

MEMORIAL UNIVERSITY OF NEWFOUNDLAND
Department of Computer Science

Computer Science 3200 – Fall 2019
Algorithmic Techniques for Smart Systems

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Course Website: <https://www.cs.mun.ca/~dchurchill/courses/3200>
(most course activity will take place on D2L)

Course Objectives:

This course is an introduction to Artificial Intelligence, covering algorithmic techniques and data structures used in modern problem-solving environments. Each topic will have a related assignment where the learned techniques are applied to simple video games.

Course Outline:

- Introduction to Artificial Intelligence
 - Agents, Environments, and Problems (Modern Examples)
- Search Algorithms
 - Exhaustive Search (BFS / DFS)
 - Heuristic Functions / Incorporating Knowledge
 - Heuristic Search (Best-First Search / A*)
 - Hill-Climbing Algorithms
 - Adversarial Search (Minimax / Alpha-Beta)
 - State Hashing / Lookup Tables
 - Data Structures / Optimizations for Search
 - Balancing Speed vs. Optimality
- Reinforcement Learning
 - Introduction to RL: Agent, Environment, Actions, Policies, Rewards
 - Bandit Problems (Exploration vs. Exploitation)
 - Action-Value Methods
 - Markov Decision Processes
 - Value Functions / Policy Improvement
 - Generalized Policy Iteration
 - Monte-Carlo Methods
 - Temporal Difference Learning (SARSA / Q-Learning)
 - Brief Introduction to Neural Networks
 - Introduction to Deep Reinforcement Learning (DQN)

Textbook: Artificial Intelligence: A Modern Approach (Optional)
Russel & Norvig

Reinforcement Learning: An Introduction (Free Online)
Sutton & Barto
<http://incompleteideas.net/book/the-book.html>

Format: 2 lectures per week on Tuesday / Thursday (80 minutes each)

Evaluation:

The final grade in the course will be determined as follows:

Mid-Term Exam (October 22 nd)	10%
Final Exam	20%
Assignments (submitted via D2L)	50%
Final Project + Report	20%

Memorial University Policies:

Memorial University of Newfoundland is committed to supporting inclusive education based on the principles of equity, accessibility and collaboration. Accommodations are provided within the scope of the University Policies for the Accommodations for Students with Disabilities (www.mun.ca/policy/site/policy.php?id=239). Students who may need an academic accommodation are asked to initiate the request with the Glenn Roy Blundon Centre at the earliest opportunity (www.mun.ca/blundon).

Students are expected to adhere to those principles which constitute proper academic conduct. A student has the responsibility to know which actions, as described under Academic Offences in the University Regulations, could be construed as dishonest or improper. Students found guilty of an academic offence may be subject to a number of penalties commensurate with the offence including reprimand, reduction of grade, probation, suspension or expulsion from the University. For more information regarding this policy, students should refer to the University Regulations for Academic Misconduct (Section 6.12) in the University Calendar.