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Academic Senate  
2021-22

Distinguished  
Faculty Awards

March 9, 2022

**UCI** University of  
California, Irvine

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The University of California, Irvine's mission is to discover and disseminate knowledge through research, teaching and creative expression in acclaimed academic programs. Our system of governance shared between the Board of Regents, the administration, and the faculty Senate guides the development of our campus and the realization of these goals.

# Program

## Welcome Remarks

**Joanna Ho**

Chair, Academic Senate

**Hal S. Stern**

Provost and Executive Vice Chancellor

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Chair, Academic Senate

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**Svetlana Jitomirskaya**

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**Joanna Ho**  
Chair, Academic Senate

## Committee on Scholarly Honors and Awards 2020-21

### Members

Barbara Finlayson-Pitts, Chair  
Diane Campbell  
David Hirshleifer  
Peter Krapp  
Donald Saari

Physical Sciences  
Biological Sciences  
Business  
Humanities  
Social Sciences

### Ex Officio

Associate Dean Brian Sato

Division of Teaching Excellence  
and Innovation

Vice Chancellor Pramod Khargonekar

Office of Research



## **Claudia H. Kawas, M.D.**

*Professor*

*Departments of Neurology and*

*Neurobiology & Behavior*


**Academic Senate Better World Award**

I am truly honored to receive the UC Irvine Better World Award. As a researcher in brain aging and a physician who cares for patients with dementia, it is a deeply humbling award

considering that we haven't developed cures or effective treatments yet for most of the cognitive disorders that afflict my patients and their families. I hope to see this goal realized in my lifetime and, as a teacher, I anticipate it will be accomplished by the incredible young scientists and physicians now entering the field, some of whom I have had the privilege of teaching. I count on them to make a better world for us all.

Like most young medical students, I didn't begin with any particular interest in aging, dementia or Alzheimer's disease (AD). It seemed more useful and exciting for a physician to deliver babies, remove cataracts, fix broken bones or hearts. As a medical student, I was taught that Alzheimer's disease was rare, occurred in people before age 65, couldn't be diagnosed during life, had no available treatments and I would probably never see a case. I have witnessed the complete transformation of these notions during my career. We now know that AD is the most common cause of dementia in advanced age. We also know there are many other diseases that contribute to cognitive losses with age. We have developed brain MRI, PET scans, blood tests and spinal fluid tests to aid in the diagnosis. Several drugs are now approved by the FDA to treat patients with cognitive loss and AD, and investigations in the field continue to grow exponentially. It is hard to imagine a more exciting area in which to do research, or a more pressing public health problem. To contribute to the observational studies, clinical pathological investigations, genetic research, environmental studies, and clinical trials that resulted in approval of our first therapies has been a privilege and intensely rewarding. I never anticipated any part of this journey.

Many, many mentors, colleagues, patients and families played huge roles in making things happen throughout the years and I thank them all, beginning with my outstanding colleagues at UCI. I am grateful to my mentor Dr. Robert Katzman, Chair of Neurology at Albert Einstein College of Medicine and a leader in aging research. Bob offered me a fellowship in Dementia and Aging when I didn't think I was interested and suggested I take the position until I decided my 'real' interests.



He was a very smart man. I never looked back. Along with the many extraordinary scientists and physicians at Einstein, he illuminated the principles of excellence in research, teaching and patient care. I hope the same happens for some of my students.

I continue to be involved in many studies of aging, including the *The 90+ Study*, initiated with Dr. Maria Corrada when I first arrived at UCI two decades ago. This longitudinal, multidisciplinary investigation of more than 2000 individuals over age 90 continues to inform us about dementia and successful aging in the oldest-old, the fastest growing segment of the population. Maria and I have worked together for more than 30 years beginning when we were both in Baltimore at Johns Hopkins. I would be lost without her.

I am also profoundly grateful to my family, especially my parents who provided roots to grow and wings to fly. As immigrants whose first language was not English, they changed the potential course of my life by coming to the United States for education and opportunities, especially for their children. And, last but definitely not least, I especially want to thank the students at all levels who have enriched my thoughts and actions every day...the future is in your hands. You will make all of us age better, and that has meaning for a better world.

