

The Future of Work in the Cognitive Computing Era

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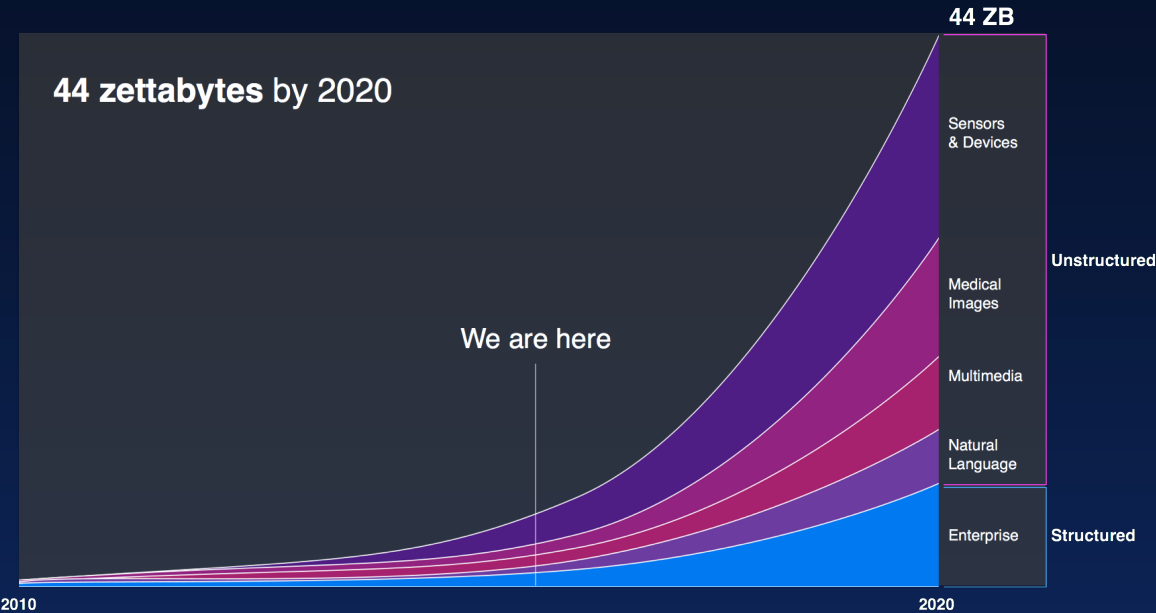
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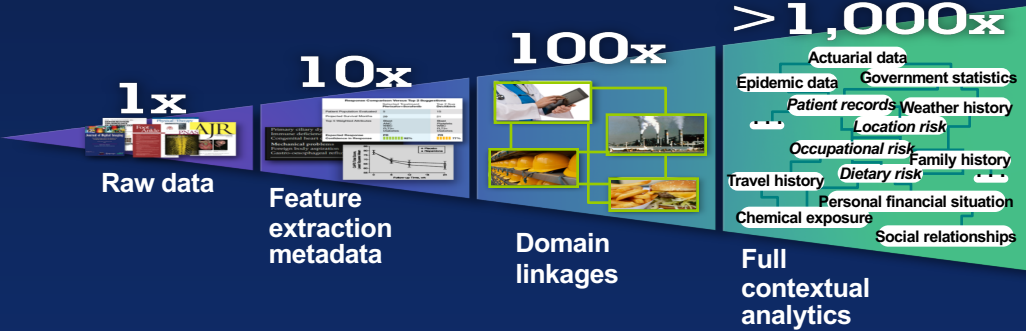
 [#CognitiveEra](#)



Data is transforming every industry



*But the true value
of Big Data is in
the embedded,
multi-modal context*



We pay a big price for **not knowing**



Cognitive Systems are the new tools for the 21st century

*Cognitive Computing enables
a deep partnership between people and computers
that enhances and scales human expertise*

