AI applications

II. Strategic Competition

   U.S., China, Others

III. Strategic Environment

   Arms racing, Offense-defense, Social dimension

"The convergence of the artificial intelligence revolution and the reemergence of great power competition must focus the American mind."

First sentence, *Interim Report of the National Security Commission on Artificial Intelligence*, November 2019

I / Strategic Concepts

- Strategy Definitions
- Dimensions of Strategy
  - Logistical
  - Operational
  - Sociological
  - Technological

Clausewitz
> "the use of engagements for the object of war"

Hart
> "the art of distributing and applying military means to fulfill the ends of policy"

Howard
> "the deployment and use of armed forces to attain a given political objective"

I / Strategic Concepts

- Strategy Definitions

- Dimensions of Strategy

- Grand Strategy
  - Broader aspects of war
  - Inversion of conquest and defeat
 - Technological v. social dimensions

I / AI Applications

- AI is Power
- Tactical Applications
  - Autonomous control
  - ISR, target identification
  - Battlefield management
- Operational Decision-making
  - Situational awareness
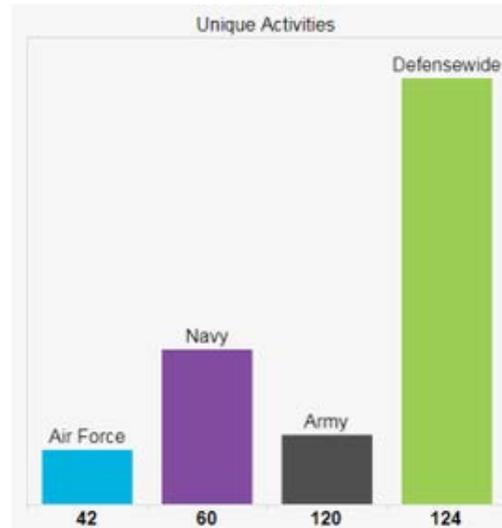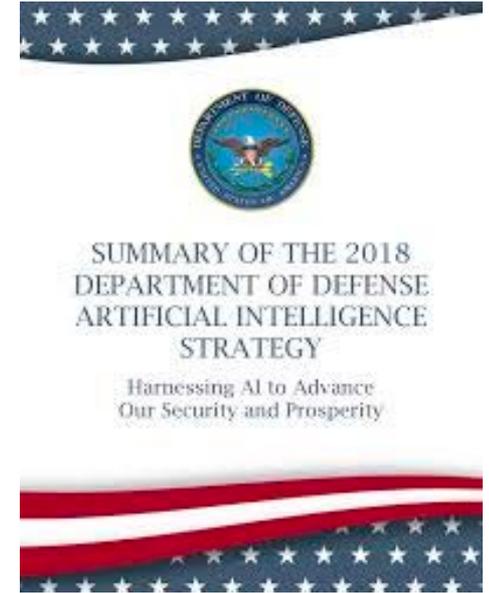 - Risk analysis

