

FALL 2018

Catching FIRE

THE OFFICIAL NEWSLETTER OF THE NYU TANDON DEPARTMENT OF FINANCE AND RISK ENGINEERING

IN THIS ISSUE • FROM THE DEAN'S DESK • ON THE JOB FRONT • BOOT CAMPS AND BOATS • CUTTING-EDGE COURSES
NEWS FROM OUR FACULTY • FRE STUDENTS FOR THE WIN • HERE COME THE BRIDES • WE'RE HONORED • IN OTHER NEWS
FRE FALL 2018 LECTURE SERIES



This past fall, we had a record-breaking 1,905 applicants to our program — an almost 20% increase over the previous year and up almost 50% since my arrival two years ago. Deputy Chair Barry Blecherman and Program Manager Zahra Patterson worked tirelessly to evaluate the candidates, and the result is a relatively small, elite cohort of talented students with an average Quant GRE score of 169.1, up from 168.9 last year. The entering group is almost evenly divided between men and women, reflecting NYU Tandon's commitment to closing the gender gap in the STEM fields. In another exciting development, we saw the arrival of Dean Jelena Kovačević, the first woman to head the School of Engineering since its founding in 1854.

In the past two years, the faculty and staff have made (and continue to make) substantial changes to the curriculum in an ongoing effort to modernize and keep up with the rapidly shifting financial industry. We have, for example, added six new courses on machine learning in the last year, as well as half-courses on cryptocurrencies and cloud computing. This shift towards financial technology paid off handsomely for our students in terms of both summer internships and full-time job offers. In fact, for the first time ever, we were forced to cancel all of our summer courses, because first-year students found better ways to advance their careers. Additionally, this past summer, the incoming cohort became part of Tandon history as we held our first on-campus boot camp, and this fall we also inaugurated our first for-credit online course for our students, which complements a non-credit MOOC taught via Coursera that launched last summer.

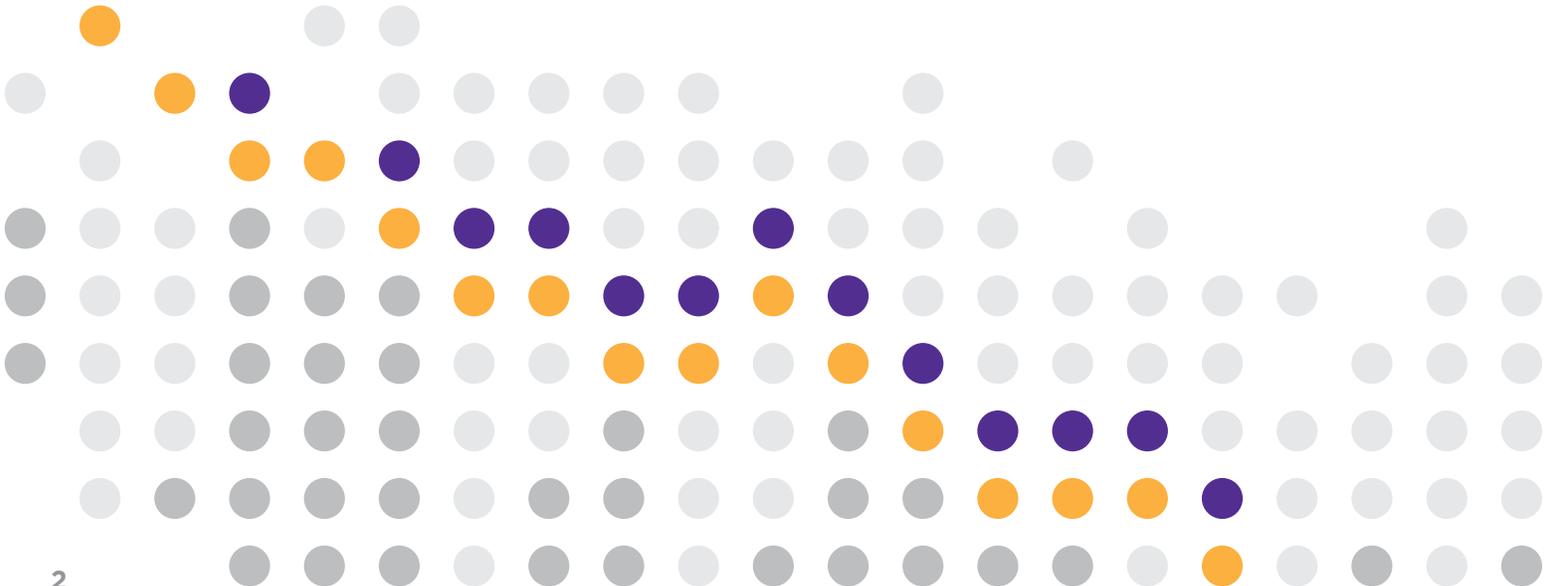
To keep up with our evolving program and curriculum, during the last academic year we added several new part-time professors, hailing from such iconic firms as Bank of America, Morgan Stanley, and Google. This fall, we plan to hire both a new full-time professor and a new full-time staff person to meet the growing academic and professional needs of our students.