**Fun fact:** *I grew up in the U.S. Army, and went to seven schools during the first six grades.*



## Tiffany Willoughby-Herard


Associate Professor

Department of African American Studies

### Distinguished Faculty Award for Mentorship

I am an Associate Professor of African American Studies at UCI and Professor Extraordinarius in the Chief Albert Luthuli Research Chair at University of South Africa.

My focus is on Black political thought and the material conditions of knowledge production, Black movements, South African historiography; blackness in international relations, diaspora, third world feminisms, decolonizing theory, feminist pedagogy, Black & African feminisms, and racial capitalism/gendered racisms/sexuality in international relations. My current work explores cross-generational youth-led political organizing around land return, sexual violence, and colonial legacies in South Africa. I am concerned with political consciousness across generations and creative sites for political education. I am the author of *Waste of a White Skin: The Carnegie Corporation and the Racial Logic of White Vulnerability* (University of California Press 2015) and of articles in *African Identities*; *Journal of Women Politics, and Policy*; *PS: Political Science and Politics*; *Critical Ethnic Studies Association*; *Frontiers: A Journal of Womens Studies*; *Abolition Journal*; **Contemporary**; *Journal of Contemporary Thought*; *Politics, Groups and Identities*; *Race @ Class*; *National Political Science Review*; *Social Justice*; *Theory @ Event*; and *Kroeber Anthropology Society Papers*, among other publications. I am also the co-editor of a new book on Black feminist cultural studies in contemporary South Africa co-edited with Derilene (Dee) Marco and Abebe Zegeye, entitled *Sasinda Futhi Siselapha: Black Feminist Approaches to Cultural Studies in South Africa's Twenty-Five Years Since 1994* (Africa World Press 2020), and a textbook, *Theories of Blackness: On Life and Death* (Cognella Press 2011). Building intimate and vulnerable spaces for high quality research by under-represented people has required crafting intentional, collaboratively-led, scholar activist formations. I am a founding member of the Transnational Black Womxn Scholars of African Politics Research Network with Takiyah Harper-Shipman, Robin Turner, Adom Getachew, and Kira Tait; a founding member of the feminist of color research network LUNAS with Lisa Beard, LaShonda Carter, Khanum Shaikh, Jeanne Scheper, Natalia Molebatsi, Khanum Shaikh, Salvador Zárata, and Deshonay Dozier; and a founding member of the Black Women and Gender Non-Binary research and creative writing group, #InForUs with Onyekachi Ekeogu, Tara Atherley, Desireé Melonas, and Tiffany Caesar. I am



the Intellectual Wellness Specialist for the Women’s Wellness Garden, a digital community for transformation and health founded alongside Joy White, Starlerra Simmons, Kelly Rivas, Sharon Adams, Odunayo Esther Ongunrinu, and Ashley Woolard. Such models reflect what I have inherited from the radical scholars that fought for space for liberatory histories and “leader-full” movements. I am a Co-Principle Investigator with historian Jessica Millward, lynching scholar LaShonda Carter, and artist scholar and actor Ella Turenne of a Black Digital Humanities online research archive, Activist Studio West: A Digital Repository of Movement Material, that serves as a pathway to doctoral education programs for students at Historically Black Colleges and Universities. I am the Humanities Equity Advisor and Special Assistant to the Dean of Humanities on Equity, Diversity and Inclusive Excellence. As President of the 52 year old National Conference of Black Political Scientists and a member of the LGBTQ+ Caucus and the Association for the Study of Black Women in Politics, I have found space to grow as a poet, an editor, a reader, a mama, a member of a church choir, a teacher, an undergraduate research supervisor, a friend, an ethical and grounded political scientist, and a Black internationalist lesbian feminist who survived.

***Fun fact:*** *I am an avid spin cyclist.*





## **Keramet Reiter**

*Professor*


*Department of Criminology,  
Law and Society*

**Distinguished Mid-Career Faculty  
Award for Service**

I started college aiming for a career in international development – studying Arabic, global inequality, and economic policy. I also signed up to volunteer in a juvenile detention center; I liked teaching, and I was intrigued by what sounded like a challenging and unfamiliar environment. By the time I traveled to Morocco, as a college junior, to write a thesis on women's literacy programs, the highlight of the trip ended up being a meeting with a group of women teaching in prison. I listened eagerly to their stories about unjustly incarcerated people they were able to help reenter society. I realized I had inadvertently found my passion not in foreign travel, but in understanding and reforming American prisons.

