

Program in
Mathematical Methods
in the Social Sciences

2018-19

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

Dear MMSS Community:

It has been another great year of milestones for our program highlighted by exciting changes to the MMSS curriculum, a boundary-breaking increase in the diversity of our first-year class, and a new research initiative that could pave the way for meaningful developments in the future.

MMSS 300 is a brand new, and one-of-a-kind, foundational course that fills a longstanding gap in the MMSS coursework. It provides our students with the conceptual and formal tools for talking about individual and social welfare. These concepts are central to all social science and policy questions, but are rarely given their due in undergraduate (and even some graduate) social science education. I am especially excited that our students are learning this material from Eddie Dekel, a star teacher from the Economics department. Fall 2018 was the first iteration of MMSS 300 and by all accounts it was a great success.

I am very proud to report that the 2018 entering MMSS cohort which was 52% female is the first on record to achieve gender balance. This was the end result of a multi-year effort of outreach and mentoring which raised the visibility of the amazing women in our program.

Finally, it has been my goal since taking over as director to build on the reputation of our Police Projects and to create new external partnerships to enable our students to engage in impactful research as the basis for their thesis. There have been some exciting developments on this front with hopefully some concrete results that I look forward to telling you more about next year!

A handwritten signature in black ink that reads "Jeff Ely". The signature is stylized and cursive.

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

MMSS 300 Foundations of Math Social Science with Professor Eddie Dekel

»»» What is the most important topic you teach in MMSS 300?

How to connect between concepts about behavior and mathematical models of that behavior. More specifically, how to go from an idea, such as that people have limited attention, to a formal model of decision making that incorporates that idea.

Why do you think it is important for students of social science to learn this material?

Models are commonly used in social sciences, especially economics. The path from having a novel idea about behavior, to describing mathematically such behavior in a way that can be embedded in general models is beautiful, and important to understand.



Professor Eddie Dekel is the William R. Kenan Jr.
Professor of Economics at Northwestern University

What was your first impression of MMSS students?

They are curious and willing to be challenged which leads to engaging discussions about the material.

Is there anything you plan to do differently next time?

Whenever I finish teaching any class I always think of additional material I'd like to cover. What to remove to make space for that is the dilemma! I'm considering various options and in the end the class and I will have to see how things go.

MMSS 300

2018–19 Year in Review

First Year Orientation

First Year Orientation is held during the beginning of Wildcat Welcome Week and it serves as the initial gathering point for entering MMSS students. Program Director Jeff Ely and First Year Advisor Eric Schulz welcome the students and provide insights on what to expect over the next four years. Professor Ely shared some of program's rich history and underscored how proud the faculty, staff and alumni are of the MMSS experience and community. The program continues to provide students with rigorous preparation that allows our graduates to contribute a valuable and unique perspective in their post-graduate pursuits.



First-Year Student Data for Class of 2022



52% female



10% international



35 avg ACT Math
789 avg. SAT Math



welcome

Fall Welcome Party 2018

Over 75 students and faculty gathered to kick off the 2018-2019 school year and connect with new and returning classmates. Professor Ely took the stage to welcome everyone and was able to announce the launch of the new MMSS 300 course, as well as additional resources for MMSS students including free access to the Datacamp platform which provides tutorials for coding languages such as R and Python.



Clockwise from left to right:

First Row: Andrew Chung, Jason Liu, Mary Cui, Ilayna Schlesinger, and Akshay Jain. Second Row: Catherine Zhang, Chadya Harding, and Tony Hao.

Program Director Jeff Ely.

Div Dasani, Jeff Ely and James Zhao.

Kitra Razin, Tina Zhang, Ben Hool, Ben Lampert and Tyler Merzer.



welcome

2018–19 Year in Review

Thank you to our MMSS Peer Advisors for helping to on-board the First-Years!



Special thanks to our 2018-2019 Peer Advisors Michael Schwartz, Jessica Waldman and Jason Liu for leading the First Year Advising Session.