I / AI Applications

- Strategic Influences
  - Tactical and operational impacts
  - Command and control
  - Limited grasp of human meanings
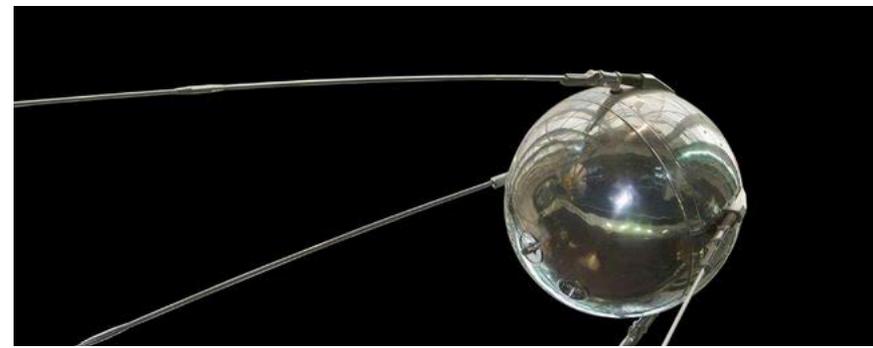 - Challenge of trust
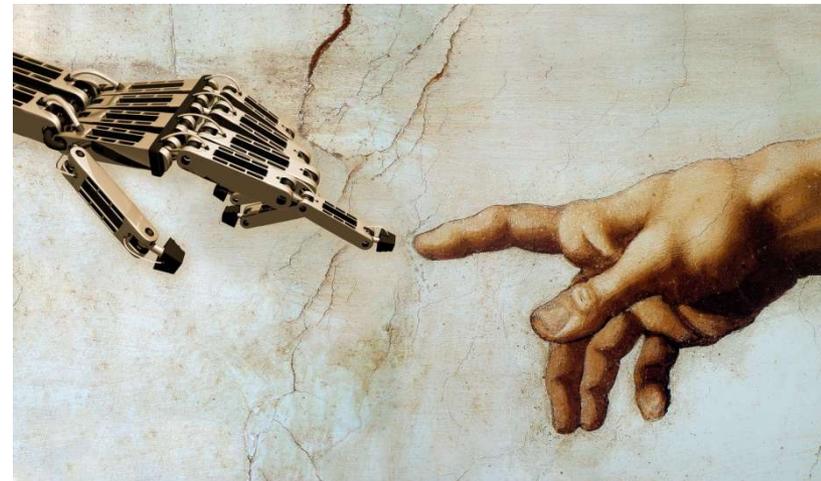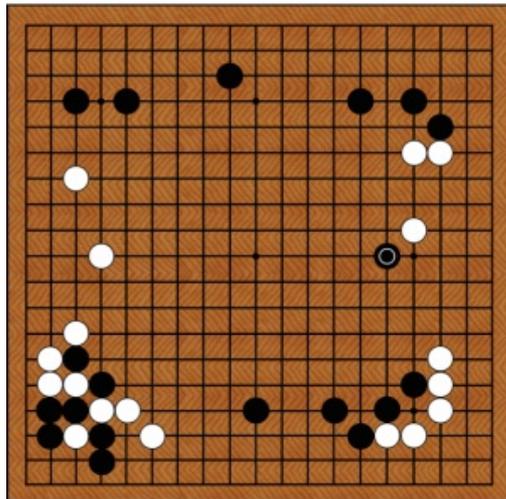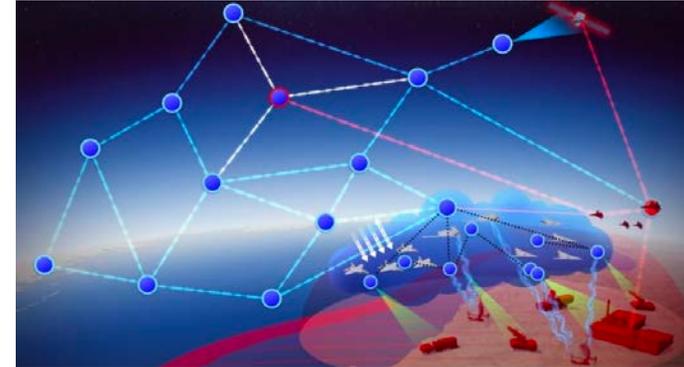
II / United States

