MATH-5211-FB MATHEMATICS & MACHINE LEARNING
FALL 2024

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Classes: reading course
Office Hours: by appointment via email

Description

- **Textbook**: *Mathematics for Machine Learning*, by Marc Peter Deisenroth, A. Aldo Faisal, and Cheng Soon Ong. We will cover:
  - When Models Meet Data: Data, Models, and Learning; Empirical Risk Minimization; Parameter Estimation; Probabilistic Modeling and Inference; Directed Graphical Models, Model Selection.
  - Linear Regression: Parameter Estimation; Bayesian Linear Regression; Maximum Likelihood as Orthogonal Projection.
  - Dimensionality Reduction with Principal Component Analysis: Problem Setting; Maximum Variance Perspective; Projection Perspective; Eigenvector Computation and Low-Rank Approximations; PCA in High Dimensions; Key Steps of PCA in Practice; Latent Variable Perspective.
  - Density Estimation with Gaussian Mixture Models: Gaussian Mixture Model; Parameter Learning via Maximum Likelihood; EM Algorithm; Latent-Variable Perspective.
  - Classification with Support Vector Machines: Separating Hyperplanes; Primal Support Vector Machine; Dual Support Vector Machine; Kernels; Numerical Solution.

  Each chapter will roughly take 2 weeks.
- **Midterm:** 1 midterm exam counting for 35% of the final grade.
- **Final Exam:** There will be a final exam which will count for 65% of the final grade. There will be *NO* 100% final option.
- **Policies:**
  - Important announcements will be made through MyCourseLink to registered students via MyCourseLink. You are responsible for reading the info posted on MyCourseLink.
  - I attempt to reply to e-mail in a timely fashion, but do not expect immediate responses.
- **Academic Dishonesty**: All cases of academic dishonesty will be dealt with according to the university's Code of Student Behavior and Disciplinary Procedures, copies of which are available from the university's web-site.
- **Accommodations**: Lakehead University is committed to achieving full accessibility for persons with disabilities. Part of this commitment includes arranging academic accommodations for students with disabilities to ensure they have an equitable opportunity to participate in all of their academic activities. If you think you may need accommodations, you are strongly encouraged to contact Student Accessibility Services (SAS) and register as early as possible. For more information, please visit: http://studentaccessibility.lakeheadu.ca