Artificial Intelligence:
How knowledge is created, transferred and used

Trends in China, the US and Europe

Maria de Kleijn-Lloyd
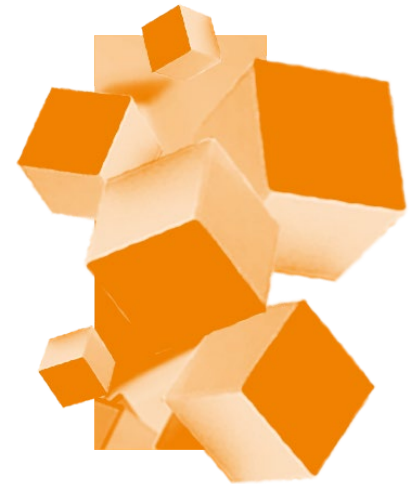SVP, Analytical Services, Elsevier Research Networks
February 5, 2019

Outline

Introduction — Defining AI

Key findings — Trends globally, in China, Europe and US

Ethics in AI

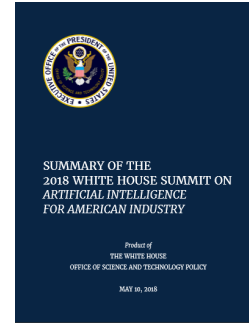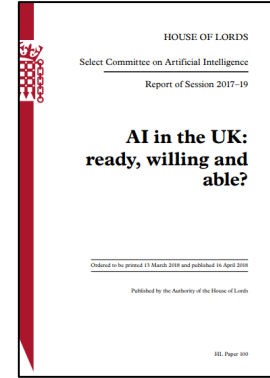# A transformative force, requiring action across sectors

How is AI being taught?

How is AI researched?

How is AI being talked about in media?

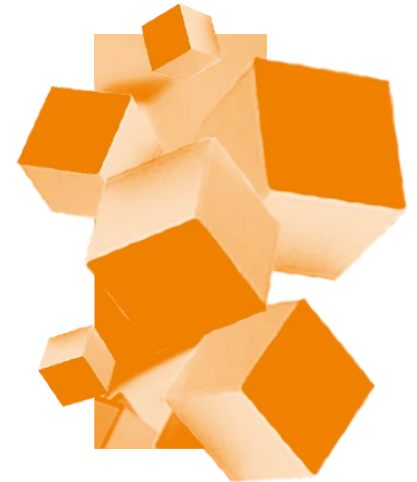How is AI being described in patents?

Experts agree there is no common definition on AI

"An umbrella term to describe the capability to make computers apply judgment as a human being would"

"Many people say AI when they actually mean machine learning"

"There is no commonly agreed ontology for AI"

