CS 151: ARTIFICIAL INTELLIGENCE

Professor America Chambers

Getting to know you

- Name
- Major, College
- What you did this summer
- Interesting fact about yourself

Course Topics

- Part I: Problem solving
  - Search
  - Adversarial Games
  - Constraint satisfaction
- Part II: Reasoning with uncertainty
  - Logic and probability
  - Bayesian networks
  - Reasoning over time (hidden Markov models)
- Part III: Learning
  - Supervised learning
  - Clustering
- Throughout: Applications
  - Natural language processing, speech recognition, etc.

Course Information

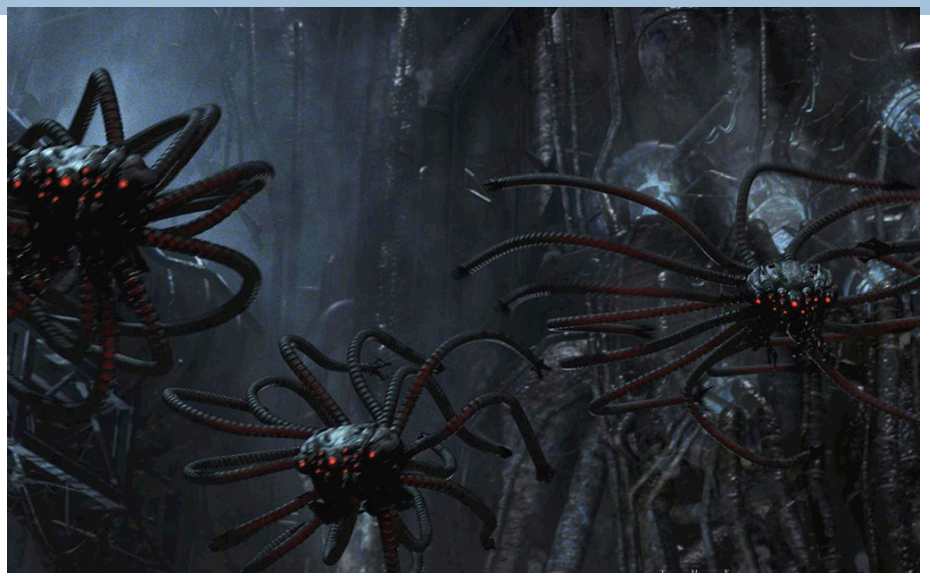
http://www.cs.pomona.edu/classes/cs151/

Today

- Reading
  - Artificial Intelligence: A Modern Approach (AIMA) Chapter 1

- Goals
  - Introduction to Artificial Intelligence (AI)
    - How do we define AI?
    - Subfields of AI
    - A short history of AI
  - Getting started with Python…

AI in popular media

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Optimizing Paths & Flows
Planning
AI & Creative Expression
Plan Recognition
AI in Art
AI in Music
Humanoid Robots
Autonomous Vehicles & Safety
Robot Guides & Assistants
Augmenting Cognition
Intelligent Tutoring
Ubiquitous Computing
Social Computing
Autonomous Space Exploration
AI and Preferences, Media & Entertainment
Home Robotics
Descartes
Aristotle
Leibniz
Lovelace
Whitehead
Russell
Turing
Gesture Recognition
Multimodal Interfaces
Mixed-Initiative Collaboration
Robots For Education
Robotic Surgery
Diagnosis
Drug Design
Scientific Discovery
Assistive Technology
AI LAB
MEDICAL CENTER
Handwriting & Sketch Recognition
Recommender Systems & Question Answering
Search & Retrieval
Security & Privacy
User Modeling
Communications Triage
Machine Translation
Vehicle Navigation
Ecocomputing
See the AI timeline and more at
www.aaai.org/AILandscape
The AI Landscape
David Leake, Indiana University, Poster Development Committee Chair
Poster Design: Giacomo Marchesi, www.GiacomoMarchesi.com

What is AI in reality?