The new professors and staff are integral parts of my broader vision for the department, which includes a strong emphasis on re-defining financial engineering, bridging the gap between theory and practice, conducting innovative research, and preparing graduates for increasingly high-tech careers. I look forward to meeting with new students and hearing from alumni to discuss how we can continue to re-engineer both ourselves and our futures.

On a more personal note, this summer, my new book, *Convex Duality and Financial Mathematics*, was published by Springer. Aimed towards graduate students, researchers, and practitioners in mathematics, finance, economics, and optimization, it will, I hope, prove to be a valuable reference. I also spent time over the summer giving talks in Lisbon, Dublin, Shanghai (Fudan/SAIF), and SWUFE in Chengdu, China, and I visited NYU Shanghai to check out a new Quant Finance master's program that will be launched next year by the NYU Stern School of Business.

This new academic year promises to be a productive and fulfilling one, and I am certain I will have more good departmental news to share with you as it progresses.

Peter Carr
Department Chair
NYU Finance and Risk Engineering





ON THE JOB FRONT

Companies on Campus

As the semester commences, FRE students have already had the opportunity to attend exclusive, on-campus recruitment presentations from many top firms, including PwC, Chicago Trading Company, Ernst & Young, Citadel, Barclays, Credit Suisse, Morgan Stanley, American Express and Goldman Sachs. These popular events allow students to network with potential employers and learn more about job openings in risk, quant, and other finance-related fields.

Companies are invited to contact the Career Placement Director, Sara Tomeo (Sara.Tomeo@nyu.edu), with any career opportunities that you would like to share with our department.

Capstone Projects with Real-World Importance

In 2017, the department began inviting industry employers to assign second-year FRE students capstone projects that would allow them to apply their content knowledge to real-world problems, gain industry exposure, and receive mentorship. The program has been highly successful, and this fall our industry hosts include Oppenheimer, Deutsche Bank, Barclays, and UBS O'Connor, to name just a few.

We will soon be accepting project proposals for spring 2019. If you would like to hear more about industry-hosted projects and how you can get involved, please contact Professor Agnes Tourin (atourin@nyu.edu) or Sara Tomeo (Sara.Tomeo@nyu.edu).

Students Preparing Students

On Wednesday, September 19, 2018, more than 75 first-year M.S. in Financial Engineering students gathered to hear a panel of their successful second-year counterparts speak about their experiences and give insights on a variety of topics, including seeking an internship, preparing for interviews, and winning full-time jobs. The second-year students featured included Yusi (Sara) Yang, Jianqiu (Lisa) Chen, Zhongyuan (Lucas) Bi, Tiancheng Hou, Pei-Ling Wu, Xiao Liu, and Fangya (Freya) Li. The highly engaging panel concluded with a chance to ask individual questions and a networking session.

Boot Camps and Boats

This August, the department launched its first-ever in-person pre-program boot camp for newly admitted students. An extension of our online summer boot camp, which had been piloted in 2017, the event was intended to prepare students with the solid foundation of knowledge they would need to meet their maximum potential once classes and summer internship interviews began in the fall. The boot camp courses covered such topics as risk management, math, probability, statistics, stochastics, and financial engineering.

It wasn't all work and study, however. On August 9, the department hosted its first-ever New Student Welcome Boat Ride aboard a Hornblower yacht in the Hudson, and the incoming cohort enjoyed an evening of dancing, food, and amazing views of New York City.

Meet the Visiting Boot Camp Professors

Pasquale Cirillo, who taught a Risk Management course for the boot-campers, specializes in risk analysis and extreme value theory, with applications in economics and the social sciences. He holds a position in the Applied Probability Group at the Delft University of Technology, in the

Netherlands, where he also coordinates the Financial Engineering Specialization of the master's program in Applied Mathematics. Outside of academia, he has collaborated as a statistical consultant with international institutions like the World Bank and the European Food Safety Authority, as well as with many private companies and banks.

