CS 461
ARTIFICIAL INTELLIGENCE

Lecture # 01
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SPRING 2021
FAST – NUCES, CFD Campus

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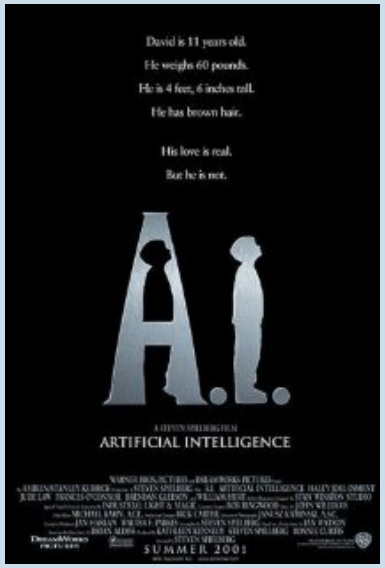
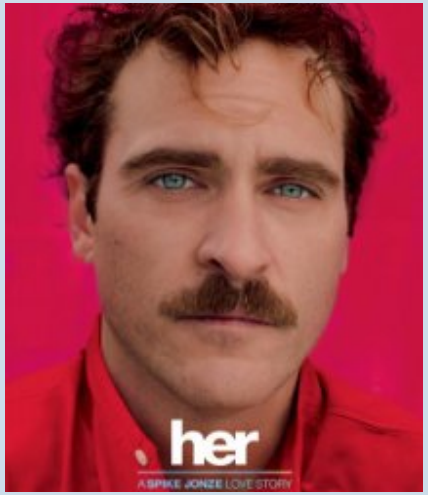
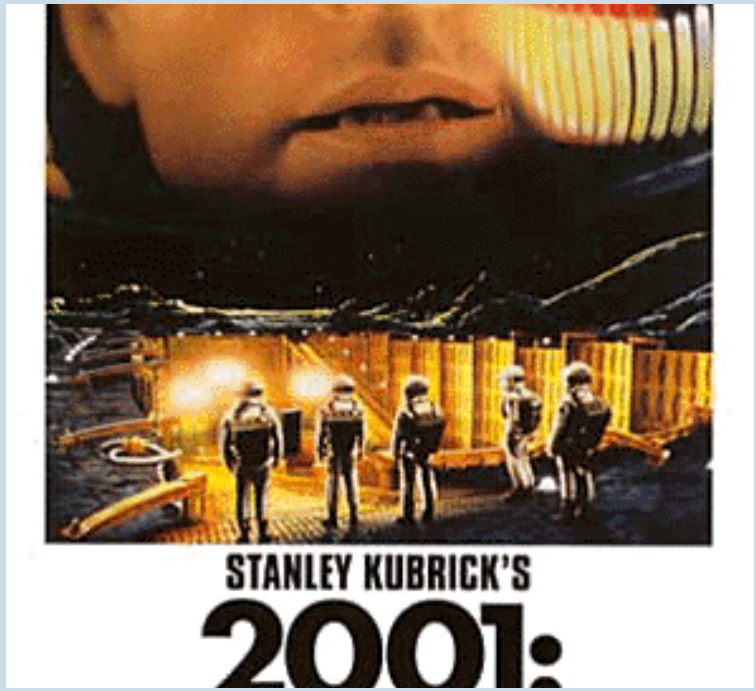
Today's Topics

- Artificial Intelligence Introduction
- Applications and state-of-the-art
- Myself, Course & Conduct

Our lame introduction to “Artificial Intelligence” starts with movies.







Intelligence and Machines – A perspective

- What is Intelligence?
- Is it possible for a “machine” to be intelligent?
- Can machines think?
- Can machines decide?
- Can we emulate intelligent behavior in machines?
- How far can we take it?

What is Intelligence?

Few definitions…

- Webster's Dictionary definition:

  The faculty of acquiring and applying *knowledge*.

- A lay man's perception:

  Mental skill, brightness or high IQ level.

What is Intelligence?