- "AI is our attempt to create a 'machine' that thinks (or acts) humanly (or rationally)"

Think like a human Cognitive Modeling	**Think rationally** Logic-based Systems
Act like a human Turing Test	**Act rationally** Rational Agents

Subfields of AI: Natural Language Processing (NLP)

- Understanding
  - Speech recognition
  - Entity and co-reference resolution
- Generation
  - Automatic summarization
  - Natural language generation
  - Speech and gesture generation
- Other
  - Machine translation
  - Question answering
  - Sentiment analysis

Subfields of AI:

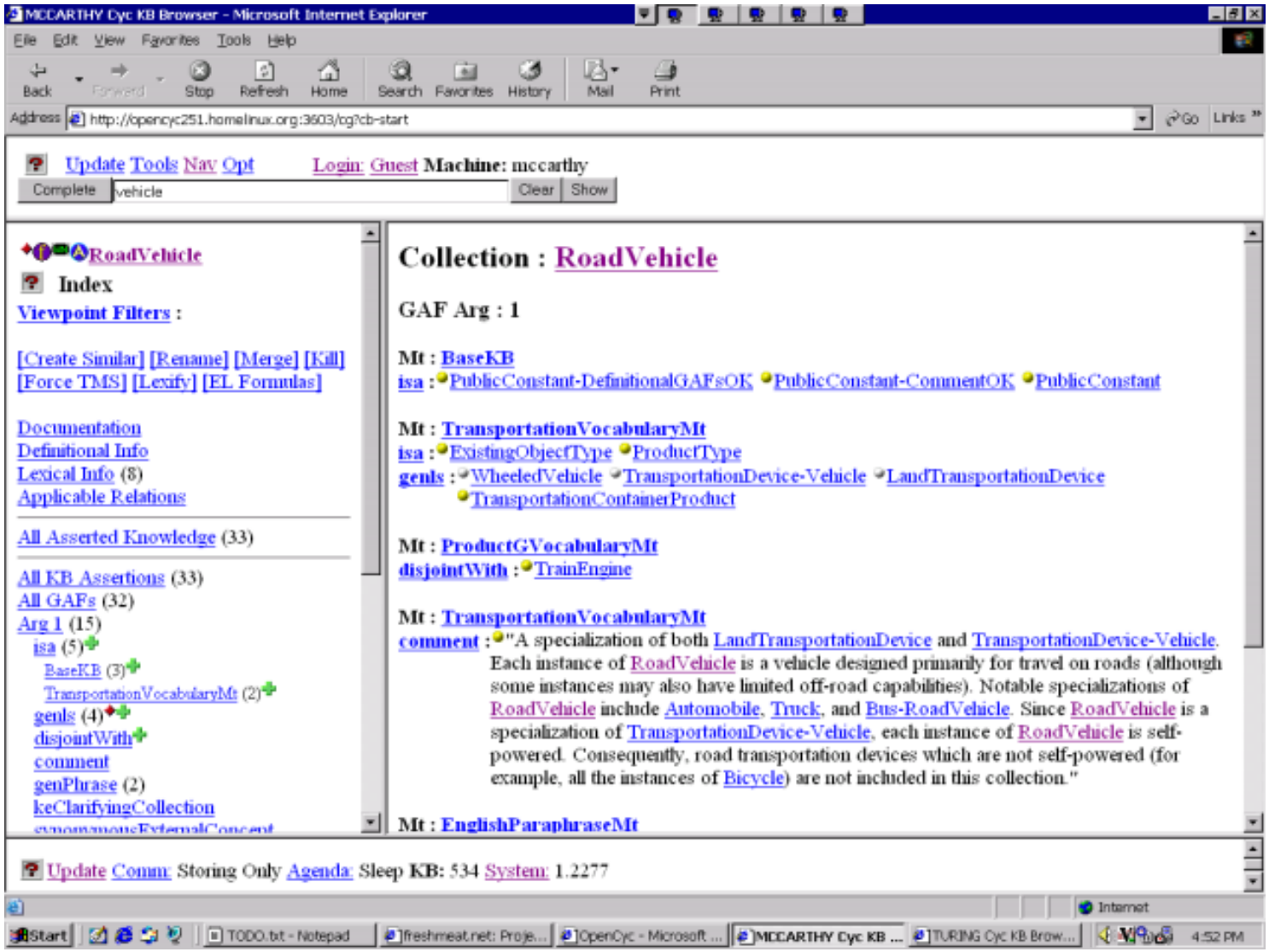
Knowledge representation and common sense

- What would happen if I dropped my computer on the ground? How do you think I would react?

