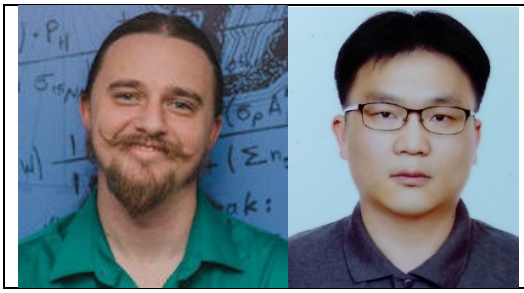
The Quaternion

Spring, 2022

CodeBreakHERS

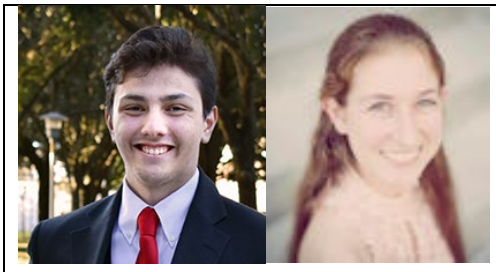
Last summer, a research center in the Mathematics & Statistic Department organized the second CodeBreakHERS summer camp for Grade 8-12 girls interested in cybersecurity. Faculty from three departments and two local businesswomen led students through mathematical activities. For details, [click here].

Faculty



This year, we welcomed two new faculty members. Robert Connelly was a visiting instructor at USF, and he is now an assistant instructor in the Mathematics Unit. Jiwoong Kim was a researcher in medical and biological units, and is now an assistant professor in the Statistics Unit. For details and more faculty news, [click here].

Students



Our students continue their outstanding performance, and last year saw two recipients of the USF Chapter's Pi Mu Epsilon Outstanding Scholar Award: Alexander Mercier and Marissa Rozear. Mr. Mercier also was one of two USF students to receive a Goldwater Scholarship and the first USF student to be a Rhodes Scholarship finalist. For details and more news, [click here]

Transitions

Two new faculty joined the department during the previous year.

After receiving his baccalaureate degrees in mathematics and mathematics education from USF, **Robert Connelly** was a substitute teacher in the Pinellas County school district and a tutor at the Palm Harbor Sylvan Center. He returned to USF as a graduate student in mathematics, ultimately earning a Masters degree - while working as a teaching assistant, and later, as a visiting instructor. He joins the department as an assistant instructor in the Mathematics Unit.

After undergraduate and graduate studies in economics, **Jiwoong Kim** received a Ph.D. in statistics from Michigan State University. After a year at the University of Notre Dame, he worked as a research fellow at Seoul National University, the Ajou University Medical Center, the Seoul St. Mary's Hospital of The Catholic University of Korea, and a computational biology laboratory at Michigan State University. His research includes nonparametric estimation, time series, computational statistics, machine learning, and image segmentation. He joins the department as an assistant professor in the Statistics Unit.

News

Margherita Maria Ferrari Wins Grand Prize at Research Symposium

Margherita Maria Ferrari won the $750 Grand Prize at this year's Postdoctoral Research Symposium for her talk on *Designing DNA Nanostructures* on September 24, 2021.

Dr. Ferrari is a Postdoctoral Research Scholar in the Department, and she works on mathematical models for DNA assembly and DNA-RNA interactions. She is part of the USF Math-Bio

research group led by Drs. Nataša Jonoska and Masahico Saito, and is also a member of the Southeast Center for Mathematics and Biology.

The Postdoctoral Research Symposium is sponsored by the USF Office of Postdoctoral Affairs, and brings together postdocs from all over campus to present their research to a broad audience in the form of quick 5-minute "lightning" talks. The goal of the symposium was to convey the scope and significance of the research in a concise, engaging manner without technical jargon.

Nataša Jonoska Recognized and Receives Awards

Nataša Jonoska received the 2021 Award for Distinguished College or University Teaching of Mathematics from the Florida section of the Mathematical Association of America (MAA). Professor Jonoska has worked with and mentored many undergraduate and graduate students at USF. Awardees are listed on the award archives.

