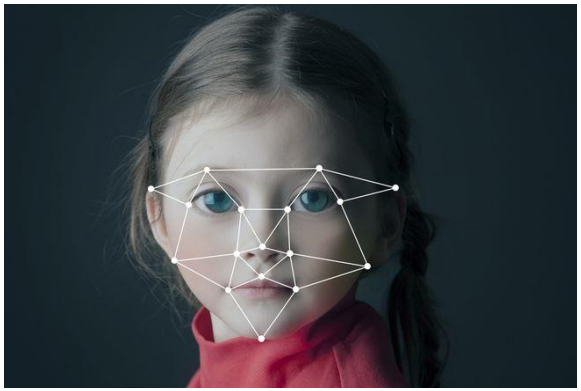
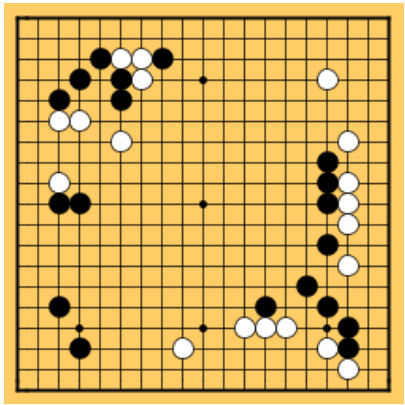
AI, now and future

Wei Xu
Baidu

1. Now
2. Future

AI wave

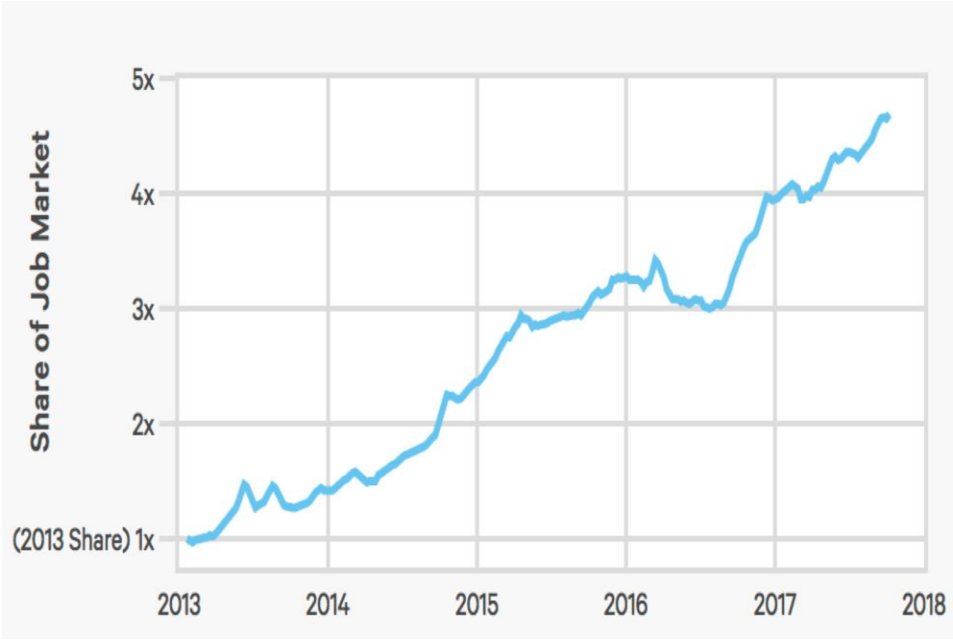




Baidu

AI job market

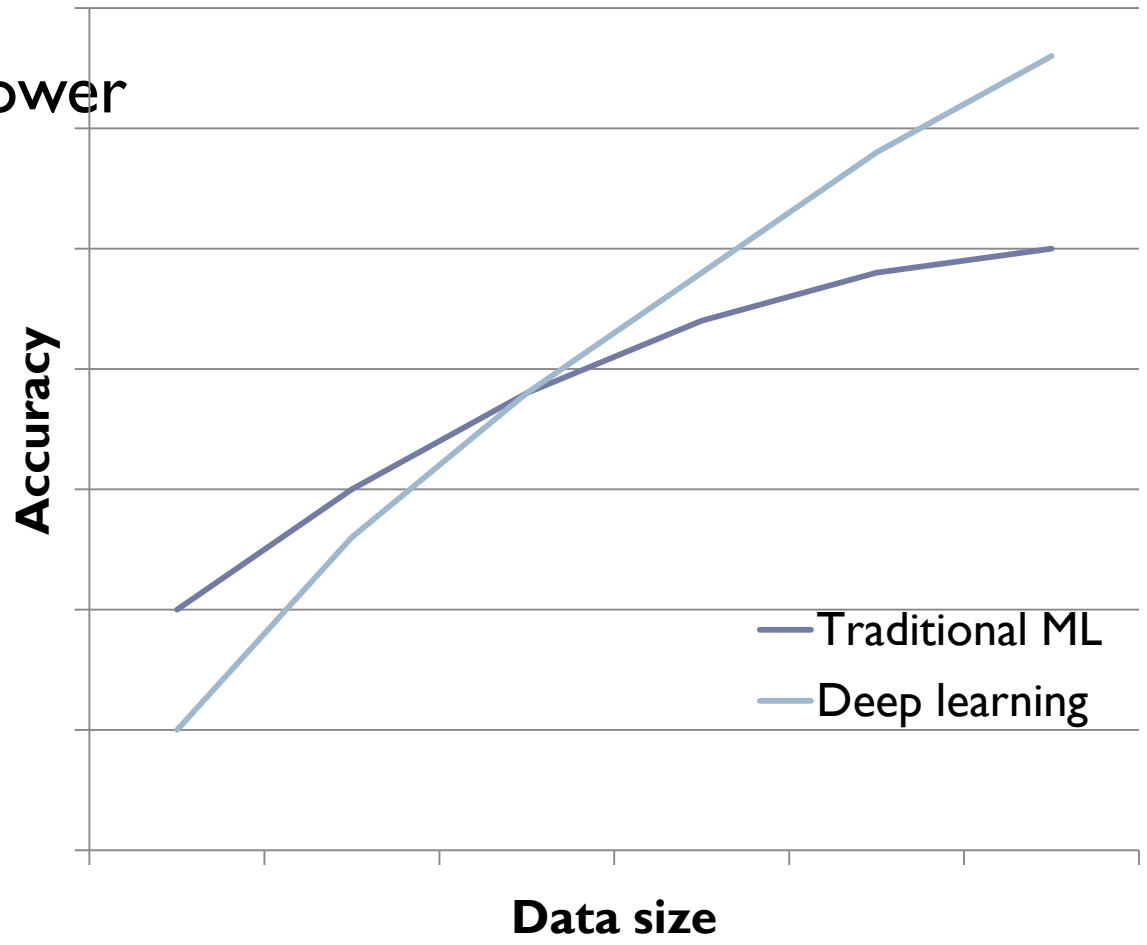
AI Job opening change in China (%)
Data source: zhaopin.com
Figure credit: zhaopin.com