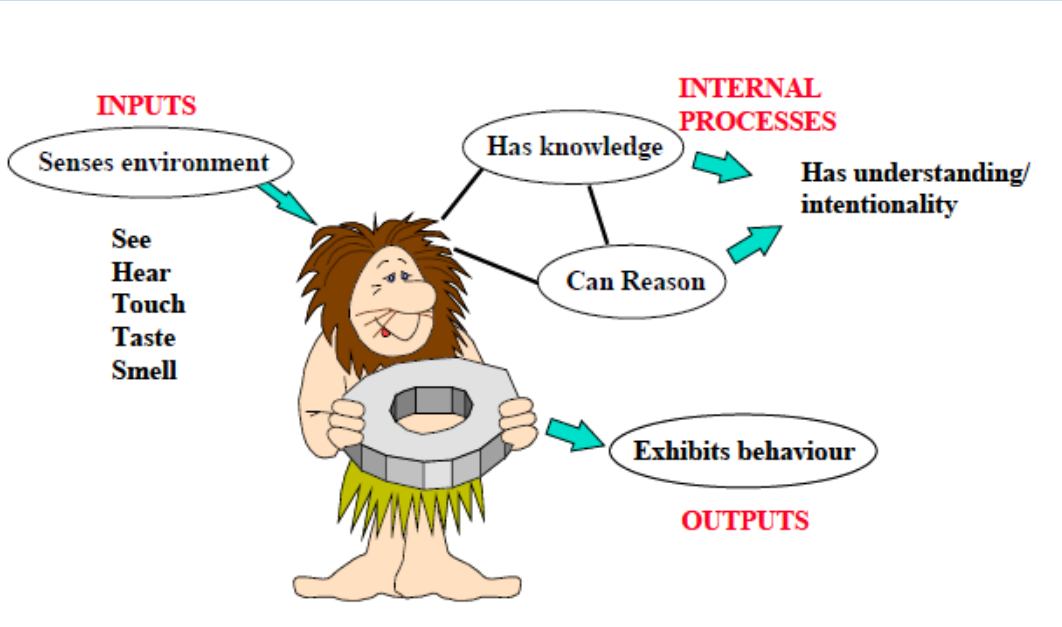
- **More scientific definition:**

Intelligence is a measure of the success of an entity in achieving its objectives by interacting with its environment.

Reveals important points…

- Presence of an environment to observe intelligent behavior
- Measure goals on a scale to measure intelligence

What is Intelligence?



It provides us the possibility of designing intelligent machines

- The ability to *express* intelligence depends on the *richness* of interaction with the environment, and on the achievement of the goals as well as internal mechanisms.

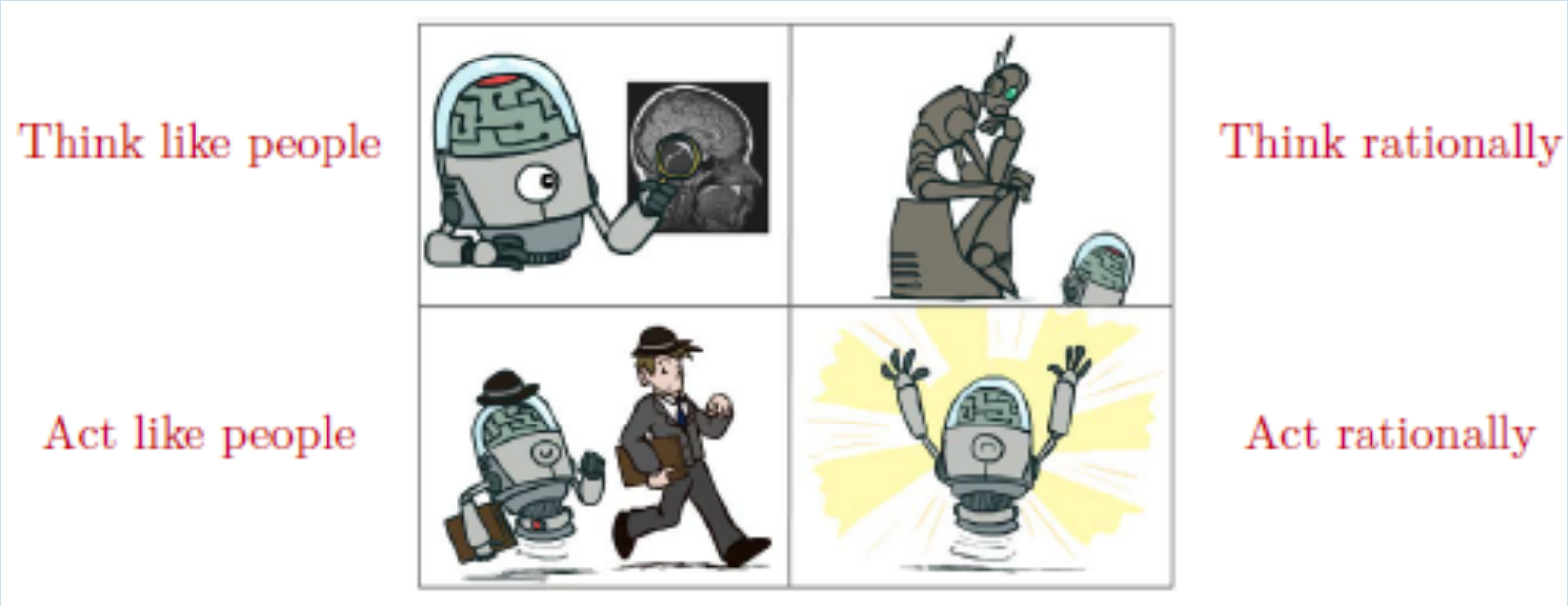
What is Intelligence?

