What's Artificial Intelligence?

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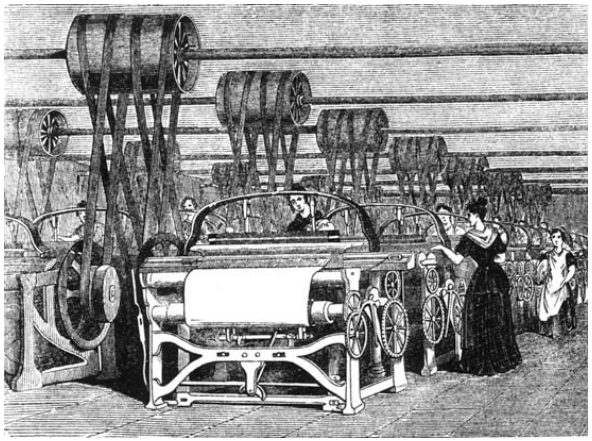
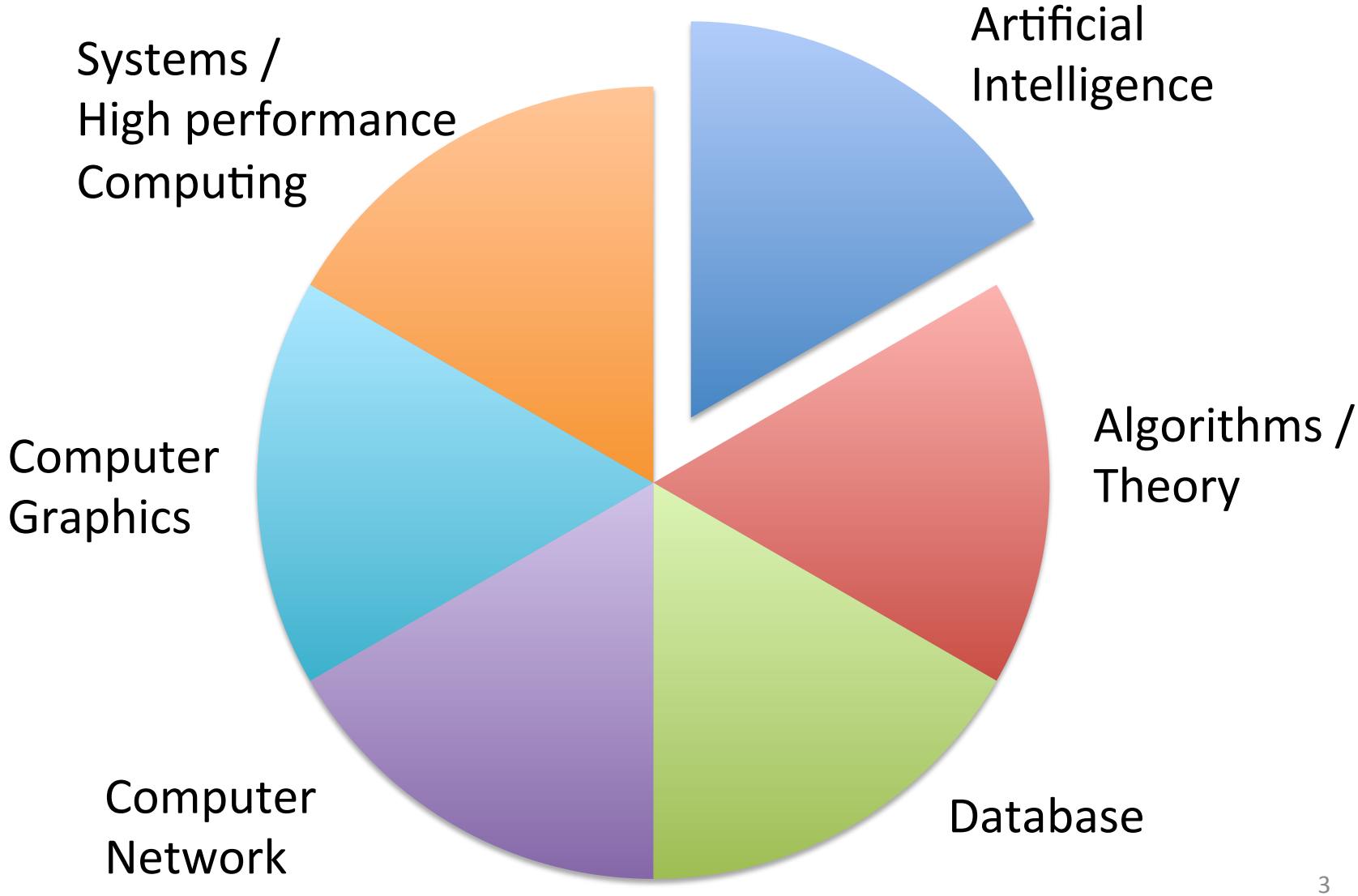
Information Revolution

