CS 156:Introduction to Artificial Intelligence

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Course Objectives:

- Equip students with a foundational understanding of key AI concepts and techniques.

- Develop practical skills through hands-on implementation of AI algorithms and systems.

- To develop practical skills in AI applications through hands-on projects.

Course Structure

- ## Lecture
  - Class Format and Schedule: The class will be conducted in hybrid mode:

  - Tuesday (1:00 – 3:00pm): Online session via Zoom. Please use the following details to join:
  - Link: Join Zoom Meeting

  - Thursday: In-person session at MacQuarrie Hall 422.

  - ## Office Hours
  - TuTh 3:00 PM - 4:00PM
  - Please make an appointment if you don't reach me, as there are sometimes long waiting lists.
  - **Email:** sayma.akther@sjsu.edu

Course Materials

- **Textbook**
  - Russell & Norvig, AI: A Modern Approach, 4th Ed.
  - Deep Learning" by Ian Goodfellow, Yoshua Bengio, and Aaron Courville

- **Notes**
  - Book aren't required, we recommend further reading for those students who are curious.
  - This is not a course textbook, so the way I present lectures may differ from the book's presentation

- **Development Tools**
  - Python-based platforms
- .

Assessment Structure:

1.**Quizzes and Participation Exercise (10%)**: Assessing theoretical understanding (in-class). This credit is for who will present in the class. If you absent in the class, you will not get the credit.

2.**Assignments/Homework (10%):** Based on lectures. Late submission marks will reduced by time.

3.**Exam (50%):** Two In-class exams (27th June and 1st August).

4.**Project (30%)**: A long project where students can delve deep into an AI area of interest.

Course Design

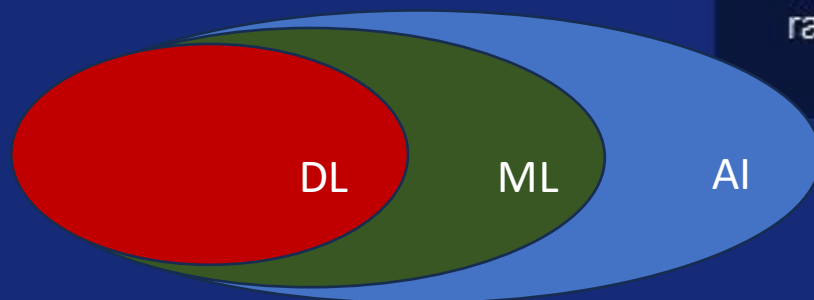| Date	Cover
June 4	Introduction
June 6	Lecture + Project Group
June 11	Lecture + Project Group
June 13	Lecture + Project Dataset Motivation(Demo 1)
June 18	Lecture + Project Dataset Motivation(Demo 1)
June 20	Lecture + Project Dataset Motivation(Demo 1)
June 25	Lecture + Project Dataset Motivation(Demo 1)
June 27	Exam
July 2	No class
July 4	No class

Course Design

Date	Cover
July 9	Lecture + Project Dataset Motivation (Demo 1)
July 11	Lecture + Project Dataset Motivation (Demo 2)
July 16	Lecture + Project Dataset Visualization (Demo 2)
July 18	Lecture + Project Dataset Visualization (Demo 2)
July 23	Lecture + Project Dataset Visualization (Demo 2)
July 25	Lecture + Project Dataset Visualization (Demo 2)
July 30	Lecture + Project Dataset Visualization (Demo 2)
August 1	Exam 2
August 6	Final Project Presentation (Demo 3)
August 8	Final Project Presentation (Demo 3)