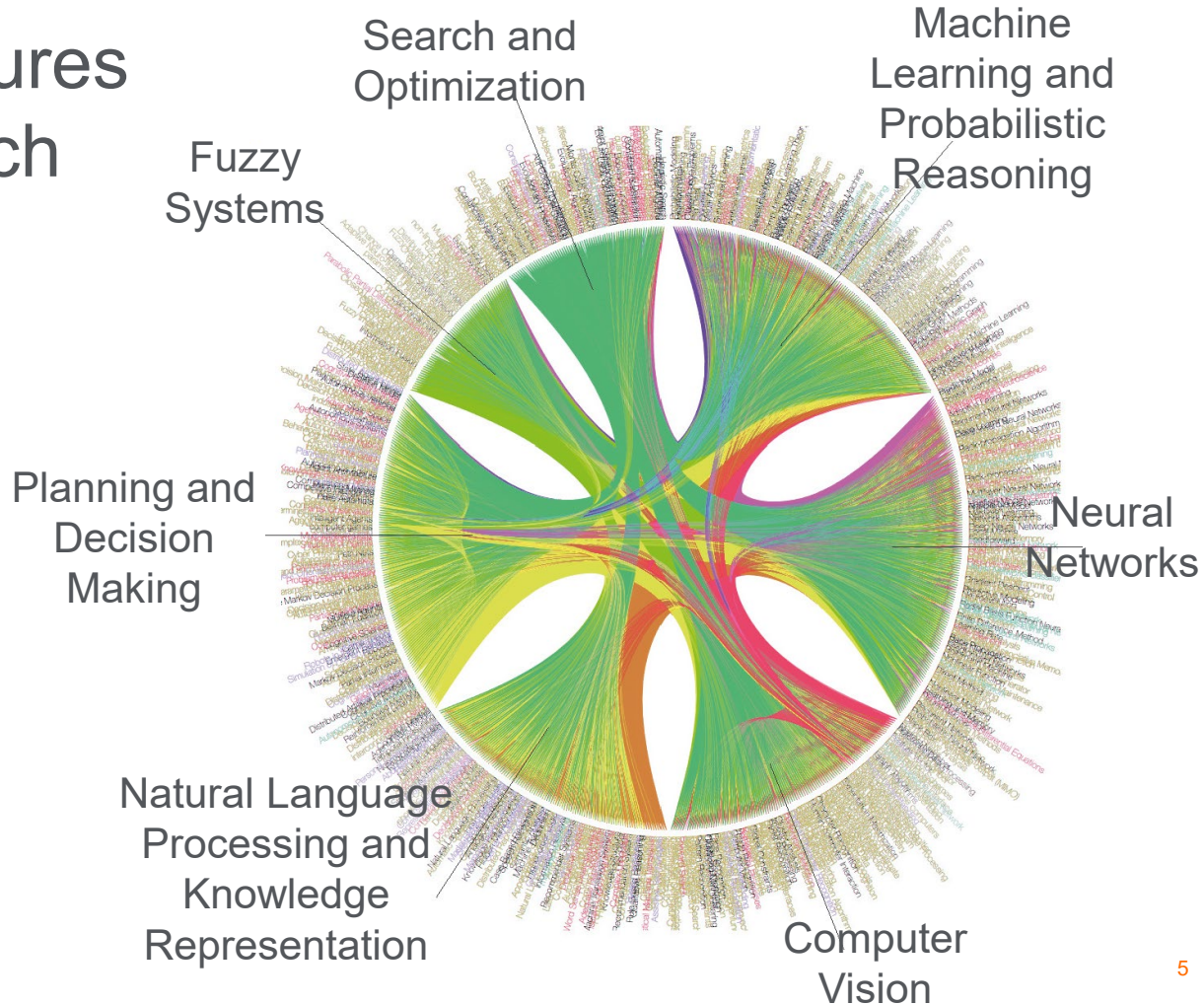"It's just statistics on steroids"

ELSEVIER

Globally, AI structures into seven research clusters

Using AI to define and structure AI

- Trained classifier to distinguish AI papers from non-AI papers

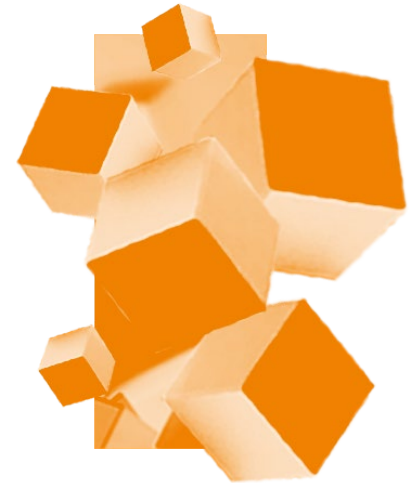- Supervised learning using keyword co-occurrence to structure the field

