February 26, 2020

TO: Members of the Board of Trustees

FROM: John A. Elliott, Ph.D.
Provost and Executive Vice President for Academic Affairs

RE: Graduate Engineering Data Sciences Certificate

RECOMMENDATION:

That the Board of Trustees approve a new Graduate Engineering Data Sciences Certificate.

BACKGROUND:

Data Sciences is a fast growing focus area amongst extensive numbers of the School of Engineering industry partners. Engineering companies are increasing reliance on data sciences to drive strategic engineering technical decisions. This certificate is designed to provide functional literacy in critical data sciences engineering technical analytics.

This program will train students in the design of advanced techniques to analyze different kinds of engineering data. They will also be trained in the art of visualizing data and communicating technical ideas through data visualization. In addition, the students will be exposed to various Data Mining, Artificial Intelligence, and Machine Learning algorithms.

The certificate will be offered by the Department of Computer Science and Engineering within the School of Engineering. It is anticipated that 15-20 students will be enrolled each semester, with expected growth quite quickly.
Request for New UConn Academic Degree Program

General Information
Name of degree program: Graduate Engineering Data Sciences Certificate
Name of sponsoring Department: Computer Science and Engineering
Name of sponsoring College: School of Engineering
Campuses: Program Entirely Online
Contact persons: Kylene Perras
Type of Proposal: New
Type of Program: Graduate Certificate
Anticipated Initiation Date: Fall 2020
Anticipated Date of First Graduation: Spring 2021
Entrepreneurial program, approved by Yes
Provost’s Office:
Tuition for the program approved by Fee-based
Provost’s Office: 30.7099 (Data Science, Other)
CIP Code:

Justification for the New Program
Data Sciences is a fast growing focus area amongst extensive numbers of the School of Engineering industry partners. Engineering companies are increasing reliance on data sciences to drive strategic engineering technical decisions. This certificate is designed to provide functional literacy in critical data sciences engineering technical analytics.

Are there similar programs in CT or elsewhere?
There is a strong demand from CT companies that is not being fulfilled (Pratt & Whitney, Eversource, Langan Engineering, Medtronic, EDAC Technologies, Pfizer, and more).

Data Science certificate programs are available in many universities in the nation. We show below the descriptions of data science certificates offered by Northeastern University, Columbia University, and UC Berkeley (as taken from their websites).

Northeastern university: The Graduate Certificate in Data Analytics provides foundational knowledge in data analytics, including data management, machine learning, data mining, statistics, and visualizing and communicating data. The program is designed to provide students with foundational knowledge in “big data,” data analytics, including data management, machine learning, data mining, statistics, and visualizing and communicating data that can be applied to data-driven decision making in any discipline.
Graduate Engineering Data Sciences Certificate

Columbia University: The Certification of Professional Achievement in Data Sciences prepares students to expand their career prospects or change career paths by developing foundational data science skills. Individuals looking to strengthen their career prospects or make a career change by developing in-depth expertise in data science would benefit from this program.

UC Berkeley: Data is everywhere—from e-commerce sales, app downloads to a smartphone, to supply chain management or bioinformatics or connected devices. And that massive increase in the amount and variety of data being collected is translating to an exponential growth in the computer power needed to process that data. In addition, there continues to be an incredible need for data scientists to make sense of the numbers and uncover hidden solutions to messy business problems. With the Certificate Program in Data Science, you gain the skills to perform advanced data wrangling, data mining, statistical modeling and machine learning on data sets that may be very large and complex.

As can be seen from the above descriptions, all of these programs are very generic and offer classes to teach generic data analytics techniques. Any data analytic technique can be optimized if domain knowledge about the data can be utilized. For instance, analytic techniques suitable for biological data may not perform well on business data. There is a crucial need for a certificate program that teaches data science methods specific to engineering data. Given that existing programs cater to a general audience, they are not able to offer skill sets needed to analyze engineering data exclusively. This is where the data science programs we offer are unique.

What are the desired learning outcomes of the program?
- Ability to formulate and analyze engineering data science problems.
- Ability to conduct experimental engineering work related to big data.
- Ability to apply data mining and machine learning methods to solve various data science problems that are engineering challenges.

Program Description
This program will train students in the design of advanced techniques to analyze different kinds of engineering data. They will also be trained in the art of visualizing data and communicating technical ideas through data visualization. In addition, the students will be exposed to various Data Mining, Artificial Intelligence, and Machine Learning algorithms.

Proposed Graduate Catalogue Copy
The Computer Science & Engineering Department offers a 12-credit certificate program to train engineers on the design of advanced techniques to analyze different kinds of engineering data. The certificate program will build competency in the art of visualizing data and communicating technical ideas through data visualization, as well as competency in data mining, artificial intelligence and machine learning algorithms.
Required Courses: CSE 5717, CSE 5820, CSE 5520 and CSE 5713.

The certificate is offered by the School of Engineering.

**Faculty Involvement**
Sanguthevar Rajasekaran, Wei Wei, Derek Aguiar, Jinbo Bi, Caiwen Ding, Qian Yang, Dong-Guk Shin, Sean Hong

**Enrollment and graduate projections**
15-20 students each semester, with expected growth quite quickly.

**Program Evaluation**
Overall enrollment, performance of students in the course, surveys to students to receive their feedback, as well as gathering information from these students that are working professionals about their employment to help us continue to assess need and value proposition for each student. Program administrators and directors will review all of these items to make ongoing assessments about the certificate to discuss options for future improvements. Feedback from relevant employers and the External Advisory Board will also be sought and utilized in the evaluation process.

**Program Administration**
The program will be led by the Computer Science & Engineering Department, with additional administration and support by the Professional Education team in the School of Engineering.

**Funding and Financial Resources Needed**
None.

**Internal and external applicants can apply to this program.**

**Anticipated term and year of first enrollment**
Fall 2020

**Admission Requirements**
Bachelor's degree in engineering or closely related STEM field, cumulative GPA of 3.0 or better, four semesters of calculus.

**Required for application:**
- Personal Statement
- One Letter of Recommendation
• Resume

Term(s) to which students will be admitted
 • Fall
 • Spring

Rolling application deadline.

Initiator
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