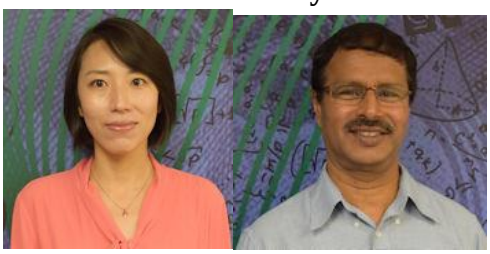
Professor Jonoska and Professor Francesca Storici of the Georgia Institute of Technology received a $1 million research award from the W. M. Keck Foundation research directed toward decrypting the hidden message of ribonucleotide incorporation in human nuclear DNA. Based in Los Angeles, the W. M. Keck Foundation was established in 1954 by the late William Myron Keck, founder of the Superior Oil Company. The Foundation's grant making is focused primarily on pioneering efforts in the areas of medical research and science and engineering as well as undergraduate education.

And a special issue of the distinguished journal Theoretical Computer Science *Building Bridges - Honoring Professor Jonoska on the Occasion of her 60th Birthday* was issued this fall.

Wen-Xiu Ma Named Highly-Cited Researcher for Seventh Consecutive Year

Professor Wen-Xiu Ma, whose 164 publications were cited 10,124 times, was selected for the Clarivate Analytics list of Highly Cited Researchers for the 7th consecutive year (2015, 2016, 2017, 2018, 2019, 2020 and 2021). Highly Cited Researchers identifies the world's most influential contemporary researchers across 21 scientific fields. Over three thousand researchers earned the distinction by writing the greatest numbers of reports officially designated by Essential Science Indicators (ESI) as Highly Cited Papers — ranking among the top 1% most cited for their subject field and year of publication, earning them the mark of exceptional impact.

Lu Lu and Kandethody Ramachandran coordinate local arrangements for ASA Meeting

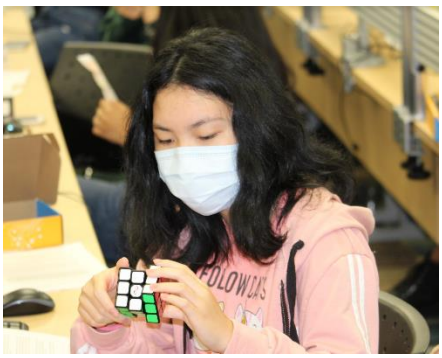


The annual meeting of the Florida Section of the American Statistical Association met virtually over the April 1 & 2 weekend. The meeting is intended to promote research innovation and applications of statistics and data sciences as well as engaging research activities and networking among local community members.

Giacomo Micheli and Jean-François Biasse Receive $500,000 NSF Grant

Professors Giacomo Micheli (PI) and Jean-François Biasse (Co-PI) were awarded a $500,000 research grant for *SaTC: CORE: Small: Applications of Galois Theory to the Search for Non-Linear Functions* from the National Science Foundation. This project supports research on the construction of Almost Perfect Nonlinear functions that impact the design of the next generation of ciphers which will need to operate in constraint environments (lightweight cryptography), and feature large keys to offer high levels of bit security against quantum adversaries.

The CodeBreakHERS summer camp 2021



Hash functions with Rubrix Cubes

From Monday August 2nd to Friday August 6th 2021, the Center for Cryptographic Research (CCR - hosted by the Mathematics & Statistics department) organized the 2nd edition of the CodeBreakHERS summer camp. This was one of the first in-person USF summer camp to be organized since the beginning of the pandemic. The CodeBreakHERS is an all-girl summer camp aimed at Grade 8-12 girls who want to learn about cybersecurity through fun hands-on activities. It is organized by core CCR members Jean-François Biasse and Giacomo Micheli of Mathematics & Statistics, Mehran Mozzafari Kermani and Attila Yavuz of Computer Science & Engineering, and affiliate members Megan Cannon of Mathematics, Robert Karam of Computer Science, and Ruthmae Sears of Mathematics Education. Additionally, guest lecturers, including former Mathematics undergraduate student Keller Blackwell who flew from Stanford especially for the occasion, provided precious help in delivering instruction.