I finished college and stayed in the United States – moving from Massachusetts to California to work as a paralegal at the Prison Law Office, investigating disability rights violations in California state prisons. I found myself writing variations of the same letter on behalf of multiple paraplegic prisoners, who needed wheelchair accessible cells. Seeking a role with more impact on the whole system, I went to work for Human Rights Watch in New York, in its U.S. Program, hoping that maybe hard-hitting policy reports would produce faster change. There, as at the Prison Law Office, I was shocked by how often we did not have the information we needed to make basic policy recommendations. How many people in prison had disabilities? How many kids had been sentenced to life without parole in the United States? I wanted more tools (and more intellectual freedom) to investigate prison and punishment policy. I applied to JD-PhD programs and landed at the University of California, Berkeley. Although I had only lived in California for a year after college, I felt as if I was coming home for graduate school.


I was lucky to have amazing mentors at U.C. Berkeley, especially Frank Zimring, who supported me as I learned to translate my frustrations with prison policy into empirical research questions. I wrote a dissertation on the history and (mis) uses of solitary confinement in California (later published as *23/7: Pelican Bay Prison and the Rise of Long-Term Solitary Confinement*). And I spent many evenings



teaching in what was then the only college program for incarcerated Californians, at San Quentin State Prison. When I finished my PhD, I sought out public university jobs, where I hoped I would be able to both teach diverse students about criminal (in)justice and pursue empirical questions specifically motivated by obvious defects in the current system. UCI's Department of Criminology, Law & Society has been an ideal home for both types of work. The undergraduate students I teach at UCI are often equally divided in their career aspirations between law, law enforcement, and community organizing. The conversations we have across these aspirations make every class energizing, no matter how many times I teach it. The graduate students have transformed me from a solitary scholar, who writes intensively-researched legal histories, into a collaborative scholar who conducts massive mixed-methods data collection projects in a variety of prison systems, and co-authors relatively more succinct analyses of where and how prisons fail to achieve their goals. The productivity of these collaborations, in turn, has opened doors to shift from knowledge generating to institution-building activities.

Starting in 2018, I have been among a team of colleagues, in CLS and across campus, building LIFTED, a program to offer UC bachelor's degrees to incarcerated Californians. We are in the process of assisting our first cohort of 29 students complete transfer applications – they are finishing associate's degrees in Sociology at Southwestern Community College, inside Richard J. Donovan prison – to matriculate to UCI in the fall of 2022. The same elements that attracted me to UCI as a job candidate have made this campus an ideal platform for launching an initiative that I hope will simultaneously shrink our prisons and extend the opportunities and benefits of a UC education to a broader and more diverse set of California residents. When COVID-19 hit in the spring of 2020, LIFTED work required dizzying re-orientations as we slowly acknowledged how long it would be before we could enter our prisons again. (The period from spring 2020 to fall of 2021 represented the longest period I had gone without being inside a state prison since I was 18).

In that uncertain space, home with a toddler while my partner worked endless emergency room shifts at one of California's hardest-hit hospitals, I was grateful to form another classic UCI collaboration (across schools, with faculty and graduate students working side-by-side, supported by passionate undergrads) in building PrisonPandemic, an archive of incarcerated Californians' voices and experiences during the COVID-19 pandemic. Working on PrisonPandemic mitigated my feelings of futility – as I turned overnight from globe-trotting policy expert into full-time stay-at-home mother – and I hope the archive will endure as another example of UCI's sustained



commitment to centering and amplifying marginalized voices. I am honored to receive this award from our challenging, supportive, inspiring community.

***Fun fact:*** *I love dachshunds, but I am too busy doing campus service to own one.*



## **Andrew Noymer**

*Associate Professor*

*Department of Population Health  
and Disease Prevention*


### **Distinguished Mid-Career Faculty Award for Service**

I am honored to receive the Senate Mid-Career Award for Service, in recognition of my work to communicate the science of the COVID-19

pandemic to the public. My vision of the university's mission includes informing the broader public, and I am grateful to the Senate for the acknowledgment that this endeavor is service. My path to playing this role began in college, where I was a biology major at Harvard, and became interested in the health of populations. This led to a master's degree in medical demography from the London School of Hygiene & Tropical Medicine. This was followed by sojourns in Angola, working on population and development issues, at the International Institute for Applied Systems Analysis (IIASA) in Austria, and at Centre Français sur la Population et le Développement (CEPED) in Paris. It was at CEPED where an observation I made led to a serendipitous discovery about the impact of the 1918 influenza pandemic in the United States. This work kindled a career-long interest in the demography, epidemiology, and sociology of pandemics, particularly of respiratory diseases.