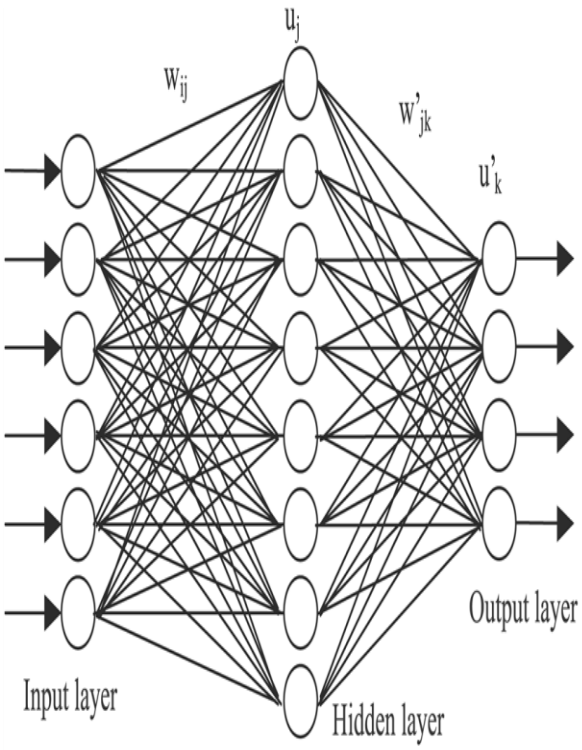
Shares of US Jobs Requiring AI Skills
Data source: indeed.com
Figure credit: AI Index 2017 Annual Report

Driving forces for the recent AI progress

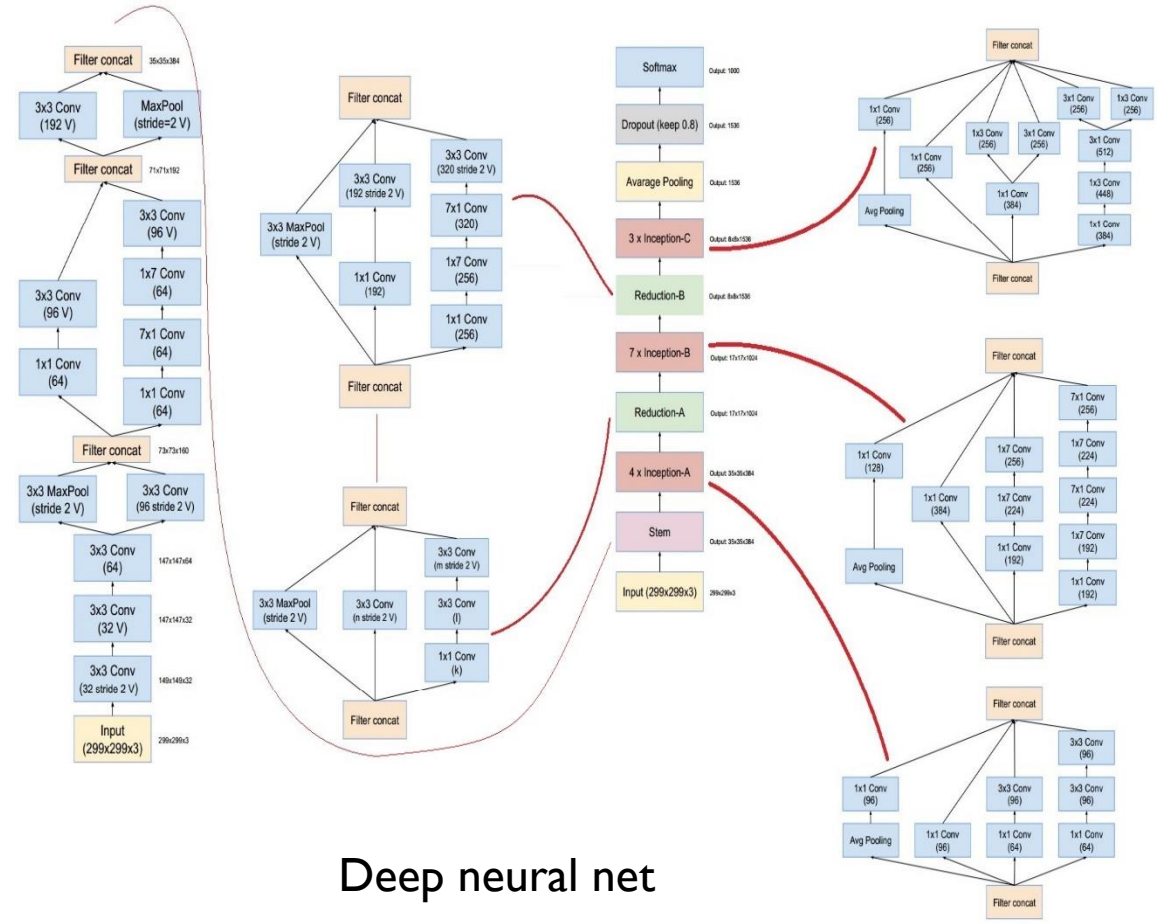
- Big data
- Computation power
- Deep learning