Artificial Intelligence
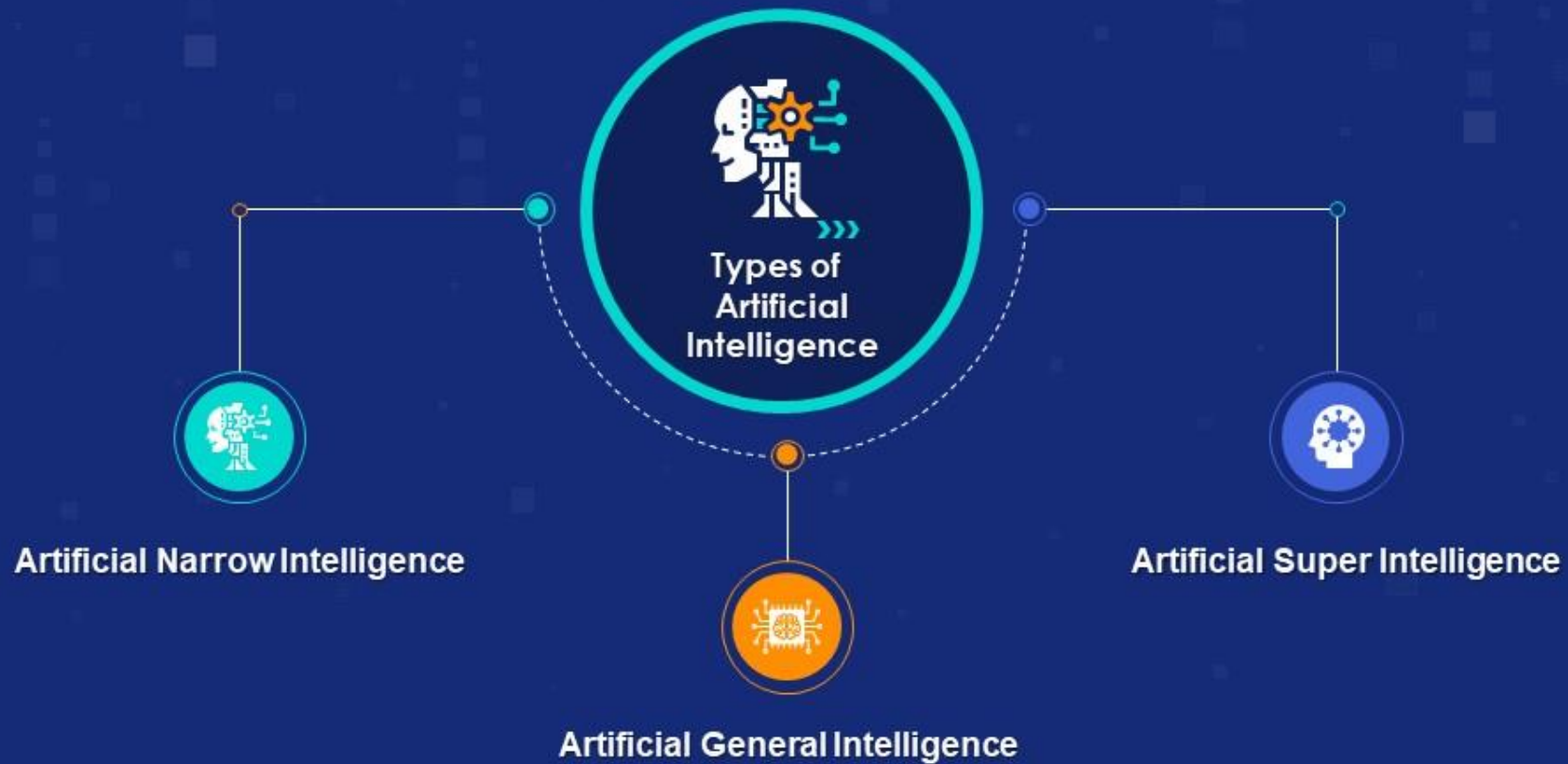
Machine Learning

Deep Learning

Artificial intelligence (AI) is a popular branch of computer science that concerns with building "intelligent" smart machines capable of performing intelligent tasks.

