CSYE 7374

Autonomous Behavior

and Learning in Games

Course Description

Game artificial intelligence (Game AI) is used to generate intelligent behaviors in games. This course has three sections: 1) the mathematical foundations of game-tree search and Markov decision processes (MDPs), 2) deep learning for games and 3) reinforcement learning for games.   
  
With the advent of deep learning, Game AI is undergoing a revolution. Convolutional neural networks (CNNs) are used to segment and identify anything on a game screen in real-time. Recurrent neural networks (RNNs) are used for real-time natural language speech processing in games.  Generative adversarial networks, or GANs, are used to create art and game assets that are indistinguishable from human-created art. The second part of this class covers the use of deep learning as it is applied to games including CNNs, RNNs, Autoencoders, VAEs, and GANs.  
  
Reinforcement learning has a direct correspondence to the gameplay optimization problem. In reinforcement learning, state-action pairs are mapped to rewards. The state-of-the-art systems such as AlphaGo or AlphaGoZero are based on reinforcement learning.  The third part of this class covers reinforcement learning as it is applied to games including Monte Carlo methods, temporal difference (TD) learning, value-based methods, Q-learning, deep Q-learning, policy-based methods, multi-agent reinforcement learning, and imitation learning.