Deep learning revolution

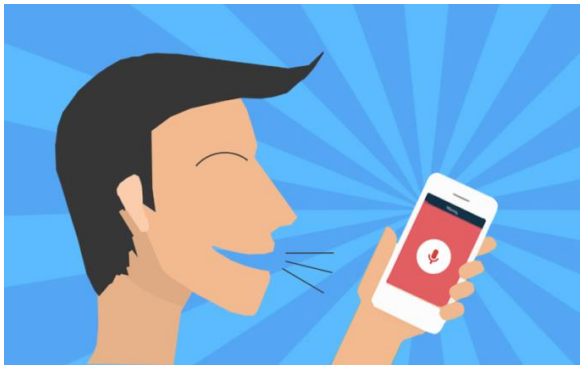


Shallow neural net



Deep neural net

Speech recognition



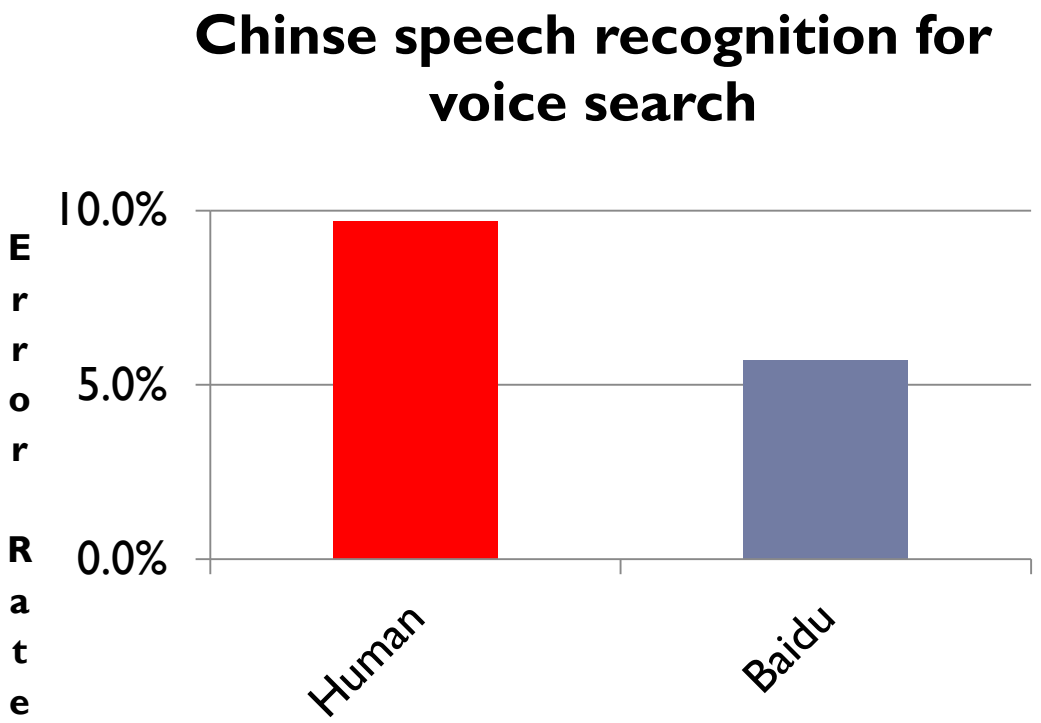


Image recognition

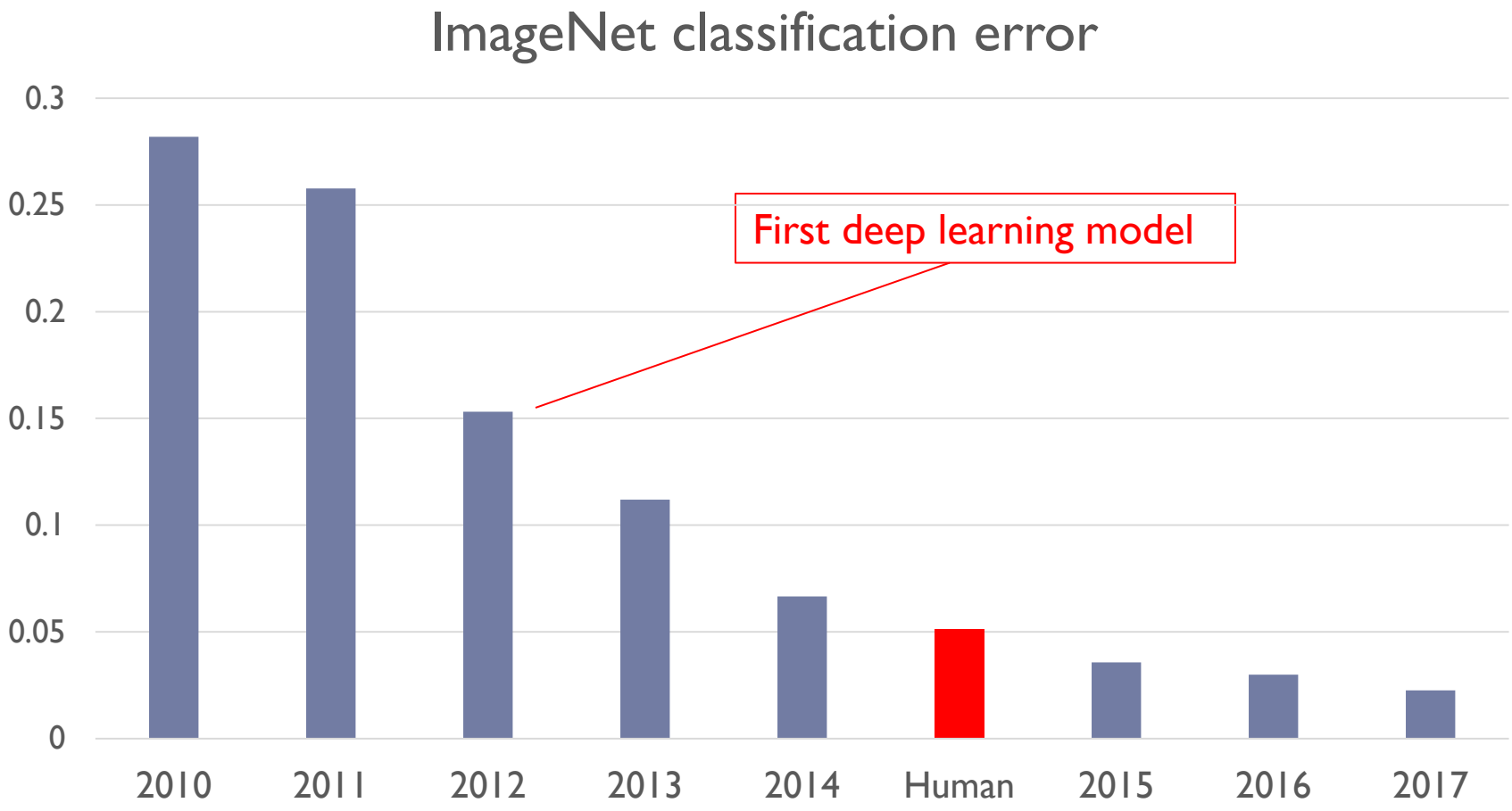


Image recognition

Japanese cherry

Sushi

Ferrari California

Echeveria Mebina

Mapo tofu

Toyota land cruiser

Face recognition from parental faces

Face recognition across time - finding lost person

4 year old

10 year old

Generating faces

Karas et. al. 2018

Medical image analysis: skin cancer

