ME 453 Data Science in Manufacturing Quality Control
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Fall 2022
3 or 4 Credit Hours; Class Time: MW 1pm–2:20pm

• **Topics:** Manufacturing quality management in the big data era; statistical and machine learning methodologies for manufacturing quality control.

• **Objective:** Students will obtain a comprehensive understanding on fundamental quality management philosophy and a grasp of data science techniques for quality control in modern manufacturing. Students will be able to implement statistical and machine learning methods for real-world industrial applications using Python.

• **Real-world manufacturing experience**
  • The class will work with real-world manufacturing data in homework, labs, and final projects. Caterpillar, John Deere, nanoMFG Node, etc. have contributed data.
  • Students will have an opportunity to operate an ultrasonic welder in the Automation and Digital Manufacturing Lab and collect their own data for labs and the final project.
  • A mock industry review will be adopted for the presentation and grading of the final project.
Testimonials from former students

• Student 1 (B.S. student in ME, now a Semiconductor Packaging Engineer): “ME 453 is an essential course for anyone considering a career in manufacturing, quality, and/or process engineering. This course extensively covers statistical methods and process control which are vital in the current manufacturing industry that relies heavily on data analysis for yield and product improvement. As an engineer working in a quality group, my team’s work revolves around working with modeling and design teams to support the design release process and make sure that new designs which go into production have high yield and low risk in order to be cost-competitive. The course also gives a great introduction into multivariate processes, big data, and machine learning techniques which, I believe, will define the future of manufacturing. I came into the class with very little knowledge of programming but left proficient in Python and some of its libraries. The labs are enjoyable and easy to understand. The final project allows you to work on a real-life project sponsored by a company and helps you build confidence in using machine learning. Overall, this course was a lot of fun and taught me a lot of applicable knowledge that will be useful in my career. I greatly recommend this course.”

• Student 2 (MS student in ME, now an Application Support Engineer at MathWorks): “It is a very good course for someone who wants to learn about data science workflow, machine learning algorithms and their applications in the manufacturing industry. We got a chance to work with important python packages (numpy, pandas, scipy, sklearn, opencv) through hands-on programming assignments and labs. The final project was a real-world manufacturing application where we implemented end-to-end data science workflow. The practical industrial skills learned through this course also helped me in job search and interviews.”