AI TOOLS
ARTIFICIAL INTELLIGENCE

• *Artificial intelligence (AI)* – the science of making machines imitate human thinking and behavior

• *Normally associated with Robot* – a mechanical device equipped with simulated human senses and the ability to take action on its own
ARTIFICIAL INTELLIGENCE

• Some of AI systems/technologies
  – Expert systems
  – Neural networks
  – Genetic algorithms
  – Intelligent agents (hundred available)
EXPERT SYSTEMS is an AI

- **Expert (knowledge-based) system** – an artificial intelligence system that applies reasoning capabilities to reach a conclusion
- Used for
  - Diagnostic problems (what’s wrong?)
  - Prescriptive problems (what to do?)
# Traffic Light Expert System

<table>
<thead>
<tr>
<th>Rule</th>
<th>Symptom or Fact</th>
<th>Yes</th>
<th>No</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Is the light green?</td>
<td>Go through the intersection.</td>
<td>Go to Rule 2.</td>
<td>Should be safe if light is green. If not, need more information.</td>
</tr>
<tr>
<td>2</td>
<td>Is the light red?</td>
<td>Go to Rule 4.</td>
<td>Go to Rule 3.</td>
<td>Should stop, may not be able to.</td>
</tr>
<tr>
<td>3</td>
<td>Is the light likely to change to red before you get</td>
<td>Go to Rule 4.</td>
<td>Go through the intersection.</td>
<td>Will only reach this point if light is yellow, then you’ll have two choices.</td>
</tr>
<tr>
<td></td>
<td>through the intersection?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Can you stop before entering the intersection?</td>
<td>Stop.</td>
<td>Go to Rule 5.</td>
<td>Should stop, but there may be a problem if you can’t.</td>
</tr>
<tr>
<td>5</td>
<td>Is traffic approaching from either side?</td>
<td>Prepare to crash.</td>
<td>Go through the intersection.</td>
<td>Unless the intersection is clear of traffic, you’re likely to crash.</td>
</tr>
</tbody>
</table>
Developing and Using an Expert System

• Step 1: expert provide expertise to knowledge engineer

• Step 2: knowledge engineer converts expertise to rules

• Step 3: computer – expert systems

• Step 4: user interface delivers facts to expert system and sends back the conclusions to the user
What Expert Systems Can and Can’t Do

- An expert system can
  - Reduce errors
  - Improve customer service
  - Reduce cost

- An expert system can’t
  - Use common sense like human
  - Automate all processes
NEURAL NETWORKS

Neural network (artificial neural network or ANN) – an artificial intelligence system that is capable of finding and differentiating patterns
Layers of a Neural Network

Figure 4.9
The Layers of a Neural Network

Input Layer

- Age, income, occupation of card holder
- Number of large purchases on card
- Frequency of large purchases
- Locations where large purchases took place

Hidden Layer

Output Layer

- Transaction OK
- Transaction probably fraudulent
Neural Networks Can...

• Learn and adjust to new circumstances on their own
• Take part in massive parallel processing
• Function without complete information
• Cope with huge volumes of information
• Analyze nonlinear relationships
GENETIC ALGORITHMS

*Genetic algorithm* – an artificial intelligence system that mimics the evolutionary, survival-of-the-fittest process to generate increasingly better solutions to a problem
Evolutionary Principles of Genetic Algorithms

1. **Selection** – or survival of the fittest or giving preference to better outcomes

2. **Crossover** – combining portion of good outcomes to create even better outcomes

3. **Mutation** – randomly trying combinations and evaluating the success of each
Genetic Algorithms Can...

• Take thousands or even millions of possible solutions and combining and recombining them until it finds the optimal solution
INTELLIGENT AGENTS

• *Intelligent agent* – software that assists you, or acts on your behalf, in performing repetitive computer-related tasks
Intelligent agent/software on a Web sites that helps you, the customer, find products and services you want –Amazon.com
Intelligent agent that **takes action** on your behalf

- Examples:
  - Prioritize e-mail
  - Act as gaming partner (partner in game)
  - Assemble customized news reports
  - Fill out forms for you
  - “Discuss” topics with you
Intelligent agents that can *observe and report on equipment* such as a software that can evaluate the performance of your computer, scheduling antivirus scan etc.
Intelligent agent/software that can discover important information from a data warehouse – data mining (knowledge discovery) - google
Reflection: state some keywords which can associate with words below

Expert systems
Neural networks
Genetic algorithms
Intelligent agents