STATISTICS AT BERKELEY • SPRING 2021

WHAT'S INSIDE

IN THIS ISSUE

Designed and Edited by Angie Wu

State of the Department

With Professor and Chair Sandrine Dudoit

I am writing these lines during my second year as Department Chair and 27th year at Berkeley. And what a year it has been!

The COVID-19 pandemic, of course, has upended our lives and the activities of the Department. We have successfully transitioned to fully-remote instruction, research, and administration. We are overcoming obstacles that would have seemed unfathomable just a little over a year ago, thanks to the dedication, resourcefulness, and resilience of our faculty, staff, and students. For that, I am immensely grateful and heartened.

Our community has been outraged and saddened by the murders of Ahmaud Arbery, George Floyd, Breonna Taylor, and too many before them whose names have not made the headlines. Members of the Department have engaged personally and collectively in actions to combat systemic oppression, racism, and police brutality. Inspired by the advocacy and activism of our students, the Department has formed a Diversity, Equity, and Inclusion Committee, with faculty, staff, and student representation, to work on an action plan on matters ranging from departmental climate to student admissions and faculty recruiting. In particular, our virtual booth at DataFest was a great opportunity to meet with promising prospective graduate students.

The November 3rd, 2020 elections and their aftermath have been on everyone's mind. The Department co-organized a live panel on "Election Integrity and Security" in the Berkeley Conversations series, with Philip Stark as panelist and Jennifer Chayes as moderator.

While we are certainly still dealing with the urgency of current affairs, I'd like to step back a little and reflect on the big picture for the Department, what we've accomplished despite the challenging circumstances, and the key directions we are pursuing.

We are delighted to have welcomed two new faculty members, Associate Teaching Professor Andrew Bray and Assistant Professor Song Mei, as well as three new staff members, David Apilado (Masters Program Coordinator), Shantel Mitchell (HR Coordinator), and Natalie Poulos (Undergraduate Student Services Advisor & Course and Curriculum Officer). All have joined the Department during the pandemic. Given how much they've already contributed and how familiar they seem, it is hard to believe we've never actually worked together in Evans Hall. We've also welcomed 12 new PhD students and 33 new MA students, from all over the World. While we can't wait to meet these students in person, we've also appreciated getting to know them in different ways in online socials, reading groups, and professional development panels.

We are excited to be making progress on our planned move into the new Division of Computing, Data Science, and Society and to be already working with Associate Provost Jennifer Chayes on new opportunities for the Department. In particular, we look forward to moving into The Gateway, which will be the brick-and-mortar home for Data Science on campus, thanks to UC Berkeley's largest gift ever of $252M. With Deb Nolan as Associate Dean for Undergraduate Studies, the Data Science Major is thriving and was ranked as #1 undergraduate Data Science program by U.S. News & World Report.

We are so proud that La Shana Porlaris (PhD Graduate Advisor & Director of Student Services) won the Mary Slakey Howell Excellence in Advising Award, Berkeley's highest honor in advising.

As the University of California is celebrating the sesquicentennial of the UC Regents' unanimous approval of a resolution: "That young ladies be admitted into the University on equal terms in all respects with young men", we have had the opportunity to revisit the invaluable contributions of distinguished women throughout the history of the Department, from pioneers such as F. N. David, Evelyn Fix, and Elizabeth (Betty) Scott, to current faculty, staff, and students. I invite you to read about some of these women in this newsletter and on our 150 Years of Women in Statistics Webpage. Special thanks to PhD student Amanda Glazer for generously contributing her time and writing talent to this project (checkout her STEMinism in the Spotlight column in the Berkeley Science Review).

Our faculty and students have continued to distinguish themselves by their research accomplishments, too numerous to list exhaustively here. Among recent highlights are: the $12.5M UC Berkeley-MIT Foundations of Data Science Institute (FODSI) with Co-Director Peter Bartlett and Co-PIs Mike Jordan, Martin Wainwright, and Bin Yu; the $10M NSF/Simons Foundation program on deep learning with Peter Bartlett (PI) and Bin Yu (Co-PI); Peng Ding and Shirshendu Ganguly receiving NSF CAREER Awards; PhD students Olivia Angiuli, Eli Ben-Michael, Bryan Liu, and Zoe Vernon winning the $20K first-place prize at the 2019 Berkeley Datathon sponsored by Citadel. We have also been at the forefront of COVID-19 research, on topics ranging from Nick Jewell's work on epidemiological modeling to Bin Yu's work on medical equipment supply chain management. Other faculty involved in COVID-19 research include Ben Brown, Sandrine Dudoit, Mike Jordan, Fernando Peréz, Elizabeth Purdom, Philip Stark, and Jacob Steinhardt.

We held our first-ever online and live-streamed Commencement on June 5th and were thrilled that Statistics Major Anna Boser won the University Medal, Berkeley's highest honor for a graduating senior.

> "After this year, I have a new appreciation that challenging times can bring out the best in people and a sense of collective purpose."

And I also see constant threads that have contributed to the strength of our department throughout its history. One is the dedication and fighting spirit of its members, from the early days' World War II effort to today's efforts on the public health, social justice, and democracy fronts. Another one is the relevance of our work to Society, with recent examples including fairness in machine learning/artificial intelligence, open-source software, and interfaces with domain applications that include clinical trials, electoral audits, environmental sustainability, finance, and neurobiology.

Please take good care of yourself and each other.

- Sandrine Dudoit

Celebrating the Women of Berkeley Statistics

In commemoration of the campus-wide "150 Years of Women at Berkeley" celebration, we are highlighting some of the women luminaries of Berkeley Statistics that continue to leave their mark on their fields, the university, and beyond.

To read more stories, visit our 150 Years of Women page on our department website at ***berkeley.statistics.edu***


F.N. David


Kellie Ottoboni


Denise Yee


Betty Scott


Deb Nolan


Patricia Hardy


Sandrine Dudoit


Evelyn Fix

Bin Yu


Ashia Wilson

Deborah Nolan

Deborah (Deb) Nolan is a Professor of Statistics and the Associate Dean for Undergraduate Studies in the Division of Computing, Data Science, and Society at UC Berkeley where she holds the Zaffaroni Family Chair in Undergraduate Education. Nolan's work has contributed to the advancement of statistics and data science education as evidenced in the four books she has authored highlighting the practice of teaching statistics with case studies and hands-on problem solving. Nolan is a fellow of the American Statistical Association and the Institute of Mathematical Statistics. She has served as the Statistics Department Chair for five years and Associate Dean for Math and Physical Sciences for nine years.

Nolan's academic career has been filled with a number of firsts. As an undergraduate, she attended Vassar College in the early days of the campus becoming co-ed.

"It was an exciting time to be at Vassar because men were first admitted four years previously and they were going to graduate that year," she said in a previous interview with the Journal of Statistics Education. "There was a lot of buzz in the news and on campus about it. There was a strong sense on the campus of the importance of women's education and people wondered how this might change now that Vassar was co-ed. I found it exciting to be a student in this environment."

After completing her Ph.D. in Statistics at Yale University, Nolan began her teaching career at UC Berkeley. It was not until after a few years into her role as an assistant professor that she learned she was the first female professor hired in Statistics since Betty Scott was hired in 1951.

"For me, the transition from being a student to an assistant professor was not easy. My colleagues at Berkeley were always supportive of me and my career, but being the only woman in the department was difficult," she said. "The connections that colleagues make over the tennis court and soccer field didn't happen for me. I felt this so keenly that I wrote an article on the topic, called 'Women in Academe: Mentors Matter' (Nolan 1990). That's why I co-founded the IMS New Researchers Meeting in Statistics and Probability in 1993."

Nolan was awarded the Berkeley Distinguished Teaching Award for excellence in teaching and is noted for working with and encouraging all students in STEM. She helped design the Data Science Major and develop and teach Principles and Techniques of Data Science (Data 100). She has created and led programs to encourage students to pursue their education in STEM, including the Summer Math Institute (1991-97), Explorations in Statistics Research (2005-12), CalTeach (2006-20), and Berkeley Unboxing Data Science (started in 2020). Her pedagogical approach connects research, practice, and education, and she is co-author of four textbooks: Stat Labs, Teaching Statistics, Data Science in R, and Communicating with Data.

After teaching for over 30 years, Nolan is now focusing on preparing the next generation of students for a successful undergraduate career at Berkeley.

"One piece of advice I would offer someone interested in statistics and the prospect of teaching is that statistics is a field in which it takes a long time to develop expertise and to be a good teacher they need to work at developing this expertise," she said. "I would encourage them to be lifelong learners in the field, to try their hand at data analysis, and learn how experts approach statistical problems."