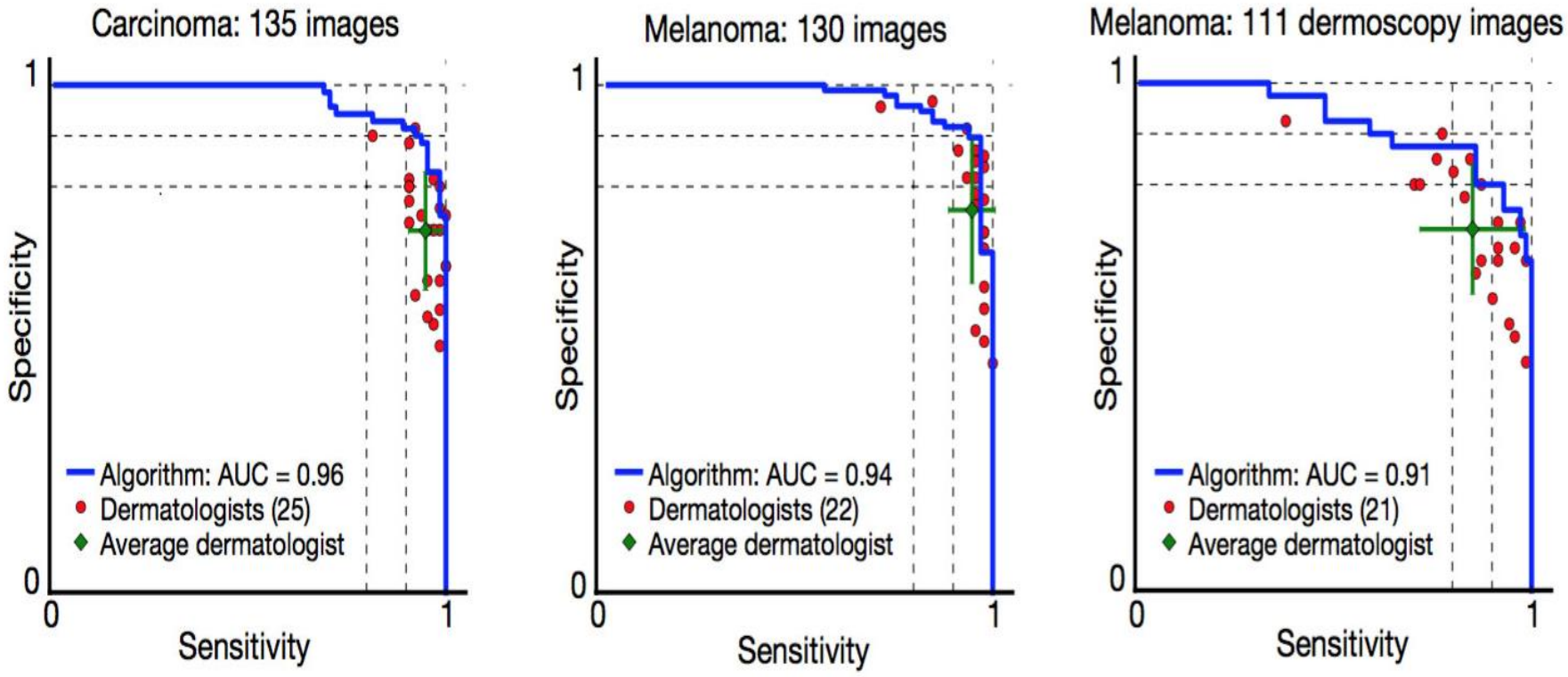
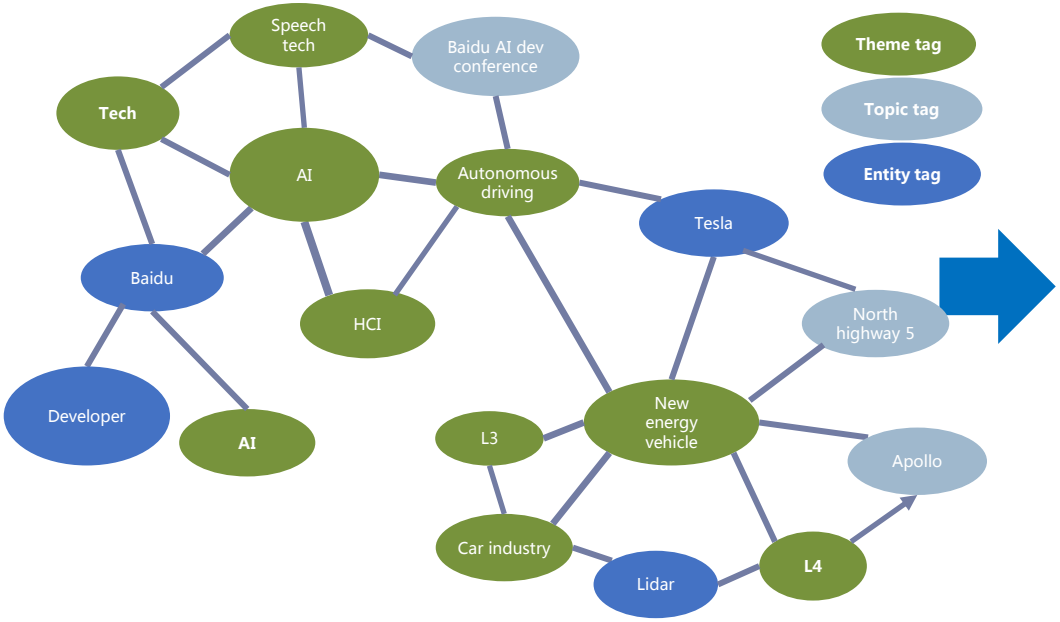


Figure from Esteva et al.

Document analysis



Graph

Baidu held its first AI developer conference
Creating the most complete AI open eco-system

Jul. 5, Baidu AI developer conference (Baidu Create 2017) was held in Beijing national conference center. Baidu announced its complete AI eco-system strategy to 5000 developers and partners.

Baidu founder, board president and CEO Robin Li said, "AI is the destined future, openness will benefit more people.