- Policy direction
  - Clear acceleration
  - Strategy of inclusion
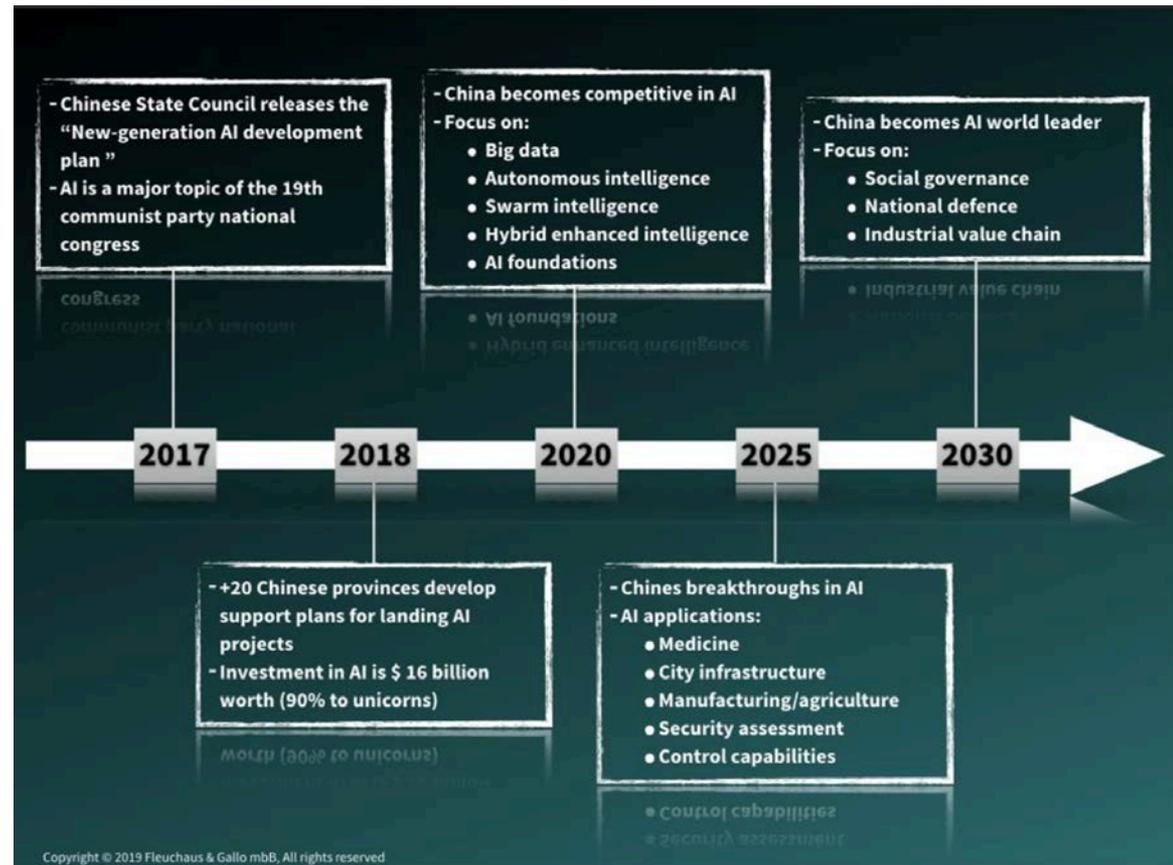- Resourcing
  - USG + private sector

SUMMARY OF THE 2018
DEPARTMENT OF DEFENSE
ARTIFICIAL INTELLIGENCE
STRATEGY

Harnessing AI to Advance
Our Security and Prosperity

BA #	Budget Activity Title (group)	Unique Activities	FY2020 Funding
1	Basic Research	62	$569.49
2	Applied Research	122	$908.35
3	Advanced Technology Development (ATD)	86	$814.76
4	Advanced Component Development & Prototypes (ACD&P)	34	$821.49
5	System Development & Demonstration (SDD)	9	$80.27
6	RDT&E Management Support	16	$429.93
7	Operational Systems Development	17	$398.11
Grand Total		346	$4,022.39

Unique Activities

Air Force	Navy	Army	Defensewide
42	60	120	124

II / China

- "Sputnik moment"
- Policy direction

国务院关于印发
新一代人工智能发展规划的通知
国发〔2017〕35号

- Chinese State Council releases the "New-generation AI development plan"
- AI is a major topic of the 19th communist party national congress

- China becomes competitive in AI
- Focus on:
  - Big data
  - Autonomous intelligence
  - Swarm intelligence
  - Hybrid enhanced intelligence
  - AI foundations

- China becomes AI world leader
- Focus on:
  - Social governance
  - National defence
  - Industrial value chain

2017   2018   2020   2025   2030

- +20 Chinese provinces develop support plans for landing AI projects
- Investment in AI is $ 16 billion worth (90% to unicorns)

- Chines breakthroughs in AI
- AI applications:
  - Medicine
  - City infrastructure
  - Manufacturing/agriculture
  - Security assessment
  - Control capabilities

II / China

- "Sputnik moment"
- Policy direction
- Military applications
- Social implementation

II / US-China

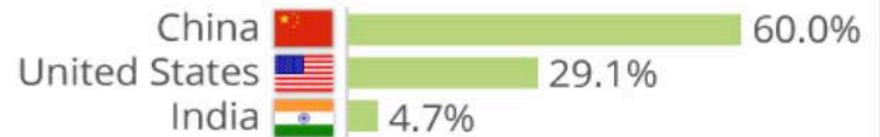| Area	U.S.	China
AI Researchers "Top" Researchers (H-index)	28,536 5,158 (18%)	18,232 977 (5%)
"Top" AI Researcher Ph.D. Source	44%	11%
Published Papers Impact (FWCI)	1.83 (83% > avg.)	0.94 (6% < avg.)
Capital Resourcing (VC + PE)	$16.9 billion	$13.5 billion
Highly Cited AI Patents (1960-2018)	28,031	691
Firms Adopting / Piloting AI	22% / 29%	32% / 53%
GDP Payoff Projection 2030	$3.7 trillion (14.5%)	7.0 trillion (26.1%)
Semiconductors: # Firms Top 15 Sales # Firms Top 10 R&D # Firms Designing AI Chips	6 5 55	1 0 26
# Supercomputers in Top 500	92	219