Cognitive
Systems



Watson
2011



Deep Blue
1997



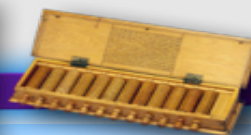
System/360
1964



ENIAC
circa 1945



Counting Machine
Circa 1820



Napier's Rods
circa 1600



Antikythera
Astronomical
Computer
circa 87 BC



Abacus
circa
3500 BC

Computing Capabilities

Time



Memorial Sloan Kettering
Cancer Center



Cancer



Diabetes



Education



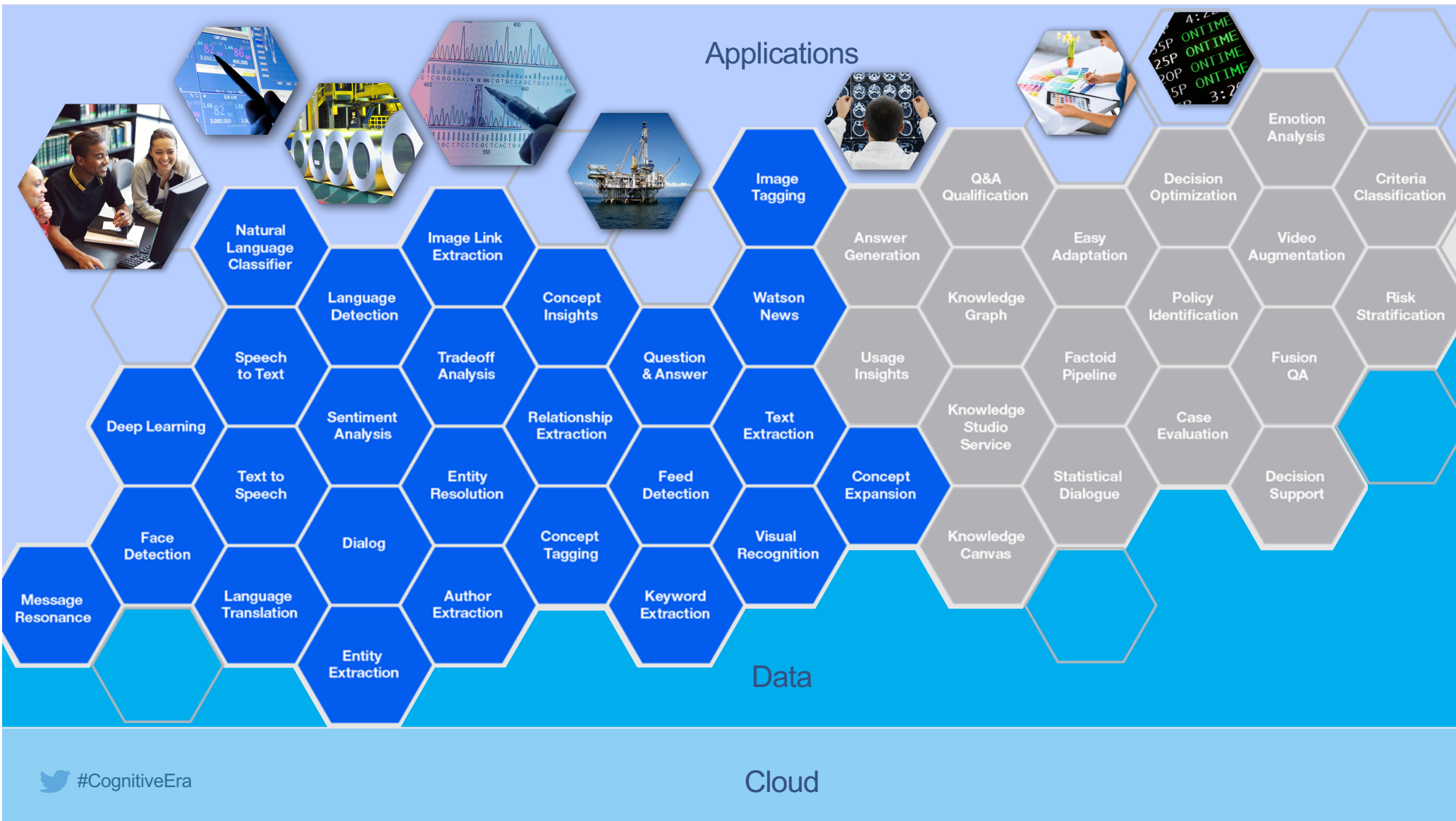
Transportation



Watson at the US Open



Watson movie trailer



A vision of the **future**: Every professional will have a **cognitive assistant**

Healthcare

Surface best protocol options
for practitioners

Finance

Enhance portfolio analysis
and risk management

Education

Deliver personalized programs
for students & teachers

Business Decisions

Analyze complex scenarios and
support strategic decisions

“Before I recalculate the findings, would you like to hear about the other important factors that may impact your decision?”

A composite image featuring a woman with curly hair and glasses smiling on the left, and a server room with rows of server racks on the right.