Outline

Introduction — Defining AI

Key findings — Trends globally, in China, Europe and US

Ethics in AI

Data on peer-reviewed articles and conference proceedings from Scopus

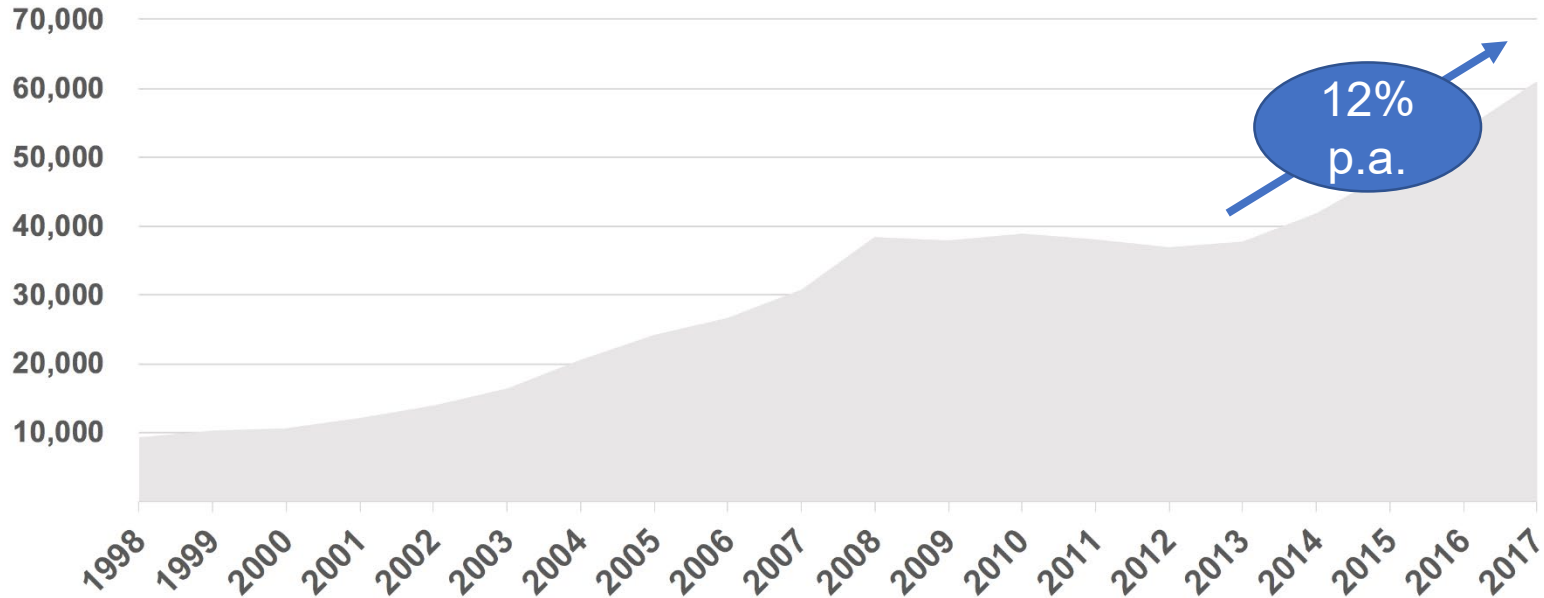**Other sources used for quantitative analysis**
- Preprint servers (arXiv)
- PlumX dashboard
- Online competitions (Kaggle)
- ScienceDirect
- Graduate information (CAS, China)

Article
70+ million
Journal, conference, & Book records

Author
16+ million
Author profiles (active)