- Dramatic economic and social changes taking place starting from the second half of the 20th century due to the automation of information processing tasks by computer.
- Akin to the Industrial Revolution in the 17th century and the Agricultural Revolution.
- Computer science is the main driving force of this movement.



Core Areas in Computer Science

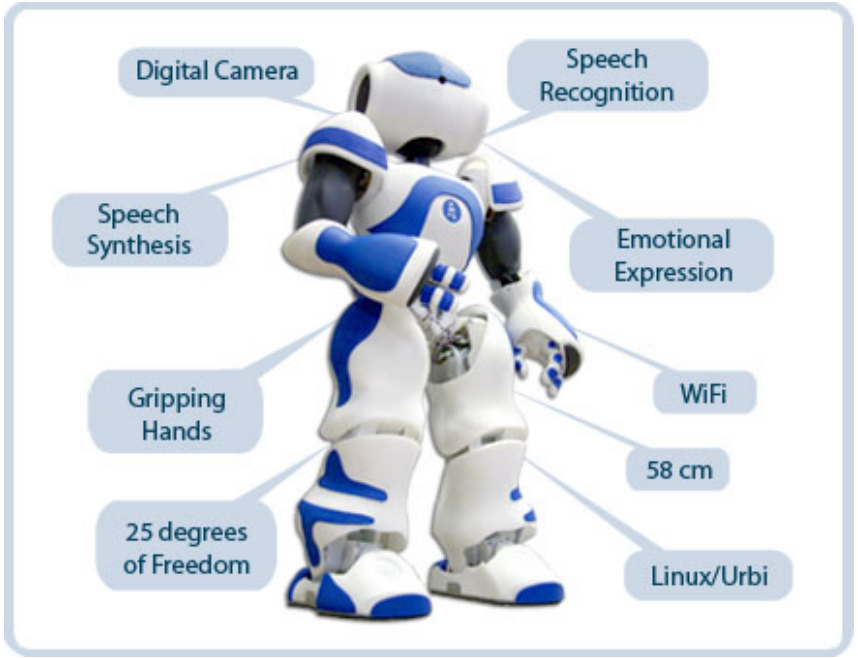


Question 1

What's Artificial Intelligence (AI)?

What is Artificial Intelligence?

- Systems that *think* like humans
- Systems that *act* like humans
- Goal: imitate human intelligence

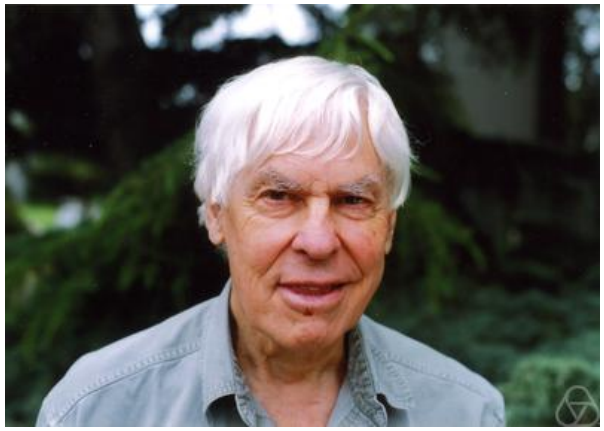


What is Artificial Intelligence? (cont.)

- Systems that think *better* than humans
- Systems that act *better* than humans
- Goal: achieve a high level of intelligence *beyond* human intelligence.

Smale's 18th Problems

- Stephen Smale, a Field medalist, was asked to list 18 most important unsolved problems in mathematics for the 21st century.