- How do you get common sense into a computer?
- Opencyc.org
- OpenMindCommonSense (OMCS)

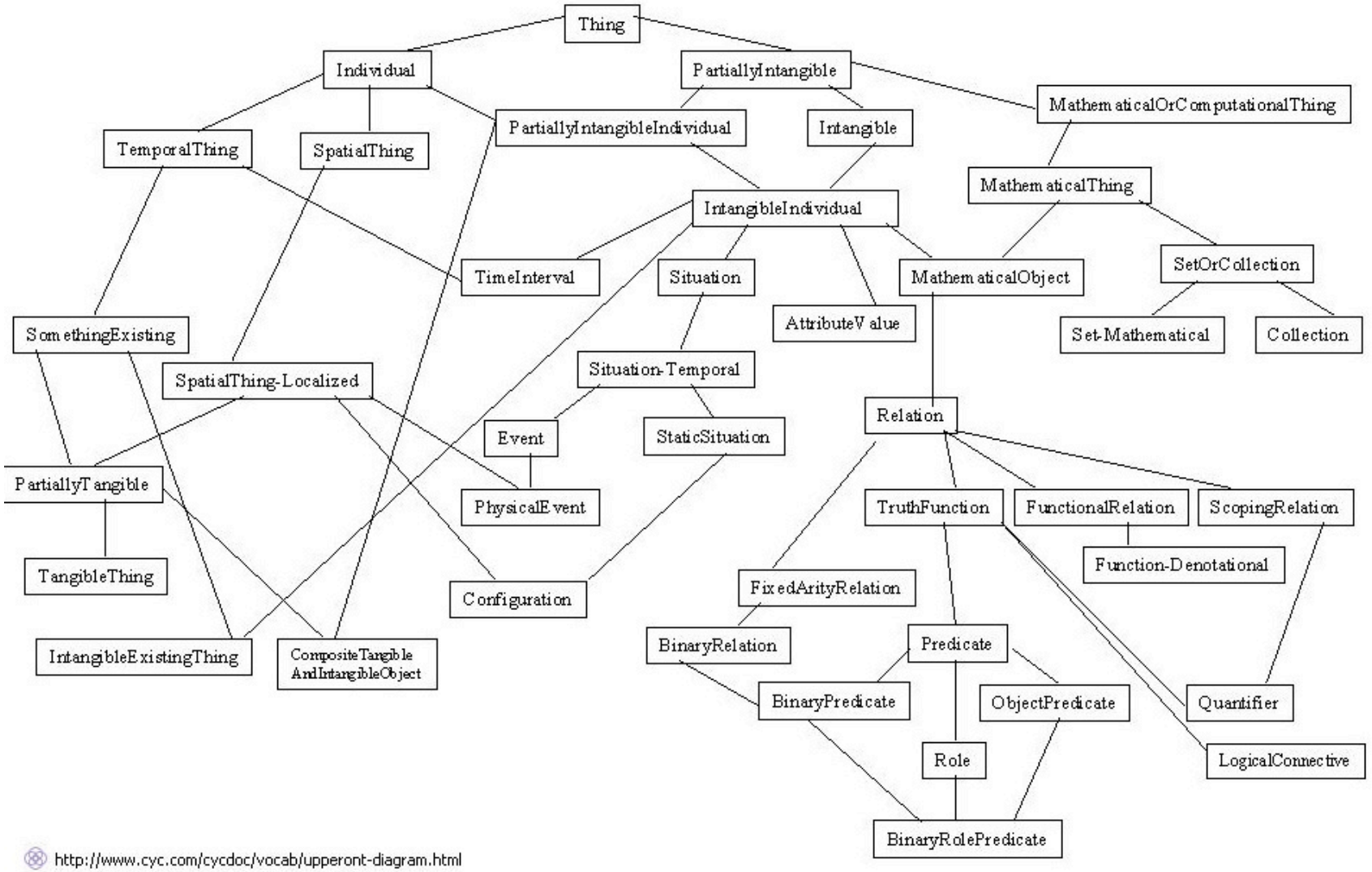
Subfields of AI:

Knowledge representation and common sense



Subfields of AI:

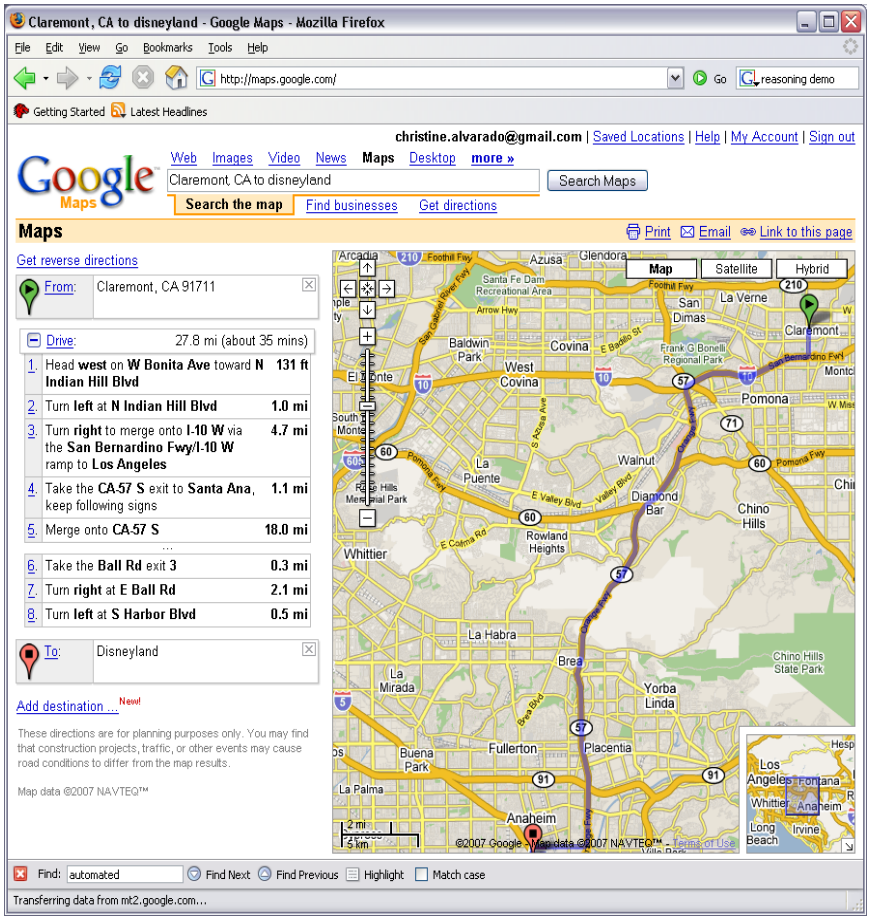
Knowledge representation and common sense



http://www.cyc.com/cycdoc/vocab/upperont-diagram.html

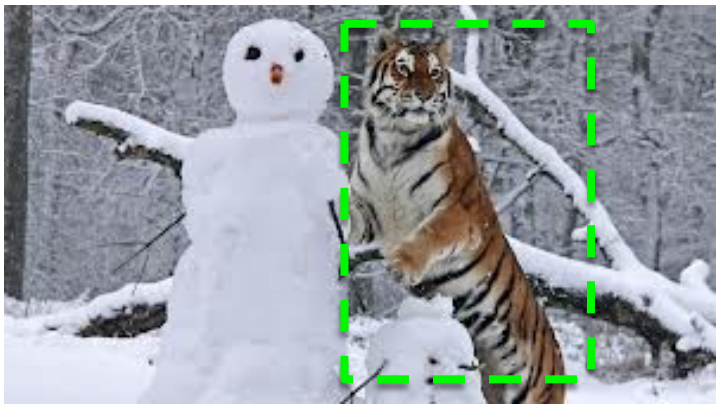
Subfields of AI: Automated Reasoning and Planning