Affiliation
70,000+
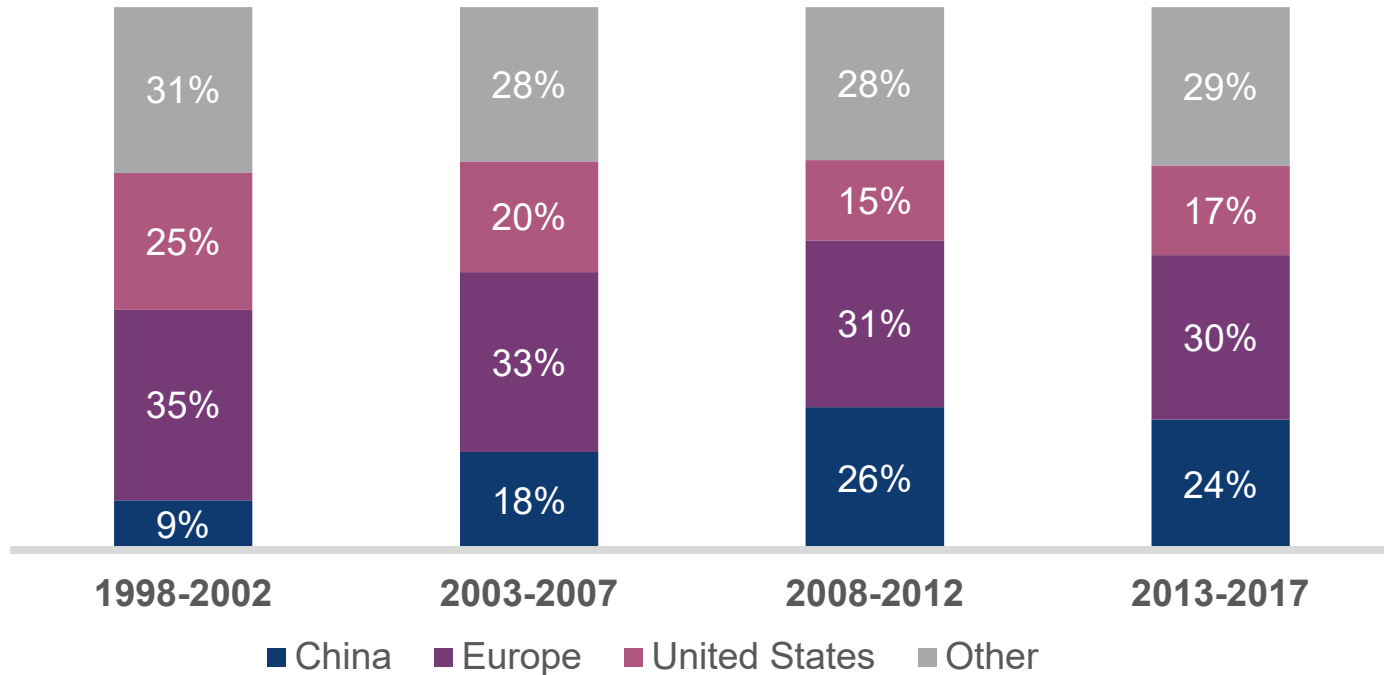Affiliation profiles

Published research volume growing quickly

Peer reviewed AI publications, all document types, worldwide
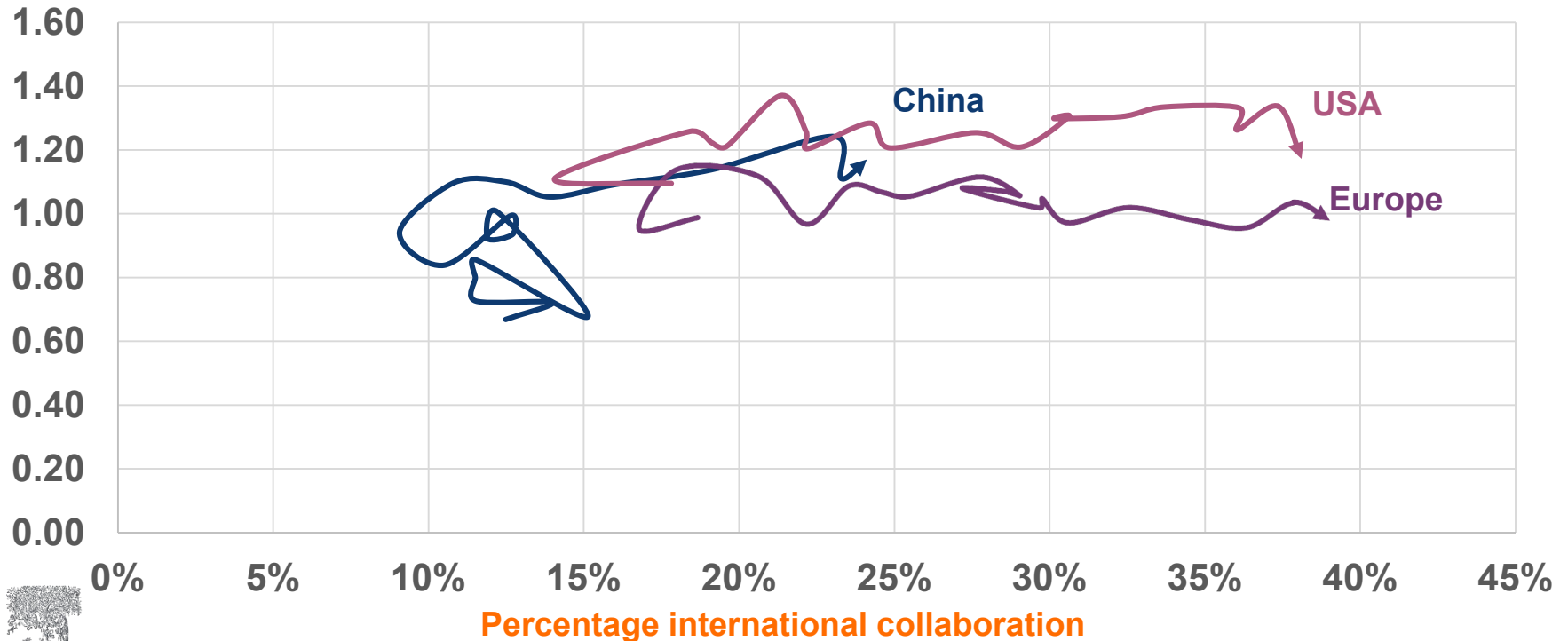
China, EU and US are growing, but not equally

Share of world publications in AI

	1998-2002	2003-2007	2008-2012	2013-2017
Other	31%	28%	28%	29%
United States	25%	20%	15%	17%
Europe	35%	33%	31%	30%
China	9%	18%	26%	24%

