Multi Dimensional Data Processing

Syllabus Information

CS 2900 - Multi-dimensional Data Processing

Associated Term: 2022/23 Academic Session

Learning Objectives:

During this module the student will be introduced to a progression of topics in Linear Algebra, starting from an introduction to vectors and matrices, applications in Graph Theory and the Page-Rank algorithm moving to Singular Value Decomposition and least squares fitting, and then to Principal Component Analysis. The emphasis of this module will be computational, and a strong focus will be the Computer Science applications of the theoretical concepts covered.

Pre-requisites:

None

Learning Outcomes:

By the end of the course students should be able to:

1. Demonstrate an understanding of how to carry out vector operations such as dot product, length etc. on vectors in arbitrary dimensions. Demonstrate an understanding of the geometrical interpretation of vectors in 2 and 3 dimensions, and its applications in computer graphics.

2. Demonstrate an understanding of linear transformations and their representation as matrices, of the application of matrices to vectors, and of matrix operations and their interpretation in 2, 3 and higher dimensions.

3. Apply concepts such as matrix rank, transpose, upper and lower diagonal matrices, orthogonality, trace and symmetry.

4. Demonstrate an understanding of Singular Value Decomposition, Principal Components Analysis and Least Squares Fitting.

5. Understand Adjacency Matrices, their application in Graph Theory and algorithms such as Page-Rank.

6. Throughout all the topics, demonstrate an understanding of the application of theoretical concepts and results of Linear Algebra in various areas of Computer Science.

Required Materials:

Click here for the reading list system

Technical Requirements:

The total number of notional learning hours associated with the course are 300.

These will normally be broken down as follows:

Teaching & Learning Methods:

Lectures - 1 hour twice a week - 11 weeks - 22 hours

Laboratory classes - 1 hour per week - 11 weeks - 11 hours

Guided Independent Study - 117 hours

Formative Assessment:

In lecture exercises   - Verbal plus computer-based

In lab verbal feedback - Verbal plus computer based

Completion of quizzes embedded in asynchronous materials - Feedback through course completion block on moodle

Summative Assessment:

Quiz   (1 Hours) - 5%

Quiz   (1 Hours) - 5%

Quiz   (1 Hours) - 5%

Quiz   (1 Hours) - 5%

Exam (2 Hours) - 80%