Cirillo received his Professorial Habilitation in Applied Statistics from the University of Bern, in Switzerland, and his Ph.D. in Statistics from Bocconi University, in Italy. In addition to statistics, he studied economics at Sant'Anna School of Advanced Studies in Pisa, Italy.

"My students were motivated and eager to learn, so it was an intensive and rewarding experience to work with them. Students often seemed shy, but during breaks they asked interesting and relevant questions. I think we met our goal of providing them with the necessary knowledge to have successful interviews and to start their Masters coursework with confidence."

— Pasquale Cirillo

Conall O'Sullivan, who taught "From Brain Teasers to Black-Scholes," a boot camp course focused on Quantitative Finance, is an Assistant Professor of Finance at

the Michael Smurfit Graduate Business School at University College Dublin (UCD), where he directs the M.Sc. program in Quantitative Finance and teaches courses in Derivatives, Financial Economics, Numerical Methods and Fixed Income Securities, among other topics. He has also taught in Singapore and Hong Kong and is the recipient of a 2017 UCD Award for Teaching Excellence. His primary research interests involve numerical methods for derivatives pricing, option implied information, and fixed income securities markets, and his published works have appeared in such publications as Quantitative Finance, the International Journal of Theoretical and Applied Finance, and the Journal of Computational Finance. He has presented papers at many international conferences, including the European Finance Association, Bachelor World Congress, and Computational Financial Econometrics.

"I really enjoyed my time at NYU teaching the boot camp course. We covered a number of crucial topics in quantitative methods and financial engineering with an emphasis on problem solving. The students worked very hard, and I'm looking forward to catching up with the group when I return to NYU in the spring."

— Conall O'Sullivan



The Fine Points of FinTech

“News Analytics and Machine Learning,” a new course taught by Adjunct Professor Andrew O. Arnold, introduces students to machine learning (ML) and natural language processing (NLP), with a focus on how they can be used to develop quantitative trading strategies. “Students will learn the mathematical fundamentals underlying many of the latest ML and NLP technique including deep neural networks, embeddings, and sentiment models,” he explains, “along with the basics of developing practical quantitative trading strategies based on these insights, such as quantifying the positive or negative sentiment of text, determining the relevance of text to particular stocks or classes of stocks, and the amount of novelty contained in textual content.”

An expert in machine learning and quantitative trading, Arnold is currently working on large-scale machine learning problems at Google; previously, he served

as a quantitative portfolio manager and research director at Cubist Systematic Strategies. His CV also includes stints as a hedge fund co-founder, CTO, quantitative portfolio manager, machine learning researcher, and software engineer at such companies as Ophir Partners, Trexquant, WorldQuant, Merrill Lynch, Microsoft Research, IBM Research, and Bloomberg.

Adjunct Professor Meninder Purewal’s course, “Machine Learning in Finance,” is dedicated to preparing students for an increasingly data driven world. The syllabus emphasizes both the mathematics that drive machine learning techniques and the practical implementation in Python of real-world financial problems. This course will feature several guest speakers from major banks, hedge funds, and tech firms for a discussion of how machine learning is used in a professional setting. “Job postings related to data science and machine



learning are outpacing fundamental and quantitative analyst positions,” Purewal says of the course’s importance.

With a decade of experience in the financial industry, Purewal is currently a Data Scientist for the Equities division of Bank of America, where he is a Director. He holds a Ph.D. in Applied Physics from Columbia University, where he began using data to understand the fundamental properties of electron transport in low-dimensional materials.



Demystifying Cryptocurrency

This year, Visiting Professor Gianna Figatalamanca and Industry Associate Professor Agnes Tourin are both teaching courses on the topic of cryptocurrency. Tourin’s course, which begins in the spring, is a novel offering that addresses both the technological and financial aspects of cryptocurrencies and culminates in individual projects carried out by the students on a variety of topics introduced in class, such as market microstructure, cryptocurrency price models, volatility estimation, investment and trading strategies. She explains, “Cryptocurrencies and the technology behind their existence undeniably constitute major innovations, which led to the creation of a broad range

of cryptocurrency focused jobs, in particular for traders or financial software developers, both within cryptocurrency startups and well established companies. In practice, today cryptocurrencies have a total market capitalization of almost \$200 billion and a daily trading volume of \$11 billion.”

Figa-Talamanca, who is visiting from the University of Perugia, in Italy, adds, “My course gives an introduction to blockchain technology and the consensus protocols behind BitCoin and other cryptocurrencies. Most importantly, cryptocurrencies and blockchain are a hot topic within the Fintech sector that deals with digital banking and financial innovation, and the need of experts in this domain is constantly increasing.”