■ China ■ Europe ■ United States ■ Other

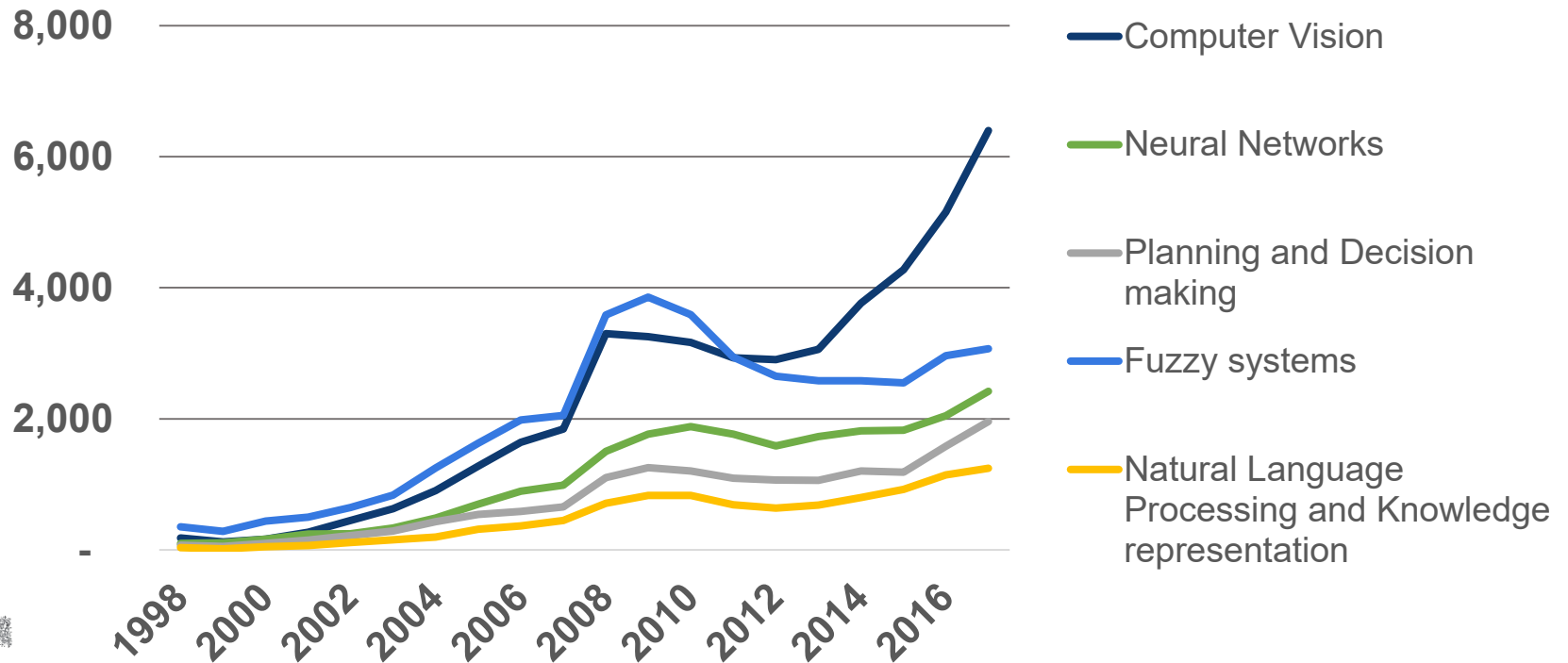# Collaboration on the rise globally

Rebased FWCI vs. international collaboration
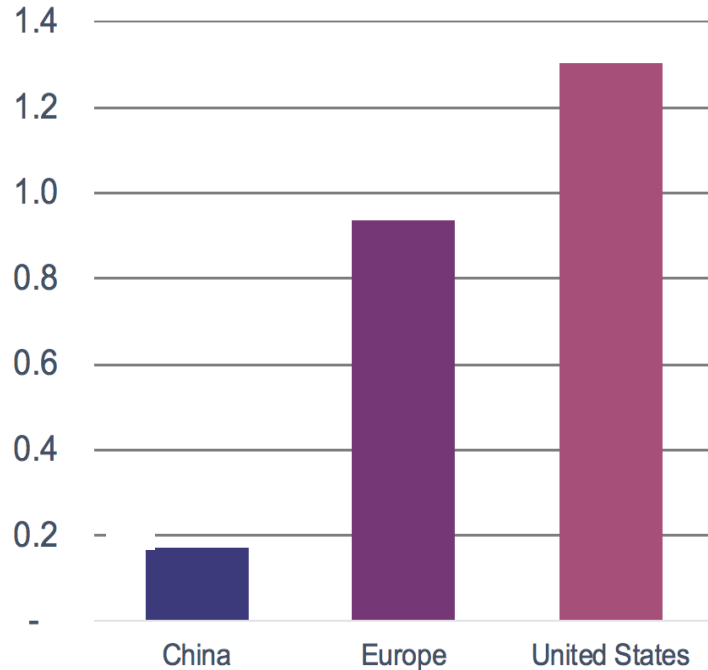