By Lauren Pitcher

Patricia Hardy

Growing up in the small rural town of New Edinburg, Arkansas, Patricia Hardy never imagined that one day she would work for the top public university in the nation. As a child, Patricia and her brother would watch their dad plow their fields behind a mule. Their mother stayed home to take care of the household. Patricia's parents instilled the values of hard work, family, and education; lessons she would later instill in her own children. The Great Migration during the Dust Bowl of the 1930s led Patricia and her family to Oakland where she would meet her husband, start a family, purchase a home, and begin her career at UC Berkeley.

In 1967, Patricia decided to transition from her work in the banking industry to apply for a role at UC Berkeley. She had heard that Cal would be a great place to build a long-term career. Her first role on campus was in the Graduate Division. Then she moved on to Berkeley Summer Sessions before eventually securing her career role in the Department of Statistics as a clerk/senior typist. One of Patricia's fondest memories from her career in Statistics was with Professor Elizabeth "Betty" Scott.

"Professor Scott took us to Evans Hall in the 1980s to ask us (staff) to look for changes to improve the building. Because of Professor Scott's vision to include staff in that tour of the Evans Hall construction, changes were made to include women's restrooms on every floor and at least two restrooms that included interior rest areas with a small sofa," she recalled. "Scott knew it was important to have women's restrooms on every floor. From this, I learned there were many ways to contribute to campus, even as a staff member."

The Statistics faculty provided immeasurable support to Patricia throughout her career. She recalls never feeling like her role was less important than faculty and that she was a valued member of the department. "Deb Nolan, David Blackwell, Jerzy Neyman, David Freedman, and Erich Lehmann were some of my biggest supporters."

In 2003, Patricia earned her BA in Sociology from UC Berkeley, fulfilling her lifelong dream of becoming a college graduate. "I was inspired by our children. My husband and I had a dream to put our children through college without any student loan debt and we did it. After our kids completed college, I decided it was time for me to pursue my education." Just three years later in 2006, Patricia retired from the department; commemorating a 39-year career with UC Berkeley. "I am so happy I worked for UC Berkeley. It was the best thing ever! I attribute my connections to the community to UC Berkeley and Statistics."

Patricia continues to reside in Oakland as the proud mother of three adult daughters and six grandchildren. She enjoys spending her time volunteering in the community. She supports a variety of organizations such as the Reclaim Your Vote Campaign, Oakland Promise, and she serves as the president of the Oakland Women's Rowing Club.

By Lauren Pitcher

Evelyn Fix

Note: This biography is a shortened version from the Calisphere article written by Jerzy Neyman, Joseph L. Hodges, Jr., Lucien LeCam, Erich L. Lehmann, and Elizabeth L. Scott. Read the full article on our 150W page under History on the Statistics Department website.

Evelyn Fix was born in Duluth. She studied mathematics at the University of Minnesota where she earned an A.B., an M.S., and an M.A., in 1924, 1925, and 1933. In the summer of 1931, she attended a course in mathematical economics taught by Griffith C. Evans, subsequently Chairman of the Department of Mathematics at Berkeley. This acquaintance is likely to have contributed to her decision to come to Berkeley for a summer session of 1939. A year later she came to stay, starting as a Research Assistant in the Statistical Laboratory (then a part of the Department of Mathematics) working on a research project of the Applied Mathematics Panel of the National Defense Research Committee.

The war years were hard. They brought difficult, but occasionally interesting problems. Every demand on the Laboratory emphasized urgency. High-speed computers did not exist; all the numerical work had to be done on desk calculators consuming much time and effort. Endowed with unusual energy and with a special spirit of getting the job done and done right, Evelyn spent days and nights at her machine, aided by a group of students and some faculty wives, so that the needed results could be transmitted on time, usually to New York but occasionally directly to England. During these years Evelyn also continued her own studies and lectured to students.

The end of the war found Evelyn with very substantial experience in practical statistics, with an extensive table of the bivariate normal distribution computed in the course of the war work, with several reports written for the National Defense Research Committee, and also with an incipient Ph.D. thesis. In 1948, the thesis was completed and Evelyn Fix received her Ph.D. degree. She thus became a regular member of the faculty, acquiring the rank of Professor of Statistics in 1963.

Miss Fix participated in the organization of the Statistical Laboratory and then of the Department of Statistics. It pleased her to see statistics come alive and she contributed a great deal to the spirit of the Laboratory and Department.

In the scholarly work of Evelyn Fix, several periods are discernible: war problems of probability with heavy numerical calculations; then preoccupation with a theoretical problem in probability which became her thesis; next came a period of cooperation with Joseph L. Hodges, Jr., especially on problems of discriminant analysis; a period of cooperation with J. Neyman which led Miss Fix to the computation of her tables of the power of X^2 test and to studies of problems of risks; and lastly a period of cooperation with F. N. David on statistical problems of biology and health. Now in the press are studies of the connection between chromosome patterns in human cells and abnormalities in man, and also some epidemiological studies. Aside from her own research, Miss Fix was very generous and very able in helping colleagues from the university and the community at large with statistical questions arising in their research.

Following her death in 1965, friends and colleagues created The Evelyn Fix Memorial Fund, the proceeds of which have been used for annual prizes to the most promising student in statistics.

DIVERSITY, EQUITY, AND INCLUSION:
Statistics in Action

When the killing of George Floyd prompted worldwide protests in late May, members of the Statistics Department were inspired to take concrete action to promote diversity, equity, and inclusion in our community. In June Department Chair Sandrine Dudoit convened a virtual department get-together to start a conversation about issues and possibilities for change. The resulting discussion, which included faculty, graduate students, and staff, identified several key areas for growth: developing an antiracist curriculum to educate ourselves and future students about effective anti-racist action, ensuring improved diversity in our undergraduate and graduate programs, valuing diversity and ensuring equity in faculty and staff hiring and promotion, improving overall department climate, and speaking out publicly against police violence. Members of the department community volunteered to participate in informal working groups in each of these areas.

An Update from the SGSA Diversity Committee

The Statistics Graduate Student Association (SGSA) Diversity committee, Amanda Glazer, Jake Spertus, Adam Jaffe, Alex Asemota, Drew Nguyen, and Huong Vu, has been deeply involved in the Department's DEI efforts and in many cases leading the action. Spring 2020 they hosted a movie night for Crip Camp (about the disability rights movement) and Fall 2020 they hosted Disclosure (about Hollywood's depiction of trans people). Both were excellent! They also had a joint panel discussion with Michigan's DEI committee about applying to grad school for prospective grad students last month. Details and the recording can be found here: https://www.statsphd.com/. The SGSA has also hosted an anti-racism reading group this past summer. Here's the reading list from the anti-racism group this summer, as well as a list of some of the ideas that came out of the group: bit.ly/StatsReadingGroup

The SGSA has also started a book club! Books loosely focus on diversity, inclusivity, and STEM. They are finishing up "Transcendent Kingdom" by Yaa Gyasi. Before that they read "Teaching to Transgress" by bell hooks and "Diversity, Inc." by Pamela Newkirk. If you would like to join the book club and be added to the email list please contact Amanda Glazer atamandaglazer@berkeley.edu

A more permanent change inspired by the conversation and discussion in this meeting was the formation of a standing department committee on Diversity, Equity, and Inclusion (DEI), incorporating the Department Chair, the Department Manager, two faculty members serving as Equity Advisors, and additional representatives from the SGSA and the administrative staff. The committee's first major goal is to create a comprehensive diversity, equity, and inclusion plan to direct efforts within the department for the next several years. With substantial help from the informal working groups, the DEI committee has compiled a draft plan, which includes a mission statement and sections with concrete action items in several key areas: department climate; faculty hiring, mentoring and advancement; graduate admissions; undergraduate curriculum and major; graduate program advising, participation, and mentorship; and administration. The DEI committee aims to release the finalized plan in the Spring 2021 semester, once feedback has been obtained from different communities across the department.

A Word from the **Statistics Department Administration**

The Statistics Department Administration is committed to efforts around equity, diversity, and inclusion, including diversifying the administrative and computing staff. They participated in a bi-weekly "Mission and Value Workshop" from July – October. They built shared Core Values around DEI: Belonging, Excellence, Accountability, Respect, and Service (BEARS). The quality of work staff produce and the way staff show up for the Statistics Departments' customers, and each other is driven by these shared core values, and they will continue to apply these values to ongoing DEI actions.

Beginning in February 2021, staff will participate in a monthly staff diversity, equity & inclusion development session. The sessions will use readings, discussions, and guest speakers to foster a deeper awareness of the experiences of race, gender, LGBTQ identity, disability, and/or other identities, explore any unconscious biases, and strengthen our group relationship. **Shantel Mitchell (left)** has been appointed as the staff DEI representative to serve on the department DEI Committee as well as staff recruitment committees.

