

Doane University

Mathematics and Data Analytics

Math Museletter

October 2020 (COVID-19 Edition)

Dear students, alumni and friends,

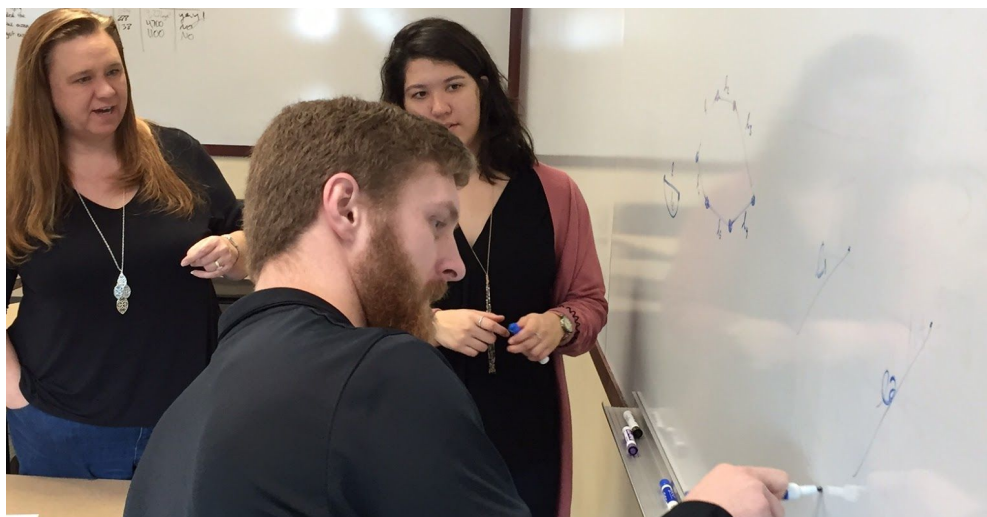
As everywhere, the Doane world is different this fall. But, our Mathematics & Data Analytics faculty are busy as ever, in different ways than ever. As you will read below, we have developed new programs and courses, are recruiting more students, are connecting with industry and non-profits, and are still mentoring and transforming students in the personal ways we always have.

Despite not seeing many of you at our regular social events this year, we want you to know that we appreciate and miss you. Our department is nothing without you, our muses. We have always been people-focused, and always will be. Hopefully you will enjoy reading this, the first of (hopefully) many "museletters" to come!

Our best wishes to you this year: may you be safe, may you be healthy, and may you be at peace.

Sincerely,

Barb, Billy, JL, Kris, Margaret, Peggy and Tracee



Dr. Herzog, Madeline Sladovnik ('20) and Ryley Dugan ('20) in pre-COVID Geometries class.

Data Analytics Credentials Easy Add-ons to Existing Degrees

Through consultation with industry professionals, Doane's Department of Mathematics & Data Analytics designed credentials in data analytics, conveniently building on courses already required for general education and many majors. These courses combine practical problem solving, mathematical thinking and cutting edge techniques and technologies desired by industry.

The Data Analytics Certificate provides students, campus-wide, an opportunity to acquire certified data analytics skills and is a valuable add-on to existing double-majors or majors/minors.

- MTH120- Introduction to Data through Visualization
- BUS215, SSI217, MTH/EGR225, or BIO295 - Introductory Statistics
- MTH 315 - Multivariate Statistics
- MTH 316 - Categorical Data Analysis

The Data Analytics Minor (18-19 hours) provides students, campus-wide, an opportunity to specialize in data analytics and pairs with a variety of majors, especially for students interested in graduate school.

- MTH120 - Introduction to Data through Visualization
- BUS215, SSI217, MTH/EGR225, or BIO295 - Introductory Statistics
- IST145 - Introduction to Programming
- MTH315 - Multivariate Statistics
- MTH316 - Categorical Data Analysis
- RES497 (or 497 in department) or MTH421 - Data analytics internship

[Video from Peggy about vision for this program](#)

Recruiting Changes - MDA Experiences Two Years of Growth

After 20 years, over 2000 mathletes and 4000 donuts, the triMATHlon was cancelled this year, and will likely not return. Despite providing great outreach to high school students and creating great relationships with area teachers, the event was labor-intensive and yielded few recruits to the program. However, the MDA department is brainstorming new events targeting high school students, and also planning ways to foster relationships with high school teachers. In addition, in the spring the department held its first *Math Scholars Day*, an invite-only comprehensive recruiting visit, and will hold another this fall. This event highlights the personal nature of our program and, so far, has been successful in growing our program.