AI: A Two Horse Race For Global Dominance

Countries with the highest shares in the following areas of artificial intelligence

Share of global AI patent applications from 1997 to 2017

China — 37.1%
United States — 24.8%
Japan — 13.1%

Share of global AI investment and financing from 2013 to Q1 '18

China — 60.0%
United States — 29.1%
India — 4.7%

Share of AI experts/talents worldwide in 2018

United States — 16.5%
China — 9.4%
India — 8.5%

Share of papers published in the field of AI from 1997 to 2017

United States — 22.1%
China — 19.6%
United Kingdom — 5.8%

Share of AI companies as of June 2018

United States — 41.0%
China — 20.5%
United Kingdom — 8.0%

@StatistaCharts

statista

10

Biggest AI startups
(Source: CB insights — Feb. 2019)
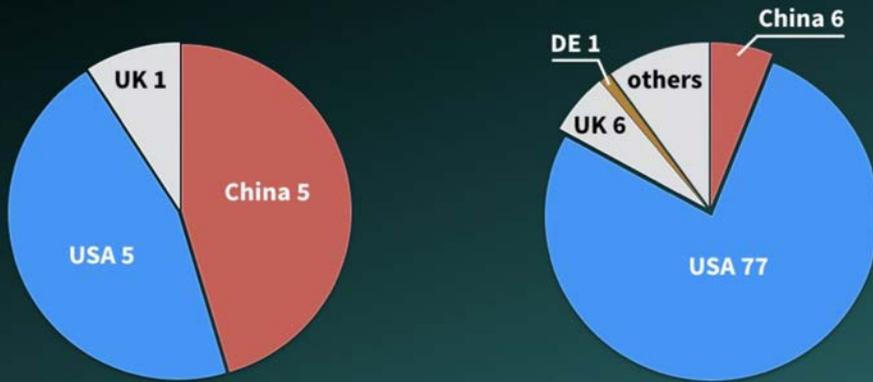
Top AI unicorn startup — UK 1, China 5, USA 5

Top 100 AI startups — China 6, DE 1, others, UK 6, USA 77

Top 20 universities in AI research
(Source: WIPO Technology Trends 2019 Artificial Intelligence — 2019)

France 1, Singapore 2, Japan 1, China 10, USA 6
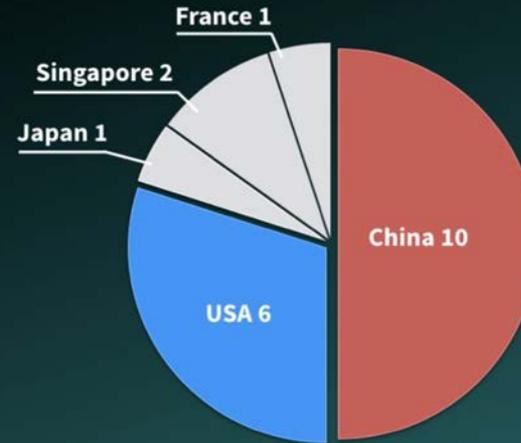
Top 20 Universities and public research organisations by number of papers

ACTIVE PLAYERS IN AI
(Source: Boston Consulting Group — Dec. 2018)

AI adoption / AI piloting

China: 53% / 32%
USA: 29% / 22%
France: 29% / 20%
Germany: 29% / 20%
Switzerland: 31% / 15%
Austria: 29% / 13%
Japan: 28% / 11%
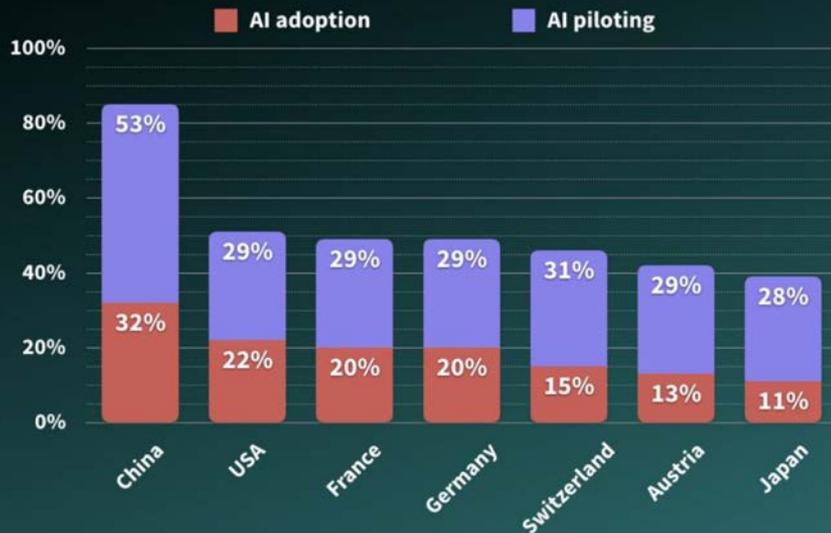
Patent filings by patent office
(Source: WIPO Technology Trends 2019 Artificial Intelligence)