COMPUTING, DATA SCIENCE, AND SOCIETY:

A Conversation with Associate Provost Jennifer Chayes

Jennifer Chayes is Associate Provost of the Division of Computing, Data Science, and Society (CDSS) at UC Berkeley, which comprises EECS, Statistics, BIDS, the Data Science Education Program, the Center for Computational Biology, and the School of Information, for which she is also Dean. Chayes is Professor in four departments and schools: EECS, Information, Mathematics, and Statistics. For 23 years, she was at Microsoft, most recently as a Technical Fellow, where she co-founded and led three interdisciplinary labs in Cambridge, Mass., NYC, and Montreal.

She is a member of the National Academy of Sciences, and the American Academy of Arts and Sciences. Chayes has received numerous awards and honors, including the 2012 Anita Borg Institute Women of Vision Leadership Award, the 2015 John von Neumann Award of the Society for Industrial and Applied Mathematics (the highest honor of SIAM), and an honorary doctorate from Leiden University in 2016. Chayes is deeply committed to diversity in STEM; she has participated in numerous activities and served on many committees for gender and racial diversity.

In this Q&A she talks about the need for an organization like CDSS and how data science can help tackle some of the world's most pressing problems.

Question: You certainly picked an interesting time to start a new job pulling together a new division at UC Berkeley. How are things going after your first nine months?

Jennifer: People have said to me, "Oh my, you arrived in January and the world collapsed in March." But I think that times of great disruption are also times of great opportunity. Disruption allows us to rethink everything. Could we use the disruption of online education to think through new ways to make education more inclusive? Can we identify some of the sources of inequities that played out so devastatingly in COVID, and come up with ways to address these going forward? We are looking to push some conventional boundaries in order to have bigger impacts.

There is such depth and dedication among the people at Berkeley. But we need to make sure that the whole is greater than the sum of the parts. As I have virtually met more and more of the CDSS staff, I'm impressed by the breadth of expertise they have and their commitment to the organization. We continue to hire people for critical positions--many of them from campus. We are also striving to ensure we have a culture reflecting how we value diversity and inclusion. If we just talk about it, but don't demonstrate that commitment they are just empty words.

Q: When colleagues ask about your new position, what's your "elevator pitch" reply?

A: Our job is to weave together the riches of the university to solve societal problems. We are focusing on climate and sustainability, biomedicine and health, and social welfare and social justice. We're not here just to advance our core capabilities (though we will do this too), but to integrate expertise from around the campus to advance new research agendas and to ensure that students come out of Berkeley thinking masterfully and ethically about data so they can transform whatever field they choose to enter.

Q: You mentioned COVID, which presents an incredible opportunity to show how data science of data can help us create a more just, more resilient future. How is CDSS helping battle the pandemic?

A: We have many examples, but here are a few. In mid-March when the outbreaks began, Prof. Bin Yu of the Statistics Department worked with many students and outside collaborators to create predictions of hospital demand seven days out. She and her team used 20 databases from counties and hospitals to come up with five models to accurately learn where to ship PPE and ventilators. They then created visualizations so that non-experts could understand the results. Over1 million face shields were delivered around the world

as one result of this effort.

In the area of drug design, Jennifer Listgarten of EECS has been using machine learning to research the use of small molecules in drug design. Once the pandemic hit, she started looking for small molecules that could prevent the binding of the COVID-19 virus to human cells.

One other project sits closer to our home. Maya Petersen and Art Reingold from the Department of Epidemiology and Biostatistics in the School of Public Health and their collaborators are working on a project to help Berkeley and other campuses figure out when it will be safe to reopen. They want to take in many sources of data, such as for symptoms, exposure, mobility, place-based data such as from air filters, and aggregate public health data to create a machine learning-based risk prediction of who is most likely to contract the disease.

Q: In both external and campus presentations you've talked about how data that are skewed -- either intentionally or not -- can have devastating effects on people in areas such as health care, economics and social divisions. How does this problem intersect with the recent surge in protests for equal treatment all across social and economic levels? How is CDSS working to address these issues?

A: As I mentioned, structural inequities in our health care systems played out in devastating ways during the pandemic. But this was in many ways predicted in a paper written by Ziad Obermeyer of Berkeley's School of Public Health and his co-authors and published last October in Science magazine. Using machine learning, the authors found the racial inequality in how health care is allocated. The authors found racial bias in one widely used algorithm because it uses health costs to measure health needs. Because less money is spent on Black patients, the algorithm wrongly concludes that they are healthier than equally sick white patients on whom more money is spent. This resulted in reducing suggested care to Black patients who need extra care by more than half. We saw similar things happen when the pandemic struck. That paper predicted it to a large extent.

The hideous murder of George Floyd is also proving to be very disruptive and, again, is an opportunity to make significant changes in society. I originally considered having "fairness" be one of CDSS' main foci, but in talking with Linda Burton, Dean of School of Social Welfare at Berkeley, we decided to go beyond striving for fairness and commit to improving human welfare and increasing social justice.

I see us reaching out to people who can effect change. Public defenders, social workers, child welfare workers, policy experts, K-12 educators and have rich experiences that inform the way we can look at the relevant public data. These people are our Berkeley alumni. If we work with the people on the ground who see and live with the effects of racial and economic injustice, we can do proper causal inference, not just causation. We want to understand the effects of interventions. I think we can define a new field around the concept of human welfare and social justice.

We can try out this approach by working with our alumni and hopefully it will then go farther and ultimately benefit everyone in California. I want this to be what we're known for in five to ten years.

Q: In an interview before you joined campus, you talked about your commitment to getting more women interested in STEM careers and in getting more students overall to take an introductory class in data science. About 6,000 students take such a class at Berkeley each year and more than half of them are women, which is a good start. What do you think is motivating these students and why do you think such a class is important for students, whatever their major?

A: One descriptor of CDSS is "leading in a data-driven world." Students are increasingly aware of the role of data in their daily lives. But awareness only goes so far -- we want to touch every student who comes through Berkeley so that when they leave, they can think confidently, critically, and ethically about data. I like to think we are inoculating them against misinformation.

It's not just about Berkeley. Our Data Science Education Program is being used as a model by other colleges and universities, including community colleges and Historically Black Colleges and Universities. We want all students to think about and question data because it comes into play with whatever their field of study. The more you have this ability in your toolbox, the more you will be able to learn using data and transform whatever field you are in.

When I was at Microsoft, I would meet with groups of young women in middle and high schools through our DigiGirlz program. We would talk about how knowledge of data and computer science could enhance whatever they wanted to do with their lives; not replace what they were thinking of doing, but enhance it.

This is a shortened version of a Q&A by Jon Bashor. You can read the full article on the Berkeley Computing, Data Science, and Society website.

NEW FACULTY

Andrew Bray

Associate Teaching Professor - Fall 2020

Andrew Bray joined the faculty as an assistant teaching professor in July 2020. Since receiving his Ph.D. from the Department of Statistics at UCLA, he has been on the faculty at Reed College, where he developed and taught a range of courses. Andrew has been inspired to teach statistics as one of the primary grammars of science and is interested in the role that statistics can play in broader conversations around data science. He is an author of an R package that allows for resampling-based inference using an expressive syntax and is a contributor to the OpenIntro project for open-source statistics education. His recent research interests include scientific computing, differential privacy, and applications to environmental sciences.

Song Mei

Assistant Professor - Fall 2020

Song Mei joined the Department of Statistics at UC Berkeley as an Assistant Professor in July of 2020. He recently obtained his Ph.D. degree in the Institute for Computational and Mathematical Engineering at Stanford University. Song's research is motivated by data science and lies at the intersection of statistics, machine learning, information theory, and computer science. His work often builds on insights that originated within the statistical physics literature. His recent research interests include theory of deep learning, high dimensional geometry, approximate Bayesian inferences, and applied random matrix theory. His Ph.D. thesis title is "Computational and Statistical Theories for Large-Scale Neural Networks."

Innovations in Remote Instruction

Since the onset of the COVID-19 pandemic last year, both professors and students alike have been thrust into the world of remote learning. Navigating classes online is no small feat, as it presents a steep learning curve and many challenges for those on both sides of the screen.

The Semester in the Cloud program was launched to provide resources and support to help instructors adjust their teaching and address the hurdles of remote learning, Dr. Cari Kaufman, the lecturer for STAT 2 (Introduction to Statistics), completed this training with great enthusiasm and success, and created a new course structure to facilitate an enriching remote learning experience for her students.

To help guide her restructuring of the course, she not only took into consideration the "best practices" from the Semester in the Cloud program, but also examined her previous course evaluations. Overall, she found that students most appreciated a clear and easy to follow course organizational structure, as well as empathy for the challenges they may have been experiencing in and outside of the classroom. Clarifying learning objectives and modularizing different units so that course material was easily accessible, Cari made sure that her course was easy to navigate for all students. She also kept in mind that students adapt and react to a remote learning environment differently, and increased flexibility in grading and course expectations accordingly.

