Program in Mathematical Methods in the Social Sciences

2016–17 Year in Review

Northwestern

WEINBERG COLLEGE OF **ARTS & SCIENCES**

Program in **Mathematical Methods in the Social Sciences**

mmss.northwestern.edu

Welcome Letter from **Director**

Jeff Ely

This was my second year as Director of MMSS and it was an eventful one for our program and our students. From the Police Projects in Los Angeles, Philadelphia, and Houston, to the One Book One Northwestern data science events to the very special spring dinner with guest speaker Ben Jones, MMSS continues the tradition of integrating the rigorous tools of the curriculum with the big, real-world questions of the day. Looking ahead, a considerable focus of the program will be helping the students tie all of these resources together into better and more impactful Senior Theses. This year was a great start!

I personally was thrilled at my first opportunity to teach Advanced Game Theory in the MMSS program. For me it was the bliss point combining rigor at the level of a graduate course with the focus on applied questions that I have always valued in undergraduate teaching. Another quintessential MMSS moment from the year was in the aftermath of the November election. It was obviously a dramatic, emotional, historic time and we grappled with it the MMSS way: in one of our fall lounge sessions we used game theory to debate the relative merits of the Electoral College system versus a nationwide popular vote.

Jeff Ely is the Charles E. and Emma H. Morrison Professor of Economics at Northwestern University

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2016–17 Year in Review:
Events

First-Year Orientation

>> Program Director Jeff Ely and Economics Professor Eric Schulz welcome the MMSS Class of 2020 during orientation week and provide insights on what to expect their first year and beyond within the MMSS Program.

The Peer Advisors (PA) for MMSS are invaluable resources to the incoming first-years. They assist in acclimating the first-years to campus and even walking them through the registration process. We're grateful to the 2016-2017 PAs Garret Matsuda, Paul Salamanca, and Christina Ding for their steadfast dedication and enthusiastic mentorship of our first-year students!

welcome

Fall Welcome Party

>> Students were able to meet the new first-year and sophomore entry students, as well as reconnect with their existing classmates at our annual Fall Welcome event. Professor Ely also shared examples of how he is working to connect students with interesting projects, which included: research sponsored by the American Bar Association on pro bono service activity across the United States; a fellowship program focused on data science projects with social impact (Data Science for Social Good Summer Fellowship), and a Kellogg School of Management research project on Walmart and personnel data.

2016–17 Year in Review: **Events**

MMSS Homecoming Open House

>> Per the suggestion of some MMSS alumni, we pulled together an open house after the Homecoming game. A number of current students enjoyed hearing from alumni on both their MMSS experiences while at NU, and their interesting career paths since graduating from the program.

Ben Woo '06, Evan Shive '07, Jeff Ely – MMSS Director, Matthew Sibery '08 and Lee Branstetter '91.

"Since graduating from NU a quarter century ago, I've obtained a Ph.D. from Harvard, taught at an Ivy League business school, and helped advise a U.S. President (Barack Obama) on economic policy. None of that would have been possible without the training I received in the MMSS Program. And I am delighted to see that the program is still going strong."
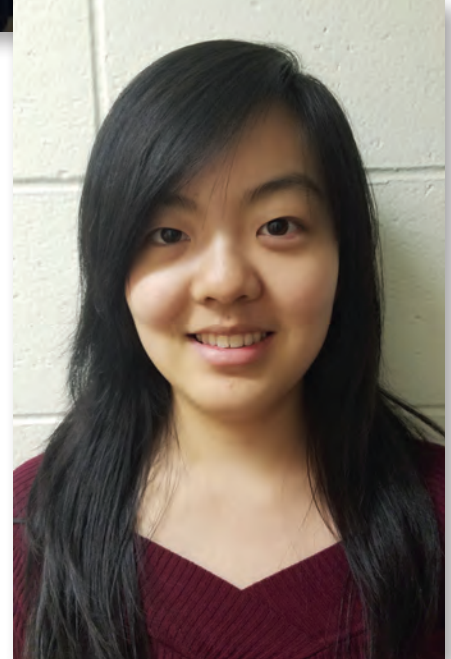
**Lee Branstetter,
MMSS Class of 1991**

"I enjoyed attending the Homecoming event and hearing about various MMSS alumni's experiences; they have achieved a lot throughout their careers, and the diversity of their work is inspiring."