With rapid advancements in deep learning and machine learning, the tech industry is transforming radically.
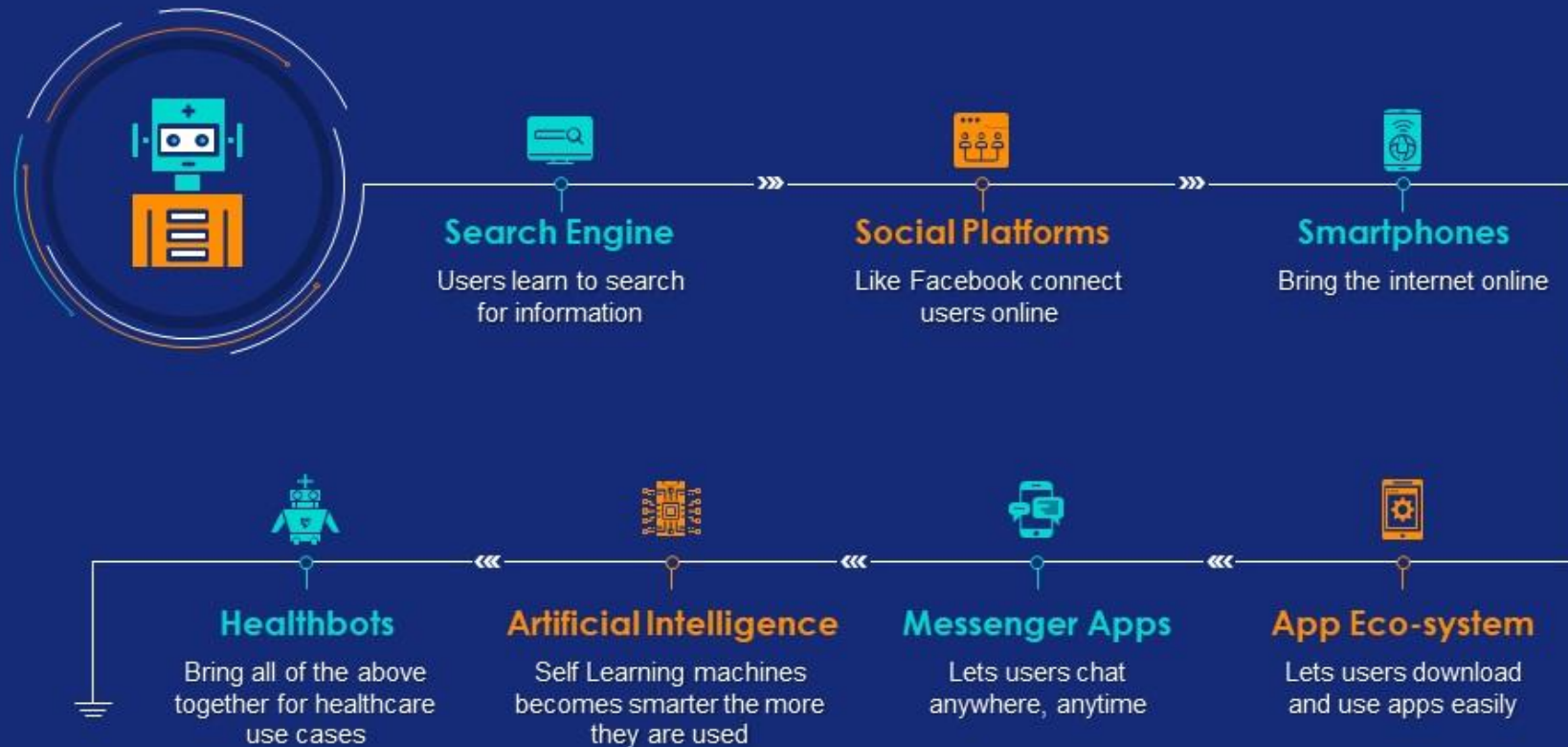
DL ML AI

Introduction to AI Levels?

