

## CISC271: Linear Data Analysis

### **Detailed Description:**

*Linear methods* encompasses a broad range of ways to analyze of structured data. This course will cover methods that address sets of data in vectors. The purpose is to provide preparation for subsequent courses in machine learning.

To test, implement, and analyze this material, we will use MATLAB as an interactive tool and programming language. Students are expected to learn basic MATLAB on their own. Some tutorial information will be provided early in the course.

For basic material in data analytics, students can expect to be instructed in:

- organization of data into vectors and matrices
- description of vectors in a space
- minimal space descriptors
- linear relations
- spaces of solutions to linear relations

For basic material in machine learning, students can expect to be instructed in:

- linear regression
- polynomial regression
- data reduction by PCA
- SVD methods
- validation and cross-validation
- elementary material for artificial neural networks

### **Learning Outcomes:**

By the end of the course, a successful student will be able to:

**LO1:** Select and implement algorithms for vectorial data

**LO2:** Synthesize data and solution methods for principal-component analysis

**LO3:** Implement, test and evaluate methods for linear regression

**LO4:** Interpret and explain methods and solutions in data classification

**LO5:** Evaluate and critique performance of algorithms in data classification

These learning outcomes will be assessed by computer implementations, written assignments, and tests.

### **Textbook:**

We will use the text *Introduction to Linear Algebra, Sixth Edition* by Gilbert Strang. We will also use the instructor's notes and other sources that are available through permissions granted to the Queen's University Library.