One of the most popular events for our first years has become the winter quarter advising session (and pizza dinner) in November hosted by First Year Advisor Professor Eric Schulz and the MMSS Peer Advisors. This is an opportunity for students to hear advice on how to manage the Winter Quarter classes—both MMSS and various electives and distribution requirements. It's also more helpful to gather again in November after students have had a chance to see how they are handling classes and campus life.

welcome

Happiness Club Celebrates Pi Day with Pie a Professor

Northwestern University has a Happiness Club and they invited Professor Ely to their “Pie a Professor” event on Pi Day in March. The Happiness Club is committed to increasing the happiness of the NU community and apparently students can increase their happiness by being given the opportunity to throw pie at their professors. While we only have photographic evidence of one MMSS student here, rest assured there was a line up of other students ready to share their happiness with Professor Ely.



Senior Hassan Sayed helps Professor Ely.

2018–19 Year in Review

Spring Dinner with Young Alumni Panel

»»» On April 8, 2019, we hosted five young MMSS alumni from the Chicago area for our spring dinner at the Guild Lounge in Scott Hall.

Panelist gave insights on career choices, decisions around graduate school and what to expect during the first few years in the workforce. Over 50 MMSS students attended the event and they had a number of questions on how to best prepare at NU for their first job after graduation. Advice from the panel centered around not being afraid to reach out to alumni to learn about new careers, and the importance of charting your own path through the development of a personal, unique and genuine set of interests.

The panelists included the following:

- **Dharini Subramanian Shukla '11**, Senior Associate, Madison Dearborn Partners
- **Yong Cho '10**, Data Scientist at GrubHub
- **Danny Baker '17**, Associate Consultant for Bain & Co
- **Julia Kuhn '18**, Analyst, Bank of America Merrill Lynch
- **Tim Yuan '12**, Strategy & Operations Manager, Screenshot



Top photo, left to right: Dharini Subramanian Shukla, Yong Cho, Danny Baker, Julia Kuhn, Tim Yuan, Jeff Ely

spring dinner

Spring Dinner Alumni Panel



Danny Baker

Industry: Consulting

Company: Bain & Co

Title: Associate Consultant

Graduation Year: 2017

Northwestern MAJORS: MMSS and Econ **MINOR:** Classics

Danny is currently an Associate Consultant at Bain & Co. in Chicago. While at Bain, Danny has worked on an operations strategy project for an IT outsourcer, a strategy project for Community Colleges in Chicago, and multiple strategic diligences in Bain's Private Equity Group. While at Northwestern, Danny started and sold a company that provided predictive analytics for college football recruiting departments in order to improve the recruitment process.

Yong Cho

Industry: Data Analytics

Company: GrubHub

Title: Senior Data Scientist

Graduation Year: 2010

Northwestern MAJORS: MMSS and Econ **MINOR:** BIP

Yong Cho is a Senior Data Scientist on Grubhub's CRM Marketing team, whose work is a cross-section of data science, product design, and marketing strategy. Yong believes in the key to successful customer lifecycle marketing being A/B test driven messaging—by messaging the right diner at the right time with the right content and right incentive, there is always room for further data-driven optimization. Yong uses everything from machine learning to product design to best align these concepts and ultimately increase retention and business value of Grubhub diners.

Julia Kuhn

Industry: Investment Banking

Company: Analyst

Title: Bank of America Merrill Lynch

Graduation Year: 2018

Northwestern MAJORS: BS in Industrial Engineering;
Kellogg Certificate FE

Julia Kuhn is an investment banking analyst at Bank of America Merrill Lynch in the Global Industrials Group. She advises on mergers and acquisitions, equity and debt transactions for industrials companies, mainly in the automotive and capital goods sectors. She interned at Bank of America after her junior year and started as a full time analyst in 2018. She is a lifelong Chicago sports fan, enjoys standup comedy shows, and is always looking for good books to read.

Dharini Subramanian Shukla

Industry: Private Equity

Company: Madison Dearborn Partners

Title: Senior Associate

Graduation Year: 2011

Northwestern MAJORS: MMSS and Econ

**Stanford University Graduate School of
Business MBA and MA in Education (2017)**

Dharini Subramanian Shukla is a senior associate at Madison Dearborn Partners. She has previously held positions in middle-market private equity, investment banking and tech business operations. She received a joint Master in Business Administration and Master of Arts in Education at the Stanford Graduate School of Business and Graduate School of Education. Prior to starting graduate school, Dharini was a Business Operations Associate at LinkedIn's User Growth & Engagement division. Before LinkedIn, she was at CC Industries, Inc. (CCI), a subsidiary of Henry Crown & Company, as an Associate in Corporate Development, she evaluated new equity investments, provided strategic support to portfolio companies and analyzed the performance of current holdings for the Crown family. Prior to CCI, Dharini worked as an Investment Banking Analyst in the Global Industrials Group at Bank of America Merrill Lynch.

