The Computer Science & Engineering department and the Mathematics Department are proposing an inter-disciplinary undergraduate
Minor in Data Science

Minimum credit hours required: 20 (+ pre-reqs ?)

The following courses are required:

- CSE 107 Introduction to Python Programming (4 cr)
- CSE 207 Advanced Python Programming for Data Science (3 cr)
- CSE 241 Foundations of Computer Science (3 cr)
- MATH 382+L Probability and Statisics (4 cr)
- CSE 4xx (/ 3xx!) Introduction to Data Science (3 cr)
- Either
  - **(a)** CSE 465 Neural Networks (3) or
  - **(b)** CSE 4xx Computational Machine Learning (3) or
  - **(d)** CSE 4xx Predictive Data analytics (3)
  - **(d)** MATH 441 Statistical Machine Learning (3)

Changes to existing courses:

- CSE 241: include simple properties of matrices

Learning Outcomes: At the conclusion of the Data Science Minor students SBAT

1. apply data science and machine learning techniques to creatively solve data analysis problems;
2. gather, organize, and clean data; develop appropriate machine learning models; and visualize and communicate model results.

New courses:

- CSE 207 Advanced Python Programming for Data Science 3 cr, 3 cl hrs
  Prerequisites: CSE 107, Math 131 Calculus I, Math 132 Calculus II, each with a grade of C or better.
  Types and functions; Mechanisms for parameter passing, optional and keyword-based parameters. Dictionary and list comprehension. Native data structures, e.g., dictionaries, lists, strings, and tuples; arrays using NumPy. File input/output. Techniques for noise removal, cleaning, and transformations on real-world datasets.

- CSE 4xx Introduction to Data Science 3 cr, 3 cl hrs
  Prerequisites: CSE 207, Calculus II, Math 382,
  Data preprocessing: assembly, integration, cleaning, analysis. Visualization. Introduction to Machine Learning using Python: Continuous and categorical features. Evaluation metrics such as F1-score and AuC. Problems from different domains. Students are expected to communicate and present their findings and results. Every student must complete at least one hands-on project.

- CSE 4xx, Computational Machine Learning Algorithms 3 cr, 3 cl hrs
  Pre-requisites: CSE 207, Math 382 + 382L, CSE 3xx /4xx Intro to Data Science.

  Foundations of machine learning algorithms; Decision Trees; Introduction to neural networks; Support Vector Machines; Hidden Markov Models; Bayesian learning. Advanced algorithms. Statistical assumptions behind machine learning algorithms. Goodness of fit and generalization. Course involves programming implementations of the algorithms covered.