Number of patent applications filed — USA, China, Japan, WIPO, EPO, Rep. of Korea, Germany

11
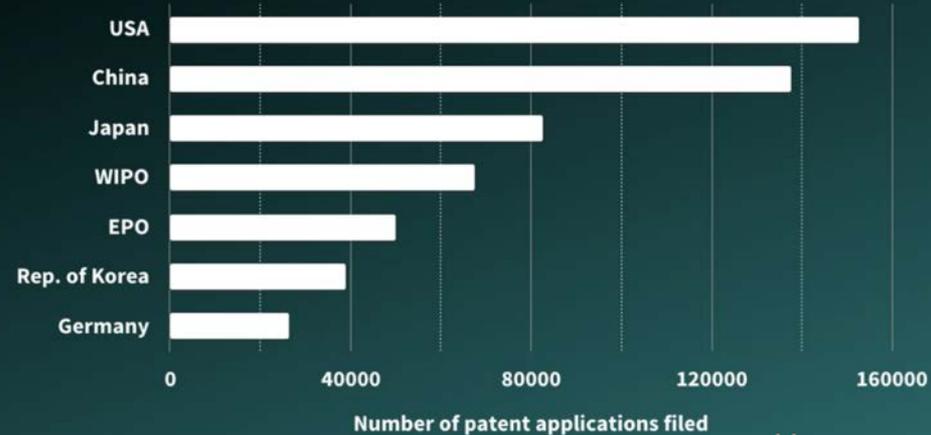
Field-weighted citation impact, 1998–2016

Legend: China · EU · U.S.
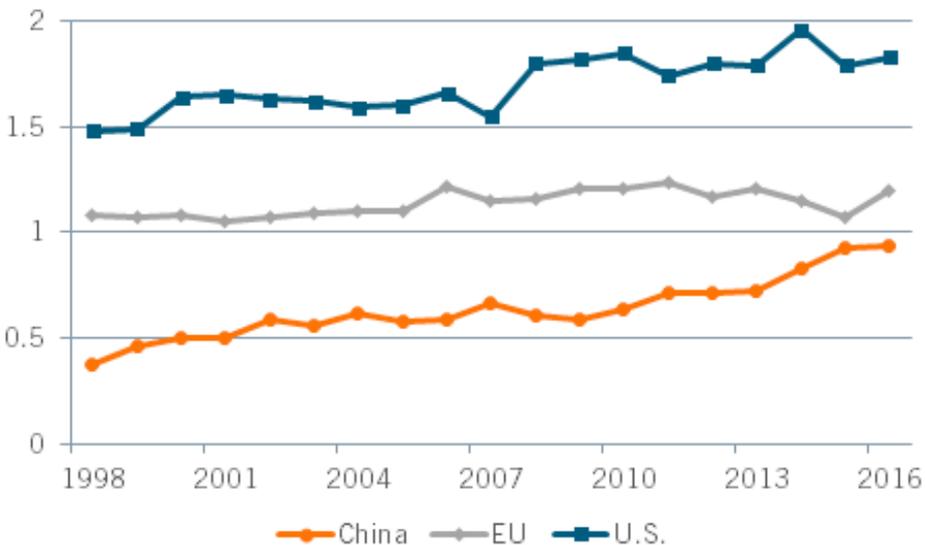
Share of top 50% of AI Papers

