

# Data Science (DS)

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## Courses

### ***DS 101 Introduction to Data Science I: 3 semester hours***

Our world is driven by data. In order to navigate this world and understand the influence data and its science has on modern life, students will learn the core concepts of inference, data analysis, and computing. Students will work with real data sets from a variety of fields such as economics, geography, and sociology. Topics will include basic computing techniques using spreadsheets or other computing software, basic statistical concepts such as Bayes' Theorem, and the pitfalls of bias inherent in data sets.

### ***DS 301 Introduction to Data Science II: 3 semester hours***

Linear regression and associated techniques are some of the most tested and trusted methods in data science and statistics. In this course, we will develop the skills to apply linear methods to investigate relationships between various types of data, visualize data, and consider the responsible use of such models. Topics may include linear and multiple regression, resampling, model and feature selection, representing analyzed data visually, logistic regression, and the data science life cycle. Python/R will be used throughout. Prerequisites: : MA 162, MA 202, MA 214, CS 106, DS 101.

### ***DS 400 Data Science Techniques I: 3 semester hours***

In this course, we will learn a variety of techniques often used in data analysis. Methods for classification and regression may be considered. Students will continue to develop deeper mathematical skills, programming skills using Python/R, the ability to produce high-quality documents conveying the results of data-based analysis, and more. Topics may include classification with tree-based methods and support vector machines, clustering (such as k-means, hierarchical, and spectral), and dimension-reduction (such as principal component analysis). Issues regarding the ethical use of data will be explored. Prerequisite: DS 301.

### ***DS 420 Data Science Techniques II: 3 semester hours***

This course will be an introduction to deep learning with artificial neural networks. The course will focus on applications and computations with software such as Python/R but will have significant mathematical content. Issues of appropriate uses, un/interpretability, and ethics in data will be considered in the context of employing neural network models. Topics may include single and multi-layer perceptrons, feedforward networks, recurrent neural networks, convolutional neural networks, and corresponding mathematical foundations. Prerequisite: DS 400.