Computer activities

Throughout the week, the participants of the CodeBreakHERS learned about internet security, coding theory, cryptography, hardware security, biometrics, and business applications of cybersecurity. All these topics are illustrated by hands-on activities. For example, the week started with an ice-breaker activity where students got to start their own internet server hosting a webpage introducing themselves … and then learned how to hack each other's web browsing (full disclosure: the hacking part eventually brought our local network down, apparently too much fun was being had). Coding theory instruction included fun games such as building QR codes with LEGOs, and a tweaked version of the "Guess Who" game where participants are allowed one lie (this activity was originally introduced by former USF Mathematics postdoctoral scholar Annamaria Iezzi). Cryptography curriculum featured the introduction of hash functions with Rubix cubes, and an illustration of key exchange with paint. Participants also got to use devices that monitor power consumption in order to perform so-called "side channel attacks" which allow the recovery of cryptographic keys from a power trace. Much fun was had during the afternoon dedicated to facial recognition (courtesy of the amazing Computer Science faculty Tempestt Neal). The software we used really struggled with a pair of participants who were identical twins! Finally, we wrapped up the week with a day of "Shark Tank" challenge where participants formed teams and worked on a sales pitch presentation on topics relevant to cybersecurity. The final presentations were given in front of two CEOs of Tampa-based companies: Maureen McWhite (CEO of

Learning crypto with crafts

4Gen Consulting Service) and Rosa Shore (CEO of Blockspaces). Our guests were amazed at the creativity of the participants!

Meeting with Maureen McWhite

During the week, the camp participants received the visit of multiple real-life CodeBreakHERs. In addition to CEOs of local tech companies Mareen McWhite and Rosa Shore, the campers had the opportunity to exchange with former National Security Agency cryptographer Margaret Salter (who is now working for Amazon Web Services in Orlando), and USF faculty Tempestt Neal who specializes in biometrics. These visits from role models were praised by the participants and were a highlight of the week. Indeed, it is an amazing occasion to learn about the real-life opportunities of cybersecurity. Each guest brings their unique perspective on cybersecurity careers coming from their background.

The CodeBreakHERs summer camp will return in 2022. To ensure the recruitment of campers from diverse backgrounds, it runs free of charge. In 2021, 20 participants were chosen among over 100 applicants. The camp runs thanks to the support of the National Science Foundation, faculty startup funds from Mathematics & Statistics and Computer Science & Engineering, as well as from Cyber Florida, which provided a computer room, as well as precious help for the marketing of the camp. For more information about the CodeBreakHERS, visit the summer camp website.

Student News

At the end of the spring semester of 2021 sixteen USF undergraduate students were inducted as new members of the USF-based Florida Epsilon Chapter of Pi Mu Epsilon, the national mathematics honor society: Alexander Brower, Youssef Boules, Alejandro Cano, Sreten Dedic, Brandon Eleff, Ricardo Frumento, Ca Hoang, Asher King, Grace Klein, John Meeks, Eion Mulrenin, Brandon Nunez, Caitlin Salerno, Kali Sardina, Grace Wolfe, Carson Wright. These students satisfied high academic requirements both in mathematics and general undergraduate work in order to be invited for membership in PME.

Also, USF math students Alexander Mercier and Marissa Rozear were selected as co-winners of our chapter's 2021 Pi Mu Epsilon Outstanding Scholar Award, which goes to a USF math undergraduate student representing academic excellence and dedication to mathematics.

Alexander is a double major in Mathematics and Biology - motivated by an interest in epidemiology - and has also been the president of our USF Math Club for the past two years, and he delivered the USF Math Club Lecture Presentation "Math and Pandemics" on Oct 1st of 2021. A student in USF's Judy Genshaft Honors College, Alexander was one of two USF students to receive a Barry Goldwater Scholarship last year, and he was USF's first ever finalist for a Rhodes scholarship.

We wish all our students well on their further adventures.