China: very focused
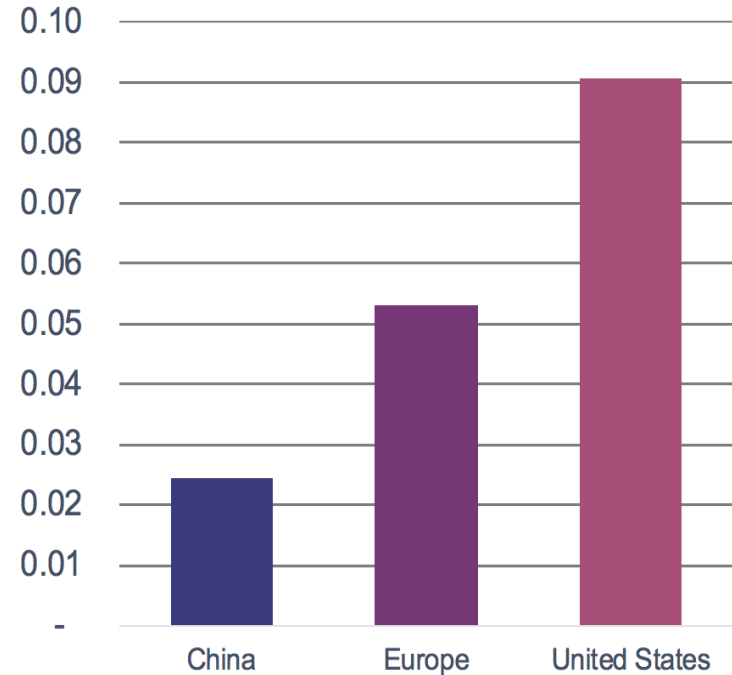
Number of publications

China: relatively isolated

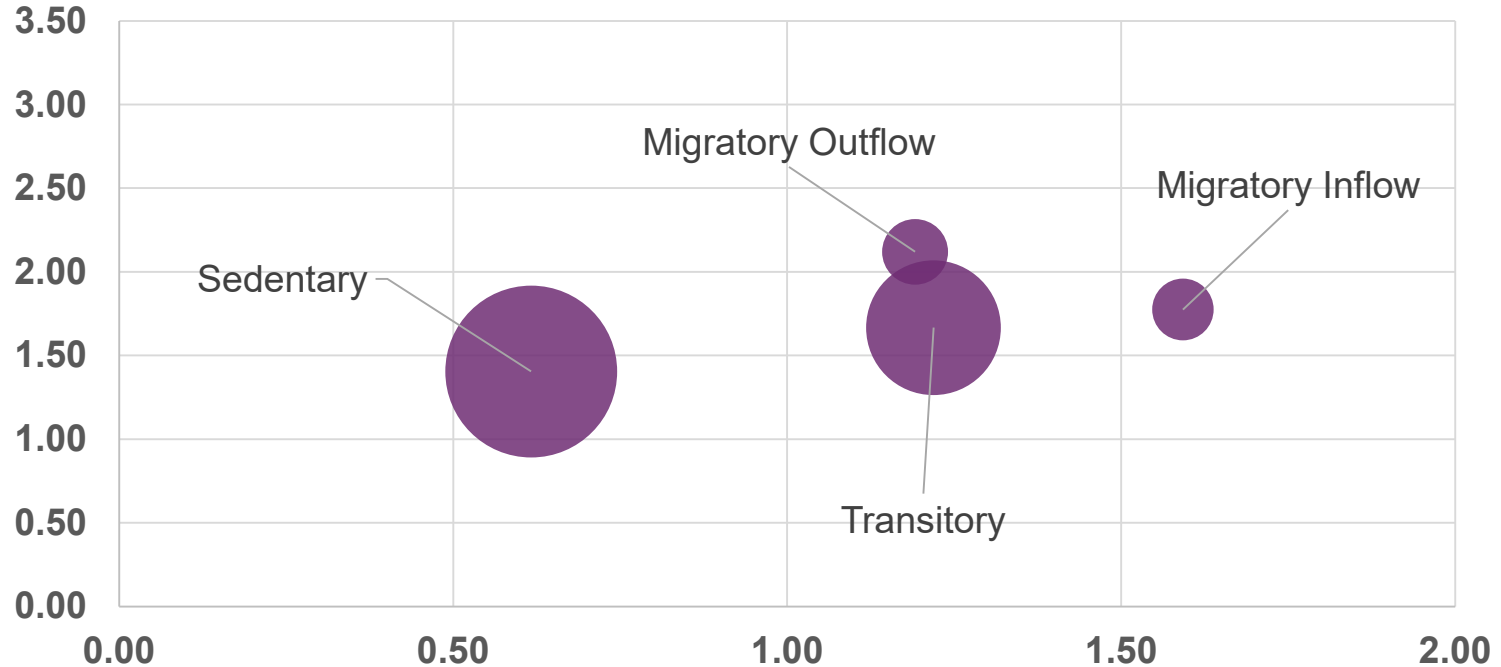Average social media mentions per publication