- So, an intelligent entity interacts with its surroundings and it implies the followings:
  - *Some form of getting input*
  - *A way to produce output*
  - *Ability to process input to give the output some relevance*

Artificial intelligence is the simulation of intelligence in machines

Approaches to AI

- The science of making machines that:

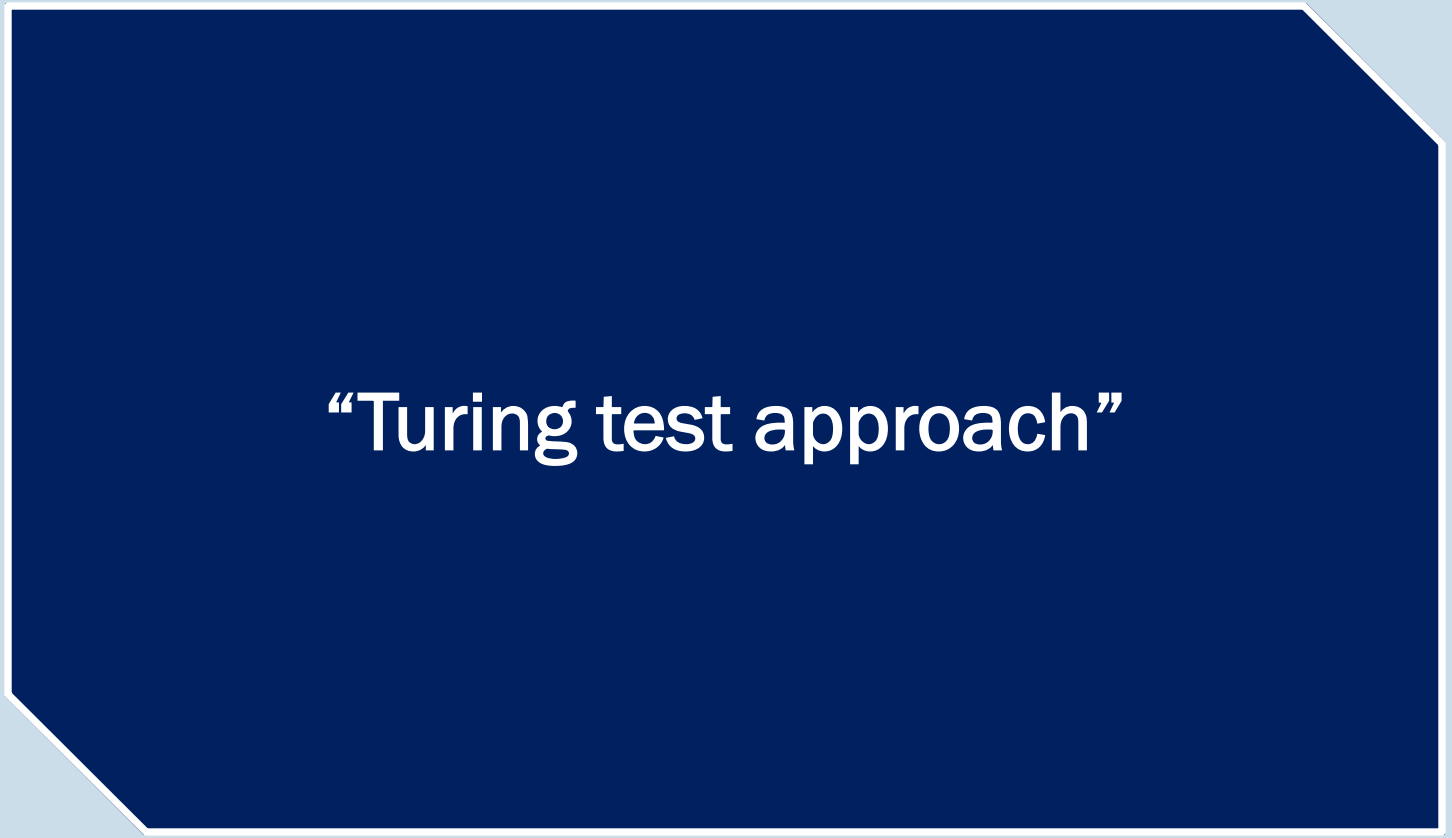


Think like Human

"Cognitive approach"
Three ways to do this:

- Through introspection
- Through psychological experiments
- Through brain imaging

Act like Human



Alan Turing

1950 – He proposed the Turing test to decide if a computer is exhibiting intelligent behavior.