- Game playing
- Planning
- Route finding



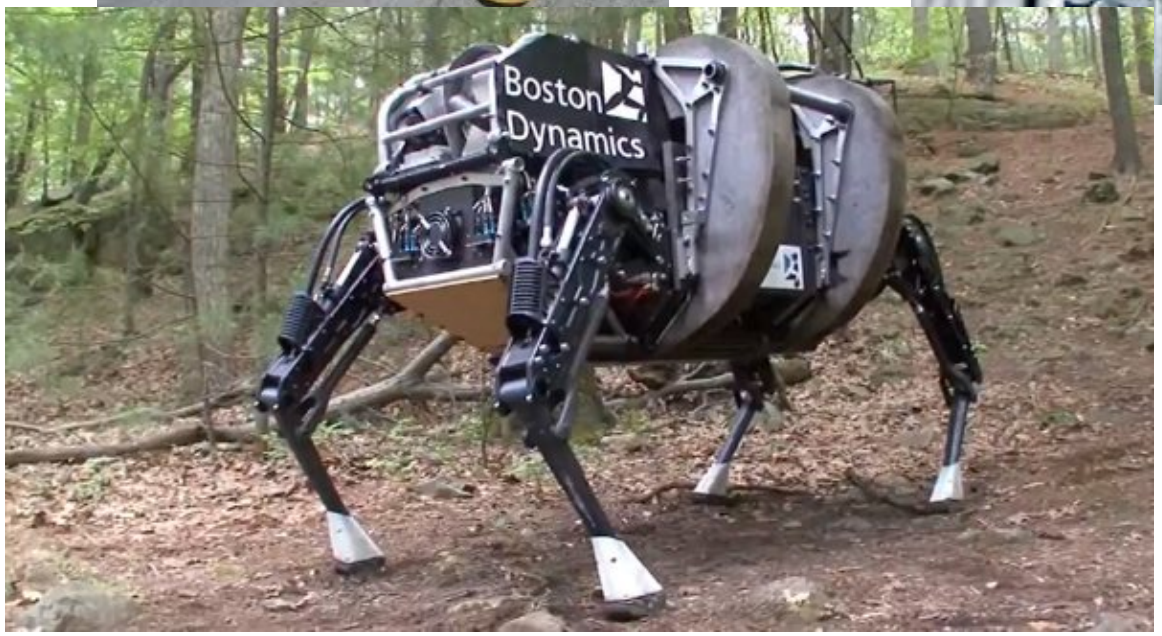
Subfields of AI: Perception (vision, graphics)

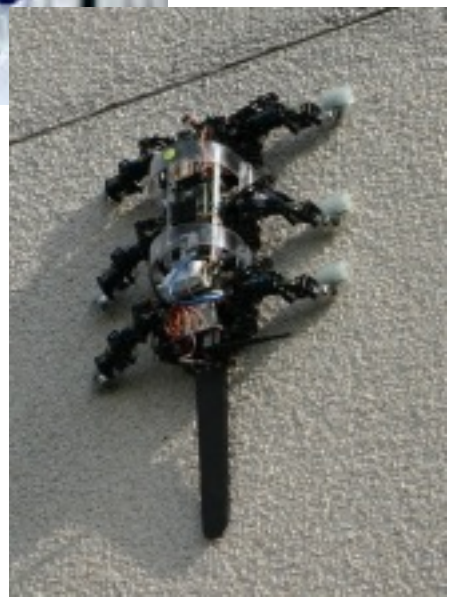
- Image classification
  - Does the image contain an instance of X?
  - Where is the person's head? What is the person doing