Types of Artificial Intelligence

Artificial Narrow Intelligence

Artificial General Intelligence

Artificial Super Intelligence

Ai Chatbots in Healthcare

Search Engine
Users learn to search for information

Social Platforms
Like Facebook connect users online

Smartphones
Bring the internet online

Healthbots
Bring all of the above together for healthcare use cases

Artificial Intelligence
Self Learning machines becomes smarter the more they are used

Messenger Apps
Lets users chat anywhere, anytime

App Eco-system
Lets users download and use apps easily

Why is AI booming now?

Global AI Revenue Forecast by 2025, Ranked by Use Case in millions US Dollar

Use Case	Revenue (millions USD)
Static Image Recognition, Classification and Tagging	8,097
Algorithm Trading Strategy Performance Management	7,540
Efficient, Scalable Processing of Patient Data	7,336
Predictive Maintenance	4,680
Object identification, detection, classification, tracking	4,201
Text Query of images	3,714
Automated Geophysical Feature Detection	3,655
Content Distribution on Social Media	3,564
Object detection & classification, avoidance, navigation	3,169

Penetration of Artificial Intelligence Skills, by Country

Country	Percentage
United States	100%
China	92%
India	84%
Israel	54%
Germany	45%

Organizations deploying AI, by Functional Areas

Functional Area	Percentage
External Communication	71%
Customer Relation/Interaction (i.e., chatbots)	66%
Security/Fraud	60%
HR/Workforce Management	60%
Operational Environment	51%
Monitoring Through External Devices/Systems	37%
Logistics & Supply Chain	36%
Production Floor Systems	27%
Expediting Transactions	24%
Fleet Mobile	22%

Definition of AI?

The science of making machines that:

Rational Decisions

We'll use the term **rational** in a very specific, technical way:

- Rational: maximally achieving pre-defined goals
- Rationality only concerns what decisions are made

  (not the thought process behind them)
- Goals are expressed in terms of the **utility** of outcomes
- Being rational means **maximizing your expected utility**

Maximize Your Expected Utility
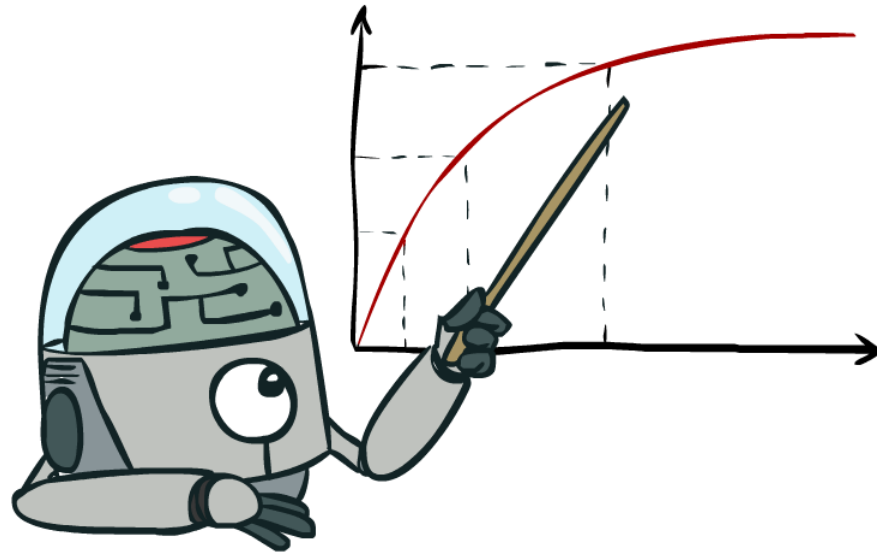
What About the Brain?

Brains (human minds) are very good at making rational decisions, but not perfect

Brains aren't as modular as software, so hard to reverse engineer!