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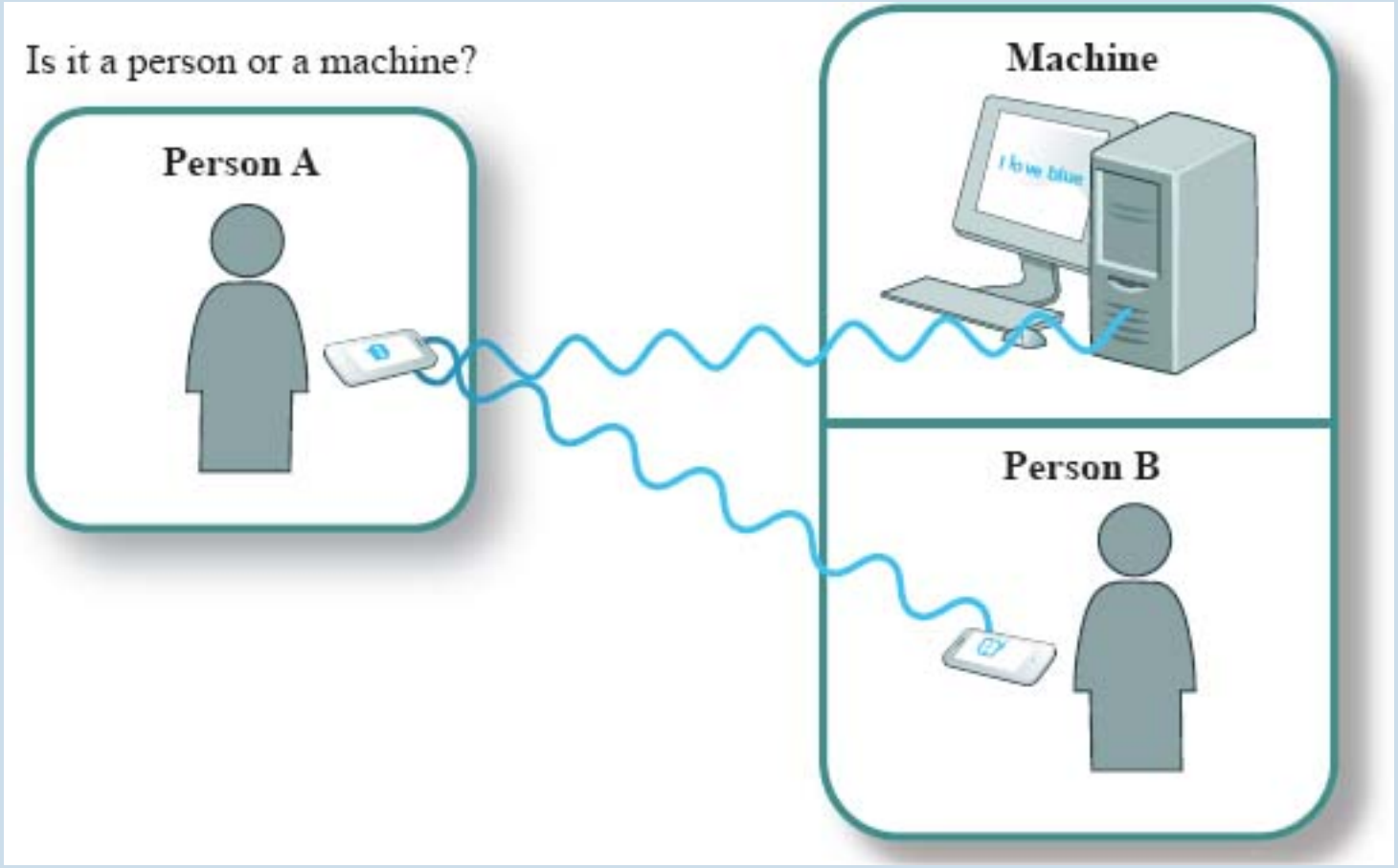

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Act like Human

"Turing test approach"

Six disciplines are required:

- Natural language processing,
- Knowledge representation,
- Automated reasoning,
- Machine learning,
- Computer vision,
- Robotics

Think Rationally

"Laws of thought"

Based on logical inferences.