Theme tag
Technology 0.93
AI 0.95

Topic tag
Baidu create 0.95

Entity tag
Baidu 0.9
Robin Li 0.9
Qi Lu 0.9
DuerOS 0.75
Apollo 0.7

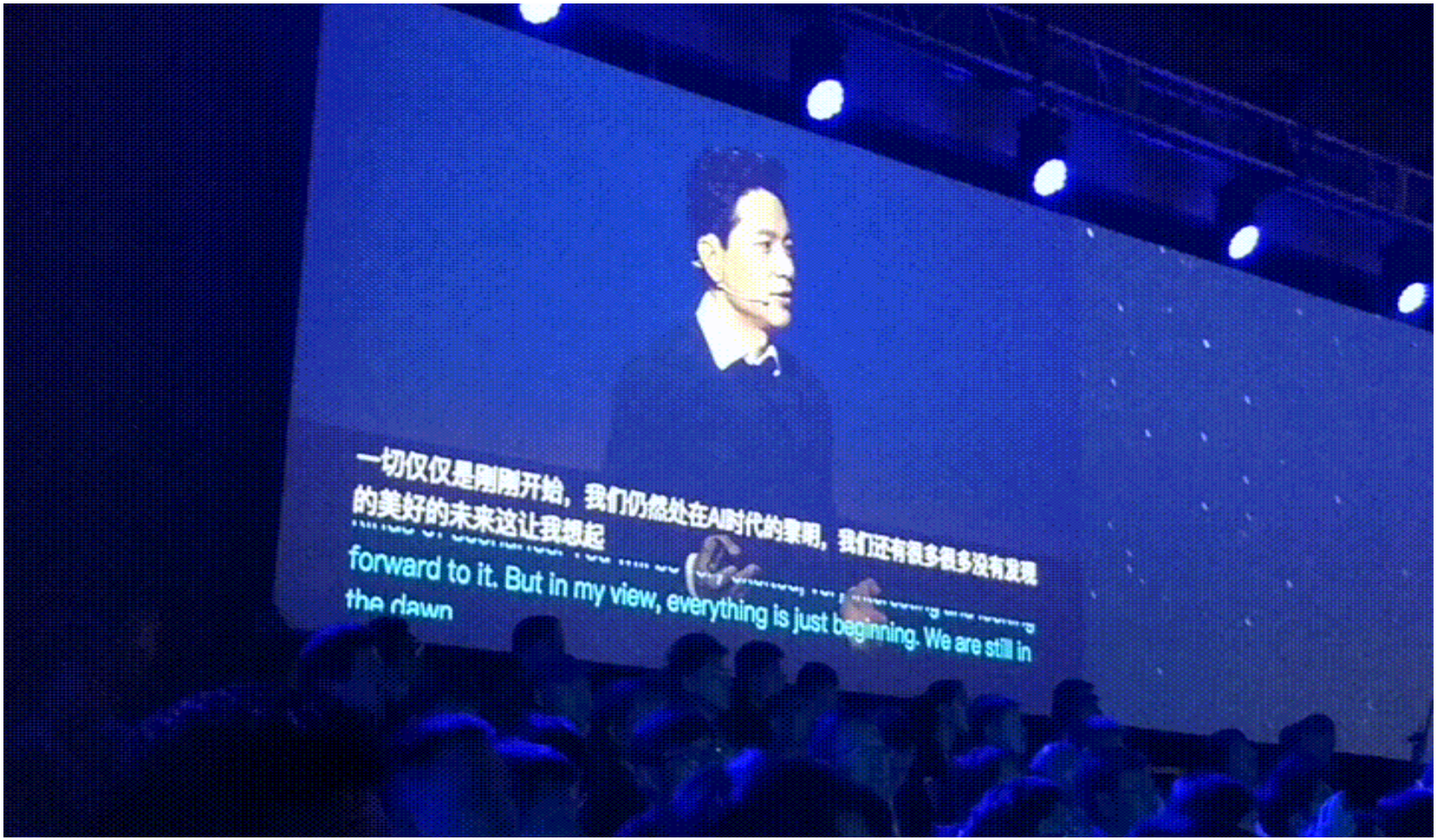
Machine Translation

Text translation

Conversation translation

OCR translation

Simultaneous translation



Reading comprehension – single document

The Stanford Question Answering Dataset

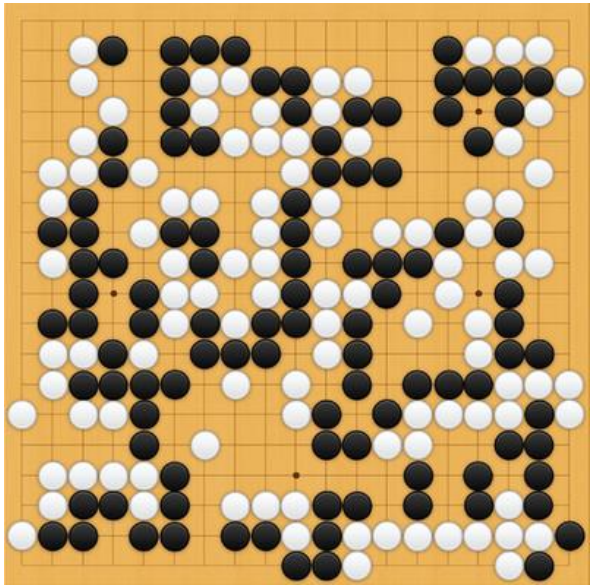
Rank	Model	EM	F1
	Human Performance *Stanford University* (Rajpurkar et al. '16)	82.304	91.221
1 Mar 19, 2018	QANet (ensemble) *Google Brain & CMU*	**83.877**	**89.737**
2 May 10, 2018	MARS (ensemble) *YUANFUDAO research NLP*	83.520	89.612
3 Mar 06, 2018	QANet (ensemble) *Google Brain & CMU*	82.744	89.045
4 May 09, 2018	MARS (single model) *YUANFUDAO research NLP*	82.587	88.880

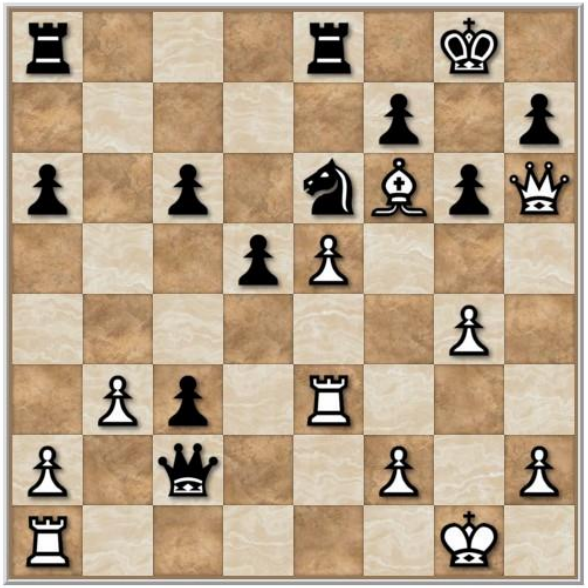
Reading comprehension: multi-document

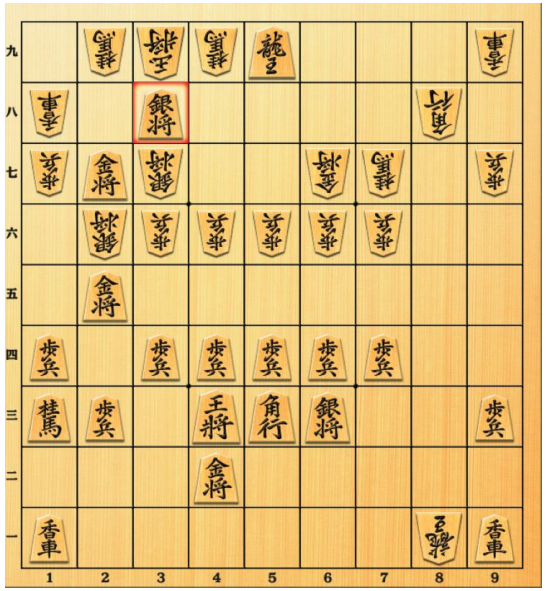
Microsoft Machine Reading Comprehension Dataset (MS MARCO)