This growth ends two low years of recruiting. The first year student count for 2019 was 14 majors, and this year we have 12 new majors – the highest two-year total in the program’s history. The growth may be attributed to an increase of math-oriented new students interested in engineering who then “see the light” during Calculus. In addition, the new data analytics curriculum seems to have driven some interest. This growth is not only vital to the department, but also to the College of Arts and Sciences during a difficult budgetary cycle which has been further hindered by the coronavirus pandemic.

If you know friends, family members, co-workers, with students looking at colleges, and you like what you read here, please plug Doane. You are one of our best recruiting assets!

Watts Awarded MAA Tensor Grant

Margaret Watts was principal investigator on a grant awarded by the Tensor Foundation, via the Mathematical Association of America. The project will use \$6000 to implement Doane GEMs (Girls Engaged with Mathematics), an after school enrichment program for middle school girls. Led by women professors from Doane's Mathematics and Data Analytics Department, the project will provide a community encouraging these young women to explore mathematics and pursue STEM. The program hopes to partner with the Crete Middle School afterschool program, and plans to include math-education majors as mentors. The Tensor Foundation provides funding to support projects designed to encourage women and girls to study and persist in mathematics.



New Math Biology Course Scheduled for Spring

A special topics Math Biology Class will be co-taught by Margaret Watts and Erin Dolye in Spring 2021. The focus of the class will be on Mathematical Modeling with the students gaining experience in collecting their own data and designing their own experiments.

Here is the course description and learning outcomes:

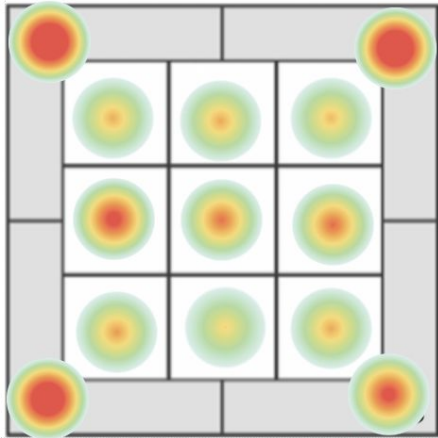
By answering questions that cannot be addressed by other means, mathematics can be an indispensable tool for biological research. The interdisciplinary field of mathematical biology combines experiment, mathematical theory, statistics, and computation to better understand biological systems. In this course you will engage in all of these areas by collecting data and implementing the essential modeling techniques of formulation, implementation, validation, and analysis. These tools will be applied to a wide variety of biological systems and disciplines.

By the end of this course student should be able to:

1. Formulate discrete and differential equation models that represent a range of biological problems.
2. Choose and apply computational tools to perform parameter estimation and to solve discrete and differential equation models.
3. Interpret model and data output in terms of the original biological problem, and use results to direct a follow-up experiment.
4. Perform appropriate data manipulations, and graphically display model output and data clearly and accurately.
5. Effectively communicate across the disciplines.
6. Demonstrate appropriate laboratory technique, design an experiment, and collect data.

Want more information? Contact margaret.watts@doane.edu.

Rotation Nation: Putting the Spin on Doane Fastballs

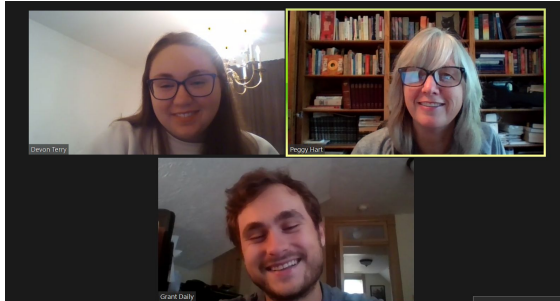


This heat map, created in *Tableau* by Elizabeth Krejci, shows the most common strike zones Doane pitchers hit when pitching to right-handed batters. The left side (the side away from the batter) is slightly more common than the right side near the batter. The pitchers successfully keep the ball out of the middle of the zone where it is easiest to hit.