- His last question is actually a computer science question:

What are the limits of intelligence, both artificial and human?

Alan Turing and his definition of Artificial Intelligence

- Alan Turing is the father of Computer Science and Artificial Intelligence.

Turing Test:

Instead of asking “Can machines think?”

ask “Can machines behave intelligently”

Early Excitement

1940s	McCulloch & Pitts neurons; Hebb's learning rule
1950	Turing's "Computing Machinery and Intelligence"
1954	Georgetown-IBM machine translation experiment
1956	**Dartmouth meeting: "Artificial Intelligence" adopted**
1950s-1960s	**"Look, Ma, no hands!" period:**
	Samuel's checkers program, Newell & Simon's
	Logic Theorist, Gelernter's Geometry Engine
1966—73	Setbacks in machine translation
	Neural network research almost disappears
	Intractability hits home

Boom and Bust Cycles of AI Research

1974-1980	The first “AI winter”
1970s	Knowledge-based approaches
1980-88	Expert systems boom
1988-93	Expert system bust; the second “AI winter”
1986	Neural networks return to popularity
1988	Pearl’s *Probabilistic Reasoning in Intelligent Systems*
1990	Backlash against symbolic systems; Brooks’ “nouvelle AI”
1995-present	Increasing specialization of the field
	Agent-based systems
	Machine learning everywhere
	Tackling general intelligence again?

What AI can do now

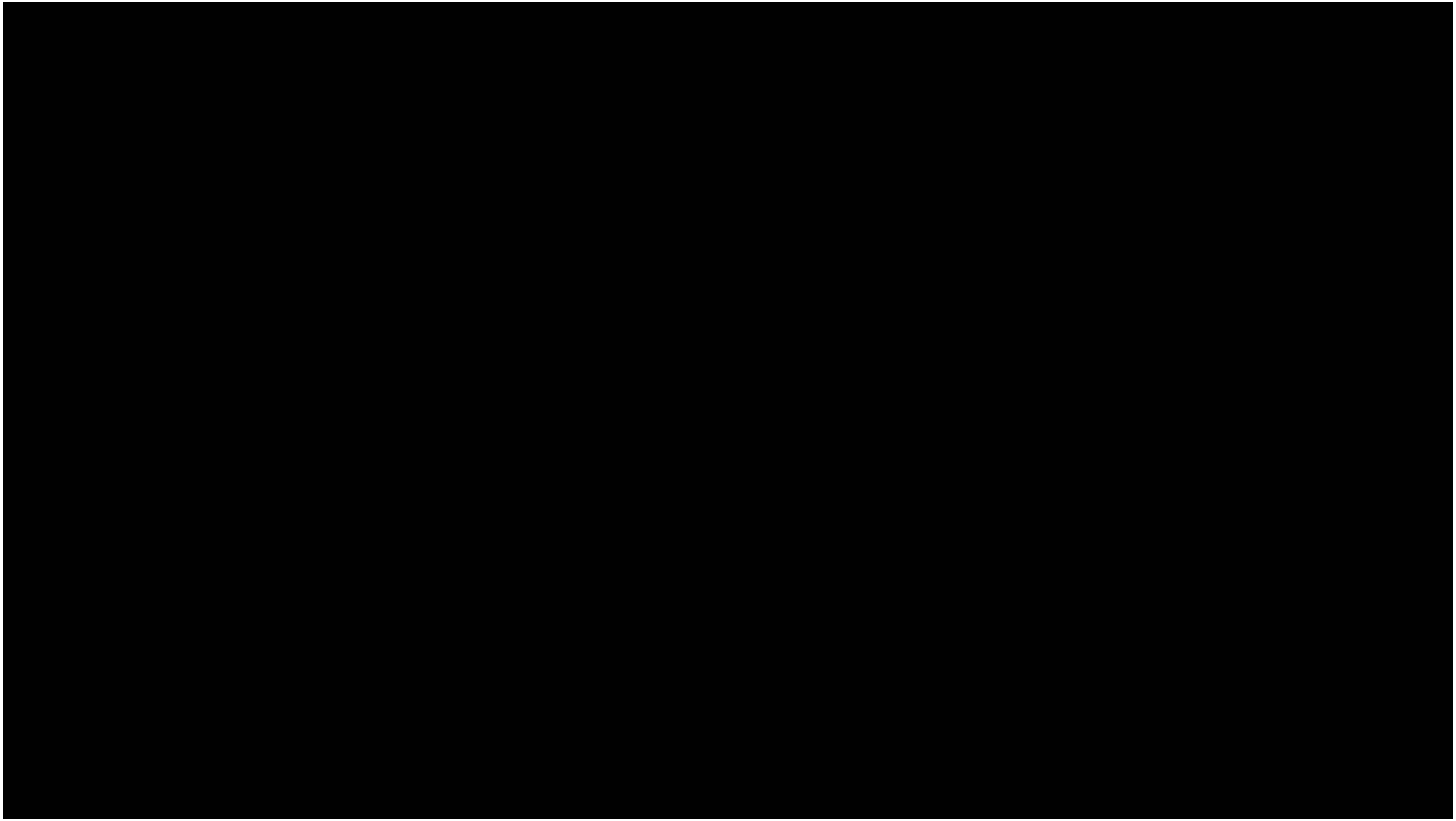
Which of the following can be done at present?