Rank	Model	Submission Date	Rouge-L	Bleu-1
1	**MARS** YUANFUDAO research NLP	March 26th, 2018	49.72	48.02
2	**Human Performance**	December 2016	47.00	46.00
3	**V-Net** Baidu NLP [Wang et al '18]	February 15th, 2018	46.15	44.46
4	**S-Net** Microsoft AI and Research [Tan et al. '17]	June 2017	45.23	43.78
5	**R-Net** Microsoft AI and Research [Wei et al. '16]	May 2017	42.89	42.22
6	**HieAttnNet** Akaitsuki	March 26th, 2018	42.25	44.79

Board games







Google DeepMind: AlphaZero

AI applications at Baidu

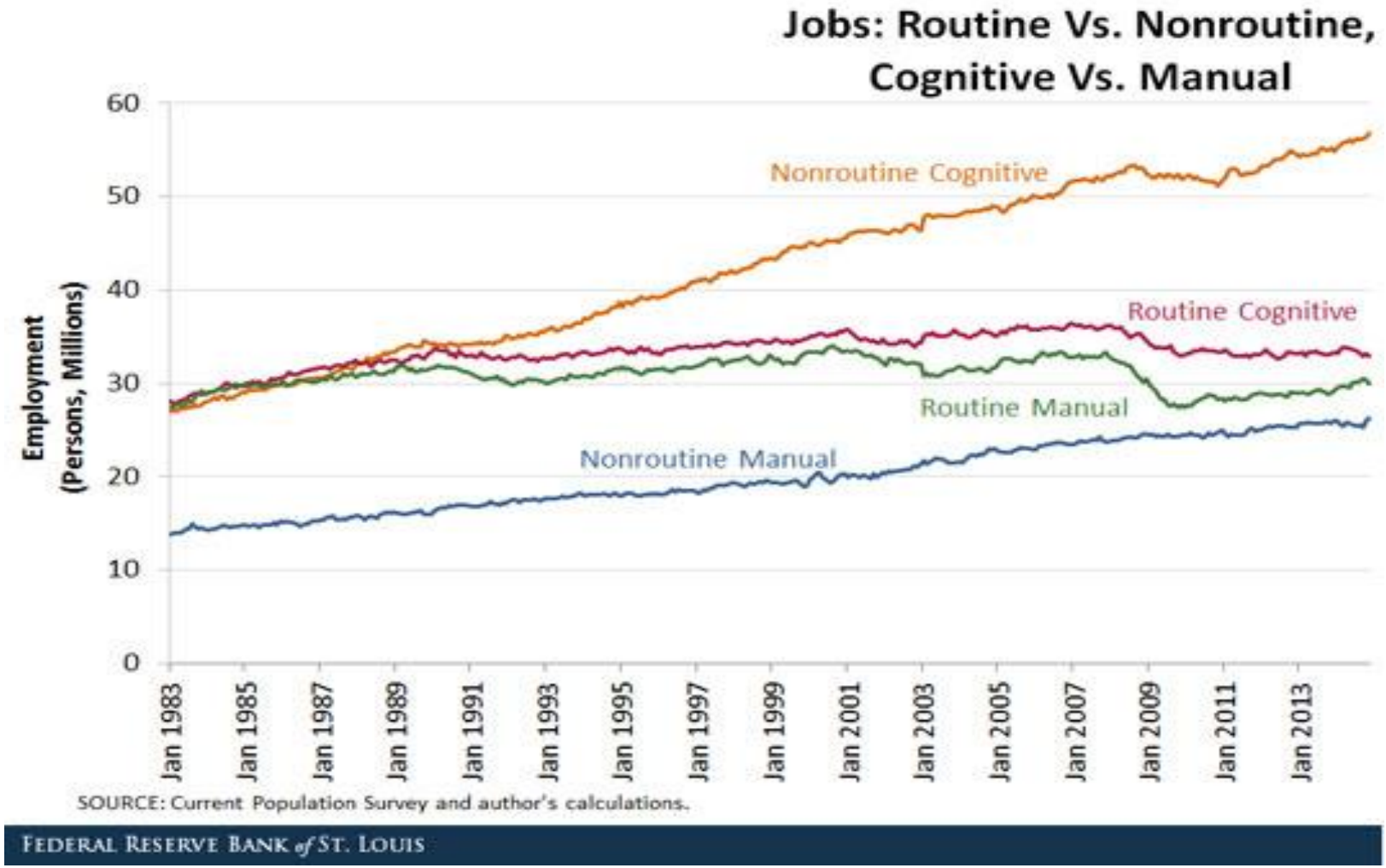
What tasks are suitable for AI?

Criteria	✓	✗
Well defined input-output mapping	Predict loan default	Summarize document
Large data sets	Predict ad click	Detect intrusion
Clearly definable goals and metrics	Play board games	Education
No long chains of reasoning using diverse background knowledge or common sense	Play video shooting game	Dialog
No need for detailed explanation	Recognize character	Diagnose disease
A tolerance for error	Recommend product	Drive
No specialized dexterity, physical skills, or mobility required	Manufacturing robot for specific task	Household robot