Obstacles in doing so:

- Not easy to state informal knowledge in formal terms
- Big difference in solving a problem in practical and to solve it in principle

Act Rationally

"Rational agent approach"
Merits:

- More general than "laws of thought" approach
- More adjustable to scientific development

This course is about designing rational/intelligent agents

There are many specialized subfields (each of them is a separate course - often graduate course)

MAJOR AREAS OF AI

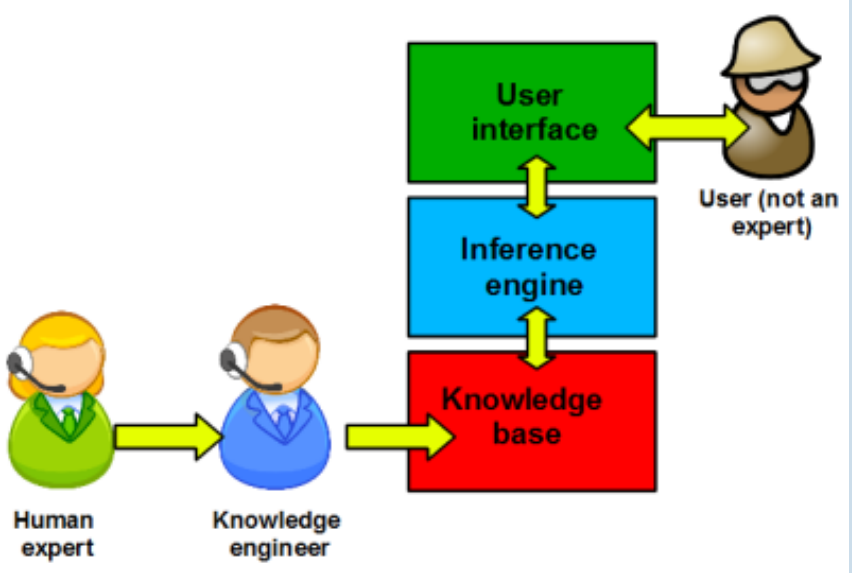
Natural Language Processing

- Speech technologies
  - *Automatic Speech Recognition (ASR)*
  - *Text-to-speech synthesis (TTS)*
  - *Dialog systems*

- Language Processing Technologies
  - *Machine translation*
  - *Information extraction*
  - *Information retrieval*
  - *Text classification, spam filtering*

Expert Systems

- A computer program designed to act as an expert in particular domain.
- An ES includes:
  - *Knowledge base (collection of facts and rules)*
  - *Inference engine (applies rules to known facts to deduce new facts)*



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Robotics

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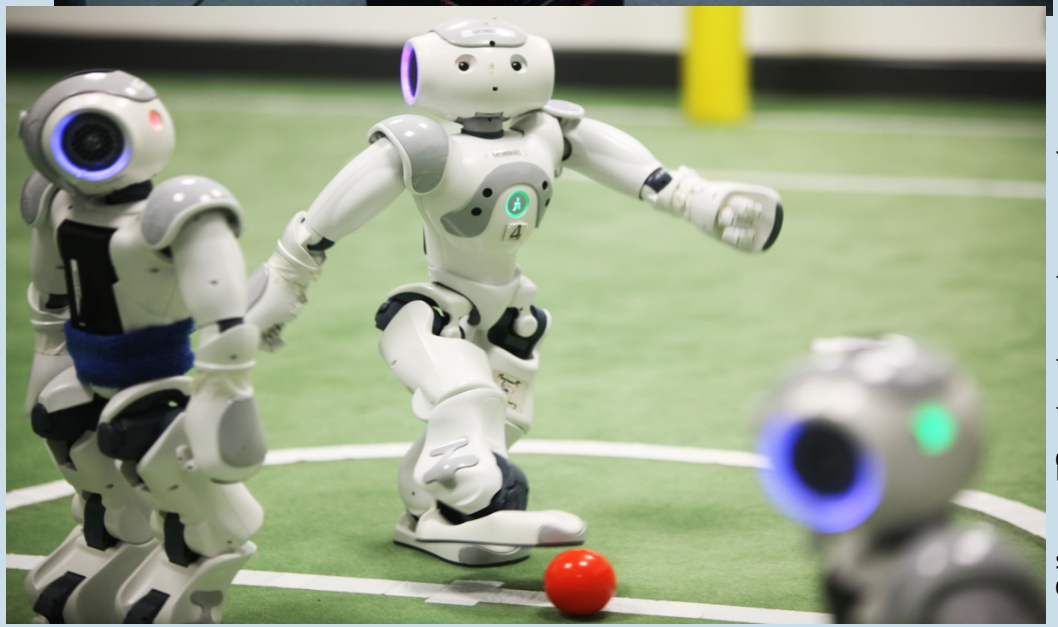