Peter Carr



Andrew Papanicolaou

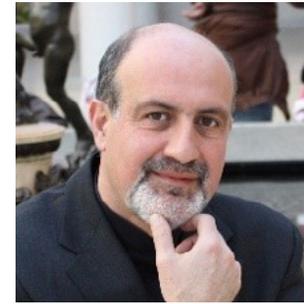


Sander Willems

The Bachelier Congress is a bi-annual conference, and this year's installment took place at Trinity College in Dublin, Ireland. Among the high-profile plenary speakers were Walter Schachermayer from Vienna, Monique Jeanblanc from France, Mete Soner from Zurich, Jianfeng Zhang from the University of Southern California, and Xin Guo from UC Berkeley. FRE Department Head **Peter Carr** and Assistant Professor **Andrew Papanicolaou** attended, as did visiting professor Conall O Sullivan

and visiting Ph.D. student **Sander Willems** [see page 10 for more about him], and each gave a special-session talk on their research.

The Bachelier Society's membership includes the most well-known financial engineering and financial mathematics professors from around the world, and this year's congress was lauded by many as one of the liveliest, thanks to its vibrant location and fascinating speakers. The 11th Congress is scheduled for June 2020 in Hong Kong.



Nassim Nicholas Taleb

Nassim Nicholas Taleb recently received the Wolfram Innovation Award for his contributions to "decision making under complicated and less idealized probabilistic structures" and "computational pre-asymptotics" in probability.

This past year, he has presented several keynotes, the most prominent being at the International Conference on Complex Systems, held in Boston in July 2018. A few months earlier, in March, he gave a lecture to the entire staff of researchers and practitioners at NASA's Jet Propulsion Laboratory and took part in Jeff Bezos' MARS conference, a gathering a collection of roboticists, data scientists, and innovators. Other speaking engagements took him to Tbilisi, Madrid, Hong Kong, Miami, and Toronto.

Thus far this year, he has published six peer-reviewed papers, including one on probabilistic risk in medicine. His main paper, on the pre-asymptotics of the law of large numbers, was accepted in the International Journal of Forecasting.



Charles Tapiero

Like most years, this has been a busy one for **Charles Tapiero**, whose titles include Topfer Distinguished Professor of Financial Engineering and Technology Management, and Founder of the Department of Finance.

On the publishing front, he saw the release of a brand-new edition of his highly regarded 1977 two-volume *Managerial Planning: An Optimum and Stochastic Control Approach*, which explains the dynamic processes and provides a bridge between quantitative optimal and stochastic control theories imbedded in the systems approach and managerial decision-making over time and under risk. Additionally, along with co-author

Unurjargal Nyambuu, he published *Globalization, Gating, and Risk Finance*, a timely and in-depth guide to global and risk finance based on financial models and data-based issues that confront global financial managers.

By invitation from the Cournot Institute at École Polytechnique, in Paris, he delivered a talk on R/S and Fractional Finance and at their invitation produced a booklet on financial and fractional statistical randomness. In addition, he was invited and delivered talks on financialization and data science at France's École des Mines at Nantes, where he was co-founder of its department on Production and Automation. Finally, he was also invited and delivered several talks at the University of Hong Kong, where for the last ten years he has been a member of its board in the department of Actuarial Science and Statistics, as well as at the City University of Hong Kong.

With a new book on financial models and data science in the works and other projects being planned, slowing down is obviously a zero-probability event for Tapiero.



Mysterious Orient



The Mysterious Orient team of FRE students from Tandon came out on top at the International Association for Quantitative Finance's Seventh Annual Academic Affiliate Membership Student Competition, which attracted 23 teams representing 16 academic programs.

Teams were required to construct four portfolios and analyze option and momentum strategies, and their submissions were then subjected to a blind, multi-level selection process and reviewed by a judging panel comprised of IAQF Board Members.

The winning student paper, "Implementing Momentum Strategy with Options: Dynamic Scaling and Optimization," was the work of team captain, Beixi Chen, along with team members Yizhou Chen, Xutao Chen, Tiancheng Hou, Yusi Yang, and Mengrui Zhang. Deputy Department Chair and Industry Professor Barry Blecherman served as their faculty advisor.

Datathon Winners



In recent years, competition for skilled data scientists has been fierce, with major companies vying eagerly to identify and recruit top talent. Citadel, a leading global investment firm, has found a novel way to address the issue. In partnership with search firm Correlation One, they mount a series of "datathons" – competitions aimed at finding the best young data experts the world.