Brynjolfsson et. al. 2017

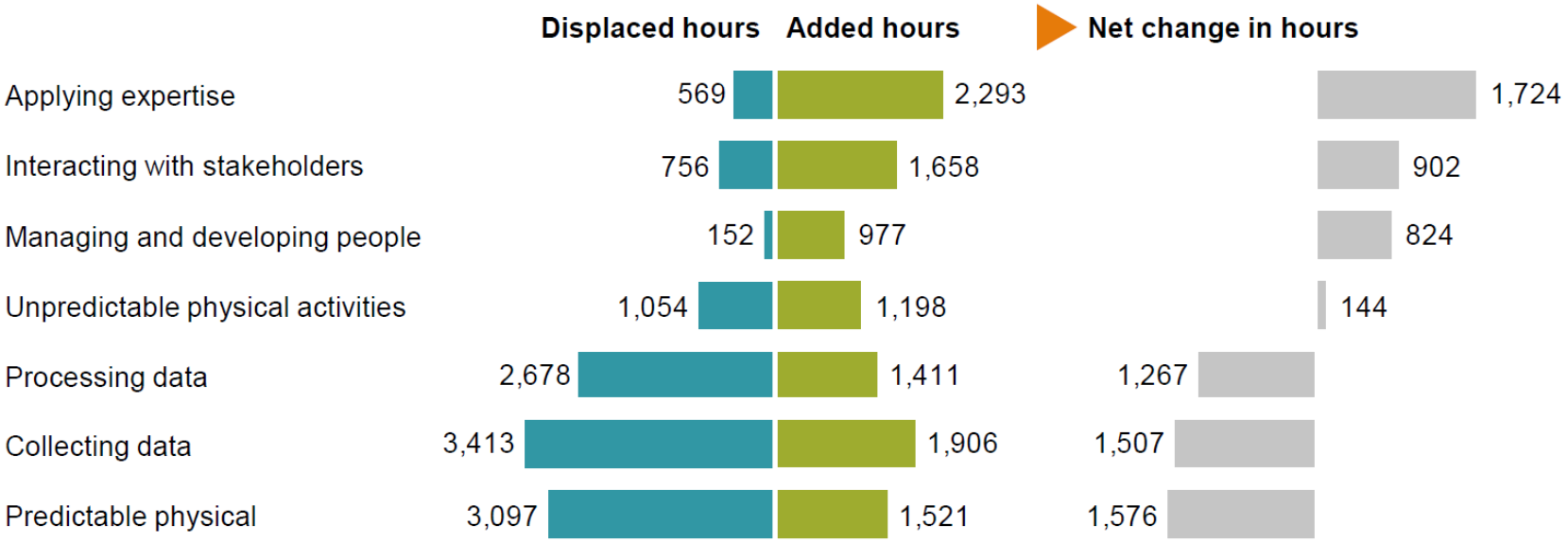
1. Now
2. Future

Near term impact: more routine jobs will be automated



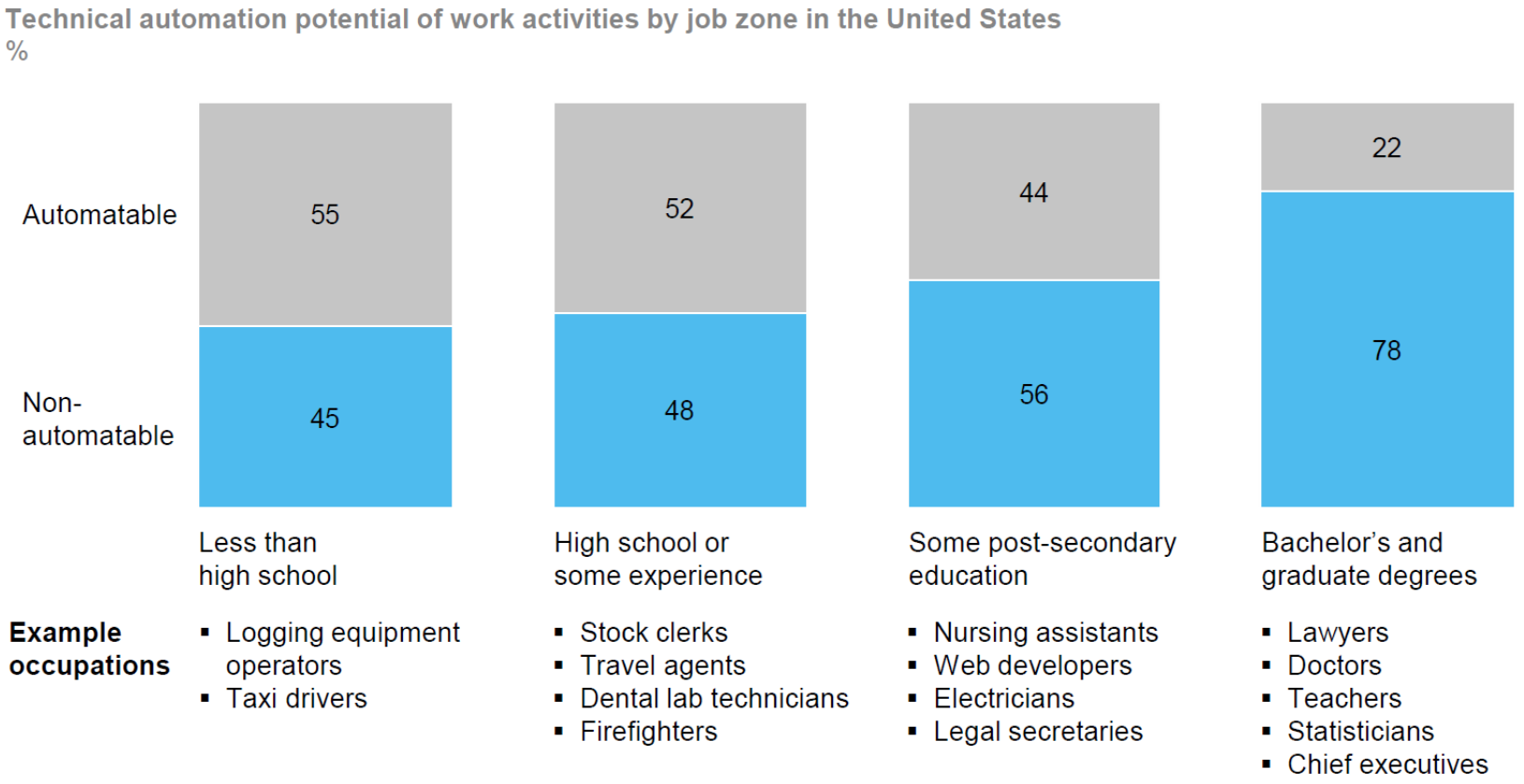
Near term impact: job displacement

Net growth in work will involve more application of expertise, interaction, and management: Germany example
Total work hours by activity type, 2016–30 (Midpoint automation, step-up demand) (million)