Tim Yuan

Industry: Tech/Start Up

Company: Snpasheet

Title: Strategy & Operations Manager

Graduation Year: 2012

Northwestern MAJORS: MMSS and Econ

University of Michigan Business School (2018)

Tim is a strategy and business operations manager at Snpasheet, focused on building the Snpasheet Transactions product from the ground up. Previously he was the lead business development associate with Techstars Mobility, mentoring and building strategic initiatives for 11 companies in the 2018 class. He also has four years of management consulting experience for Fortune 500 companies across multiple industries while at EY and IBM. He is laser-focused on helping growing ventures succeed through go-to-market strategy development, business development, product road mapping, and product management. He is an avid soccer fan supporting Aston Villa and enjoys traveling, having hiked Machu Picchu and backpacked through Asia.

MMSS Senior Thesis Projects

»»» The senior thesis is the capstone to 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 are summaries of three research projects from the class of 2019:



“Protestantism and Economic Outcomes: German Immigrants during the Age of Mass Migration.”

by **Helen Burkhardt**

Helen examines the famous link hypothesized by Weber between a Protestant “work ethic” and economic growth. She uses a natural experiment given by the spike in immigration from Germany to the United States in the latter half of the 19th century to compare economic outcomes of Protestant and Catholic immigrants. In this level playing field Helen finds no evidence of differences in educational attainment, social mobility or income growth between the two groups.

“The Effect of Medical Cannabis Legalization on the Medicaid Opioid Prescription Rate.”

by **Nathaniel Downs**

Nathaniel studied the opioid epidemic using three different methodologies based on difference-in-differences, he investigated whether the legal availability of cannabis as a substitute pain medication resulted in a reduction in the prescription rate of addictive opioids for Medicaid patients. The results show a clear one-time substitution effect with a lag of about a year after legalization.

“Present Bias in Proxy Decision-Making.”

by **Prannay Srivastava**

Present-bias is an important and well-documented finding in decision-making: instant gratification leads us to make choices we later regret. Prannay poses the original question of how present bias is affected when decisions are delegated to others. Through an incentivized experiment comparing decisions made for ourselves and decisions made for others he found no statistical difference in present bias.

senior thesis

Dacey Grant Recipients

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, two Dacey Grants were awarded to Gloria Mao for her thesis titled *“The Influence of Weekly Petroleum Report on the Price of Crude Oil Futures Contracts,”* and Garrett Matsuda for his thesis titled *“Testing User’s Willingness to Authenticate their Identity to their Phones.”*

MMSS Students Partner with Los Angeles Police Department and win Dacey Prize for Best MMSS Thesis

For many years Mark Iris has been supervising and mentoring our students’ research in collaboration with Police Departments around the country. The Los Angeles Police Department has been involved in a dozen of these. This year, a team of three students worked with the LAPD as the department was responding to a consent decree by the US Department of Justice to carefully scrutinize all incidents of the use of force.

Our students, Saloni Singhvi, Eric Rolfs, and Josh Wasserman were given a data set with details of all instances in which TASERS were used by LAPD officers in 2017. They spent a year using these data to document patterns of interest including: identifying cases of inappropriate use, quantifying the effects of the presence body cameras on usage rates, correlating usage with mental illness and/or intoxication by subjects and identifying units within the LAPD with disproportionately high usage.

Parsing the data in every conceivable way, the students gave the LAPD a clear overview of the circumstances in which their officers use TASERS. LAPD command staff, present for the students’ formal presentation of their findings, were very impressed. It is quite likely LAPD will use the students’ findings to help shape future TASER related policy review and training.