After Paris I came to California to do my PhD in sociology at Berkeley, where I was also an NIH trainee in demography. My PhD dissertation was on the 1918 influenza pandemic, setting the stage for my work on COVID-19. I would like also to take this opportunity to acknowledge the profound impact of the late Prof David A. Freedman, who was in the Statistics Department, and therefore was the extra-departmental member of my PhD committee (he could not chair, per university rules). David's influence on my career and my way of thinking was (and remains) profound. In 2006, I completed my PhD and began as an assistant professor at UC Irvine, in the Sociology Department. I was tenured in 2012, and moved to the Program in Public Health in 2013. My work focuses on the demographic impact of infectious diseases.

I have a longstanding interest in communication of public health science to the public; I eschew the term "scicomm", which has been intermingled with industry-funded agitprop. In 2014, during the West African Ebola outbreak, amidst great confusion about the risk to the American public, I spearheaded a public information session at UCI. This featured internal and external speakers, press involvement, and led to my being on the Columbia Broadcasting System nationwide news



broadcast, speaking on the lack of risk of unchecked Ebola transmission in the United States.

In January 2020, I warned that the “coronavirus outbreak” (the term COVID-19 was not yet coined) would become pandemic. I have been deeply involved ever since, in interpreting the often-bewildering (even to experts) COVID-19 statistics for the press. I have been quoted in well over 500 pieces to date, including *The Washington Post*, *The New York Times* (national print edition, above the fold), and *The Atlantic*, among many others. *The Orange County Register* named me to the county’s 100 most influential people. The craft of talking to the press in a way that is true to the science yet accessible to their audience is one that I have worked on hard since early 2020, and one for which my entire career has prepped me.

**Fun fact:** *During the pandemic, I spent a lot of time talking to journalists. This is different from speaking in a classroom setting, because it is mostly just talking into a phone without any eye contact with the interlocutor. I honed my skills for this by being a deejay on KUCI, our campus’s own radio station, where I host the “Taillights Fade” alternative/indie radio show.*



## Sergey Nizkorodov

*Professor*

*Department of Chemistry*

**Daniel G. Aldrich, Jr. Distinguished  
University Service Award**


I am both humbled and honored to receive the Daniel G. Aldrich, Jr. Distinguished University Service Award. I have had a number of service roles at UCI and elsewhere but certainly did not anticipate they would elevate me to this level of recognition by my esteemed colleagues at UCI.

I grew up in Kazakhstan, which was part of the Soviet Union at the time. Prioritizing the needs of the society over personal interests was ingrained in school education. As a result, I had numerous service and community roles starting from middle school, and by now this has become almost a habit.

In 1987, I was interviewed by a recruiter from the Lavrentiev Lyceum in Akademgorodok, Russia, a boarding school emphasizing mathematics and physics education. I was selected to spend the last year of high school at this boarding school, and that year changed my life. When I arrived, I plummeted from the position of being the top student in my school in Kazakhstan to being smack at the bottom of the class in the Lyceum. This was an important lesson in humility. It took a year of hard work to catch up to my peers.

I stayed at Novosibirsk State University in Akademgorodok to study biochemistry from 1988 to 1993. As was customary at that time, all freshman students were sent to the fields at the start of fall semester to help gather crops. This was another critical event in my life because this is where I met my wife Elena. It was one of those “love at the first sight” tales that led to a lasting marriage. By the time I graduated from college, we already had two children, and now we have been blessed with three wonderful grandchildren.

Historically, students graduating from Novosibirsk State University stayed in Akademgorodok to work in scientific institutes there. However, the breakup of the Soviet Union in 1991 threw a major wrench in these plans. By a stroke of luck, I was able to get into graduate school at Basel University, Switzerland, and spent 1993 to 1997 doing chemical physics research. I then did my postdoctoral research in chemical kinetics and reaction dynamics at the University of Colorado at Boulder, and in atmospheric chemistry at the California Institute of Technology.