It came as no surprise to anyone at Tandon that at the September 22 event held in Princeton, a group of M.S. in Financial Engineering students from the Department of Finance and Risk Engineering (FRE) crunched their data all the way to a podium finish.

This year's competition involved using statistical models to analyze the relationship between income level and mortality rate for cancer patients.

The team, which garnered a share of a \$25,000 prize pool for their second-place win, included M.S. candidates Xiao Liu, Shuowen Shen, and Siqi Cao. (They were joined by Columbia University student Letian Wang.)

"The annual Data Open organized by Citadel is a challenging and exciting way for students to test their skills in a real-world scenario and to gain the attention of potential employers," said FRE Department Chair Peter Carr. "Our students represented their school and their department in a stellar manner, and we are proud that their immense talent and worth were recognized at the competition."



Here Come the Brides

Love was in the air this past summer for two FRE staff members.



Director of Operations **Carmen Montes De Oca** tied the knot with her fiancé, Michael, in an intimate and spiritual Mayan ceremony on a beach in Playa del Carmen, Mexico, on May 21. The bride arrived by canoe to meet her groom at the altar, and the two exchanged their sacred vows before authentic Mayan Shamans who, as per tradition, presented them to the four cardinal points and blessed their union to the four elements (Earth, Water, Fire, Air) with prayers in the Mayan language. As part of this ancestral tradition, the bride and groom then spread seeds, representing prosperity, in the ocean as an offering to Mother Nature. They then drank balché, a fermented drink made from tree bark, flowers, anise, and honey, meant to ensure that the sweetness of love remains with them forever. As part of the ceremony, the Shamans burned incense and blessed the couple to the sound of drums, flutes, conch shells, and other Mayan musical instruments, and at its conclusion, the wedding guests showered the couple with flower petals and shook maracas during their first kiss as husband and wife.

Making this a true NYU love story, the couple first met here in 2009, while working and attending graduate school.



FRE Career Placement Director **Sara Tomeo** and her fiancé, Steve, joined hands in marriage on July 7th at the Church of the Precious Blood in Monmouth Beach, New Jersey, followed by a reception at the waterfront venue Windows on the Water, in Sea Bright. The bride wore a Pnina Tornai ball gown and was escorted down the aisle by her father. The joyous wedding reception was attended by 200 guests, who danced the night away and concluded the evening with a beachside “sparkler sendoff.” The newlyweds honeymooned on the French Polynesian Islands of Moorea and Bora Bora. They now reside in the New Jersey town of Hoboken, where they first met.

Graduations, Promotions, and Awards

Program Manager **Zahra Patterson** earned her second master's degree this past May, graduating Magna Cum Laude from the NYU Steinhardt School of Education, where she studied Secondary English Education with a concentration in Special Education. Everyone in the department wishes her hearty congratulations and continued success! (Even alumni are joining us in wishing her well; during a well-deserved trip she took to Europe after walking the stage at commencement, Jorge Carbonell Navio, who earned his degree in 2014, flew in from his home in Madrid for a day to celebrate with her in Barcelona.)

We're pleased to announce the promotion of full-time faculty member **Agnes Tourin** to Industry Associate Professor. Her new title comes in recognition of her dedicated service, excellence in teaching, and tireless efforts in advising our graduate students.

Department Head Peter Carr has nominated Assistant Professor **Andrew Papanicolaou** for the Goddard Junior Faculty Fellowship, given to assistant professors upon the successful completion of their three-year reviews. The fellowship provides junior faculty with a concentrated period of time in which to conduct research and scholarship. This past June, Papanicolaou attended the First Congress of Greek Mathematicians (FCGM), hosted in Athens by the Hellenic Mathematical Society. There he presented a talk entitled "Consistent Inter-Model Specification for Stochastic Volatility and VIX Market Models."



Zahra Patterson



Agnes Tourin



Andrew Papanicolaou

Think Big, ThinkHub

The TIV ThinkHub is an interactive, multi-touch tool that unifies the moving pieces of collaborative work in real time, and FRE faculty and students can now experience it for themselves in the Distance Learning Room (Rm. 264), located on the 26th floor of 12 MetroTech. The system's interactive wall allows faculty and students to work simultaneously from anywhere in the world. A "bring-your-own-device"

environment, it enables anyone with an Android, iOS, Microsoft, or OSX operating system to connect, interact, share ideas, teach a class, collaborate on team projects, or hold presentations, to name just a sampling of its impressive functions. Used initially during the Summer Boot camp for incoming students, the system is being more widely deployed for research and instructional purposes during the year.

