

# For Friday

- Read chapter 2
- Homework:
  - Chapter 1, exercises 10-13
  - Answer each in 100 words or less.
- Send email to [mecaliff@ilstu.edu](mailto:mecaliff@ilstu.edu) from your **preferred** email address
- Student information sheet

# What Do You Know?

- Examples of artificial intelligence in your life?
- Can you name any of the areas of AI?

# Homework

- Intelligence
- Artificial intelligence
- Agent
- Evolution and rationality

# Foundations of AI

- What disciplines have contributed to the development of artificial intelligence as a field?

# Foundations

- Philosophy
- Mathematics
- Economics
- Neuroscience
- Psychology
- Computer engineering
- Control theory and cybernetics
- Linguistics

# The Birth of AI

- McCulloch and Pitts(1943) theory of neurons as competing circuits followed up by Hebb's work on learning
- Work in early 1950's on game playing by Turing and Shannon and Minsky's work on neural networks
- Dartmouth Conference
  - Organizer: John McCarthy
  - Attendees: Minsky, Allen Newell, Herb Simon
  - Coined term **artificial intelligence**

# Early Years

- What was the mood of the early years?

# Early Years

- Development of the General Problem Solver by Newell and Simon in 1960s.
- Arthur Samuel's work on checkers in 1950s.
- Frank Rosenblatt's Perceptron (1962) for training simple networks

# At MIT

- Marvin Minsky and John McCarthy
- Development of **LISP**
- **SAINT**: solved freshman calculus problems
- **ANALOGY**: solved IQ test analogy problems
- **SIR**: answered simple questions in English
- **STUDENT**: solved algebra story problems
- **SHRDLU**: obeyed simple English commands in the blocks world

# Early Limitations

- Solved toy problems in ways that did not scale to realistic problems
  - Knowledge representation issues
  - Combinatorial explosion
- Limitations of the perceptron were demonstrated by Minsky and Papert (1969)

# Knowledge Is Power: The Rise of Expert Systems

- Discovery that detailed knowledge of the specific domain can help control search and lead to expert level performance for restricted tasks
- First expert system was **DENDRAL**. It interpreted mass spectogram data to determine molecular structure. Developed by Buchanan, Feigenbaum and Lederberg (1969).

# Other Early Expert Systems

- **MYCIN**: Diagnosis of bacterial infection (1975)
- **PROSPECTOR**: Found molybdenum deposit based on geological data (1979)
- **R1**: Configured computers for DEC (1982)

# AI Becomes an Industry

- Numerous expert systems developed in 80s
- Estimated \$2 billion by 1988
- Japanese **Fifth Generation** project started in 1981.
- MCC founded in 1984 to counter Japanese.
- Limitations become apparent: prediction of AI Winter
  - Brittleness and domain specificity
  - Knowledge acquisition bottleneck

# Rebirth of Neural Networks

- New algorithms (re)discovered for training more complex networks (1986)
- Cognitive modeling
- Industrial applications:
  - Character and hand-writing recognition
  - Speech recognition
  - Processing credit card applications
  - Financial prediction
  - Chemical process control

# AI Becomes a Science

- Empirical experiments the norm
- Theoretical underpinnings are important
- The “See what I can do” approach is no longer an acceptable method for doing research
- Some movement toward learning/statistical methods.

# Rise of Intelligent Agents

- Why?

# Popular Tasks of Today

- Data mining
- Intelligent agents and internet applications
  - softbots
  - believable agents
  - intelligent information access
- Scheduling applications
- Configuration applications

# State of the Art

- Deep Blue beats Kasparov
- NASA's Remote Agent program controls a spacecraft autonomously
- High accuracy continuous speech recognition with fairly large vocabularies
- Usable natural language interface to air travel system
- No Hands Across America: Automated vehicle drives cross-country on freeways

# State of the Art

- Medical diagnosis in specialized fields is sometimes assisted by AI programs
- AI logistics programs were critically important in the Gulf War.
- PROVERB can solve crossword puzzles faster than most humans.

# Views of AI

- Weak vs. strong
- Scruffy vs. neat
- Engineering vs. cognitive