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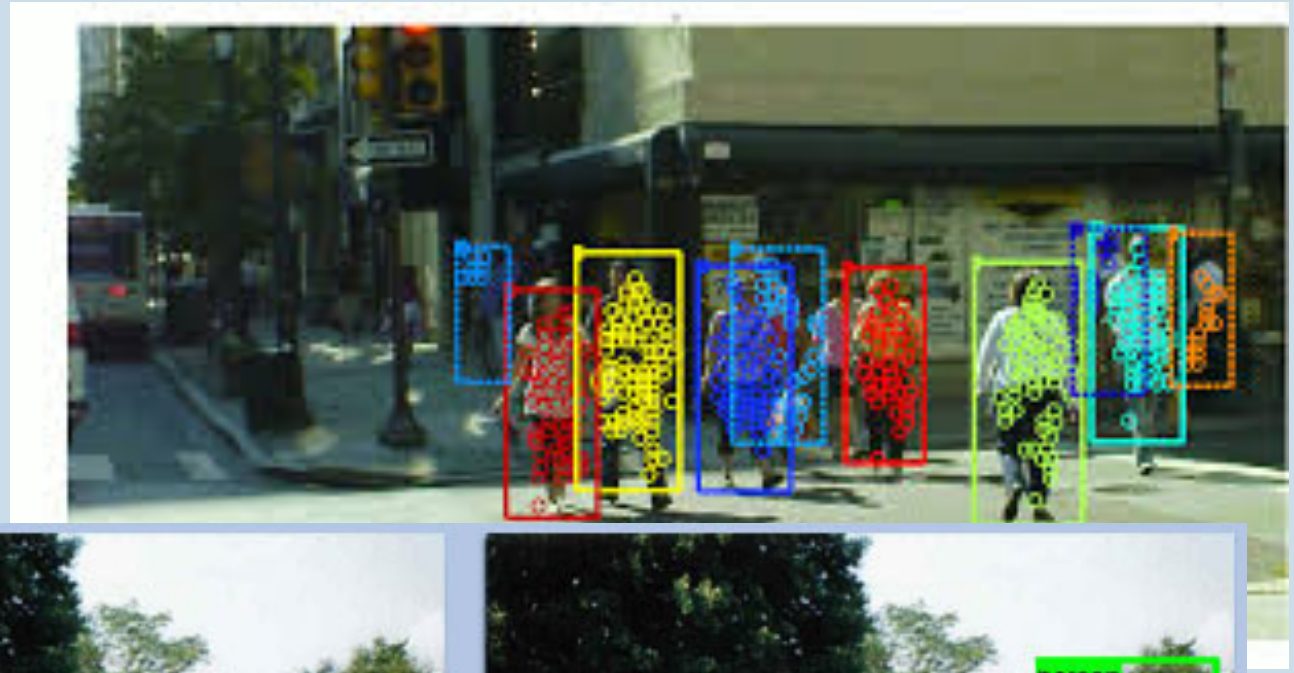
Computer Vision



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Game Playing

http://upload.wikimedia.org/wikipedia/commons/b/be/Deep_Blue.jpg

http://www-03.ibm.com/ibm/history/ibm100/images/icp/A138918I23240Y22/us__en_us__ibm100__700_series__checkers__620x350.jpg