Human + Machine

Compassion	Bias elimination
Value judgment	Anomaly detection
Social benefit	Population analysis

...leads to better **decision making**
improving the human condition

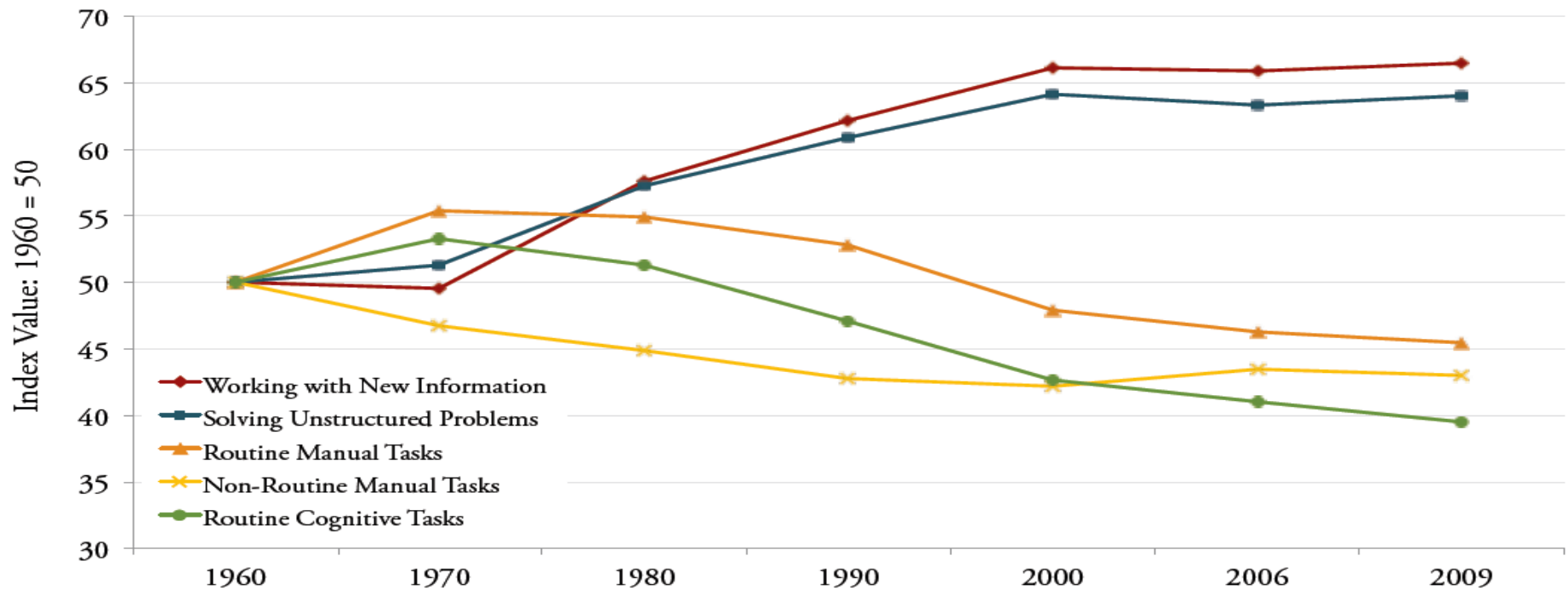
Achieving professional competence in **deep domains**

Physics | Chemistry | Math | Engineering | Law | Finance | Medical | Management ... *Thousands more*

Radiology

	INGEST	COGITATE	GENERATE	INTERACT	PERFORM <i>Metrics of Progress</i>
Professional	Understand undocumented practices	Formulate Frameworks (laws, constitutions, philosophies) Manage Contradictions Break Rules Make Rules Evaluate Ideas	Write judgments Make movies Make art Write dissertations	Negotiate Maintain credibility, viability Act ethically Manage People Deliver value	Radiologist CPA Bar Exam Real Estate exam Nursing Exam
Grad School	Understand highly specialized technical documents, papers	Formulate Goals Think strategically Form Concepts	Tell Stories Design Experiments	Operate in a (bot+human) team Teach (TA) Collaborate Understand people	Dissertation Papers
College	Understand, use college-level textbooks, math	Learn to ask questions	Write technical papers Write term papers	Tutor High School students Make presentations	GRE LSAT MCAT GMAT
High School	Understand, use HS-level textbooks (e.g. figurative lang), math, Internet media	Deal with high-level abstractions	Write high-school level essays	Design projects, take part in competitions (debates, quizzes, ...)	SAT
Middle School	Understand, use graphs, diagrams, math, videos	Start thinking about thinking	Do homework	Explain Conduct Experiments	8 th grade standardized tests
Elem School	Understand, use pictures, numbers, sentences; learn through play	Use analogies, causal inference chains, think logically about concrete objects	Construct topically coherent paragraphs	Learn to understand and follow rules	4 th grade standardized tests

