Pieces from Thesis – by Zihan Wang

*Zihan wrote her senior thesis this past fall under the guidance of **Professor Jue Wang.***

This Fall term, I participated in the Women in Data Science (WiDS) Worldwide competition organized by Kaggle. The competition aimed to develop a model to predict the time to treatment for women patients diagnosed with metastatic triple negative breast cancer. Addressing healthcare inequity is critical and has an extensive positive impact on health, society, and the economy. Women often encounter distinct health challenges and stand to gain significantly from efforts to ensure equity in access to healthcare. Achieving health equity involves addressing disparate treatments based on demographic and societal factors so that in the future women can achieve their highest level of health and well-being. As a woman, I felt driven to explore this issue. Therefore, guided by Professor Jue Wang, I completed my math thesis on this topic.

For my thesis, I mainly used R. I started by making and analyzing the distribution of Medicaid coverage across different races, ages, and genders in the U.S. Then, I shifted the focus to factors directly affecting Medicaid eligibility, such as the poverty rate. To visually represent poverty inequality, I used R to map the distribution of poverty in Schenectady County. Lastly, I applied these analytical methods to the competition dataset, selecting variables for predicting treatment time by analyzing and comparing their relationships. I employed machine learning techniques like GBDT and RandomForest for predictions, then used RMSE to measure accuracy and make improvements.

The senior thesis journey was enriching, with Professor Wang's step-by-step guidance being invaluable. Throughout this process, I not only learned advanced R techniques but also understood the significance of math formulas and data in making predictions. This thesis experience made me see how math is used in health science. Being a double major in math and economics, my econ background aided in analyzing social phenomena related to health inequities. The math learned in class helped me understand complex methods in professional papers, enhancing my work. Every class subtly contributes to the success of my thesis. So, I want to say don't be afraid to start. Things are not as hard as they seem, and sometimes, effort can yield unexpected and rewarding outcomes.

Once again, I want to thank Professor Wang for her patient guidance and all my teachers for developing my mathematical thinking and analytical skills.

Summer Job in Math with AOP this Summer

The Academic Opportunity Program (AOP) is looking to hire two summer tutors/community advisors in math, one for precalculus and one for calculus. For more information, follow the QR code in the advertisement to the right, or contact Amaralis Francis (francisa) in the AOP office.

Calculus Help Center
Sunday-Thursday, 7:30-10:00pm,
Sorum House Seminar Room

Spring Term Scheduling: Advising, Pre-Approval. Start Planning!

It is that time of the current term when we start to look forward to next term and students plan their course schedule. Academic advising is underway and Pre-Approval for courses goes through Wednesday of this week.   Note that no math classes this spring are "Pre-Approval" courses!

Timeline:
- February 5-23: *Academic Advising.* Students consult with faculty advisors.
- February 5-14: Pre-Approval surveys to be completed.
- February 26-29: Spring term registration on Self-Service

Some Math and Statistics Courses: This spring, the math department will be offering several interesting courses beyond the calculus sequence that are suitable for math majors and minors.

- **Math 199** is the department's "bridge course," intended to help students make the transition from computationally oriented courses to more theoretical proof-writing courses. It is a **required** course for all math majors and minors that is *usually* taken *after* a student has taken Math 115. This is a WAC course, too! Two sections: 199-01 MWF 8:00-9:15, and 199-02 MWF 9:15-10:20.

Beyond Math 199: There are several courses being offered that have a Math 199 prerequisite:

- **Math 224** (Geometry) studies selected topics in geometry. This course is wonderful for students looking to apply and solidify the proof-writing skills they developed in Math 199. Students considering becoming math teachers might also want to consider taking this course. **MWF 1:50-2:55.**
- **Math 238** (Methods of Applied Math) is an introduction to the fundamental concepts and techniques in applied mathematics. Topics may include dimensional analysis, scaling, perturbation theory, boundary layer analysis, differential and integral equations, calculus of variations, optimization, and eigenvalue problems. The emphasis is the use of mathematics to quantify and solve problems arising from physical, chemical, biological, and economic phenomena. This course has (Math 130 or Math 234) AND (Math 197 or Math 199) as prerequisites. **MWF 10:30-11:35**.
- **Math 332** (Abstract Algebra 1) is a beautiful course that generalizes what you know about algebra in the integers and real numbers to a more abstract setting. The main objects of study in this course are groups, rings, and fields. This course is required for the major. The prerequisite for this course is one of Math 219, 221, 224, 228, 235, or 248 or permission from the chair. **MWF 9:15-10:20**.
- **Math 430** (Complex Analysis). In this course, you will study the calculus of functions defined on the complex plane, rather than on the real numbers or R^n! What is the same? What is different? There are lots of cool ideas, methods, and results to be learned, including, perhaps, the proof of the Fundamental Theorem of Algebra, showing that every nonconstant polynomial has a root. This course is a good choice for students seeking honors in the major and/or considering going to graduate school in math. A 300-level course is a prerequisite for Math 430. **MWF 11:45-12:50**.

There are also a couple of statistics courses being offered!

- **Statistics 164** (Strategies of Experimentation: Statistical Design and Analysis of Experiments) Students will learn different experimental design options when experimenting with multiple variables as well as analytic methods. Prerequisites: one of STA 104, STA/MTH 128, MTH 228, STA 264, MER 301, ECO 243, PSY 200 or permission from the chair. **MWF 11:45-12:50**.
- **Statistics 364** (Big Data Analytics). Learn many techniques on how to analyze large data sets using statistical programming languages. This is a great course for students considering graduate study or careers in the areas of statistics, data science, machine learning, computer science, econometrics, or related disciplines. Prerequisites: STA 264 or ECO 243 or permission from the chair. **MWF 9:15-10:20.**

Problem of the Newsletter – February 12, 2024

Congratulations to **Hunter Gould** for submitting a correct answer to last week's PON.

This week's problem comes from Twitter/X: Using the digits 0, 1, …, 9 *exactly once*, find all 10-digit numbers for which the first digit is divisible by 1, the first two digits (as a single whole number) is divisible by 2, 3 the first three digits (as a single whole number) is divisible by 3, etc.

Professor Paul Friedman (friedmap@union.edu) will accept solutions until noon on **Friday, February 16.**