Amy Chen, MMSS Class of 2020.

homecoming

Winter Dinner

The Winter Dinner is an annual event at which our MMSS seniors pass along their wisdom to the underclassmen on how to best navigate the internship and job search. We had five students discuss their journey from just learning what types of industries exist, to explaining what exactly "MMSS" means to potential employers. Several themes emerged around not being afraid to pursue opportunities outside of the typical path, the importance of reaching out to alumni, and not to rush to accept the first offer you are given, but maintaining flexibility and keeping an open mind. Kelsey Pukelis emphasized the importance of building relationships with faculty and academic advisors who helped her identify research assistant roles. Ji Ho Kim found his junior internship through an MMSS email and attributed the program to giving him a life-long skill set: "MMSS coursework taught me how to think critically and not panic even in the most intense situations." Thanks to our panel of seniors: Mark Fishman, Michaela Kastleman, Ji Ho Kim, Kelsey Pukelis and Toni Stapleton.

Jeff Ely, Mark Fishman, Kelsey Pukelis, Michaela Kastleman, Toni Stapleton, Ji Ho Kim.

winter dinner

Spring Dinner

Emilie Greenberg (senior), Professors Ben Jones and Mark Iris.

Benjamin F. Jones, Gordon and Llura Gund Family Professor of Entrepreneurship, a Professor of Strategy, and the faculty director of the Kellogg Innovation and Entrepreneurship Initiative; and MMSS Director Jeff Ely.

The annual Spring Dinner is an excellent opportunity to expose students to an accomplished professional from outside of the program—possibly to a specific career path, or new field of research. For the 2017 event, we hosted Kellogg Professor Ben Jones who is an economist with research specializing in innovation. More recently he has explored the role of teamwork in innovation and the relationship between age and invention. As our guest speaker, he spoke on the topic of "Innovation and Entrepreneurship in the 21st Century." Ben highlighted how knowledge has become too immense for any single person to understand the complexities of an industry and dominate it. He reminded us how the Wright Brothers were able to pilot the first airplane in the early 1900s and how today, it takes 30 different disciplines just to build the engine for a 787 jet airliner. His research suggests that teams ultimately drive the greatest innovations in today's global economy. Professor Jones blended hard data with a number of poignant history lessons that helped crystalize for our MMSS student body what successful innovation looks like today and in the future. This team-focused approach underscores the guiding principles our students must rely upon as they complete their MMSS coursework.
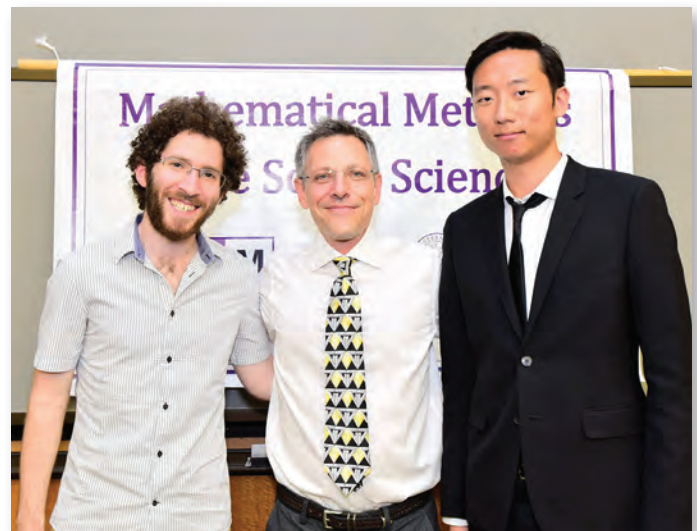
spring dinner