Figure 3: Index of Changing Work Tasks in the U.S. Economy 1960-2009²¹



Source: Reproduced from Levy and Murnane (2013)

Occupations will restructure to meet **elastic demand**...

Ambulatory Surgery Centers



Three decades ago, Licensed Practical Nurses were viewed as obsolete...

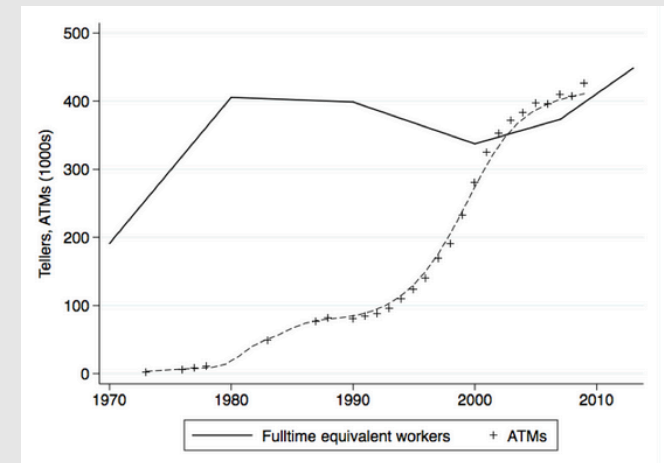
But, LPNs employed rose by 37% and hourly wages rose by 24%

Branch Banking



Even with the growth of ATMs, “tellers” employed have continued to grow

They now focus on relationship mgmt and investment mgmt



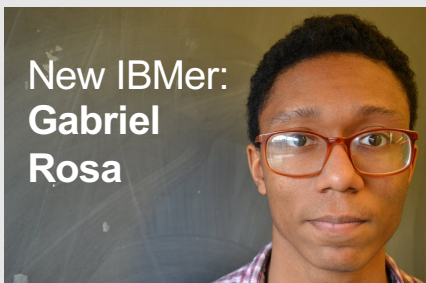
From James Bessen (2016)

Focus needs to shift to **skills** required for **tasks**... vs. qualifications for jobs

P-TECH: A new **vocational education** model for grades 9-14



Enable students to master **skills** in STEM fields for entry-level positions in high-demand industries