Senior Elizabeth Krejci (Louisville, NE) and sophomore Kellan Voggesser (Parker, CO) spent three weeks this summer doing baseball research using statistics and analytics. Led by faculty mentors Billy Garver and Peggy Hart, the students leveraged the data collected by Doane Baseball's *Rapsodo* high-speed camera technology to investigate whether Doane's pitchers can make use of a phenomenon seen in professional baseball. A *Bauer Unit* is Defined as a fastball's $\text{Spin Rate (RPM)} / \text{Velocity (MPH)}$, and high values of this ratio have been shown to lead to high *whiff rates* (swings and misses) in the big leagues. Using a variety of visualization and statistical techniques, much of the research time was spent reducing the data set's 37 variables down to 12 variables via correlation and linear determinant analyses. The students were able to show that higher Bauer Units indeed lead to more *swinging strikes* (whiffs + foul balls) for Doane's varsity pitchers.

[See the presentation's slides](#)

Fall Senior Research Projects All Data-Driven

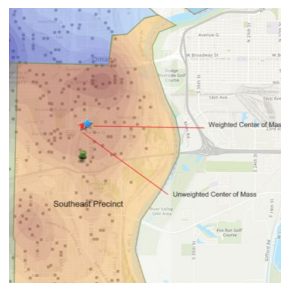


Devon Terry and Peggy Hart have regular client meetings with Grant Daily of Neighborworks as part of Devon's senior research.

Three seniors are currently working on senior research projects, all using statistics and a variety of analytics technologies. These projects are:

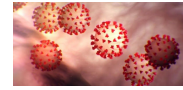
- Emma Campbell (Omaha): *Factors Related to Higher Marks in High Jump*
Emma is using data collected from GPAC high jumpers to try to determine biometric- and performance-related variables related to more successful and more consistent jumping.
- Devon Terry (Denton): *What Makes a Successful First-Time Homeowner?*
Devon has partnered with Lincoln's *Neighborworks, Inc.*, a non-profit whose mission is to combat poverty by helping low-income families buy affordable and high-quality homes. Devon's research compares the distributions of Neighborworks' clients incomes and home prices with those in their neighborhoods.
- Alec Wick (Blair): *An Analysis of Omaha Crime Data*
As part of his project, Alec is learning ArcGIS. So far, he has used the geographic mapping software and R to create optimal police precinct locations based on different centers of mass based on frequency and severity of crimes.

OPD's southeast precinct is shown with the green pin, and two different centers of mass indicated by stars. This map focuses on thefts in the precinct.



A new feature of senior research this year is Friday afternoon research colloquia, during which senior researchers share their weekly findings with faculty and each other. This has been useful for brainstorming and also for creating a sense of community for our seniors, who don't see each other often this semester.

Doane Math Hallway Quiet During Pandemic



For the first time in 21 years, Doane's Math Department hallway and offices are quiet. No constant flow of candy out of the offices, no full whiteboards during office hours, and no late afternoon philosophical discussions. Despite a majority of our math classes being "in-person", professors have been encouraged to take all of their office hours to Zoom, and most faculty have done so. "In-person classes" are classes in actual classrooms, everyone masked, socially-distanced desks, and cleaning in between sessions. But "in person" has become a misnomer as up to 25% of students in some classes have ended up quarantined due to possible exposure to COVID-19. So, faculty members have become expert "hybrid" class instructors with "Zoomers" and "roomers". Says Dr. Herzog, "It's great to work with students over Zoom, but nothing is more fun than stealing chairs from my colleagues just to fit lots of students in my office!"

[Junior Ariel Ortiz gives the student perspective](#)

WTF* is going on at Doane? Zoom with MDA Faculty

Lots of changes are in the works for Doane, as in most institutions of higher learning. We'd love to separate fact from fiction (if you've been watching things unfold via social media), and tell you how we plan to deliver high quality education despite deep budget cuts.

- Zoom Call, Tuesday, December 1st, 7 PM
- Contact Peggy Hart at peg.hart@doane.edu if you are interested in the link.

* *What the factorial?*

Comments or questions about anything you've read here?

Contact Peggy Hart at peg.hart@doane.edu.

We always love hearing from you. Thanks for reading!



[@DoaneMath](#)

Doane University Mathematics & Data Analytics, 1040 Boswell Ave., Crete NE 68333