I am tremendously thankful to the UCI Department of Chemistry for offering me a tenure-track position in atmospheric chemistry in 2002, and recommending me for tenure several years later. I am really happy at UCI, it is a second home to me. People who influenced me the most at UCI were Barbara Finlayson-Pitts and her late husband James Pitts Jr. who both supported me in various ways my from the start, helped me navigate through the academic life, and pushed me to excel in my research, service and education work. Two other people were important to my success in getting tenured at UCI: Donald Blake and F. Sherwood Rowland. It was a fantastic group of colleagues back then, and it is even better now! In recent years, Annmarie Carlton, Celia Faiola, Craig Murray, Manabu Shiraiwa, and James Smith joined the Department as atmospheric chemists, and it is a real pleasure to work with such a wonderful group! UCI definitively has the strongest atmospheric chemistry group in the country.

I take on a lot of service responsibilities because I care deeply about my Department, School, UCI, and the outside community, and want to contribute to making us even stronger. My most demanding and enjoyable service activities included coordinating the AirUCI Summer Workshop in Environmental Chemistry for Science Teachers, serving as the Chemistry Department's vice-chair for academic programs and curriculum, chairing the Subcommittee on Courses & Continuing, Part-Time, & Summer Session Education (SCOC), and presiding over the American Association for Aerosol Research (AAAR). I am looking forward to doing more for UCI in the future!

**Fun fact:** *To make ends meet during college, I worked as a train-attendant during the summers, a job that taught me to respect the very hard work of people in the service sector.*

## Stephen Mang

*Assistant Professor of Teaching*

*Department of Chemistry*

### **Distinguished Early-Career Faculty Award for Teaching**

It feels a little strange to be receiving an Early-Career award, since I've been teaching for a decade and a half now. Before coming to UCI, I was a non-tenure-track senior lecturer


at the University of Maryland, Baltimore County. UMBC was a great place to start a teaching career, but that job had no research expectation, and therefore a heavy teaching load. There was little time to reflect on my teaching practices or to plan studies on the effectiveness of my teaching. Coming to UCI as an Assistant Professor of Teaching has given me time to do both for my upper-division writing and laboratory courses.

Throughout my career, I've identified several inefficient and unsuccessful methods of teaching writing to chemistry students. Unfortunately, I mostly identified them by using them in my upper-division laboratory classes. When I got the opportunity to develop the curriculum for the chemistry department's new upper-division writing course, I stuck with what I knew: teaching students how to write a lab report, search the literature, and read journal articles. Students could do a decent job on these limited tasks, and all of their submissions were written for an audience of two: me and the TA. Was this the best we could do?

I hoped not, so in the Fall of 2018 I completely reorganized the writing course. I had recently learned about the concept of specifications grading from, among others, my chemistry department colleague, Professor Renée Link. In specifications grading, students are evaluated on their mastery of individual course learning outcomes using checklist-style rubrics. These rubrics give the students a clearer picture of the expectations of assignments and of the whole course. Another motivation for the redesign came when I read a book on how to improve as a nonfiction writer. By the time I was halfway through, I knew I would use it as a textbook, though it has nothing to do with chemistry. What it does emphasize is writing for the correct audience, and also developing an individual writing practice. The redesign has been a long and iterative process, one that has been possible thanks to the nature of my job at UCI. The fact that I have time to research teaching strategies, design surveys to measure student attitudes about the class, and apply the findings to subsequent offerings has made the class better, and has made me a better teacher.







Having written all that, receiving this award after 18 months of remote teaching feels very strange, because I don't feel like my teaching was intentional in the ways I just described. Like many of my students, I was barely holding it together between my work and family responsibilities. In Spring 2020 I was making course materials the day before presenting them to the students. I modeled a Canvas site after the one for my daughter's kindergarten class because it was the only one I had used that didn't make me feel overwhelmed. It's possible that the only journal article I read all the way through in 2020 was one that I published as corresponding author. It was hard to feel like I was doing more than the bare minimum, even when I probably was. To the extent I've succeeded, it's been possible because of the support of my fantastic colleagues, the excellent department and school staff I have worked with, and of course my family. I feel lucky to be at a university that values teaching, and research about teaching, as highly as UCI does. I look forward to continued in-person instruction, interaction with students, and continuing to reflect on and improve my teaching.