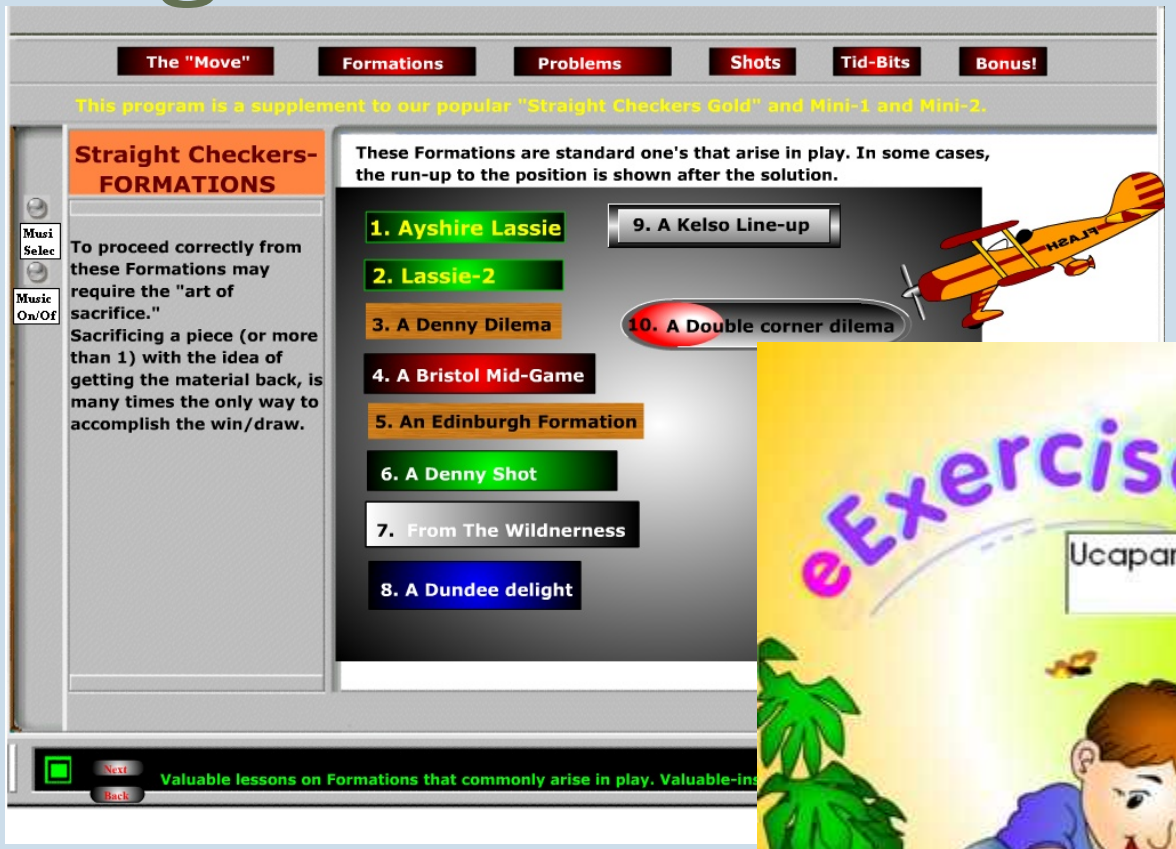
Planning and decision support

- Intelligent programs designed to provide active assistance in the planning process.
- During the 1991 Gulf War, US forces deployed an AI logistics planning and scheduling program that involved up to 50,000 vehicles, cargo, and people
- NASA's on-board autonomous planning program controlled the scheduling of operations for a spacecraft

Automatic Programming

- Computer system that could develop program by itself, in response to and in accordance with the specifications of a program developer

Intelligent CAI



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How far AI goes?

- Internet search
- Intelligent chatbots
- Unarmed vehicles
- Logistics planning
- Games
- Education
- Auction design
- Fraud detection
- Disease diagnosis
- General reasoning
- and many more…

Our focus is on AI fundamentals

MYSELF, COURSE & CONDUCT

Myself

- Rabia Maqsood

  Ph.D. (Computer Science)

  University of Milan, Italy (2020)

