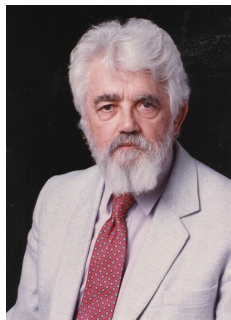# COM3211 Lecture 1: Introduction

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What is Artificial Intelligence (AI)?

It depends on whom you ask. According to John McCarthy, one of the founders of AI:

"It is the science and engineering of making intelligent machines, especially intelligent computer programs. It is related to the similar task of using computers to understand human intelligence, but AI does not have to confine itself to methods that are biologically observable."

What is AI

In more layman terms, AI is about making machines (including computer programs) do things (for us) that require intelligence and are normally done either by ourselves or by other humans:

- Do homework for us, take exams for us, write papers for us;
- Get food for us, cook for us, wash dishes for us, but do not eat the food for us - oops we like to do that ourselves;
- Many many more - the sky is the limit.

AI's long term goal is to build machines that can sense, think, and act intelligently.

How It Got Started

Ada Lovelace (1815 - 1852), the only child of the poet Lord Byron.

- Her note G describes an algorithm for Babbage's Analytical Engine to compute Bernoulli numbers, and was considered to be the first published computer program.
- She wrote that "The Analytical Engine has no pretensions whatever to originate anything. It can do whatever we know how to order it to perform. It can follow analysis; but it has no power of anticipating any analytical relations or truths."

How It Got Started

Alan Turing (1912 - 1954), the father of computer science.

Alan Turing. Computing machinery and intelligence. *Mind*, 59:433-460, 1950.

"I propose to consider the question, 'Can machines think?' This should begin with definitions of the meaning of the terms 'machine' and 'think.'"

How It Got Started

The Dartmouth Conference (1956): proposed by John McCarthy, Marvin Minsky, Nathaniel Rochester, and Claude Shannon:

> *We propose that a 2 month, 10 man study of artificial intelligence be carried out during the summer of 1956 at Dartmouth College in Hanover, New Hampshire. The study is to proceed on the basis of the conjecture that every aspect of learning or any other feature of intelligence can in princi- ple be so precisely described that a machine can be made to simulate it.*

Here was for the first time the term "artificial intelligence" was used (coined by McCarthy).

More, McCarthy, Minsky, Selfridge, Solomonoff (2006)

Shannon, McCarthy, Ed Fredkin and Joseph Weizenbaum (1966)

Some Example AI Systems

- Marvel (1992) - a real-time expert system that monitors the massive stream of data from the Voyager spacecraft, handling routine tasks, and alerting the analysts to more serious problems at JPL.

- Pegasus (1994) - a speech understanding program that handles airline ticket reservations.

- Deep Blue (1997).

- An AI planning and scheduling system employed by US military during the Gulf War. (DARPA later reported that the savings resulted from using this single AI system had paid back the US Government all its investment on AI during the past 20 years.)

- A robotic system that controls (drives) a real car in real traffic. (Have you seen a Google's self-driving car? Watch out! http://www.youtube.com/watch?v=-nYhKD8leAg&feature=related)

- IBM Watson (2011) http://www.youtube.com/watch?v=seNkjYyG3gI&feature=related

Can Machines Think?

What do we know that we have succeeded?
The Turing test:

- A human, a machine, and an interrogator;
- The interrogator's objective is to correctly identify who is machine and who is human.
- The machine's objective is to fool the interrogtor to think that it is a human;
- The human's objective is to help the interrogator

A machine passes the Turing test if it fools the interrogator.

http://en.wikipedia.org/wiki/Turing_test

Too hard in its general form and can often be cheated in restricted forms.

Winograd Schema Challenge

- An alternative to the Turing Test developed by Hector Levesque (University of Toronto).
- It poses a set of multiple-choice questions that have a particular form. For examples:
  - The trophy would not fit in the brown suitcase because it was too big (small). What was too big (small)?
  - The town councilors refused to give the demonstrators a permit because they feared (advocated) violence. Who feared (advocated) violence?
- Nuance Communications, Inc. is sponsoring an annual competition to encourage efforts to develop programs that can solve the Winograd Schema Challenge
  (http://commonsensereasoning.org/winograd.html).

Charlie Rose Panel on AI (August 27, 2007)

Issues: Can machines think? Can a machine have consciousness? Is the whole more than the sum of its parts? Can "parts turning on parts" produce something beyond the parts? Panelists:

- Ron Brachman: director of AT&T AI lab, Director of the Information Processing Technology Office (IPTO) at DARPA, past president of AAAI (2005), VP of Yahoo Research
  http://en.wikipedia.org/wiki/Ronald_J._Brachman.
- Rodney Brooks: director of MIT AI lab, founder of iRobot
  http://en.wikipedia.org/wiki/Rodney_Brooks.
- Eric Horvitz: a Senior Researcher at Microsoft Research, where he manages the Adaptive Systems and Interaction group. Past president of AAAI (2007).
  http://research.microsoft.com/en-us/um/people/horvitz/

Tutorial on Tuesday: Tu 6:00PM - 6:50PM Rm 6573, Lift 29-30

The Future of Artificial Intelligence: Robots and Beyond (Council on Foreign Relations, 2014)
https://www.youtube.com/watch?v=fxe7FVI5Ky4. Speakers:

Peter Bock, Professor Emeritus of Engineering, Department of Computer Science, George Washington University.

Paul Cohen, Program Manager, Information Innovation Office, Defense Advanced Research Projects Agency; Professor and Founding Director, School of Information: Science, Technology, and Arts, University of Arizona.

Andrew McAfee, Principal Research Scientist and Cofounder, Initiative on the Digital Economy, Sloan School of Management, Massachusetts Institute of Technology.

Presider:

Amy Alving, Member, Board of Directors, Fannie Mae; Former Chief Technology Officer, Science Applications International.