**Fun fact:** *One of my hobbies is “peakbagging,” and so far I've climbed 17 different mountains that are over 10,000 feet tall.*



## Sandy Irani

*Professor*

*Department of Computer Science*

### **Distinguished Faculty Award for Teaching**


I grew up in Ann Arbor, Michigan, the daughter of an engineering professor and an immigration attorney. My dad (the professor) laid the groundwork for my career in STEM.

In fact, there are a number of small proofs that I teach now in my discrete math classes that I can vividly remember him teaching me as a young girl during one of our many home tutoring sessions.

I was drawn to Computer Science, not so much out of a love of programming or tinkering with technology, but more as an area of applied mathematics. It was during my junior year as an Electrical Engineering major at Princeton that I took my first course in Computer Science Theory and knew that this was the field I wanted to study. A PhD was the logical next step, and I completed my degree at UC Berkeley in 1991. After a year-long postdoc, I came to UC Irvine in 1992, where I have spent my career.

Although I have had essentially the same job for over thirty years, I have been able to concentrate on different aspects of academia and continually grow in my position. As an assistant professor, I was an active participant in the Academic Senate. Later, I served as the chair of my department for five years, and I was one of the inaugural group of Equity Advisors for the ADVANCE Program. My research interests have also shifted over the years. I have always been a member of the Theory of Computation group in the CS Department, meaning that my work focuses on understanding the resources required to solve computational problems through rigorous analysis and proof. However, in the early part of my career, I focused on algorithms for computer systems, such as memory management, task scheduling, and energy efficiency. Then about 12 years ago, I switched to the field of Quantum Computation—designing algorithms for quantum computers and understanding what their capabilities will be once they can be built on a large scale.

Teaching has always played a central role throughout my years at UC Irvine. While I teach courses at all levels, from lower-division undergraduate classes to small seminars for PhD students, the two courses in ICS on Discrete Mathematics (ICS 6B and 6D) have become my trademark. These large, lower-division classes



are required for most of the computing-related majors in ICS. They lay the foundation for the kind of formal reasoning that students will need throughout their upper-division coursework and beyond.

Around seven years ago, I become involved with a company, co-founded by two ICS alumni, called zyBooks, that develops interactive, web-based textbook replacements in STEM fields. In collaboration with their company, I created a “zyBook” on discrete mathematics. While my original intent was to develop the best educational tools for my own students, I am very pleased that the zyBook has gained in popularity outside of UCI as well. *The Discrete Math* zyBook has now been used by more than 100,000 students at over 1600 institutions.

I am very happy to have spent my professional years at UC Irvine, and I feel particularly fortunate to have worked with so many wonderful students over the years. I am proud to play a role in helping our ICS students approach problem solving in a more rigorous way and hope that they also come away with a greater appreciation for mathematical reasoning. Contributing to the development of the next generation of computer scientists has been one of the most satisfying aspects of my career.

**Fun fact:** *The new hobby that I took up during the pandemic is learning how to surf.*



## Sameer Singh

*Associate Professor*

*Department of Computer Science*

**Distinguished Early-Career Faculty  
Award for Research**


AI and machine learning are becoming an increasing part of our society, with applications that span medicine, finance, education, entertainment, law, and

advertising. The proliferation has come from increasingly complex algorithms underlying machine learning. However, this very complexity has also made these algorithms opaque and difficult to analyze. It is unclear whether machine learning competently performs the intelligence tasks we expect they undertake. Further, it is difficult to understand, debug, and develop them; thus, they are difficult to use correctly and easy to be misused.

My overarching research goal is to democratize the effective and responsible use of machine learning and artificial intelligence algorithms. This interest was seeded early on when I read science fiction as a child, which provided many scenarios to explore the benefits (and harms) of a society embedded with AI. I specifically remember wanting to be like Dr. Susan Calvin, a “robotpsychologist” who helps diagnose why AI behaves errantly in Asimov’s “The Robot” series of stories. With the steady adoption of AI, this fancy of youth has become an important goal to pursue.