This dynamic team of students went on to win the Michael Dacey prize which is named in honor of Michael Dacey, a legendary past Director of MMSS. It is awarded each year to the student or team of students who in the judgment of MMSS faculty write the most outstanding thesis. This year’s winning thesis is entitled *“Police Use of Conducted Energy Devices: A 2017 Analysis of the Los Angeles Police Department.”* Congratulations to Professor Mark Iris and our stellar student team for all their diligent work.



MMSS Lecturer Mark Iris

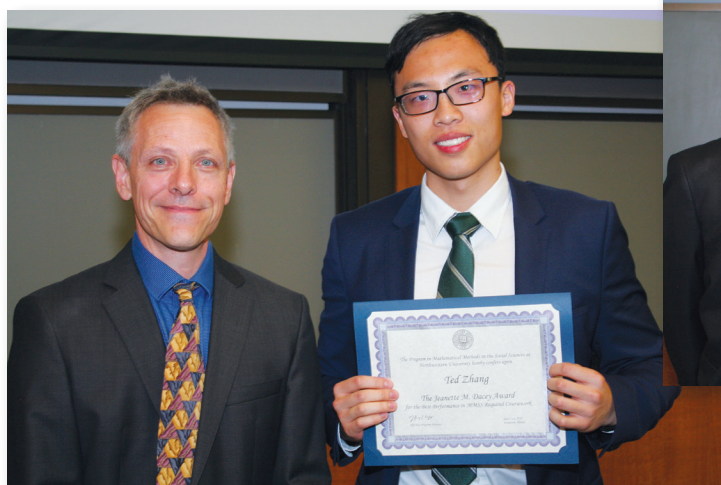
The MMSS Senior Graduation Celebration

The MMSS Class of 2019

»»» The annual graduation celebration is a special time for our MMSS seniors to spend an afternoon with their classmates and family and reflect on their undergraduate experience. Professor Ely presented awards and highlighted how the demanding curriculum and final senior thesis project has prepared our accomplished graduates to bring an informed, critical, yet humble world view to the next chapter of personal and professional their lives. Congrats to the class of 2019!



2019 Seniors pose for a final photo with their classmates.



Professor Ely presented the Jeanette M. Dacey Award for the Best Performance in MMSS Required Coursework to Senior Ted Zhang.



Professor Ely along with Seniors Josh Wasserman, Saloni Singhvi and Eric Rolfs for their Los Angeles Police Department Project that won the Michael F. Dacey Award for the Most Outstanding MMSS Senior Thesis.

graduation



Clockwise from upper left:

MMSS Program Coordinator Nicole Schneider and Program Director Jeff Ely.

Elaine (Xiaotong) Chen and her parents.

Aryeh Levin, Helen Burkhardt, Daniel Weiss and Jose Trejos.

Professor Ely, Moling Zhang, Katherine Liu, Elaine Chen and Lexi Lu.

Matthew Nicholson and Marc Scovic.

Seniors Mallika Bhandari, Andrew Choi and Jestoni Losbanes pose with their respective Mothers.

Alumni Resources and Spotlight

Class of 2019 Graduate Profiles

Mallika Bhandari

Class of 2019

Boston Consulting Group



Why did you apply to MMSS? I applied to MMSS because I was fascinated by the idea of solving social science issues through mathematical frameworks. Quantitative reasoning brought a new perspective to problems that, until that point, I had largely read about in words. However, the element of math that I loved most was not about the results, but about the process of taking a complex

situation and logically dissecting it into component proofs. I was excited by a program that used both the operations and the methodology of quantitative thinking to solve the questions and issues I was most passionate about.

How has MMSS prepared you for graduation? First of all, the knowledge I have gained through the MMSS courses has been incredibly beneficial. Take-away's from intersectional courses like econometrics and game theory have taught me principals that have been applicable across work experience in a variety of industries and roles!

Arguably more than the content-based knowledge, MMSS has best prepared me for graduation by stretching and solidifying my work-ethic. The fast-paced courses and academic rigor of MMSS challenged me to work extremely hard. In doing so, I learned much about dedication and perseverance. These process-oriented lessons are the ones that I cherish above all else, for they are applicable in any situation life may throw my way.

What have you enjoyed most about MMSS? Aside from the courses, I have really enjoyed being part of the MMSS community. My fellow peers, professors, and alumni have been some of the most remarkable, intelligent, and helpful people I've met during my time at NU. They both challenge and support me, and have grown into friends and mentors respectively.

