Syllabus

Jan - May 2020

Instructor:	Inzamam Rahaman	**Time:**	F 11:00 – 13:00
Email:	inzamam.rahaman@sta.uwi.edu	**Place:**	FST C3

Course Pages:

1. https://inzamamrahaman.github.io/COMP3608-2020/

Office Hours:

- Wednesday 15:00 - 17:00
- Friday 15:00 - 17:00

Main References: This is a list of textbooks that I would you recommend consulting on a regular basis to comprehensively grasp course content:

- Ian Goodfellow and Yoshua Bengio and Aaron Courville *Deep Learning*, MIT Press, 2016
- Murphy, Kevin P. *Machine Learning: A Probabilistic Perspective*, The MIT Press, 2012
- Kochenderfer, Mykel J. and Wheeler, Tim A. *Algorithms for Optimization*, The MIT Press, 2019
- Russell, Stuart and Norvig, Peter *Artificial Intelligence: A Modern Approach*, Prentice Hall Press, 2009
- Peter Flach, *Machine Learning: The Art and Science of Algorithms that Make Sense of Data*, Cambridge University Press, 2012.
- Deisenroth, M., Faisal, A. & Ong, C *Mathematics for Machine Learning*, Cambridge University Press, 2020
- Koller, Daphne and Friedman, Nir *robabilistic Graphical Models: Principles and Techniques - Adaptive Computation and Machine Learning*, The MIT Press, 2009

Objectives: This course is designed to introduce senior undergraduate students to foundational ideas and methods used to engineer intelligent systems. By the end of this course, a student should be able to:

- Formulate optimization problems and constraint satisfaction problems
- Design solutions to both constrained and unconstrained optimization problems that use the Genetic Algorithm, Particle Swarm Optimization, Genetic Programming, and Simulated Annealing
- Employ Maximum-Likelihood Estimation to fit probability distributions
- Understand Machine Learning basics and design machine learning experiments
- Understand and use Generalised Linear Models
- Understand and use Feed-forward Neural Networks
- Understand and use Convolutional Neural Networks

- Understand and use Naive Bayes
- Formulate a situation in terms of a Bayesian Network
- Perform inference on Bayesian Networks

Prerequisites: COMP2250 - Industry Statistics or Equivalent (I would suggest refreshing some probability). A certain degree of mathematical maturity is expected.

Tentative Course Outline:

1. Intro to AI
2. Intro to Optimization and CSP (Intro to MiniZinc)
3. Metaheuristics - Genetic Algorithm, Genetic Programming, Simulated Annealing, Particle Swarm Optimization
4. Machine Learning Basics
5. Design of Machine Learning Experiments
6. MLE and Generalized Linear Models
7. Feed-forward Neural Networks
8. Convolutional Neural Networks
9. Bayes Theorem Review and Naive Bayes
10. Bayesian Network - Representation and Inference

Grading Policy: Final Exam (50%), Assignments ($3 \times 10\%$), CW Exams ($2 \times 10\%$)

Important Dates (Tentative):

CW Exam #1 ..... 18^{th} Feb 2020
CW Exam #2 ..... 31^{st} Mar 2020

Course Policy:

- Please sign up for the Slack if you have not been already added

Class Policy and Expectations:

- Regular attendance is essential and expected.
- Reading is very important, especially for a fast moving field like AI
- Will have to do a degree of self-driven learning - Readings and Documentation will be posted