Legend: China, US, China Fit, US Fit
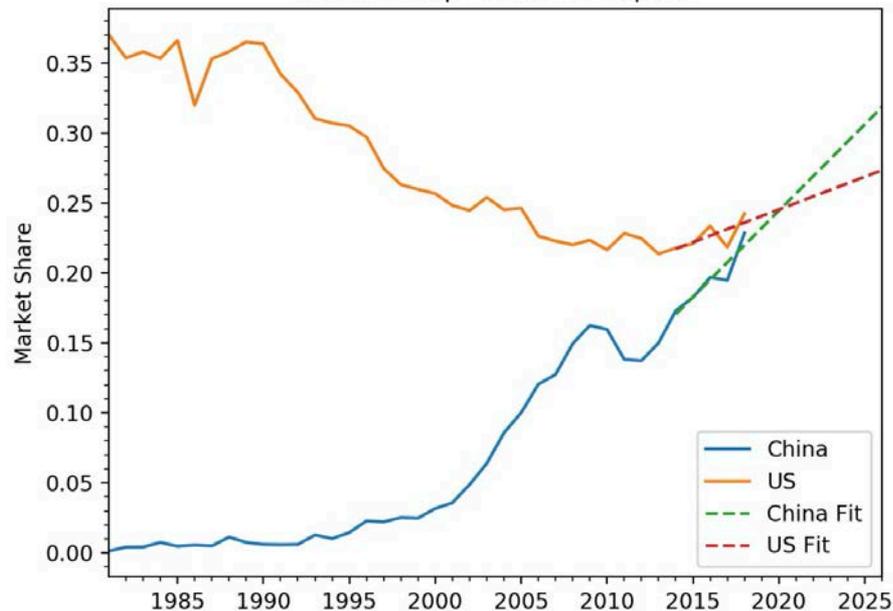
Share of top 10% of AI Papers

Legend: China, US, China Fit, US Fit
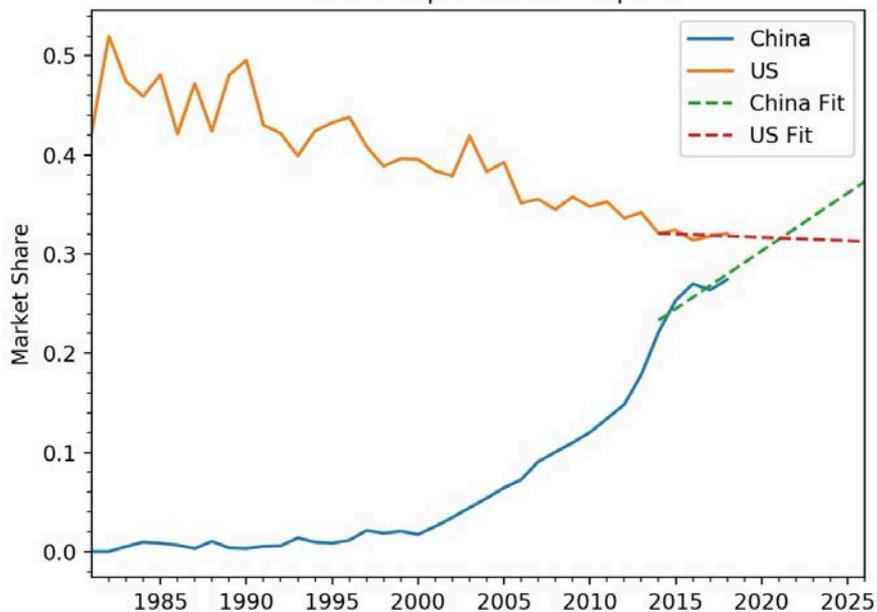
Share of top 1% of AI Papers