Incorporating current events and happenings (e.g., sources of biases in election surveys, probabilities underlying video games that became popular during quarantine) into lectures was also

Above: Dr. Cari Kaufman

something that Cari tried in hopes to make lecture content more engaging for students. This initiative, coupled with increased office hour availability and training GSIs for facilitating meaningful online interaction, made her virtual classroom a safe space for students to learn and interact with both each other and the course material.

After this thoughtful restructuring, Cari found that her class was a huge success last fall, as evidenced by enthusiastically positive student feedback. She is currently planning further updates to the course to allow both an in-person and an online version of STAT 2 to be offered after the pandemic. Cari's work to redesign STAT 2 in response to the pandemic stands as an example of new innovations in remote learning, and speaks to possible new directions in higher education. Berkeley is fortunate to have an outstanding instructor like Cari, who strives to provide the best learning experience possible for her students.

A Spotlight on David Blackwell

1919–2010: An explorer in mathematics and statistics

David Blackwell, a pioneering explorer who made foundational contributions to several branches of mathematics and statistics, passed away on July 8, 2010. He was born in Centralia, Illinois, on April 24, 1919, and, as his mathematical talents were recognized early, he entered the University of Illinois at Urbana–Champaign at age 16. Although racial discrimination affected his life and career in painful ways, his accomplishments were eventually rewarded with the honors they deserved, including election to the National Academy of Sciences in 1965 as the first Black member and the American Academy of Arts and Sciences in 1968. Nevertheless, his love of mathematics, science, people, and his sunny personality prevailed. Blackwell left contributions that bear his name and other major ideas in five quite different areas of mathematics, statistics, and operations research.

With limited opportunities available to him, Blackwell initially thought of becoming an elementary school teacher. However, his professors at the University of Illinois soon recognized his talent for mathematics and encouraged him to pursue graduate studies in the Illinois Mathematics program instead. During his graduate studies, Blackwell worked with Joseph Doob, one of the founding figures of modern probability theory, a National Academy of Sciences member, and National Medal of Science winner. In 1941, at age 22, he completed a doctoral thesis in the theory of Markov chains, a set of ideas to which he frequently returned in his later work. Following a Rosenwald Fellowship at the Institute for Advanced Studies and various temporary positions, Blackwell obtained one of the few tenure-track academic positions open to him at the time: He joined the Department of Mathematics at Howard University in 1942. In Washington, influenced by M. A. Girshick, he embarked on major research in mathematics and statistics. During the 10 years he spent at Howard, while carrying a heavy teaching load and serving as Department Chair for seven years, Blackwell published 20 papers and a monograph. His contributions from this period ranged over measure theory, renewal theory, sequential analysis, game theory, and decision theory. They included: what is now known as the Rao-Blackwell theorem, a fundamental improvement scheme in estimation; the foundations of Bayes and minimax sequential analysis (Backward induction) with Kenneth J. Arrow and M. A. Girschick, which also led to later foundational work in dynamic programming (Blackwell policies); clarification of the idea of comparison of statistical experiments, introduced by Bohnenblust, Karlin, and Shapley, through a beautiful theorem that became one of the foundations of statistical decision theory, which forms the basis of modern machine learning; and the Blackwell renewal theorem, a fundamental tool in the analysis of queuing systems.

Blackwell made further contributions to measure theory, game theory, and statistical decision theory through his monograph (with M. A. Girschick), Theory of Games and Statistical Decisions (1).

In 1954, after an initial attempt in 1942, which failed due to the racial prejudice of some faculty families, Blackwell was appointed Professor in the newly formed Department of Statistics at the University of California, Berkeley, which had just split off from the Mathematics Department (2).

Blackwell at age 22, the year he received his doctorate and was awarded a prestigious Rosenwald Postdoctoral Fellowship at the Institute for Advanced Study in Princeton, New Jersey. Image credit: The Blackwell family.

There, while continuing to contribute to probability theory and statistics, in part collaborating with new colleagues, Blackwell turned his attention more fully to game theory and a new interest, information theory. Working with Leo Breiman and Aram Thomasian, he proved the Shannon transmission theorem for a class of channels, including a novel type, now called the Blackwell channel. He also began to work in dynamic programming, which is now called reinforcement learning. In a series of papers, Blackwell gave a rigorous foundation to the theory of dynamic programming, introducing what have become known as Blackwell optimal policies.

In 1967, Blackwell added yet another area of research, while continuing to contribute to the ones we have cited: the connection between game theory and formal logic. In particular, Blackwell showed how games could be used to define classes of sets studied by logicians. This spawned a small industry in the use of Blackwell games as a tool in pure mathematics. Until his retirement in 1988, Blackwell continued to make substantial contributions to several of the areas he touched significantly during his life: Probability, mathematical statistics, information theory, game theory, dynamic programming, and set theory.

In an interview with Donald Albers (3), Blackwell gave his views on his explorations:

> "Basically, I'm not interested in doing research and I never have been. I'm interested in understanding and that's quite a different thing."

Blackwell loved to pass on his understanding and was a marvelous teacher at all levels. Some of his 65 doctoral students, collaborators, and former colleagues, including the author, testified to this in "A tribute to David Blackwell" (4). In my case,

Above: ("Abe") Girshick (Right) and friend and colleague Kenneth Arrow (Left) in 1948. Reprinted from ref. 6 with the permission of the Institute of Mathematical Statistics.

a question about a possible generalization of a result in Blackwell and Girschick led to an hour's discussion in which he made clear what was and was not possible. Blackwell then clarified completely how the problem should be treated. The discussion led to a joint paper (5) in the Annals of Statistics in 1967 and became the foundation of a collaboration between Colin Mallows and myself in 1988 clarifying a related question.

Blackwell encountered obstacles that he should never have had to face. For example, when he was a Fellow at the Institute for Advanced Studies, Blackwell's thesis advisor, Joseph Doob, had to intervene to ensure him privileges at Princeton University, which were normally granted to fellows of the Institute.

Blackwell did not forget his experiences and, when he could, passionately strove to attract young African Americans to enter the sciences and to help them achieve their goals. Together with Leon Henkin, he developed a program to expose students from historically Black universities and colleges to the mathematical sciences through summer schools. Blackwell also co-organized programs for high school students to come to Berkeley, gave lectures at historically Black universities, and supported African American students in many other ways. Eventually, Blackwell was honored as he should have been much earlier, with membership and prizes from several societies and 12 honorary doctorates. He was awarded the National Medal of Science, but only posthumously in 2014. The University of California, Berkeley named a new dormitory, Blackwell Hall, after him in 2018. Blackwell's eternal curiosity and search for "understanding," the brilliance and clarity of his thinking, and his exceptional charm and kindness are remembered and missed by all who knew him well: family, friends, collaborators, colleagues, and students.

By Peter J. Bickel

Retirement Announcement:

Michael Klass - Spring 2020

Michael Klass, a member of the Berkeley Mathematics and Statistics departments since 1974, and one of our most distinguished researchers in probability theory, retired from full service to the university in July 2020. He will continue to be involved in the department as Professor Emeritus and Professor in the Graduate School.

Michael received his Ph.D. in Mathematics at UCLA, where his thesis work in enumerative combinatorics was advised by Bruce Rothschild. After a post-doctoral position at Caltech, he was first appointed in Berkeley as a Miller Fellow in 1974, then Assistant Professor in 1975, Associate Professor in 1978, and Full Professor in 1984.

In addition to his thesis work at UCLA in the 1970s, Michael collaborated with Tom Ferguson, leading to the Ferguson-Klass representation of atom sizes in Dirichlet and other completely random measures. These now play a central role in modern Bayesian nonparametric theory, and in associated machine learning algorithms such as latent Dirichlet allocation. In other early work, Michael studied optimal stopping problems for normalized sums of independent random variables, and associated maximal inequalities and limit theorems.In the late 1970s, Michael developed extensions of the classical law of the iterated logarithm for random variables not subject to traditional moment conditions. That involved developing novel functionals of the distribution of a long-tailed random variable, which dictate the correct normalization constants for such a result, and a sustained analysis of how these functionals of the underlying distribution of terms affect the long term fluctuations of their partial sums. By the early 1980s Michael was widely acknowledged as the world's leading expert in the theory of fluctuations of random sums under minimal moment conditions. In other work around this time, Michael collaborated on the development of an estimate of volatility for security prices, based on an analysis of Brownian motion, the now widely cited Garman-Klass volatility estimator.

In a series of papers with Marjorie Hahn in the 1990s, Michael developed results for matrix normalization of sums of random vectors in the domain of attraction of the multivariate normal. He continued to work in the 1990s on a variety of problems related to maximal inequalities and the rate of growth of partial sums of independent random variables, including best possible forms of Wald's identity. In the late 1990's Michael's interest shifted to the study of self-normalized processes. Such processes are the basis to many statistical methods, dating back to the famous Student's T-test due to William Gosset in the early 1900s. Normalized processes also arise in the study of stochastic integrals, martingale inequalities and limit theorems, likelihood-based methods in hypothesis testing and parameter estimation, and Studentized pivots and bootstrap-t methods for confidence intervals.