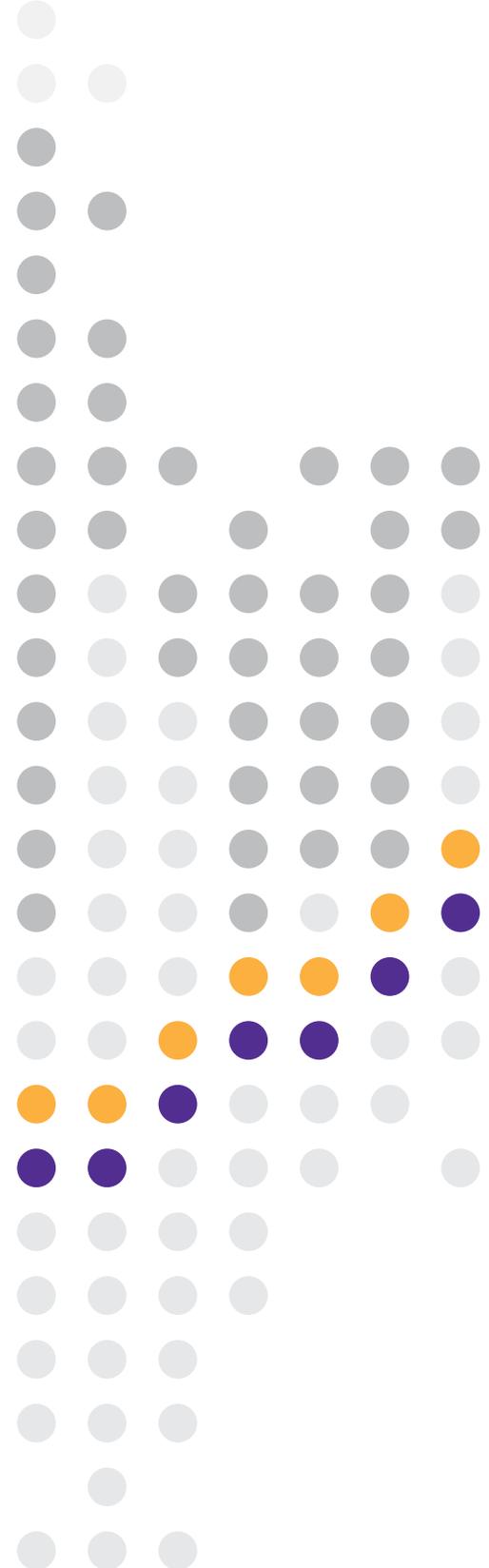


A Valuable Network

On May 7, 2018, current FRE students were joined by alumni of the master's in financial engineering program for an evening of networking. The alumni hailed from the Class of 1997 all the way up to the Class of 2017 and worked in various areas of the financial industry. The evening allowed students to make professional connections and meet potential mentors, while the alumni had the chance to reconnect with former classmates. We look forward to continuing these mixers bi-annually, with the next event tentatively scheduled for late 2018. If you would like to receive alumni communications and are not already on the mailing list, please contact Sara Tomeo (Sara.Tomeo@nyu.edu).

A Welcome Visitor

This semester Sander Willems, a doctoral candidate at École Polytechnique Fédérale de Lausanne, is visiting the department and will present a lecture on November 1 entitled "A Term Structure Model for Dividends and Interest Rates." A student of Damir Filipović, the head of the Swiss Finance Institute, Willems focuses his research on the derivatives pricing applications of polynomial processes, as well as on the ongoing transition of the London Interbank Offered Rate (LIBOR) to alternative benchmarks rates. He holds bachelor's and master's degrees in Mathematics from Ghent University and an advanced master's in Quantitative Finance from the Solvay Brussels School of Economics and Management (ULB).



FRE Fall Lecture Series

The department kicked off a lecture series this fall with invited speakers from across academia and industry discussing a broad range of topics in finance. This semester, the talks are being held on Thursdays at 6PM, in the event room at Tandon's MakerSpace (with one exception, on Wednesday, September 26th). Below is a schedule of past and upcoming talks:

Thursday, September 13

Peter Carr,

FRE Department Head

"A Probabilistic Interpretation of an Arbitrage Free Implied Volatility Smile"

Thursday, September 20

Santiago Garcia

Quantitative Analyst, Wells Fargo

"Almost Quantum Finance"

Wednesday, September 26

Ben Steiner

Global Fixed Income, BNP Paribas Asset Management

"Model Risk Management for Deep Learning & Investment Strategies"

Thursday, October 4

Frederic Siboulet

NYU Tandon Adjunct Professor

Managing Director, Deloitte

"LIBOR Extinction"