Legend: China, US, China Fit, US Fit
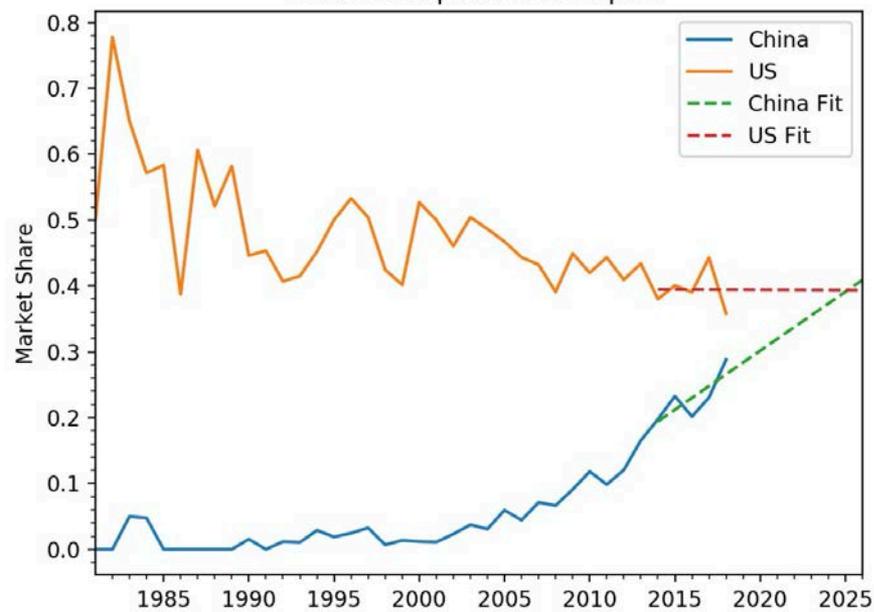
Data (2018)	U.S.	China
IoT Data (TB millions)	69	152
Broadband Subscriptions (millions)	109.8	394.2
Mobile Payments (millions / percent)	55.0 (20%)	525.1 (45%)

Global Datasphere by Region
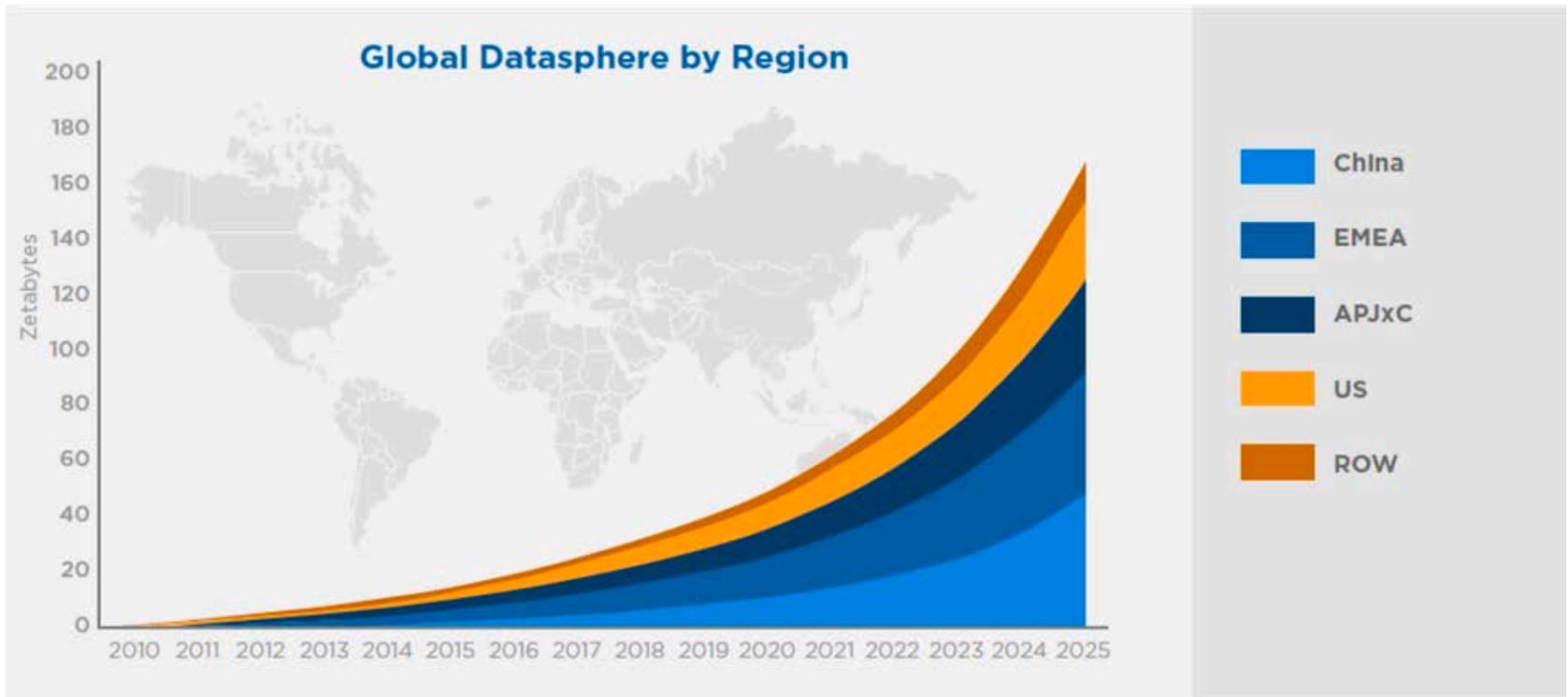
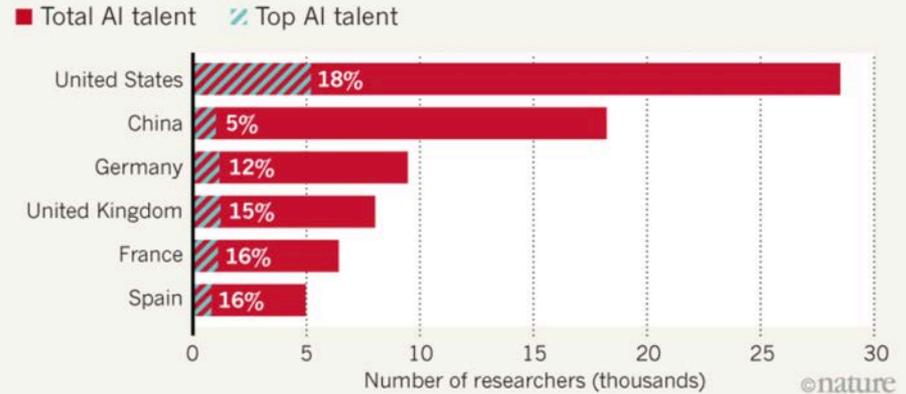Source: IDC's Data Age 2025 study, sponsored by Seagate

