SCC361 Week 1

Lecture 1 {

 Learning Outcomes {
  Understand AI Concepts, Applications and Trends
  Understand Machine Learning terms
  Train Machine Learning Models for specific tasks
  Learn and implement simple AI based systems
  Learn how to evaluate the performance of AI systems
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Introduction to AI and ML {

 AI Overview

 Definition

 Goals of AI

 AI and Society

 NLP {

 Text that combines meaning with letters

 Examples:
 - Web search engine
 - Text classification
 - Sorting algorithms
 - Spam filtering
 - Machine translation
 - Question answering
 - Recommender Systems

 Speech Technologies:
 - Siri, Alexa, Cortana, Google Assistant
 - Automatic Speech Recognition
 - Dialogue Systems

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 Explainability = Demonstrate how an AI came to a solution
 Uncertainty/Robustness = How confident is the AI with its decision

 History of AI {

 Early Days

1943: McCulloch & Pitts
Boolean Circuit Model of Brain

1950: Turing
Computing Machinery and Intelligence

Excitement

1950s: Early AI Programs
Samuel's checkers program
Newell & Simon's Logic Theorist
Gelernter's Geometry Engine

1956: Darthmouth Meeting
Artificial Intelligence adopted

1965: Robinson
Complete algorithm for logical reasoning

Knowledge-based approaches

1969-79: Early development

1980-88: Expert systems
Industry Booms

1988-93: Expert systems industry bursts
AI Winter

Statistical Approaches + Subfield Expertise

Resurgence of probability, focus on uncertain
General increase in technical depth
Agents and machine learning systems
AI Spring?

Excitement (Now)

Big data, big compute, deep neural networks
Some re-unification of subfields
AI used in many industries

}

The Thinking Machine {

 What is AI? {

  Approach 1: Thinking like a human
  Approach 2: Acting like a human
   Mimicing human behaviour
  Approach 3: Thinking rationally
  Approach 4: Acting rationally

```
        Human     Rational
      +------------------------------------
Thinking |Systems that  | Systems that
        |think like humans | think rationally
        |------------------|-----------------
Acting  |Systems that  | Systems that
        |act like humans | act rationally
      +------------------------------------
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What is an Agent? {

 Definition = Something that acts within an environment

 Acts intelligently if:
 - Action is appropriate
 - Flexible to change
 - Learns from experience
 - Makes appropriate choices

 Computational Agent: Agent whose decisions and actions can be explained in terms of computation

 Rational Agent: Acts to achieve best outcome
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 AI studies the synthesis and analysis of computational agents that act intelligently
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}

Goals of AI {

Scientific Goal = Understanding principles of intelligent behaviour
Engineering Goal = Concerned with constructing intelligent agents

Business Benefits:
 - Workflow automation
 - Enhance creative tasks
 - Increased accuracy
 - Better predictions

Social Benefits:
 - Healthcare
 - Smart cities, transport, security
 - Forecasts and predictions
 - Agriculture
 - Overall Lifestyle

}

Risks and Challenges {

 Safety and Security
 Trust and Social Manipulation
 Explainable AI

Possible Job Loss

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 Ethical Concerns {

  Accountability
  Accuracy, Bias, Privacy and Inequality
  AI learns from data from humans, which may encode prejudice
  Technological Social Responsibility

 }

 Machine Learning {

  AI systems were mostly rule-based
  Machine Learning drives AI

  Machine Learning = Field of study that gives computers the ability to learn, without being explicitly programmed

  Declarative Knowledge = Accumulation of old facts
  Imperative Knowledge = Deduce new facts from old facts

  Supervised Learning = Tell computer how to learn
   - Classification = Relationships and Categories
   - Regression = Predicting
   Mapping input to an output

  Unsupervised Learning =
   - Clustering = Inherent Grouping within data
   - Association =
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