Thursday, October 11

Ken Perry

Consultant in Risk and Quantamental Investing

"Challenge for Finance: AI Interpretability"

Thursday, October 18

Gregory Pelts

Wells Fargo

"Quantum Pricing"

Thursday, October 25

J. Huston McCulloch

Professor Emeritus of Economics and Finance,

Ohio State University

"Particle Filtering with Stable Errors"

Thursday, November 1

Sander Willems, Ph.D. Candidate

Swiss Finance Institute,

École Polytechnique Fédérale de Lausanne

"A Term Structure Model for Dividends and Interest Rates"

Thursday, November 8

Dilip Madan

Professor of Mathematical Finance,

Robert H. Smith School of Business

"Machine Learning for Quantitative Finance: Fast Derivative Pricing, Hedging and Fitting"

Thursday, November 15

Christoph Reisinger

Professor of Applied Mathematics,

University of Oxford

"A Forward Equation for Barrier Options for Efficient Model Calibration"

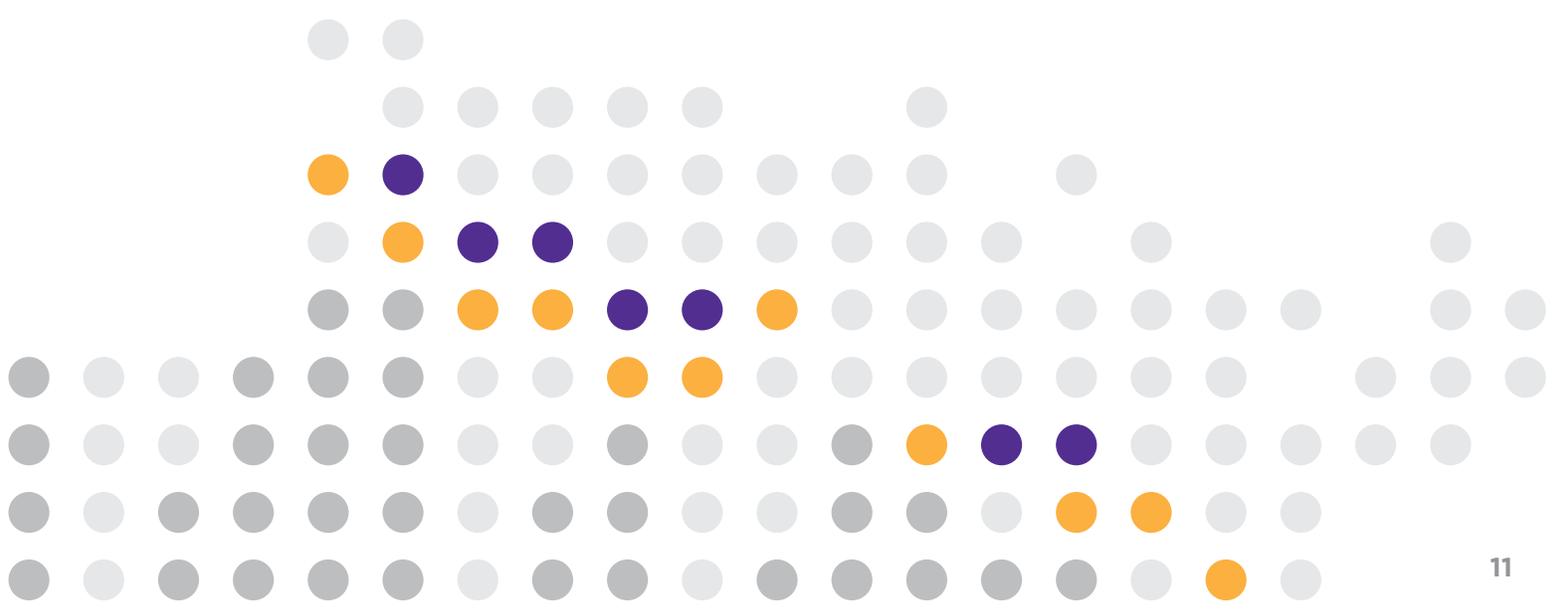
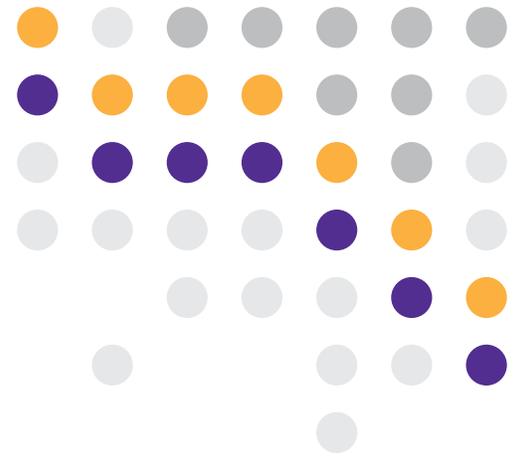
Thursday, November 29