June 16, 2017 – The MMSS Senior Graduation Reception

An obvious favorite event of the year is our MMSS graduation reception. Students are able to come together as a class one last time, along with their friends and families, to celebrate this major milestone. Much has been accomplished by this year's class and we are all excited to wish them well as they embark on their next chapter. Some special acknowledgements were made for those seniors who earned departmental honors by maintaining a 3.5 GPA within the MMSS curriculum and completing an exceptional thesis. Two prizes are also awarded to the student who maintained the highest MMSS GPA, and to the student who has written the most outstanding senior thesis.

The Michael F. Dacey Award for the Most Outstanding MMSS Senior Thesis was awarded to Joshua Klieger on *Cyclist Safety in Numbers: Exploring a Potential Mechanism through Chicago City Data*. Josh was advised by Economics Professor Ian Savage.

Professor Ely presented the Jeanette M. Dacey Award for the Best Performance in MMSS Required Coursework to two students who both achieved a 4.0: Gavriel Hirsch and Haksoo Lee.

graduation

2016–17 Year in Review:
Highlights from the MMSS Senior Thesis

Senior Thesis Projects

The senior thesis is the capstone to the twelve courses that make up the MMSS curriculum. It provides students the opportunity to draw upon the skills they have gained in class and apply them to a substantial piece of original research. During their junior year, MMSS students already begin to select a topic and advisor. As seniors, they work to refine their research question, complete any further data collection, and compile their analysis into a cohesive paper.

Here is a sampling of this year's thesis topics:

> Using Machine Learning to Improve College Football Recruitment Strategies and Decision Making
> How Incivility in Partisan Media (De-)Polarizes the Electorate
> Why Do Restaurants Offer Reservations?
> Day-of-the-Week Effect on Prices of Supermarket Goods
> One Size Fits All? Making Banking Policy Recommendations for Disparate Countries
> Stranger Danger? Removing Barriers to Social Connection through Meaningful Conversation

You can also access copies of past thesis papers via the **Thesis Library on the MMSS website**

Dacey Grant Recipient

Former MMSS Professor Michael Dacey and his wife Jeanette provided a monetary gift to both build a research fund in support of MMSS students as they completed their thesis and coursework, and award prizes for outstanding student accomplishments. This year, a Dacey Grant was awarded to Angela Lin for her thesis titled "Quantitative Analysis of Palestinian-Jordanian Identity and Opinions Toward Refugees." The funds supported both her data collection efforts and her travel to Amman, Jordan where Angela was invited to speak at the International Multidisciplinary Multilingual Research Forum this past April.

"The Dacey Grant has allowed me to apply my MMSS skill set to socially impactful issues beyond the Northwestern campus."
Angela Lin, MMSS Class of 2017.

senior thesis

Projects

MMSS Police Projects

Since 1997, MMSS Lecturer Mark Iris has set up meaningful research projects in an unusual context: acquiring real world consulting experience while providing a public service. Mark's prior experience as the Executive Director of the Chicago Police Board, has helped him connect teams of student researchers with police departments from major cities across the US, using those agencies' data to address significant policy and operational questions for the participating organizations.

Police departments typically have massive amounts of data, but are short handed in staff with statistical skills to analyze those data and help agencies work more efficiently and better serve the public. For 2016-2017, student teams worked with police departments from Houston, Los Angeles and Philadelphia.

Professor Mark Iris, along with Michelle Chen, Madeleine Rees and Brendan Giebel preparing to present their thesis research titled: "*The Los Angeles Police Department: An Evaluation of Patrol Operations in Accordance with the 7/40 Plan.*"

Students Maddie Rees and Michelle Chen were able to extend their stay in Los Angeles and were invited to take a tour of the city via helicopter by the LAPD!