Hassan Sayed

Class of 2019

Pursuing Microeconomics PhD at Princeton



Why did you apply to MMSS? Early in my college career, I realized I wanted to study some form of mathematics applied to social issues and the social sciences. Pure math was too esoteric, and applied math seemed to be more focused on hard sciences and engineering. Economics as a

discipline is dedicated to using mathematical tools to analyze economic behavior, but the economics program here is not as math-heavy, and I wanted something that looked more broadly at the social sciences. And so, I found myself in MMSS.

How has MMSS prepared you for graduation?

The advanced coursework in microeconomics and econometrics are obviously great stepping stones for graduate courses in the same subjects. The thesis program also give students a hands on approach with independent research and allows them to present their findings periodically in front of their peers—just like in graduate school.

What have you enjoyed most about MMSS?

As someone who wants to research microeconomic theory, getting to study under Professors like Prof. Ely, Prof. Rogerson, and Prof. Porter is really invaluable. They're amazing academics who actually use game theory in their research—the tools you're learning about are something your instructors use every day on the job. And even outside class, these faculty are free to help out eager students—for example, even though Prof. Ely wasn't my thesis advisor, he helped me brainstorm how to design a game theoretic primitive for my senior thesis.

MMSS Mentorships

»»» Did you know that Northwestern now has a university-wide mentor program called the Northwestern Network Mentorship Program? And students and alumni can ask for MMSS pairings?

Currently there are over 79 MMSS alumni mentors and 23 MMSS students participating in the program. To learn more, check out the [Northwestern Network Mentorship Program](#) website. The program is facilitated by an easy-to-use online platform that cultivates meaningful opportunities within the Northwestern community. The program is open to students and alumni from all class years, programs, and schools. Alumni have the option of participating as a mentor, mentee, or both at the same time. You can [register here](#) and begin your profile. Be sure to mark Mathematical Methods in the Social Sciences as your major. If you have questions, please contact Caitlin Wyler at caitlin.wyler@northwestern.edu | +1 847.467.3571.

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.

Nathan Carl Popkins MMSS Legacy Fund

»»» The Nathan Carl Popkins MMSS Legacy Fund was created by a core group of alumni who were in MMSS with Nathan Popkins (Class of 2001). Nathan was known for his drive and love for math in all facets of his life. In that spirit, the Legacy Fund is the first permanently endowed fund exclusively dedicated to enhancing the experience of the MMSS students. One of the goals of the fund is to support an active alumni engagement program that will continue to strengthen the MMSS network. We are pleased to announce that we have surpassed \$100,000 in commitments to the fund which is enough to permanently endow the fund for future MMSS students. The continued support of alumni will be critical to maximizing the Fund's impact including procuring data sets for senior research projects, assisting students in attending conferences related to their research, purchasing specific software programs, and connecting students with subject matter experts in their field of study.

Donating to MMSS

Donations from our loyal and generous alumni help ensure that the MMSS Program continues to provide vital resources to our students such as the latest statistical software, periodic replacement of computer hardware, guest speakers, networking and career planning events and more. Donors can designate gifts to MMSS by indicating their preference on the memo line of the check, or if giving online, you can select MMSS under the "Search additional gift designations" section. Visit [Giving to Northwestern University](#) for more information.

alumni

Stay Connected

Due to the MMSS Program's selectivity, the student body is small by design and the average graduating class is 32 students. Since the first students graduated in 1981, there have been approximately 1,200 MMSS alumni. Here are some key ways this community can all stay connected:

LinkedIn

With over 700 members in our "MMSS Northwestern Alumni" LinkedIn Group, it can be a great resource for connecting. To join, visit our LinkedIn Group [here](#), email mmss@northwestern.edu, or search for "MMSS Northwestern Alumni" on LinkedIn.

MMSS Mentorships

Sign up to serve as an MMSS mentor through [Northwestern Network Mentorship Program](#).

Alumni Profiles

Send an update to mmss@northwestern.edu and provide an alumni profile on how MMSS has impacted your life.

Year In Review

Sign up to receive this annual newsletter by sending an email to mmss@northwestern.edu.

Northwestern

WEINBERG COLLEGE OF ARTS & SCIENCES

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

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