- Scene segmentation
- Object and face recognition

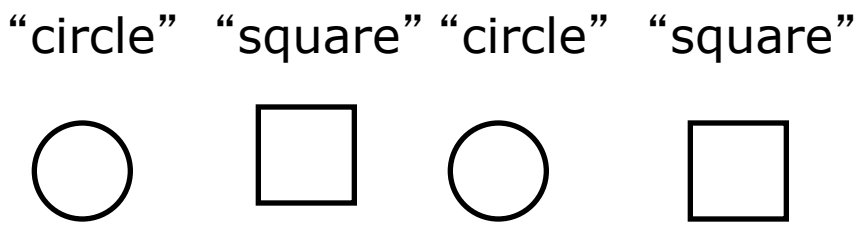
Subfields of AI: Robotics



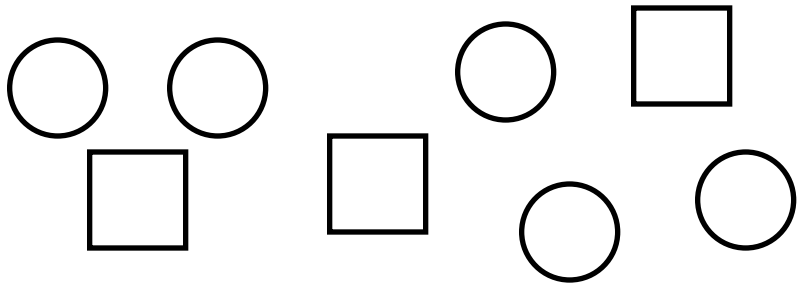


Subfields of AI: Machine Learning

- What does it mean for a computer to learn?
- Supervised (labeled data)



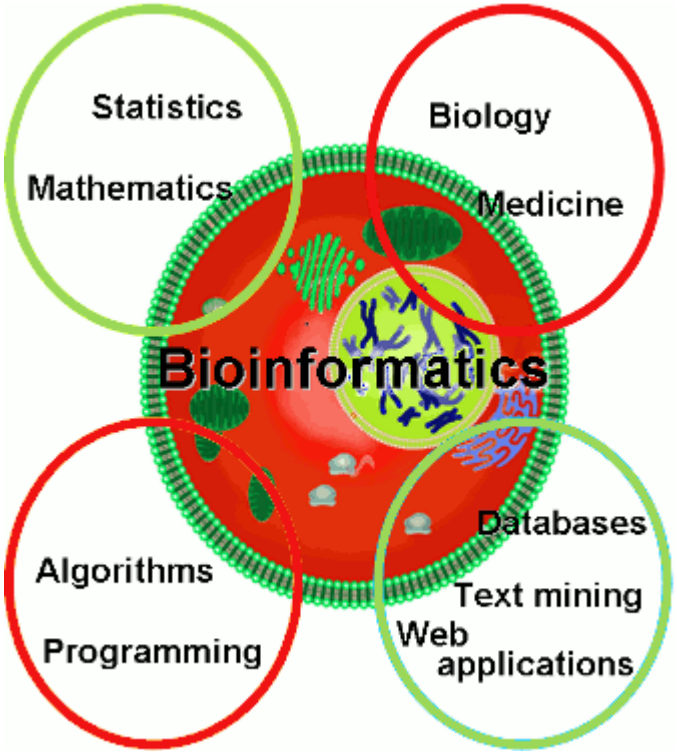
- Unsupervised (unlabeled data)



Group these objects into two categories

Applications of AI: Bioinformatics

- Sequence alignment
- Gene finding
- Genome assembly
- Drug design and discovery
- Protein structure prediction



A (short) history of AI

- 1940-1950: Early days
  - 1943: McCullogh&Pitts, boolean circuit of brain
  - 1950: Turing's "Computing machinery and intelligence"
- 1950-1970: "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
- 1970-1990: 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?"

Taken from Berkeley CS188 slides