Alumni **Resources and Spotlight**

Alumni Thank You

≫ **THANK YOU to our MMSS ALUMNI SUPPORTERS**—No other undergraduate program in the nation matches the scope, advanced level or degree of integration of social sciences and mathematics. We are thankful for the support that has allowed us to make sure MMSS students are well prepared for the future—whether going on to the graduate school of their choice, being highly sought by Fortune 500 employers, or bringing analytical rigor to traditionally less data-driven fields.

Email **mmss@ northwestern.edu** to get access to the alumni directory!

As you may be aware, we have been working to assemble an alumni directory for MMSS. A survey was issued last summer to populate the directory and we received roughly 200 responses. The directory is housed in a password protected page on the MMSS website and is accessible to only MMSS students, faculty, and alumni. If you would like to participate, please email Nicole Schneider at **mmss@ northwestern.edu**. If you have yet to fill out the survey and have a few minutes, please do so **here**.

Recent Graduate Profiles

Maxwell C. Rong

**Class of 2017
Pursuing Stanford PhD
in Economics**

Why did you apply to MMSS?
I applied to MMSS because the program's goals aligned well with my interests, combining mathematical rigor with applications to social sciences. The small class size and selectivity of the program also appealed to me.

How has MMSS prepared you for Graduation? I really enjoyed my time in MMSS. The classes were rewarding and prepared me well to face future challenges, but even outside of class material, I learned valuable skills like how to work collaboratively with others and how to do research. MMSS faculty also provided great academic and professional advice which I believe will be very helpful going forward.

What have you enjoyed most about MMSS? Two experiences from MMSS really stand out to me. The first is the sense of community. Taking classes with the same group for two years, as well as the many program sponsored events, really allowed me to get to know my classmates well. At the end of the day, I feel like I really identify with the MMSS program. Second, I appreciated the senior thesis experience. It was challenging and gratifying to pursue a self-directed project, and I learned a great deal about research.

alumni

Recent Graduate Profiles

Rachel V. Boroditsky

Class of 2016
Business Analyst at McKinsey & Company

Why did you apply to MMSS?
There were two main reasons I applied to the program. The first reason was purely academic. I wanted to take classes that demonstrated how to apply mathematical modeling to different social questions. I considered double majoring in mathematics and economics, but I realized I would miss out on many applied math concepts since the upper level courses in both majors are highly theory based. However, the MMSS classes fit my interests perfectly. The second reason was community based. The MMSS community is known for being close and there are many opportunities and resources within the community.

How has MMSS prepared you for Graduation? Freshman year I took multi-variable calculus and an economics class and for me, the coolest part of my coursework was seeing how I could use mathematical modeling to explain different social phenomena around me. In addition to explaining core economics questions, math could be used to help model anything from election outcomes to the likelihood of war between two countries to the psychology behind choosing a university to attend.

What have you enjoyed most about MMSS? I enjoyed the classes most about MMSS. Not only are they challenging, but they force you to think critically about the world around you and how you can use the skill set you learn in MMSS to make an impact. I've also enjoyed being a part of the MMSS community. If you need advice on anything from job recruitment to course selection, you can always reach out to MMSS students, alumni, or staff for support and they are incredibly willing to help. These are the two components of the MMSS program that I appreciated the most.

LinkedIn

We have almost 700 members in our "MMSS Northwestern Alumni" LinkedIn Group. To join, please email **mmss@northwestern.edu**, visit our LinkedIn Group **here**, or search for ''MMSS Northwestern Alumni" on LinkedIn.

One Degree, Many Career Paths:
A Celebration of the 40th Anniversary of the MMSS Program

Save the Date—April 2018—to celebrate the 40th anniversary of the MMSS Program launch—1978-2018. Please plan to join us for an evening of learning and networking.