II / Others

- European Union
- Russia
- Other actors?
  - Asymmetric power diffusion

AI TALENT CONCENTRATION

China has the second-largest number of researchers who have published AI papers or been issued patents in the past decade. But the proportion of those considered to be in the top 10% of the field is smaller than in other AI-leading nations.

■ Total AI talent   ▨ Top AI talent

Country	Top AI talent %
United States	18%
China	5%
Germany	12%
United Kingdom	15%
France	16%
Spain	16%

Number of researchers (thousands) — scale: 0, 5, 10, 15, 20, 25, 30

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Category	China	European Union	United States
Talent	3	2	1
Research	3	2	1
Development	3	2	1
Adoption	1	2	3
Data	1	3	2
Hardware	2	3	1

Машинное обучение
Machine learning

III / Arms Race

- Perception of Utility
- Premature Deployment
- Arms Control?
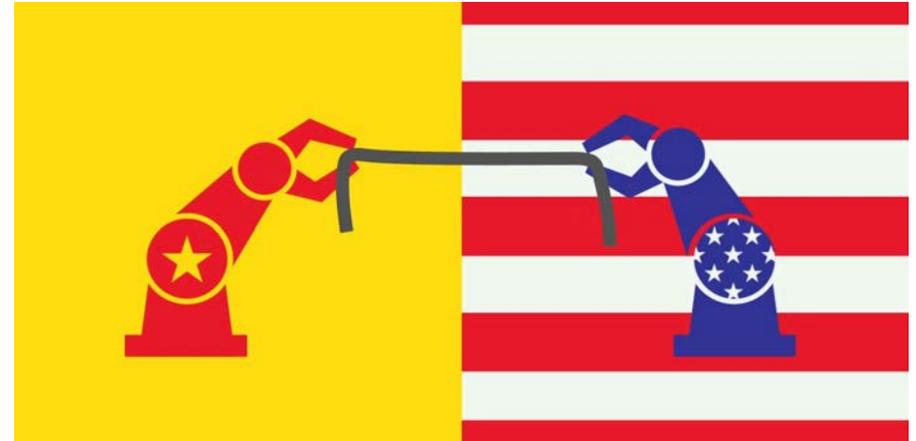
III / Offense-Defense Balance

- Shared Applications

- Uncertain Applications

- Opaque Applications

III / Sociological Dimension

- Intrinsic Factor of Strategy
- Cold War Expression
- Strategy in the Information Age

*"**Each of us is convinced of our inability, within the confines of our respective fields of expertise, to fully analyze a future in which machines help guide their own evolution.**"*

- **Henry Kissinger**, former U.S. Secretary of State and National Security Advisor
- **Eric Schmidt**, Chairman of the DoD Innovation Board; former CEO and Executive Chairman of Google and Alphabet.
- **Daniel Huttenlocher**, Inaugural Dean, Schwarzman College of Computing, Massachusetts Institute of Technology.

"The Metamorphosis," *The Atlantic,* August 2019