From the late 1990s until around 2010, Michael worked with Victor de la Pena at Columbia and Tze Leung Lai at Stanford on limit theorems for self-normalized martingales, based on exponential inequalities derived from variants of Wald's likelihood ratio martingale. The underlying method, of working with integral mixtures of Wald martingales to obtain maximal inequalities, traces back to the 1970 work of Robbins and Siegmund on boundary crossings of Brownian motion.

Michael coined the term "pseudo-maximization" for the method, and showed how it could be exploited to obtain new results controlling the behavior of self-normalized martingales. As shown by Michael, this technique is very effective in establishing various inequalities for self-normalized processes, in particular exponential bounds and moment bounds, and in the proof of the law of the iterated logarithm. See the 2007 review article of de la Peña, Klass and Lai in *Probability Surveys* for a masterly exposition of the method and its applications. Over the last ten years or so, Michael collaborated with Krzysztof Nowicki on the approximation of quantiles of sums of independent random variables, and with Nowicki and others on various problems in the theory of maximal inequalities and optimal searches.

Over the course of his career at Berkeley, Michael served as the advisor of five Ph.D. students, several of whom went on to teaching careers, and as the teacher and mentor of hundreds of other Berkeley students. One of his students, Victor de la Peña, now on the faculty of the Statistics Department at Columbia University, contributed the following impression, which sums up the feelings of Michael's many students and colleagues over the years, and serve to conclude this brief review of Michael's career:

"Mike is an exemplary teacher, a profound thinker and a compassionate human being, who has positively impacted the lives of many students and fellow researchers. I consider myself particularly fortunate to have had him as an adviser, collaborator and friend. He has been my mentor starting from the time I was a student at Berkeley, guiding me in every step of my career.

He is not only an accomplished mathematician, but also a scholar of the Old and New Testaments and an avid chess player.

I have benefited greatly from our interactions and discussions about probability, philosophy, and religion. He is very compassionate and eager to share his insights with others.

His approach to teaching involves conceptualizing the problem, no matter how difficult it is, breaking complex ideas into digestible parts and presenting them in the most straightforward manner. He is strong in the face of adversity and resilient beyond any measurable degree. Most importantly, his seriousness of purpose is only matched by his wonderful sense of humor. As Mike starts a new chapter in his illustrious career, we wish him good health and longevity, so that he continues to enrich our lives by his wisdom, camaraderie and scholarship."

By James W. Pitman

In Memoriam

Charles J. Stone

Professor Emeritus

1936 - 2019

Charles (Chuck) Joel Stone, emeritus Professor of Statistics at the University of California, Berkeley, died on April 16, 2019, at the age of 82. He is survived by his wife, Barbara, and two sons (and their spouses and children). Chuck received many honors during his career, including a Guggenheim fellowship in 1980. He was a fellow of the Institute of Mathematical Statistics and an inaugural fellow of the American Mathematical Society (2012). He was elected to the National Academy of Sciences in 1993. Among other honors, he gave the prestigious 1994 IMS Wald Lectures. According to the Mathematics Genealogy Project, Chuck had 14 Ph.D. students and 166 academic descendants.

Chuck graduated from North Hollywood High School in Los Angeles and was an undergraduate at the California Institute of Technology. He received his Ph.D. from Stanford University's Department of Mathematics in 1961 under the supervision of Samuel Karlin. Chuck's first academic appointment began in 1962 at the Department of Mathematics at Cornell University (N.Y.). He left for UC Los Angeles (UCLA), in 1964, first as a visitor and then was appointed to the faculty in the Department of Mathematics. He remained at UCLA for 17 years until he departed for the Department of Statistics at UC Berkeley. The culmination of that period was perhaps the book with his frequent collaborator Sidney Port, Brownian Motion and Classical Potential Theory (Academic Press, 1978). Three fundamental problems of electrostatics (and, more generally, potential theory) are already distinguishable in the work of Carl Friedrich Gauss in 1840: the Dirichlet-Poisson problem, the equilibrium problem, and the balayage problem. It was realized over a century later that there is an intimate connection between all three topics and the properties of Brownian motion. As the book's review by Frank Knight observes, "The book under review is a straightforward presentation of classical potential theory making full use of the connection with Brownian motion. As far as probability is concerned, the watchword seems to be economy of means. By making skilled use of symmetry, the strong-Feller property, and continuity of path, much of the general methodology of probabilistic potential theory is neatly avoided. What has long been the treasured material of a few experts is thus at last made available to anyone with a course in modern analysis." Chuck and Sidney Port also co-authored a much-celebrated trilogy of undergraduate books on probability and statistics with Paul Hoel.

In addition to further research into potential theory, other notable work of this period included investigations of local limit theorems, weak convergence of stochastic processes, and renewal theory. Major papers were "Infinitely divisible processes and

their potential theory". Ann. Inst. Fourier (Grenoble) 21 (1971), no. 2, 157–275; ibid. 21 (1971), no. 4, 179–265; "On local and ratio limit theorems". 1967 Proc. Fifth Berkeley Sympos. Math. Statist. and Probability (Berkeley, Calif., 1965/66), Vol. II: Contributions to Probability Theory, Part 2 pp. 217–224 Univ. California Press; "Weak convergence of stochastic processes defined on semi-infinite time intervals". Proc. Amer. Math. Soc. 14 (1963), 694–696; and "On characteristic functions and renewal theory". Trans. Amer. Math. Soc. 120 (1965), 327–342.

It was during Chuck's time at UCLA that his interests migrated largely to statistics (although a formal Department of Statistics at UCLA was not founded until long after Chuck left). A particular interest was nonparametric statistics, that is, statistics devoid of the usual normal (Gaussian) assumptions. He authored a much-cited discussion paper in The Annals of Statistics in 1978, titled "Consistent Nonparametric Regression." This paper grew out of Chuck's wanting to put the popular nearest-neighbor technology on a sound theoretical footing.

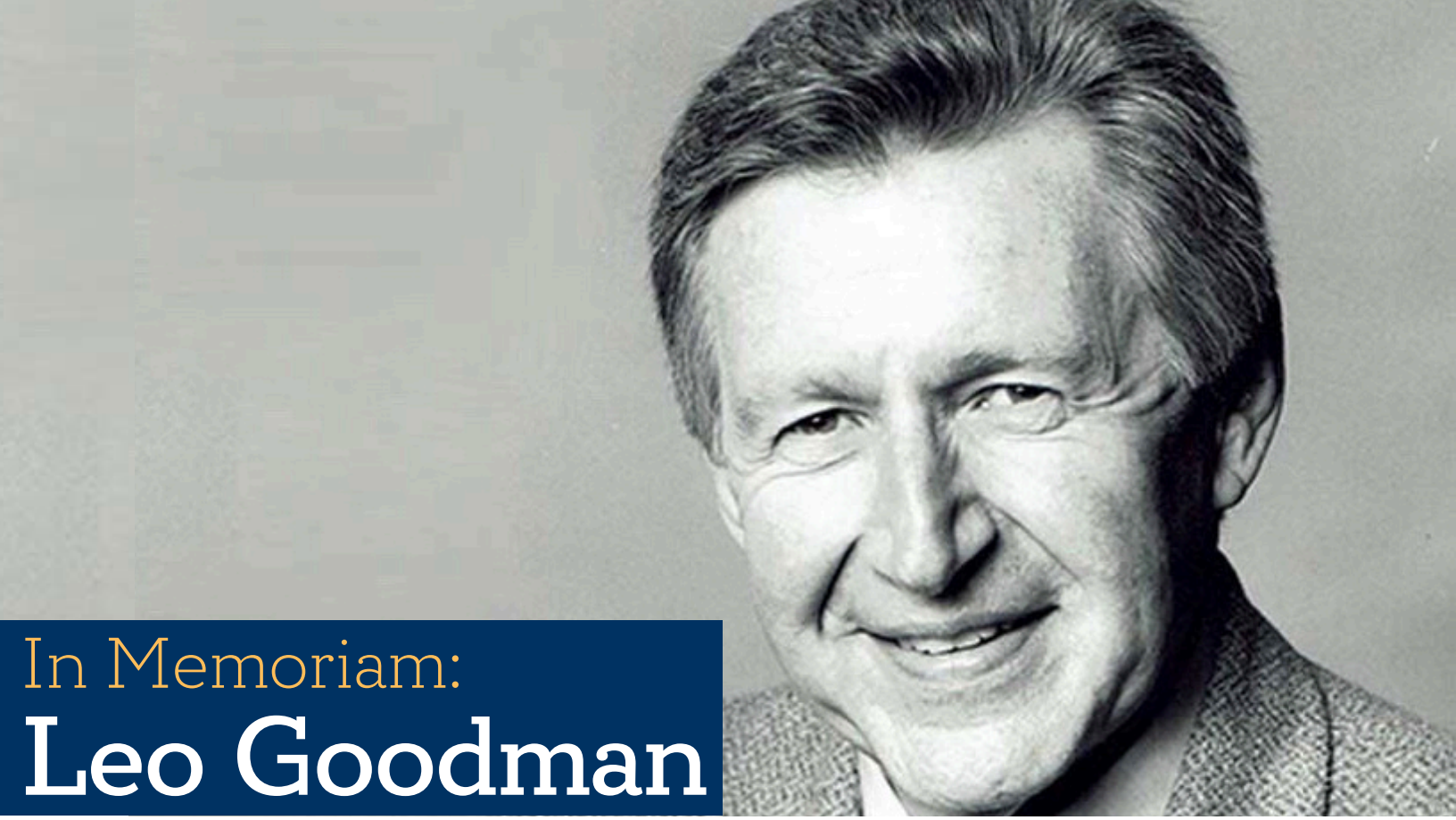
technical report and to the book was "CART pruning," an intricate scheme for validating the algorithms and enabling them to be computationally feasible with the computers widely available at the time of publication. The use of the graphs associated with mean-square error as it varies with complexity is now standard in many areas. Chuck's interest in statistics covered many areas. For example, in the early 1980s he wrote two landmark papers regarding optimal rates of convergence for statistical estimators. His results carefully took into account dependence on the dimensions of spaces in which predictors and outcomes lie, and the derivative being estimated.