General **Updates**

STEM Classification for MMSS

>> For mysterious reasons, MMSS has never been classified as a STEM (Science, Technology, Engineering, and Mathematics) program. Among other benefits, given the fluid nature of US immigration regulations, it became especially important to avail our international students of the advantages STEM provides. We are now happy to report that after much sleuthing, we have finally discovered the secret code and MMSS has been reclassified as STEM.

In Memory

We've learned of some very tragic news regarding a 2001 MMSS alumnus, Nathan Carl Popkins, who passed away on July 30, 2017. Nathan left an indelible mark on this world and the MMSS Office would like to extend our deepest sympathies to his family, friends, fellow MMSS alumni and colleagues. Nathan's contributions to his personal and professional endeavors were extraordinary and a deep understanding of math was at the core of his pursuits. Here at Northwestern, he mentored several students over the years—particularly through his 10-year career as an investment banker and through the company he founded (Align Income Share Funding). The initial pricing model at Align was built by Nathan with assistance from two MMSS student interns, and two members of the current management team were in Nathan's MMSS study group. In lieu of flowers, the family has requested donations be made to the MMSS Program. **Click here to access information on how to donate online or via mail.** This act of generosity is humbling and we thank Nathan and his fellow alumni for continuing to support the MMSS Program.

MMSS and One Book One at Northwestern

>> This year the Northwestern community reflected on the increasing role of data in science and in our daily lives through a celebration of Nate Silver's book *The Signal and The Noise*. MMSS being the flagship program in Weinberg College for applied data science, our students were given central roles in many of the most exciting events of the year, some of which are described below:

> Several students explored the world of Data Journalism working with professional mentors as well as McCormick Knight Lab faculty to devise and develop their own data-oriented stories.

> We helped build the NU Predicts mobile app, a large-scale online game for collecting and testing predictions about ongoing events. It launched at the Duke-Northwestern football game.

> Several students and Professor Ely had the unique opportunity to talk data analytics with Chris Moore, Director of Research for the Chicago Cubs.

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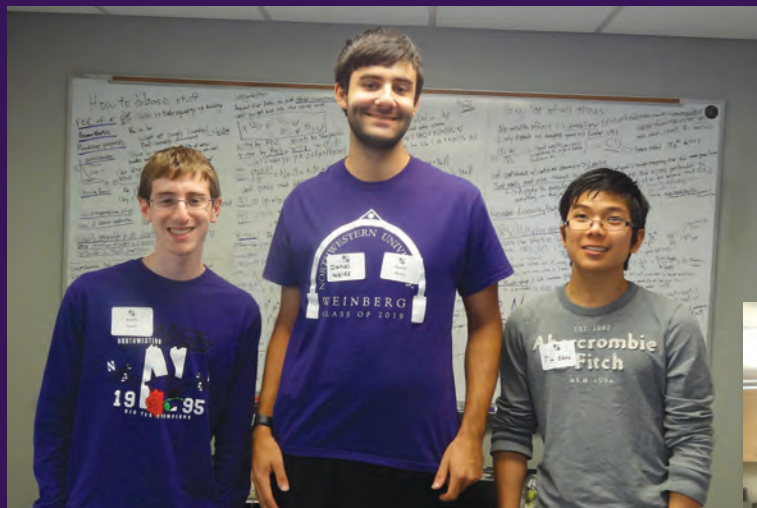Program Coordinator of Mathematical Methods in the Social Sciences Program
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Clockwise from top left: Houston Police Project students Allison Shaner, Edalina Wang, Eric Lullo and their families; Seniors Ben Krueger and Mark Fishman; Seniors Gavi Hirsch, Max Silberman, Max Rong and Karthik Srinivasan; MMSS Program Coordinator Nicole Schneider and Senior Christie Jeung; Senior Emilie Greenberg

Clockwise from above: Class of 2019 students Aryeh Levin, Daniel Weiss and Tim Zhou; Evan Shive '07 with students Armaan Kohli and Katherine Liu; Ben Woo '06 with student Lexi Lu