"Brains are to intelligence as wings are to flight"

Lessons learned from the brain: memory and simulation are key to decision making

A (Short) History of AI

- 1940-1950: Early days
  - 1943: McCulloch & Pitts: Boolean circuit model of brain
  - 1950: Turing's "Computing Machinery and Intelligence"

- 1950—70: Excitement: Look, Ma, no hands!
  - 1950s: Early AI programs, including Samuel's checkers program, Newell & Simon's Logic Theorist, Gelernter's Geometry Engine
  - 1956: Dartmouth meeting: "Artificial Intelligence" adopted
  - 1965: Robinson's complete algorithm for logical reasoning

- 1970—90: Knowledge-based approaches
  - 1969—79: Early development of knowledge-based systems
  - 1980—88: Expert systems industry booms
  - 1988—93: Expert systems industry busts: "AI Winter"

- 1990—: Statistical approaches
  - Resurgence of probability, focus on uncertainty
  - General increase in technical depth
  - Agents and learning systems… "AI Spring"?
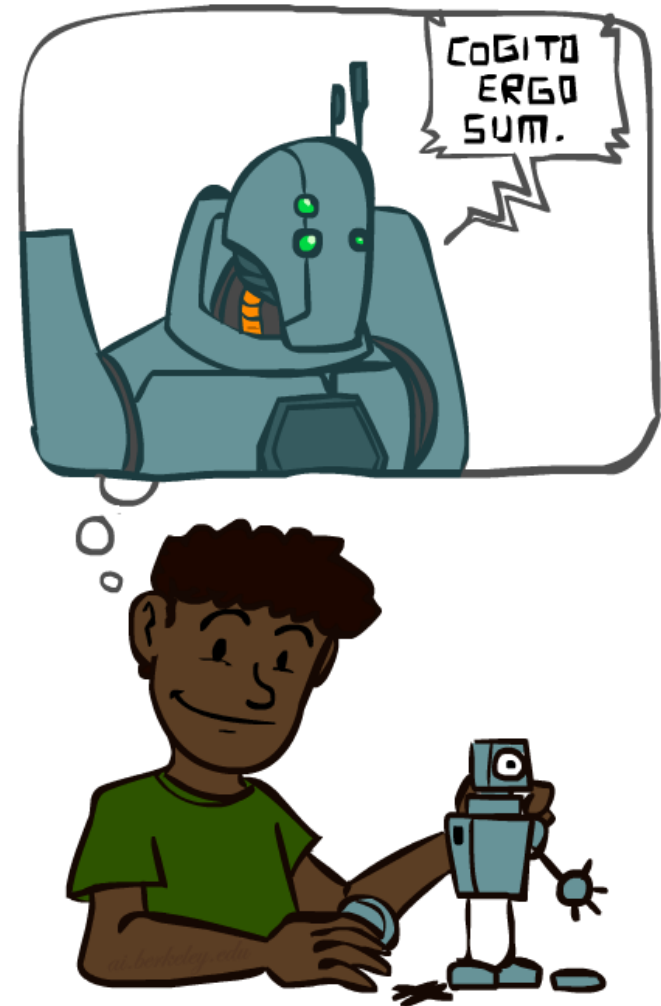
A (Short) History of AI

- 2000—: Where are we now?
    - Big data, big compute, neural networks
    - Some re-unification of sub-fields
    - AI used in many industries
    - Chess engines running on ordinary laptops can defeat the world's best chess players
    - 2011: IBM's Watson defeats Ken Jennings and Brad Rutter at Jeopardy!
    - 2016: Google's AlphaGo beats Lee Sedol at Go

CS 256: Dr. Sayma Akther

Python

- In this tutorial, we will review the basics of Python. This tutorial is largely based on the [W3Schools Python Tutorial](#).

- **Contents**
  - Installation
  - Basics
  - Fundamentals
  - Control Flows
  - Functions
  - Classes
  - Iterables

Installation

- **Anaconda for environment management**
    - https://www.anaconda.com/

- jupyter notebook <-- open jupyter in current environment

Let's Do Some

Announcement

- Learn a bit about AI. ☺
- There will be a quiz on it in the next class.
- Homework 1
- Project Team