Machine Learning

- Ability of nonliving (i.e. machine) entities to gain knowledge from their surroundings or input not specifically stated.

- Different approaches:
  * Boolean logic and resolution
  * Evolutionary machine learning – many algorithms / neural networks are generated to solve a problem, the best ones survive
  * Statistical learning – the expected output is created from a model of the probabilities of something happening in previous experiences

- Ways of learning:
  * Unsupervised learning – algorithm that models outputs from the input, knows nothing about the expected results (like a robot exploring an unknown planet)
  * Supervised learning – algorithm that models outputs from the input and expected output (like a program being trained to play capture-the-flag)
  * Reinforcement learning – algorithm that models outputs from observations (like a program analyzing human conversations and learning how to use the language)

- The components of a learning agent:
  * Curiosity Element – problem generator; knows what the agent wants to achieve, takes risks (makes problems)
  * Learning Element – changes the future actions (the performance element) in accordance with the results from the performance analyzer
  * Performance Element – choosing actions based on percepts
  * Performance Analyzer – judges the effectiveness of the action, passes info to the learning element

- Examples of machine learning:
  * Facial recognition machines learn through many trials what objects are and aren’t faces
  * Language processing machines learn the rules of English through example; some AI chatterbots start with little linguistic knowledge but can be taught almost any language through extensive conversation with humans
  * Gaming opponents learn from the player strategies and adapt to combat them
  * Personalized gadgets devices that adapt to their owner as he changes (gets older, gets different tastes, changes his moods)
  * Exploration machines will be able to explore environments unsuitable for humans and quickly adapt to strange properties