

Class #00:
Introduction to Machine Learning

Machine Learning (COMP 135)

1

What is Artificial Intelligence?

- Historical definition (Dartmouth Workshop on AI, 1956):

“The study of the conjecture that every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it.”

Machine Learning

Artificial Intelligence

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2

Modern AI: An Engineering Enterprise


- Building (partially) autonomous machines for a variety of tasks
 - Construction, transportation, search-and-rescue, exploration...
- Automating intelligence and formalizing knowledge
 - Internet search, expert systems, data mining, ...
- Using computational models to understand complex behavior
 - Automated planning, large-scale crowd simulation, traffic analysis, ...
- Using computers to discover new information
 - Medical image analysis, intrusion detection, stock market trading, ...
- Allowing computers to work better with people
 - Reactive tutoring, automated assistants, “sensitive” GPS systems, ...

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3

How Do We Define Intelligence?

- It is not clear how “intelligence” should be understood (let alone how to get a machine to behave that way)
- How a **human being** might act?



- Or is it some sort of **ideal rationality**?

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4

Turing Test: Intelligence = **Acting Humanly**

- ▶ Alan Turing (1950) “Computing Machinery and Intelligence”
 - ▶ Proposed an **imitation game**
 - ▶ Predicted that by 2000, machines could fool average person for 5 minutes, 30% of the time
- ▶ One problem: not everyone agrees on the standard proposed by the test, and whether it is meaningful
- ▶ In any case, we still haven’t got there yet...
 - ▶ Loebner prize for convincing bots would award up to \$100,000 (and a gold medal) for a truly convincing interactive agent
 - ▶ No such agent has ever really been approached

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5

What Should an Intelligent System Do?

- ▶ Following Turing, we take an **operational** approach:

Intelligence is defined by some means of measuring performance in a set task.

- ▶ An intelligent system is one that **optimizes** some measure
- ▶ How much it changes things so that it gets closer towards the goals that have been set for it
 - ▶ The word-count of error-free text translated
 - ▶ Customer satisfaction for automated dialogue systems
 - ▶ Hours of accident free, real-time driving
 - ▶ Amount of data collected by an autonomous space-vehicle
 - ▶ ...

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6

Defining a Learning Problem

- ▶ Suppose we have three basic components:

1. Set of **tasks**, T
2. A **performance measure**, P
3. Data describing some **experience**, E



Cover image: McGraw Hill,
1997 [link](#)

A computer program **learns** if its performance at tasks in T , as measured by P , improves based on E .

From: Tom M. Mitchell, *Machine Learning* (1997)

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7