My first research goal is to explain machine learning predictions to make them interpretable. When machine learning algorithms are deployed, they make predictions without any accompanying justification; it is unclear why they made a prediction, how we can change the prediction, and what they are using to make the prediction. My work focuses on explanations that describe why the model made an individual prediction, i.e., we summarize the local behavior of the model for users. We extended these ideas to develop approaches that include theoretical guarantees and explore alternative forms of explanations, including explaining predictions of graph-structured data and reinforcement learning. These directions may significantly increase the adoption of machine learning in domains that need explanations, such as criminal justice (e.g., bail decisions), health care (e.g., patient diagnosis and treatment), and finance (e.g., loan approval).

The second critical concern for practical machine learning is to know if



they are actually able to perform the task we expect them to. To introduce better evaluation pipelines, I developed a line of research through several contributions in testing for machine learning. Inspired by software engineering practices of testing complex systems, we introduce methods to identify vulnerabilities by automatically perturbing data in user-defined ways and observing the behavior. Apart from providing automated tools for testing, these contributions have also demonstrated that commonly-used algorithms all suffer from significant problems. We expect the results from these efforts will inspire researchers and practitioners to develop a more robust and comprehensive evaluation of machine learning pipelines.

Machine learning algorithms, despite their popularity and use in many domains, remain opaque and brittle. It is essential to address these shortcomings for more responsible use of machine learning in applications increasingly becoming more central to society. With the support at the university and the department, the stellar students in my lab and I are well on our way to developing responsible and trustworthy AI.

***Fun fact:*** *I wanted to stop studying after high school and become a freelance programmer. I was convinced to go to college, and twenty years later, I still haven't left.*



## Chang C. Liu

Associate Professor


Department of Biomedical Engineering

**Distinguished Mid-Career Faculty  
Award for Research**

When I was growing up, my main passion was music. I spent most of my time outside of school playing the piano and I regularly performed and competed at the state, national, and international levels. For me, the interesting thing about music is that you don't need to know anything about music theory to be a great musician or even a great composer. Sure, great musicians know a lot about theory and use it to guide some of their creative choices, but great musicians don't spend 10 years learning theory before making music. Instead, they imagine ideas, ask "does this sound good," and imagine better ideas if the answer is no, at various time and structural scales, no theory needed.

I am now a scientist. Interestingly, there is something in science that works exactly like the musician producing great music without theory. That something is evolution. Nature is the musician here, mutations are new musical ideas, and natural selection is the "does this sound good" question. Clearly, this works beautifully: all the biological wonders of the world are the product of evolution. But there is a problem. Nature is very slow, so while we may appreciate the music that evolution has generated, we usually can't watch it being produced in action and we can't commission new pieces to be composed.

My research seeks to change all this by accelerating evolution, by factors of thousands- to millions- fold, in the laboratory. My independent work has broken a fundamental speed limit on the *in vivo* rate of mutation, and with it, the rate of gene and biomolecular evolution possible inside cells. My research program has led to an advanced form of experimental evolution, called *in vivo* continuous evolution, that can generate new biomolecular functions with unprecedented scale and power, all on rapid laboratory timescales. Researchers can now be like musicians, generating biomolecules that can cure diseases and support sustainability efforts, without theory. This is particularly enabling because we haven't worked out the theory of how biomolecules function: we don't know how a biomolecule's sequence determines its function. With *in vivo* continuous evolution, we can generate biomolecules that carry out exquisitely complex new functions like target a disease antigen or catalyze a chemical reaction without having the theory to figure out how that function could be designed *a priori*.



I am not against theory. In fact, the fundamental theory behind how a biomolecule's sequence translates to function is one of the areas of research I am deeply interested in. The exciting thing is that given what our lab has achieved in accelerating evolution, the field may be better equipped to address the theory. In science, one stereotypically imagines theory coming before practice: we work out the theory of biomolecular sequence-function relationships and then design sequences that can achieve a given function. I disagree. I think you first need a rapid generator of protein function and only then do you have the controlled examples to figure out theory. Nature is a slow generator of biomolecular functions and we can't observe the process, so it has been hard to figure out theory. My lab has made a fast, scalable generator of biomolecular functions, putting us in a new position to understand theory. My two young kids, who I now play piano for, are learning to produce music; later they may like to study music theory. Researchers in music theory, physics, and neuroscience are asking the question "why does music sound good" but only because great music was generated first. And even if we don't get to theory, we still can make good music.