A number of Chuck's later efforts concerned logsplines and their applications to regression (including time series) and survival analysis. Many of the papers in this long series were co-authored. Among the co-authors are former students Charles Kooperberg (now of the University of Washington), Mark Hansen (of UC Davis), and Young Truong (of the University of North Carolina). A summary of that line of inquiry was the subject of Chuck's Wald Lectures.

During his years in Los Angeles, Chuck consulted for Technology Services Corporation in Santa Monica, along with Leo Breiman, a UCLA colleague, who also later became a UC Berkeley Professor of Statistics. Based on this work, Chuck and Leo co-authored a 1978 technical report, Parsimonious Binary Classification Trees, which has since become something of a cult classic. The technical report was published in greatly expanded 1984 book, titled Classification and Regression Trees, with Breiman and two other co-authors, Jerome Friedman and Richard Olshen (both of Stanford). This book may be the single item for which Chuck is most remembered. Its algorithms are for "classification," "probability class estimation," and "regression." They, and perhaps especially a computer program for their implementation, became known as CART. One of Chuck's principal contributions to the The CART book was the first mathematically and computationally rigorous treatment of approaches which now are commonplace and have found wide application. It has many examples, real and contrived. Some of these examples have become benchmarks for subsequent technologies in the field of "machine learning". The CART ideas are part of almost every serious statistical curriculum worldwide. There are numerous computer programs, available both freely and commercially, that incorporate extensions of CART.

Chuck's true academic devotion was to his students. He was a committed and much-loved teacher. His philosophy of statistics and many mathematical details are summarized in a single-authored book, titled An Introduction to Probability and Mathematical Statistics, that was first published in 2000. Many former students have attested to Chuck's remarkable counseling during extensive office hours, his intense teaching style, and the care he took to help students whenever possible. While all of us teach, and many of us teach well, we think it fair to say that hardly anyone took the time and expressed more concern for students than did Chuck.

By Richard A. Olshen, Peter Bickel, Steven N. Evans



In Memoriam: Leo Goodman

Leo Goodman, whose pioneering statistical analysis revolutionized the study of poverty, inequality and other social phenomena, died of a COVID-19-related lung infection on Dec. 22 at Alta Bates Summit Hospital in Berkeley. He was 92.

For three decades, Goodman was UC Berkeley's Class of 1938 Professor in the departments of sociology and statistics. He was widely considered to be among the founding fathers of modern statistics.

Among numerous other accomplishments, he pioneered techniques that are still considered a gold standard in sociology scholarship worldwide. Some of the key techniques used in today's machine learning stem from the work Goodman did in the 1990s and 2000s, his colleagues said.

"Statistics and social science today would be unrecognizable without his contributions. He will be missed immeasurably," said UC Berkeley sociology professor Trond Petersen, executive associate dean of the College of Letters and Science.

Not just a numbers guy

The Brooklyn-born, Princeton University-educated statistician led an intellectually vibrant social life. His friends ranged from mathematician John Nash, whose biography inspired the film, "A Beautiful Mind," to writer Saul Bellow and poet and novelist Sylvia Plath, a close friend of Goodman's former wife, Ann (née Davidow).

"Leo was a wonder: Handsome, blond, blue-eyed &

Jewish, on a Guggenheim at Cambridge, (will) be visiting professor at Columbia next year in mathematical statics, very warm-hearted; that unique combination of the intellectual & loving lovable Jew," Plath recalled in a letter she wrote in May 1960 describing Ann's then-fiancé.

The son of Ukrainian Jews who emigrated to New York to flee anti-Semitism, Goodman earned a doctorate in mathematics from Princeton at age 22. In 1950, he joined the faculty of the University of Chicago as one of the nation's youngest professors. For the next 67 years, he made his mark.

"Leo Goodman solved the major problem of quantitative social science, the intrinsic difficulty of studying categorical distinctions like race, religion and gender with statistics designed for continuous variables, like time and distance," Petersen said. "His fundamental insight was to count the people in the categories and use quantitative methods to understand those counts."

In addition to authoring more than 150 academic papers and four books, he led and/or collaborated on seminal work, establishing ever-new and different ways to measure non-numerical data.

Warm heart, brilliant mind

"As a statistician, he figured out a rigorous way of using the insights of modern statistics to analyze that kind of qualitative data in a quantitative way. His contributions have transformed the way we work," said Michael Hout, a UC Berkeley professor emeritus of sociology and demography.

"As a friend and mentor, he was gracious, generous, mild-mannered and very patient," added Hout, now a professor of sociology at New York University.

Indeed, at a time when the social sciences relied on traditional counting methods used in such fields as physics and engineering, Goodman — along with fellow trailblazers like University of Chicago mathematician William Kruskal — found numerical ways to track differences in race, class, gender, religion and other categories.

Three statistics used in software worldwide — Goodman-Kruskal Lambda, Gamma and Tau —are named after Goodman and Kruskal because of their contributions.

"Professor Goodman was a pioneer and leading figure in research at the interface of statistics and the social sciences, an area of greater-than-ever relevance today," said Sandrine Dudoit, UC Berkeley Chair of Statistics and a Professor of Statistics and of Public Health. "His legacy, bridging disciplines and addressing questions of great societal impact, is an inspiration for statisticians as they contribute to data science in terms of both theoretical and methodological foundations and applications to domain disciplines."

Leo Goodman was born on Aug. 7, 1928, in Brooklyn, New York, the son of Abraham Goodman and Mollie Goodman, née Sacks. He and his younger sister Janice were very close.

After graduating from Stuyvesant High School, he went on to earn a bachelor's degree in sociology and mathematics from the University of Syracuse, then a Ph.D. from Princeton, where his passion for statistics was ignited by his mentors, Sam Wilks and John Tukey.

In 1950, he joined the faculty of the University of Chicago as an assistant professor of sociology and statistics. In a 1952 research paper, he revealed a flaw in how U.S. intelligence agencies during World War II had used vehicle serial numbers to estimate how many vehicles were in the German army, and he provided a better way of calculating their numbers. In 1957, he met Ann Davidow, an artist. The two married in 1960 and had two sons, first Andy, then Tom. The couple divorced in 1976.

Abraham and Mollie Goodman with son Leo and daughter Janice in the 1930s. (All photos courtesy of the Goodman family)

A mixed decade

In the 1970s, Goodman was elected to the National Academy of Sciences, the American Academy of Arts and Sciences and the American Philosophical Society. He was also named Outstanding Statistician of the Year by the American Statistical Association's Chicago chapter.

However, during that same decade, he developed a rare cancer in the muscles of his thigh. Instead of going along with doctors' recommendations that one of his legs be amputated, Goodman did his own research and found that certain chemotherapy, coupled with innovative surgery, could save his leg and allow him to walk.

Even though three of his four quadriceps were removed, over time he retrained his body so that he walked with barely a limp for the next 45 years, said his older son, Andy Goodman, who is Amazon's vice president for device operating systems.

In 1984, Goodman spent a year at Stanford University's Center for Advanced Study in the Behavioral Sciences and fell in love with the San Francisco Bay Area. Two years later, he was hired at UC Berkeley as a professor of sociology and statistics.