Average blogging & news mentions per publication

Europe: slow but steady brain drain of top researchers

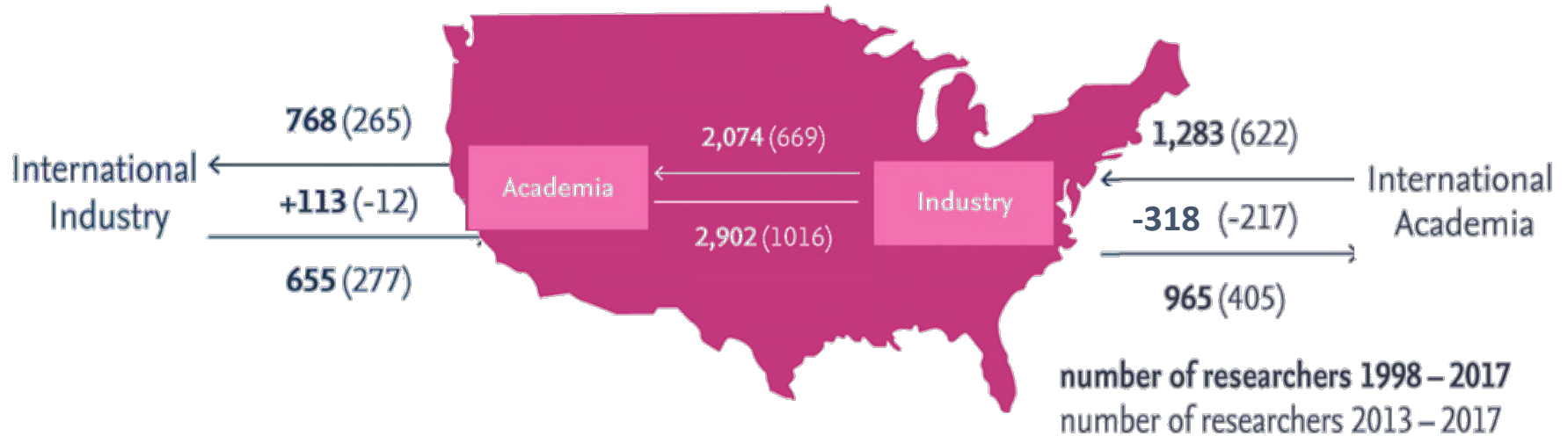## Relative impact versus relative productivity

US: strong corporate sector

Key Contribution (academic and corporate institutions)	Number of publications (all)	Field-Weighted Citation Impact
Carnegie Mellon University	4,038	3.04
Massachusetts Institute of Technolog	2,312	3.49
Microsoft USA	2,648	5.84
IBM	2,351	2.45
Stanford University	2,235	5.54

US: attracting overseas talent to its corporations

768 (265)

International Industry

+113 (-12)

655 (277)

2,074 (669)

Academia

2,902 (1016)

Industry

1,283 (622)

International Academia

-318 (-217)

965 (405)