- ♢ Play a decent game of table tennis
- ♢ Drive safely along a curving mountain road
- ♢ Drive safely along Telegraph Avenue
- ♢ Buy a week's worth of groceries on the web
- ♢ Buy a week's worth of groceries at Berkeley Bowl
- ♢ Play a decent game of bridge
- ♢ Discover and prove a new mathematical theorem
- ♢ Design and execute a research program in molecular biology
- ♢ Write an intentionally funny story
- ♢ Give competent legal advice in a specialized area of law
- ♢ Translate spoken English into spoken Swedish in real time
- ♢ Converse successfully with another person for an hour
- ♢ Perform a complex surgical operation
- ♢ Unload any dishwasher and put everything away

IBM Deep Blue – the Chess Playing Program

Google Car – the Self-Driving Car

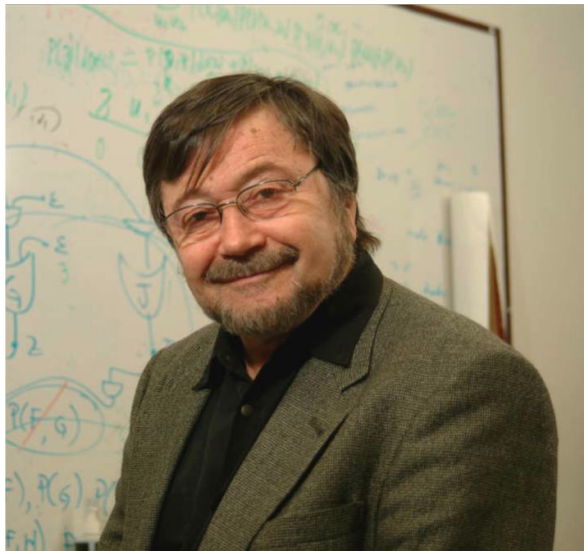
IBM Watson – the Question-Answering machine



ACM Turing Award

- Judea Pearl, a famous AI researcher, won the 2011 Turing Award, the Nobel Prize for computer science, for his work on automated reasoning.

For fundamental contributions to artificial intelligence through the development of a calculus for probabilistic and causal reasoning.