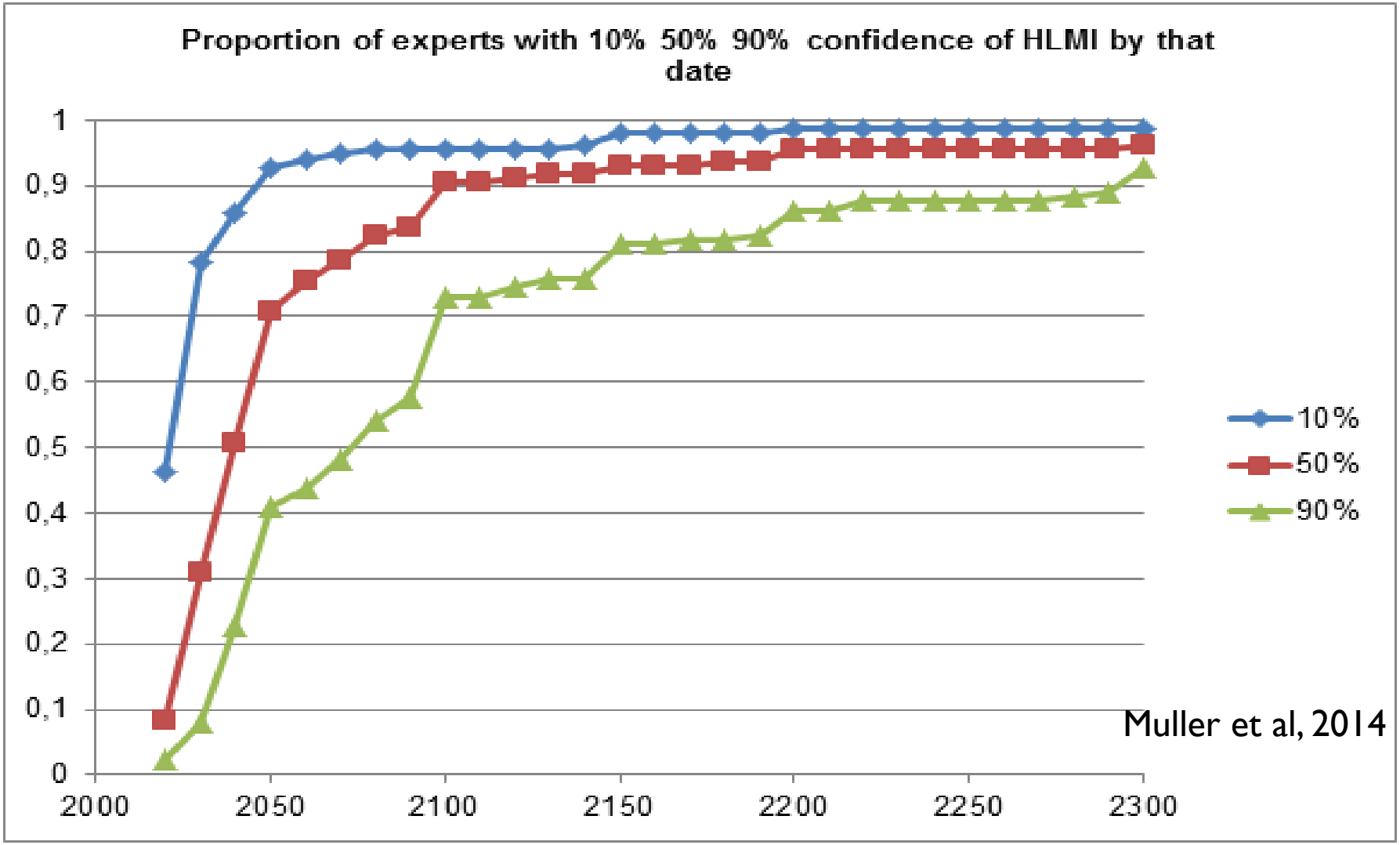
Source: McKinsey

Occupations requiring higher levels of education and experience have lower automation potential

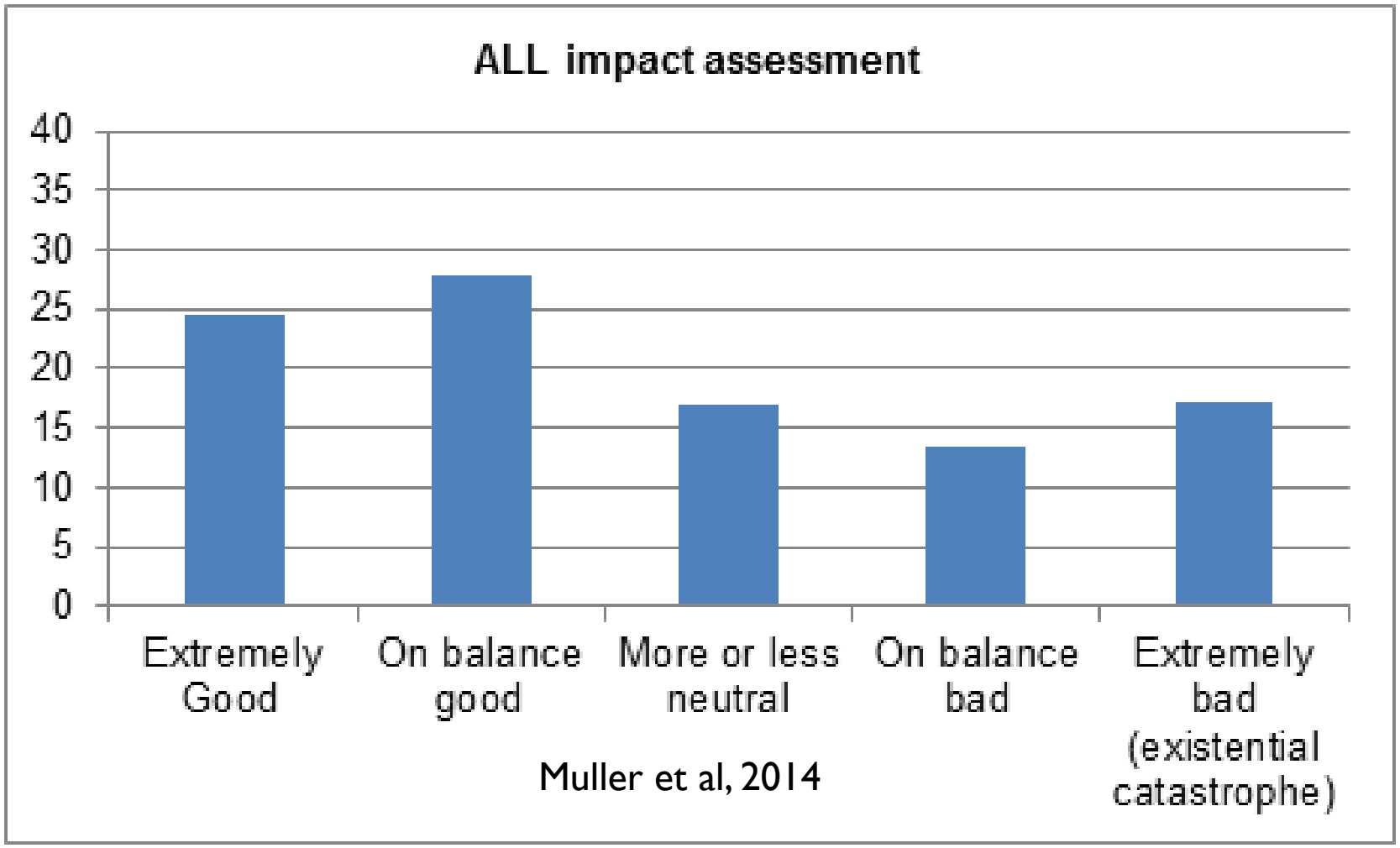


Source: US Bureau of Labor Statistics; O*Net; McKinsey Global Institute analysis

Long term impact: human level intelligence



Long term impact: good or bad?



Thank you!

Thank you!