number of researchers 1998 – 2017
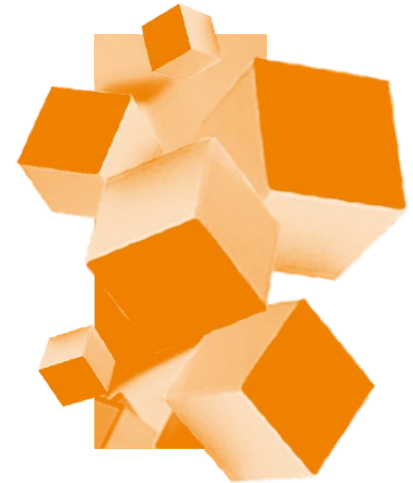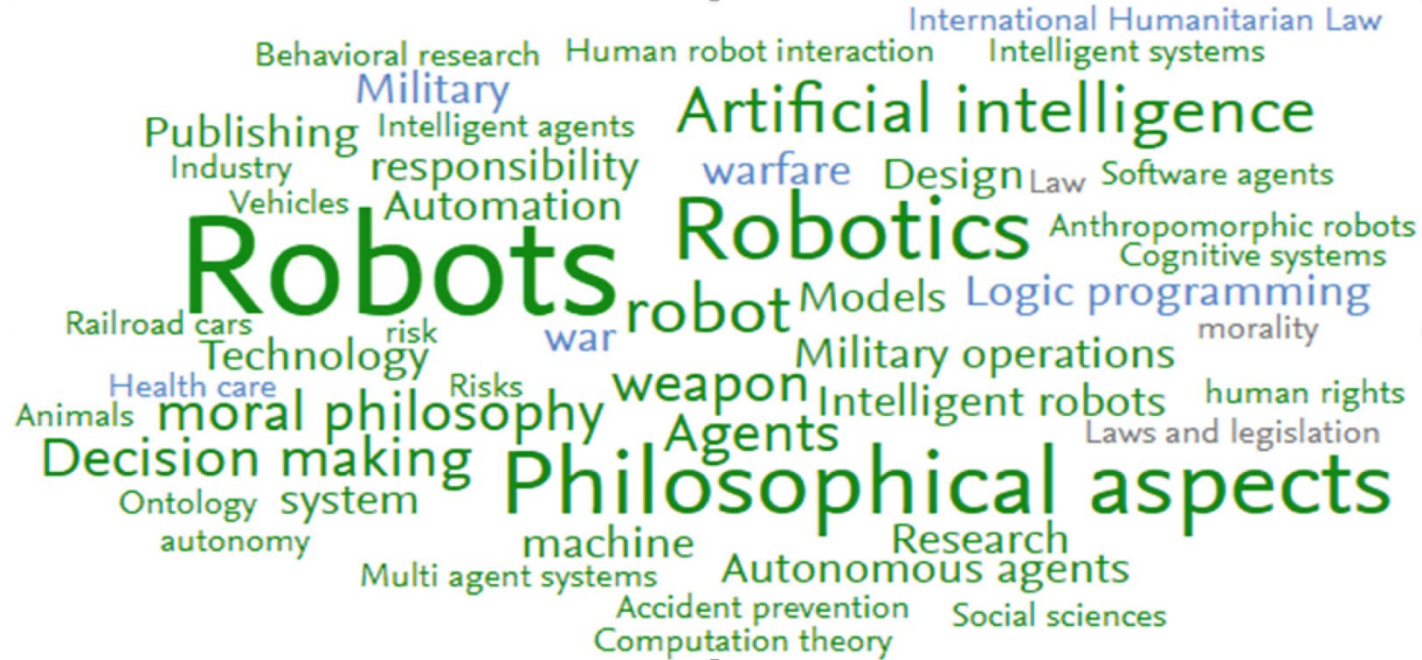number of researchers 2013 – 2017

Outline

Introduction — Defining AI

Key findings — Trends globally, in China, Europe and US

Ethics in AI

AI ethics research focused on the technical level

Available resources

Artificial Intelligence:
How knowledge is created,
transferred, and used

Trends in China, Europe,
and the United States
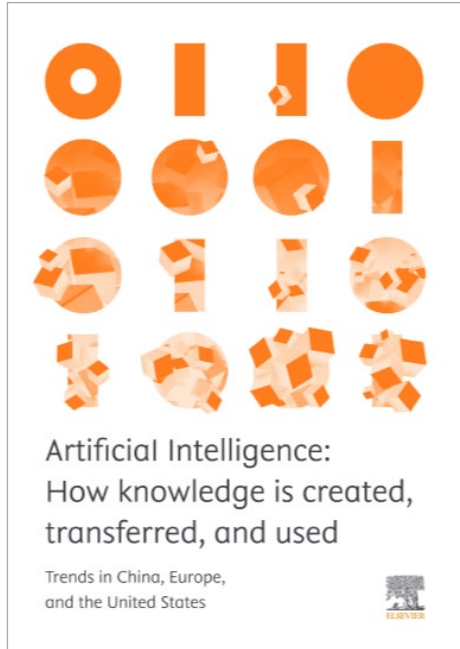
Download AI Report:
https://www.elsevier.com/research-intelligence/ai-report

AI Resource Center:
https://www.elsevier.com/connect/ai-resource-center

Thank you