New IBMer:
**Gabriel
Rosa**

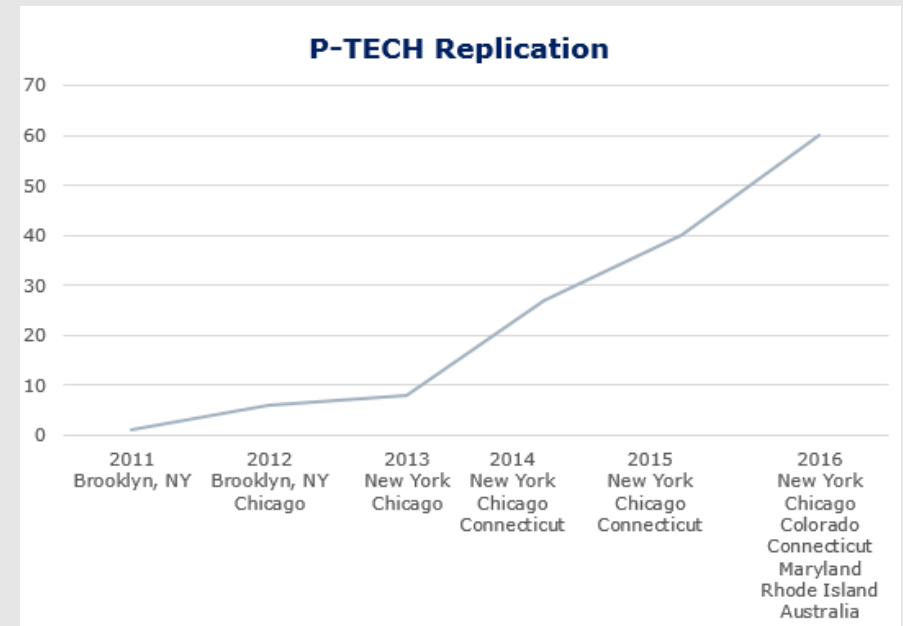
Digital Commerce Specialist



New IBMer:
**Leslieanne
John**

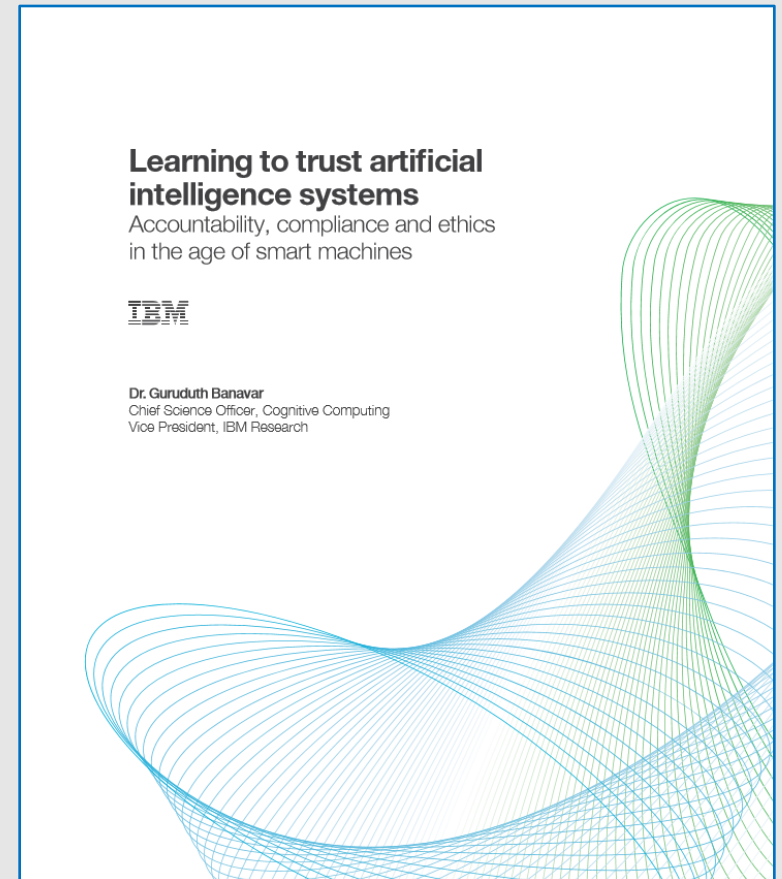
Performance Marketing
Professional

 #CognitiveEra

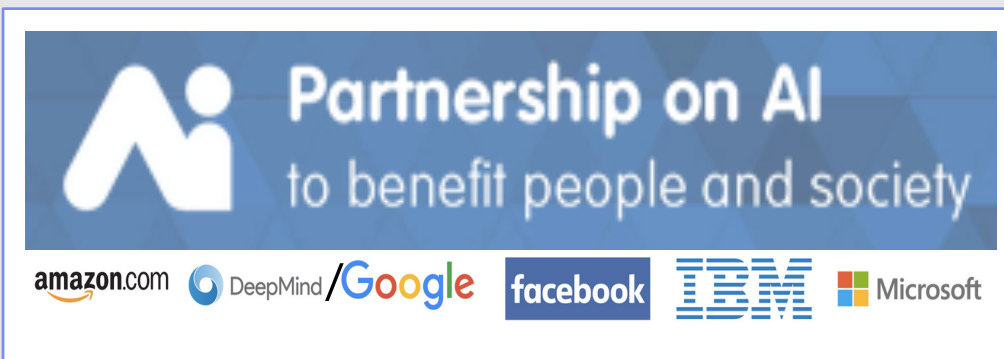


Social and **ethical** questions will come to the forefront...

- How to build **trust**?
explainability, reinforcement, intent, certification
- How to assure **integrity** and **accuracy**?
bias, risk of false positives/negatives
- How to tradeoff **privacy** and **benefits**?
delegation, accountability



New partnerships will accelerate **beneficial applications** of AI



- Advance the public's understanding of AI
- Formulate best practices for ethical AI
- Serve as an open platform for engagement on AI's influence on people and society