***Fun fact:*** *An item with my name on it has gone into space.*



## Svetlana Jitomirskaya

*Distinguished Professor*

*Department of Mathematics*

### **Distinguished Senior Faculty Award for Research**

I grew up in Kharkov in a family of two accomplished mathematicians. For some 20 years, my mom was probably the only female Full Professor of mathematics in all of Ukraine. Yet, she actively discouraged me from going into math, saying, in particular, “it’s not a good job for a girl.” Moreover, I had a deep clear passion for something else: Russian literature, especially Russian poetry, where I was even winning some national competitions. However, with time, I realized I could no longer tolerate being forced to constantly bow to the state-mandated communist ideology. Mathematics originally appealed to me mainly as something where this would be minimized in my life.

For personal reasons that I described in the biography I wrote for the mid-career award in 2004, I was very motivated to try to get admitted to Moscow State University. Yet MSU was notorious for discriminating against Jewish applicants, something later dubbed the “Intellectual Genocide.” An informal justification consisted in the desire to achieve proportional representation of various ethnicities in the student body, resulting in an effective .5% cap for Jewish students, some 20-40 times lower than the proportion of qualified applicants. The discrimination was covert because “internationalism” and other nice words were standard slogans, but in practice, Jews were subjected to extremely difficult, essentially impossible, questions during their oral exams. I spent my last year of high school preparing very hard for that oral exam and gained some skill and interest in the process. In the end, I was admitted by a miracle, and thus felt it was important to fully use MSU’s fantastic resources, something few other students did. Also, my special preparation must have paid off, because what was generally considered a very difficult program, was not that hard for me, leaving room for multiple topics courses and seminars. Thus I ended up following my mom’s example rather than her advice, but can largely attribute my choice of and initial success in mathematics to the totalitarianism and antisemitism of the Soviet Union.

Why I ended up working specifically in mathematical physics is a bit of a mystery. Even when already passionate about math, I still had no interest in physics. At MSU we were supposed to choose an advisor and a major (which determined the future coursework) by the end of the second year of undergraduate studies; for me,



it meant the ripe old age of 17. Among the professors in my classes, two stood out: Yakov Sinai (Probability) and Vladimir Arnold (Differential Equations). I knew they were great mathematicians, but who could have known that not only were they both mathematical physicists, but also future awardees of the Heineman Prize, the top prize in mathematical physics? I went with Sinai because he noticed and initially encouraged me. I realized I had been duped when the first paper he gave me to read was in physics, but it was already too late. Soon after the PhD, I quite accidentally ended up in Irvine, where Abel Klein, another prominent mathematical physicist, became my mentor. A further accidental occurrence is that it was only one hour drive from Caltech, where yet another future Heineman Prize awardee, Barry Simon, worked. Have I had any other choice but to follow in their steps? My 2019 Heineman Prize came as a shock to me, but perhaps it was destiny, too.

I spent my entire career so far at UCI, starting out as a part-time lecturer, and growing through the ranks. It is a tremendous honor to receive this award, and it is all the more humbling for me because the only other mathematician previously so honored was Don Saari (2004), a man who revolutionized not only a big area of math but also economics and other fields. Thinking of that, there is yet another accident I should mention that must have helped bring me to this point. It is my winning the lottery, quite literally so. I mean of course the UHills lottery, as a result of which I have become a next-door neighbor of Don. With a neighbor like that, some vibes must have transferred over the fence, and anybody would have started getting big ideas in their research!

***Fun fact:** I am an adherent of free-range parenting. At the same time, we homeschooled all three of our kids in Russian language and literature, and, to the extent the IUSD allowed, in math. Now they are all very strong young mathematicians, fully bi-cultural, and keep inspiring me immensely in life and work!*

### Presentation

#### **The Hofstadter's Butterfly:**

#### **From Playing with Numbers to Studying Quantum Materials**

We will present the fascinating self-similar object, the Hofstadter's butterfly, and discuss some of its properties, the history of its discovery, some related mathematical facts, and discuss how it is related to the study of superconductivity of moire materials.