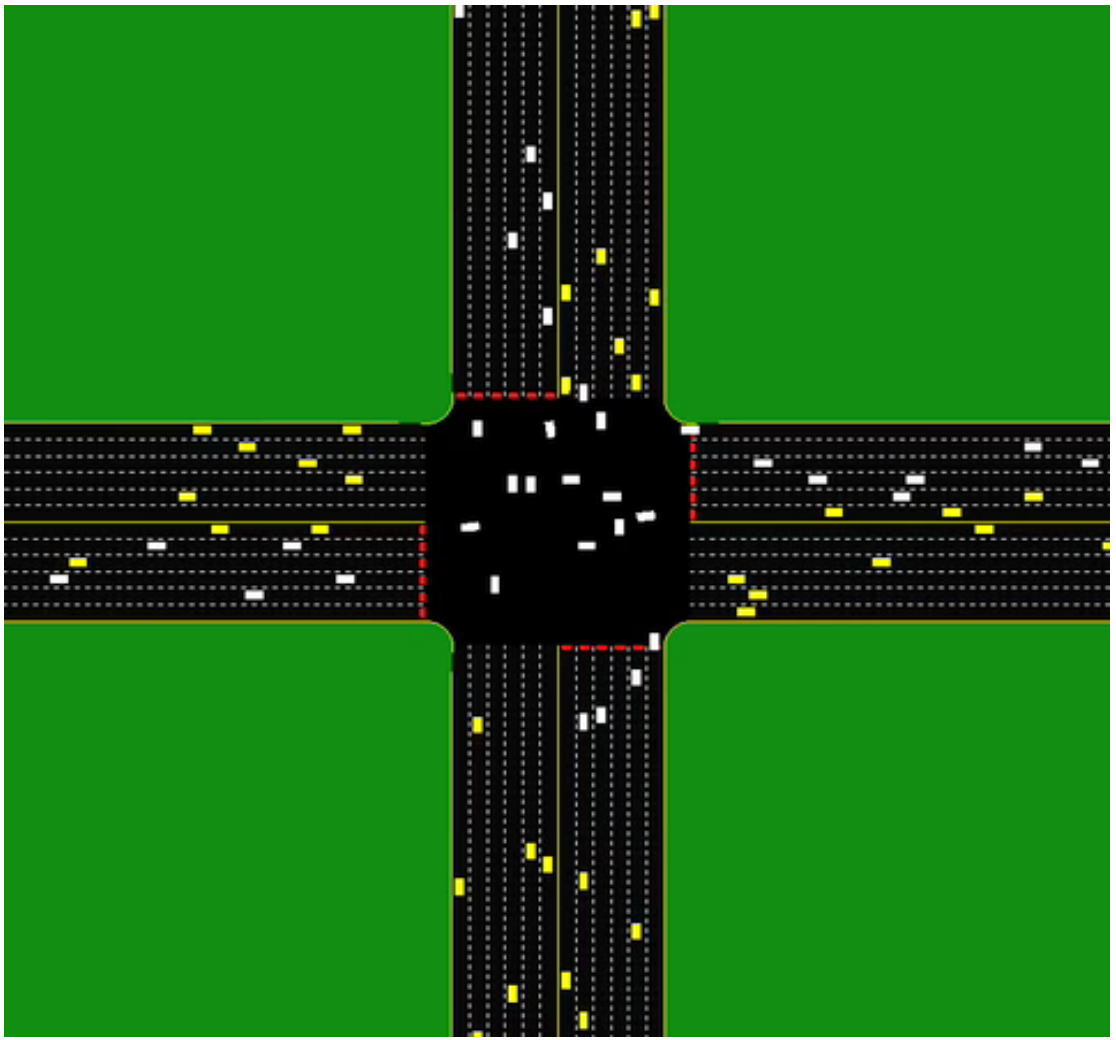


His Turing Lecture: http://amturing.acm.org/award_winners/pearl_2658896.cfm

Software is the Key

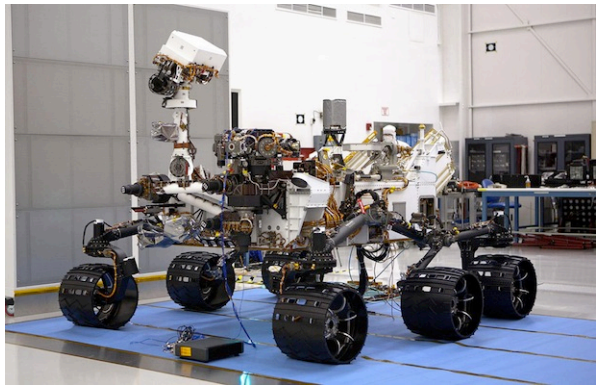
- Software (not hardware) is the key component in all of these AI systems.
  - This is why computer science is important.
- Other disciplines increasingly rely on computer as their main tool to advance their fields, but they often fail to fully realize what computer can do for them.

Computer Scientists like to think differently



The Future

The ongoing information revolution will continue to lead the economic and social development beyond the Industrial Revolution.



- The CSE track will prepare you to take part in this endeavor.
  - We currently offer two undergraduate courses on AI.
  - Lots of equipment for research


Think different.