The accolades he received for his work over the next 30 years included the American Sociological Association's 1995 Award for a Career of Distinguished Scholarship. In 2005, the association also established the Leo A. Goodman Award to recognize contributions to sociological methodology.

Upbeat to the end

On and off campus, he was warm, humorous and upbeat. When asked how he was doing, he would answer, "Not good," and then, after a long pause, shout, "TERRIFIC!" friends and colleagues recalled.

Andy Goodman treasures the many letters he and his brother Tom received from their father.

"I recently found six long letters he wrote by hand over the course of a single summer when I was 17," Andy Goodman said. "They each ended with, 'I love you very much.'"

Goodman retired from UC Berkeley in January 2017 at age 88 and later moved into the Silverado Berkeley Memory Care Community.

Leo Goodman, with sons Tom, left, and Andy, right.

"He was very, very happy there," said Tom Goodman, an engineer at BlackRock investment management company.

This past December, amid a surge in the coronavirus pandemic, Goodman contracted COVID-19, along with several other residents and members of the Silverado staff. He was moved to Alta Bates Summit Hospital, where his sons could only communicate with him via FaceTime. They played for him his beloved Mozart, as well as Klezmer music.

When asked how he was feeling, he whispered, "Terrific."

Goodman is survived by sons, Andy Goodman and Tom Goodman, both of San Mateo County, California; sister, Janice Towers (née Goodman) of Larchmont, New York; his former wife, Ann Hayes of Boulder, Colorado, and five grandchildren.

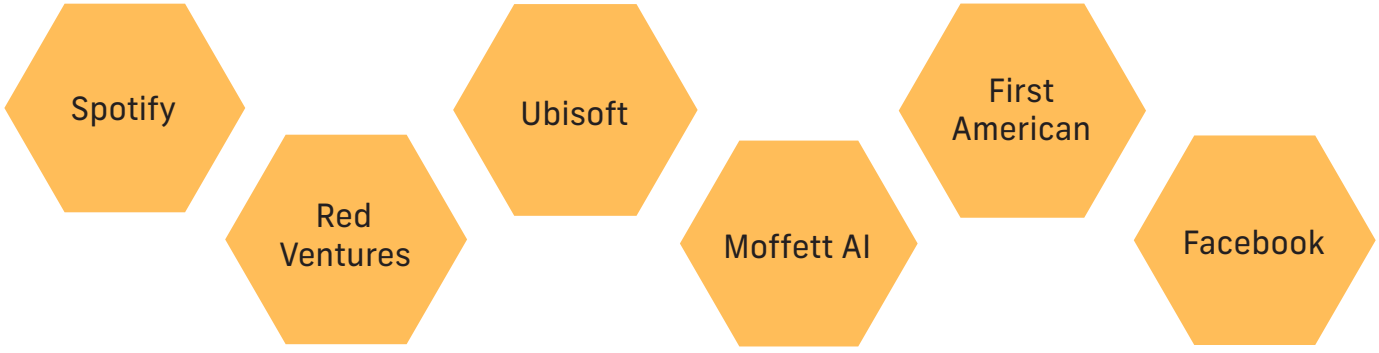
By Yasmin Anwar

What Are Our Recent Grads Doing Now?

2019-2020 MA Cohorts, Sample Companies and Titles

Company	Title
E&J Gallo Winery	Statistician
Wells Fargo	Quantitative Analytics Specialist; Data Science Full Time Associate
Wells Fargo	Credit Risk Associate
Facebook	Data Communications Research Associate Manager
Grid Dynamics	Data Scientist
Genentech	Intern
Reddit	Senior Software Engineer
Paypal	Senior Data Scientist
Blue Shield of California	Data Specialist
Moloco	Senior Data Scientist
Natera	Data Scientist
Grid Dynamics	Data Specialist
Fiddler Labs	Data Scientist

Other Companies Our 2019-2020 Grads are Working At



2019-2020 PhD Cohorts

PhD Graduate	Advisor	Dissertation Title	Currently
Sara Ann Stoudt	William Fithian, David Perry de Valpine	A Statistical Investigation of Species Distribution Models and Communication of Statistics Across Disciplines	Statistical and Data Sciences Program Lecturer at Smith College
Zsolt Bartha	Shirshendu Ganguly	Replica Symmetry Breaking in the Random Regular k-NAE-SAT Problem	Eindhoven University of Technology; Postdoc
Stephanie L. DeGraaf	Haiyan Huang, Elizabeth Purdom	Time-Course Analysis and Clustering of Gene Expression Data	Genentech
Billy Fang	Adityanand Guntuboyina, Martin Wainwright	Shape-constrained regression in misspecified and multivariate settings	Data Scientist; Google
Chun Yu Hong	William Fithian, David Perry de Valpine	Latent Variable Models: Maximum Likelihood Estimation and Microbiome Data Analysis	Data Scientist; Google
Jianbo Chen	Martin Wainwright, Michael Jordan	Towards Interpretability and Robustness of Machine Learning Models	Quantitative researcher; Citadel Securities
Omid Shams Solari	Peter Bickel	Large-Scale Interpretable Multi-View Learning for Very High-Dimensional Problems with Application to Multi-Omic Data	Senior Machine Learning Research Scientist at Ravel Biotechnology
Rebecca L. Barter	Bin Yu	Visualization, Prediction, and Causal Inference: Applications in Healthcare	Berkeley Statistics; Postoctoral Scholar
Simon Walter	Bin Yu, Jasjeet S ekhon	High-dimensional and causal inference	Senior Investment Scientist; Bridgewater Associates
Steven Richard Howard	Jasjeet Sekhon, Jon Mcauliffe	Sequential and Adaptive Inference Based on Martingale Concentration	Research Staff; The Voleon Group
Geno Anthony	Rasmus Nielsen	Statistical Inference under the Multispecies Coalescent: Methods and Theory	Postdoctoral Scholar; UCSF
Yan Huang	Haiyan Huang	Overcoming the Common Challenges in Differential Gene Expression Analysis Studies	Lecturer; Princeton University
Jason Wu	Peng Ding	Randomization Tests under the Potential Outcomes Framework	The Data Incubator
Lihua Lei	Peter Bickel, Michael Jordan	Modern Statistical Inference for Classical Statistical Problems	Postdoctoral Researcher; Stanford University
Yuansi Chen	Bin Yu	Fast MCMC algorithms, Stability and DeepTune	Postdoctoral Researcher; ETH Zurich
Soeren Kuenzel	Jasjeet Sekhon, Bin Yu	Heterogeneous Treatment Effect Estimation Using Machine Learning	Quantitative researcher; Citadel Securities

FACULTY AWARDS

Bin Yu

- Co-PI in NDAC (The Neurohub Data and Analytics Collaborative) of the new Weill Neurohub of UCSF, UCB and UW
- Breiman Lecturer at the premier machine learning conference NeurIPS in Dec. 2019 Breiman Lecture at NeurIPS 2019

Peter Bickel

- 2018 SS Wilks Award of the ASA

Peng Ding

- 2018 Guy medal in Bronze from the Royal Statistical Society UK
- 2019 CAREER award from NSF, USA

Philip Stark

- Re-appointed to the Advisory Board of the U.S. Election Assistance Commission by Speaker Nancy Pelosi

Michael Jordan

- IEEE John von Neumann Medal, 2020
- Honorary Doctorate of Engineering and Technology, Yale University, 2020
- Plenary Speaker, International Congress of Mathematicians, 2018

David Aldous

- Brouwer Medal (Holland) 2020

Haiyan Huang

- Speaker, the 2020 Myra Samuels Memorial Lecture, Purdue University

Fernando Peréz

- ACM Systems award, Summer 2018

What's New In Research?

Check out what our faculty have been working on...

Our faculty are remaining at the forefront of research in Data Science, with, for example, the recent award of a $12.5 million National Science Foundation award for the creation of the Foundations of Data Science Institute (FODSI) (Bartlett Co-Director, Jordan, Wainwright, and Yu), and $10 million from the National Science Foundation and Simons Foundation to investigate the theoretical underpinnings of deep learning (Bartlett PI and Yu co-PI).

Just this past year, our faculty have also done high-profile work on pressing questions with immediate societal impact. Among our various COVID-19-related projects, Bin Yu has led a group of 11 students and postdocs to develop methods to address urgent medical supply chain management questions in collaboration with the non-profit organization Response4Life. Infectious disease expert Nick Jewell was featured several times in the New York Times and was chosen to lead the campus' Public Health and Testing Committee. Philip Stark's risk-limiting election audit approaches, already in use in the US and abroad, were featured on PBS NewsHours.

An Update from SUSA

At the beginning of this year, SUSA was founded as a separate entity from the former SUSA (now SAAS). Our goal at SUSA is to act as a center for Cal's statistics community to pursue and succeed in their interests in statistics. SUSA hopes to enrich the undergraduate experience of studying statistics by providing freely accessible resources and events for statistics students to learn and connect. Essentially, SUSA hopes to be the undergraduate academic statistics club at Cal.

