Creating Upper Division Pathways

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WPI
Theory and Practice
Mathematical Sciences at WPI

• B.S. in Actuarial Mathematics
• B. S. in Mathematical Sciences
• P. S.M. in Financial Mathematics
• P. S. M. in Industrial Mathematics
• M. S. in Applied Statistics, Applied Math
• PhD in Mathematical Sciences

Interdisciplinary Programs

• Bioinformatics and Computational Biology
  • Biology, Computer Science, Math Sci
• Data Science
  • Computer Science, Busines School, Math Sci

Center for Industrial Mathematics and Statistics
Major Qualifying Projects at WPI

All WPI undergrads must do original research in their major area.

GOALS:

- formulate a problem, develop a solution and implement it competently and professionally,
- demonstrate application of the skills, methods, and knowledge of the discipline,
- work in teams and communicate well, both orally and in writing.
Industrial Connections at WPI

Center for Industrial Mathematics & Statistics

- Founded in 1997
- Make partnerships with industry that benefit the sponsors, and WPI’s mathematical sciences community
- Real-world research projects that come directly from industry, government and finance
- REU program, undergrads, grad students, teachers, ...

Visit http://www.wpi.edu/+CIMS
130+ projects  75+ companies
2017 Math Sci MQPs

- RSS-Based 3D Drone Localization and Performance Evaluation
- Process Mining the Credit Suisse Advisory Process
- Quasiconformal Gradient Flows
- Modeling-Backed Microwave Imaging in Closed Systems
- Acoustically Enhanced Cooling of Thin Fluid Sheets
- Investigation where a Social Media Presence Impacts Claims Severity
- Flexible Infrastructure Supporting Machine Learning for Anomaly Detection in Big Data
Newest Experimental Courses

MA 463X. DATA ANALYTICS AND STATISTICAL LEARNING
The focus of this class will be on statistical learning - the intersection of applied statistics and modeling techniques used to analyze and to make predictions and inferences from complex real-world data.
Topics covered include: regression; classification/clustering; sampling methods (bootstrap and cross validation); and decision tree learning. Recommended background: Linear Algebra, Applied Statistics II, Probability. The ability to write computer programs in a scientific language is assumed.

MA 422X. TOP NUMERICAL ALGORITHMS OF THE CENTURY
This course will highlight top algorithms that have tremendous impact on the development and practice of modern science and engineering. Class discussions will focus on introducing students to the mathematical theory behind the algorithms, and their applications. ... Algorithms to be considered may include the Fast Multipole Method, Metropolis Algorithm for the Monte Carlo Method, Fast Fourier Transform, Kalman filters and Singular Value Decomposition. Students will be expected to apply these algorithms to real-world problems. For example, ...
The PIC Math Program

**P**reparation for **I**ndustrial **C**areers in **M**athematical Sciences prepares mathematical sciences students for industrial careers by engaging them in research problems that come directly from industry.

http://www.maa.org/pic-math

Michael Dorff, Brigham Young University & SLWeekes

DMS 1345499

MAA 100

Siam
PIC Math Program Goals

• Increase awareness among math and statistics faculty and undergraduates about non-academic career options

• Provide research experience working on real-world problems from business, industry and government

• Prepare students for industrial careers.

http://www.maa.org/pic-math
PIC Math Faculty Summer Workshop

- Information on non-academic careers
- Guidance on developing business and industry connections
- Exposure to mathematical and statistical problems that arise in business and industry
- Training on how to develop skills in students that are valued by employers.

http://www.maa.org/pic-math
Making External Connections

- Friends/Acquaintances
- Alumni
- Trustees
- Strangers
- Career Development Center
- Business School
- Hospitals, Banks, Big employer in town
- Government Agencies
- Workshops and Conferences
- Strangers
Spring Semester Research Course

- PIC Math faculty run a spring semester, credit-bearing course on solving industrial problems
- Information about industrial careers
- Training for industrial careers
- PIC Math provides material, financial, and emotional support material for the course
Student Research Competition

• PIC Math faculty mentor a “PIC Math team” of students at their college to work on an industrial problem.
• Students submit a recorded oral presentation and written report of their solution.
• A panel of judges will give feedback and an assessment of each team’s submission.
• Students present their results in person at a summer conference at the MAA MathFest or SIAM meeting.
3 Faculty cohorts of PICMath

- 100+ faculty members
- 100+ different universities/colleges
- Located in 32 U.S. states and Washington D.C.
- Over 1500 undergraduate students will have participated in the PIC Math program as of summer 2017
Memorial Day week 2017

In this hands-on workshop, attendees
• were introduced to the field of data analytics/statistical learning/machine learning
• got an overview of techniques and software used to solve data analytics problems, and
• learned how to guide undergraduate students working on real world data analytic problems
Some thoughts...

• Stronger regional mathematician networks

• Stronger alumni connections

• Greater diversity in speakers – industry, government, non-profits

• Multi-university, virtual student research teams

• Access online repositories like

• Advisory Board
Georgia Southern University

Through the PIC Math program and talking to businesses around town, I became aware of business development opportunities like a local monthly "Cafe" event where small business owners share and discuss challenges that they are facing along with possible solutions. These events have been extremely enlightening and a great networking opportunity and now I wouldn't miss them for anything.

By establishing a connection between the department and a nonwoven fabric research center through a PIC Math project, one of my fellow department members has begun a collaborative research project on modeling fiber orientation in nonwoven fabrics.
I recently have been applying for jobs because the end of my senior year at Montclair State University is coming to a close. I have been looking at jobs in the analyst field such as data analyst, business analyst, pricing analyst, report analyst, and anything similar. I came across a listing for a Operations and Report Analyst for a well known company. I have made it past the first two rounds of interviews and I am currently waiting for an answer. The job entitles a data analysis to create and update reports and find discrepancies that stick out. The reports have to do with different aspects of sales such as if people open emails, coupons, who is buying their different products, etc. This company has great benefits and would be an amazing first job if I get the opportunity to work for them.

When I was in my second in person interview I was asked about the PIC project I was currently involved with for Neptune and Company which was stated on my resume. After explaining the manipulation of data that was being done, the research and time put in, and what the project goals were the man who was interviewing me (who was also the boss of the department) was impressed that I was working successfully with data from an environmental standpoint. He explained how it made me stand out because it widened my knowledge of research and being able to work with different data for different topics. He was impressed that while I took many statistical classes with normal projects this class project that I was currently working on had to do with soil which is something he did not expect me to say. Almost like if I could do anything from statistical problems to real world data problems I could probably work with any type of data. Being able to be apart of this project is helping my resume stand out to future employers. Thank you for such a great opportunity to be included in an actual real world issue.
Thursday, July 13

MS80  Panel: Data Science in the Applied and Computational Mathematics Curriculum

Organized by the SIAM Education Committee

4:00 PM - 6:00 PM  Room: 406

Data science is an interdisciplinary field that is rapidly evolving and for which there is a demand for well-trained practitioners. In this panel, we consider effective ways to modify the mathematics curriculum to better train future data scientists. How can faculty prepare students for data science careers within existing courses and in new ones? How does the material fit into the computational and applied mathematics curriculum, rather than strictly computer science, statistics or other fields? What efforts are underway to answer these questions? How can faculty retrain to handle these courses? On this panel, mathematics faculty with experience creating and delivering instruction in data science will share their experiences.
THANK YOU FOR YOUR ATTENTION