  Assistant Professor,

  Department of Computer Science

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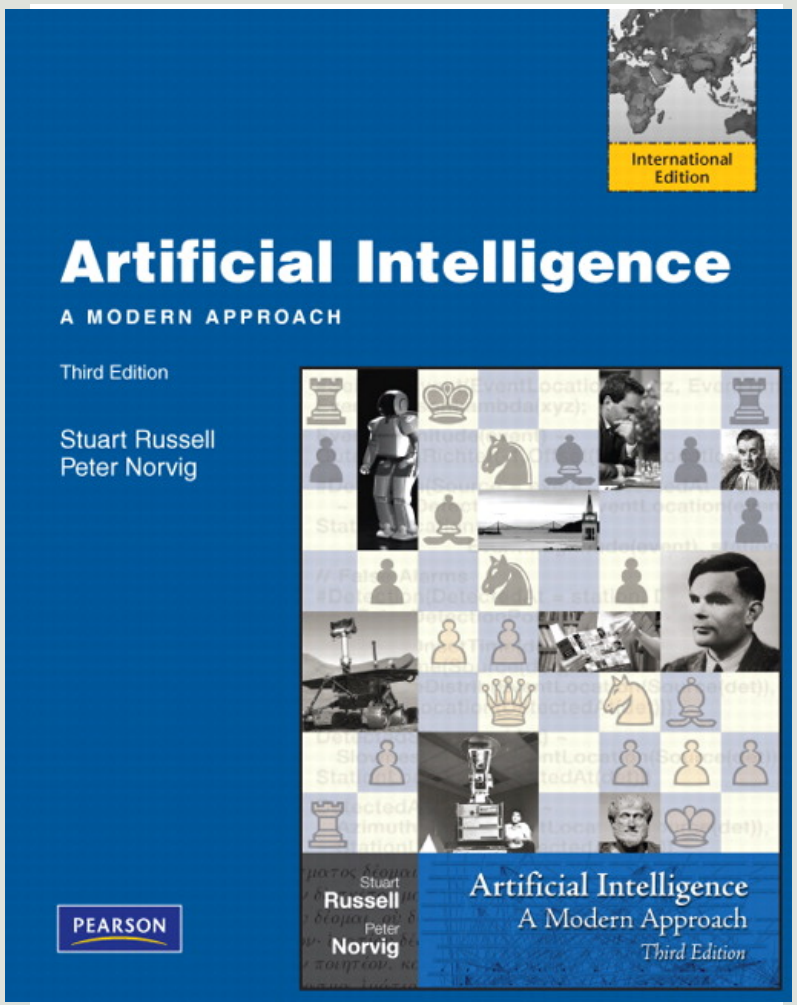
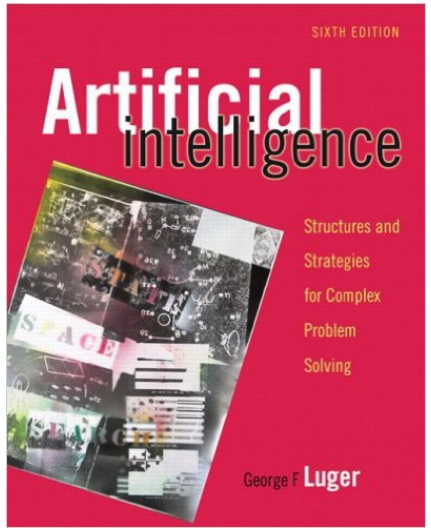
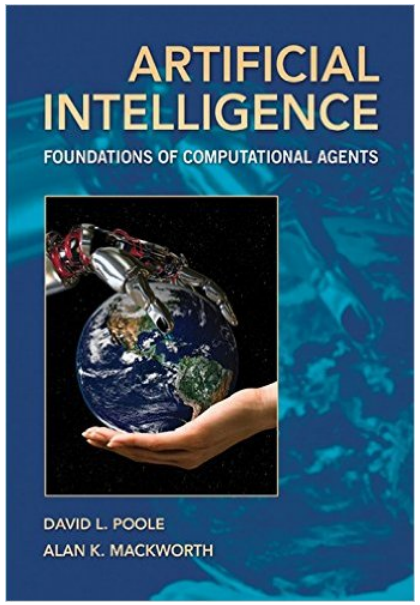
- Office Visiting Hours: *to be provided soon*
  - *Better to fix an appointment otherwise*

Course Introduction

- Credit Hours: 3 + 1
- Online tool for content sharing
  - *SLATE: **Artificial Intelligence CS 2021 - 01 FSD***
    - Lectures
    - Assignments/Quizzes
    - Reading material
    - Submission folder
    - Grade sheets
    - Announcements







COURSE BOOKS

Course Outline

Tentative Marks Distribution

Item Name	Quantity	Marks (%)
Home work	Very often	0%
Quizzes	05-06 [all announced]	10%
Assignments	05	15%
Mid Exams	02	30% [15 abs.+15 abs.]
Final Exam	01	45%

No retakes for missed quizzes
Assignment late work policy: 30% marks deduction
(per day after the deadline)

Honor Code

- Dishonesty will NOT be tolerated
- All parties involved in any kind of cheating will be punished equally
- It will result in negative marks in the corresponding work **at least**

General Guidelines

- Be regular & punctual in the class.
- Maintain class discipline.
  - *Usage of mobile phones and/or laptops is prohibited.*
- Visit course tab on SLATE *regularly* for updates.
- Confirm your scores as soon as they are updated, no changes will be made later.

General Guidelines

- Start working on projects/assignments right from the first day.
- Read book(s).
- Come prepared in the class.
- Class participation is encouraged.
- Raise your hand before you speak.

Objectives of this course

To introduce the notion of intelligence and the so-called artificiality associated with it, and how these can be modeled in computational systems.
To create a solid AI foundation which motivates students towards taking advanced AI courses/research.
To motivate students toward carrying real world AI projects, keeping the local context in view.