Though we started at an extremely inopportune time, we have achieved a lot thanks to the support of the statistics department faculty and staff. This semester, we collaborated with the Statistics Graduate Student Association to run the Statistics Undergraduate-Graduate Program, where we offered mentorship from grad students to undergrads and office hours by grad students, and we created a statistics course map to navigate the complicated requisite structures of the statistics courses. Since the spring, we've held semesterly course selection workshops and have slowly expanded our accessible resource pool on our website.

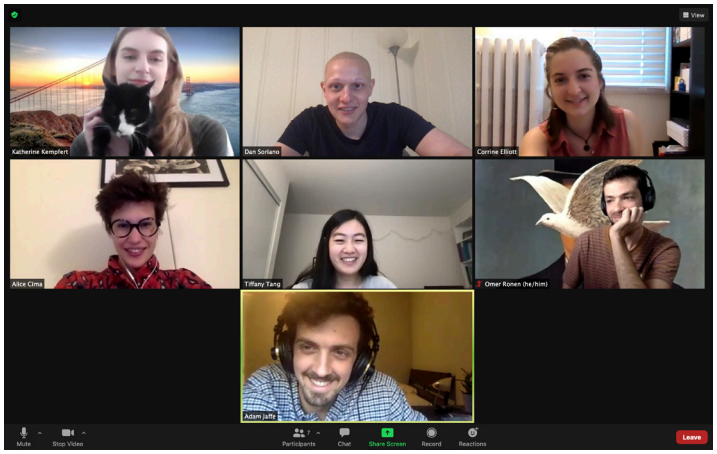
Over the course of next year and beyond, we plan on doing much more towards our mission of creating a center for statistics at Cal. To learn more about the Statistics Undergraduate Student Association (SUSA) or to get involved in our mission, you can visit our website: susa.berkeley.edu. (Edward Chang, SUSA President and Wayne Monical, SUSA Secretary).

By Edward Chang

A Word from the **Statistics Graduate Student Association**

While the COVID-19 pandemic has not left the SGSA unaffected, we are glad to have adapted and preserved many important traditions. By kicking off the year with our annual (virtual) welcome picnic and continuing virtual social events like weekly wind downs, meetings with Neyman seminar speakers, student seminars, foosball tournaments, and department-wide parties, we have attempted to mitigate the social isolation many of us have experienced. With department members residing throughout the globe, we took advantage of the online format to stay connected over the summer and academic year.

In addition to maintaining its activities, the SGSA has focused on improving the student experience at our department. Specifically, we have gathered feedback from graduate students and worked closely with faculty to address some of the difficulties students face. For instance, in conjunction with several faculty members, we have helped establish a doctoral seminar series aimed at helping junior students navigate the advisor search process and get started with research. Further, together with our undergraduate counterparts at SUSA, the SGSA service committee has established a mentorship program, which pairs statistics graduate student mentors to undergraduate students interested in pursuing graduate school.



The last year has not only been marked by the pandemic, but also by several manifestations of systemic racism. Many SGSA members, and especially the SGSA diversity committee, have been involved in efforts to address these issues and foster a more inclusive environment in our department, university, and greater community. The diversity, equity, and inclusion (DEI) committee's accompanying article provides a summary of some of the impactful work that has been done thus far.

Although the SGSA has managed to maintain a vibrant community in our current virtual world, we can't wait to get back to Evans Hall in the fall and once again see everyone in person!

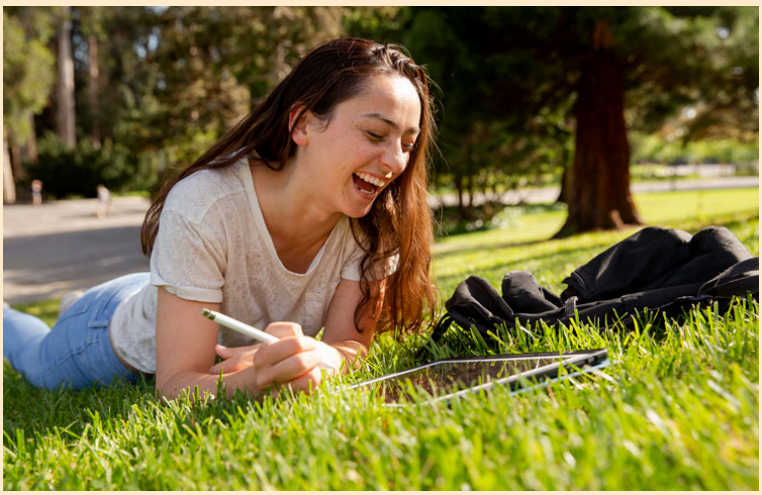
by Ella Hiesmayr and Daniel Soriano

CELEBTRATING THE CLASS OF 2020

Although the pandemic prevented us from hosting an in-person commencement, we instead celebrated our graduating class of 2020 in an online ceremony. While we were joinied by our students and their families and friends, faculty, and staff, we were also joined by a special guest speaker to send off the Class of 2020. Actor/comedian Rainn Wilson surprised the Class of 2020 with a video message on the Statistics Department's Graduation Tribute that went live on You Tube Friday, June 5th at noon PST. The Student Services team also created a video to honor our students and their accomplishments. This was aired live on YouTube for students, family, friends and department faculty and staff. Congratulations class of 2020!

Anna Boser: 2020 Winner of the University Medal

We are thrilled that Statistics Major Anna Boser is this year's winner of the University Medal, Berkeley's highest honor for a graduating senior. The University Medal was established in 1871 and the "Medalist is an exemplar of the university's highest ideals." Anna maintained a 4.0 GPA while also participating in extensive field research and serving as an EMT in the Berkeley Medical Reserve Corps.



Honoring our **2021 Graduates**

The Statistics Department held its online graduation on Friday, May 21, honoring graduates who received their doctorates, master's and bachelor's degrees and announcing the recipients of department academic awards.

For the 2020-21 school year, Statistics awarded 162 Bachelor's degrees, 43 Master's and eight Ph.D.s.

Statistics Department Chair and Professor Sandrine Dudoit opened the recorded ceremony by saying that when she recorded her comments for last year's graduating class, she never expected the pandemic to force her to do the same a year later.

"You have overcome more than a year of obstacles in and outside of the classroom to achieve this important milestone," Dudoit said. "In today's data-intensive world, your training in statistics is more relevant than ever.

"Statistics is the backbone of epidemiological studies of infectious diseases and of the clinical trials that have led to the COVID vaccines," Dudoit said. "So go use your skills to learn from data, to promote the ethical use of data and algorithms for analyzing data and to debunk misinformation."

Dudoit then introduced a surprise message from actor and producer Ralph Macchio, who is best known for his starring role in the Karate Kid movies, as well as other movies and television shows. After commiserating that it was "a bummer you can't walk across the stage to receive your diploma," Macchio passed along greetings and advice from Miyagi-Do, Eagle Fang and even Cobra Kai (his nemesis): "Remember to strike first, strike hard and show a little bit of mercy as you find your balance."

Student awards

As each class was announced, students receiving special awards were highlighted.

The Erich Lehmann Award for an outstanding Ph.D. dissertation in theoretical statistics was given to Aurélien Bibaut, who earned his doctorate in biostatistics.

The Evelyn Fix Prize presented to student(s) showing the greatest promise in statistical research, with preference given for applications to biology and problems of health, was awarded to Xiao Li.

The Department Citation, awarded for excellence in theory and application of statistics and outstanding performance in the Master's program, was given to Ryan Roggenkemper. Roggenkemper was also recognized with an Outstanding Teaching Award from the Data Science Undergraduate Studies program for his work as a graduate student instructor.

The Elizabeth Scott Memorial Award, given to a student showing the greatest promise in statistical research, was given to Master's graduate Joshua Hug.

Among students receiving their Bachelor's degrees, the Department Citation recognizing distinguished undergraduate achievement in statistics was awarded to Yanwei (Jamarcus) Liu. After completing Statistics 140: Probability in Data Science in Fall 2018, Liu was invited to apply to join the course staff. He was accepted and spent five semesters as a tutor, then head GSI. "I witnessed the growth of many students and saw them take away a newfound passion in statistics," Liu said.

by Jon Bashor

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This year campus has continued to set strict limitations on the budget. This is why we depend on the interest and generosity of our donors to help Berkeley Statistics remain one of the two pre-eminent centers for Probability and Statistics in the world. There are several ways to donate to a variety of identified needs in Berkeley Statistics, such as graduate student support, funds for the renovation of our classrooms and facilities, support to hold department seminars, and support for the student associations.

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University of California, Berkeley
Statistics Newsletter
Department of Statistics
367 Evans Hall
Berkeley. CA 94720-3860