Zachary Feinstein

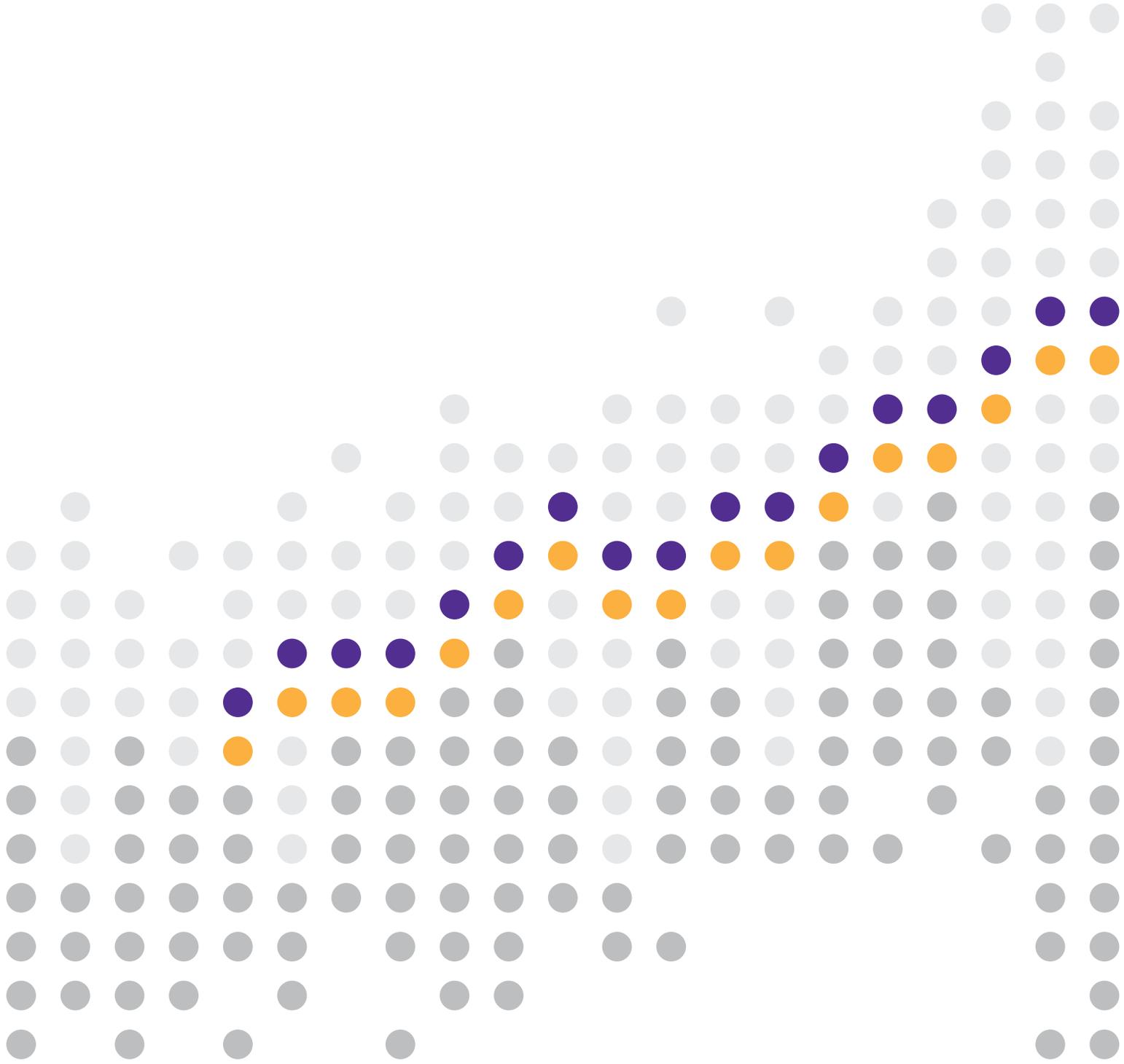
Assistant Professor, Electrical and Systems Engineering

Department, Washington University

"Illiquidity and Financial Contagion in a Multi-Layered Financial Network"



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ABOUT Catching FIRE

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