



TEXAS A&M
UNIVERSITY

Department of Electrical
& Computer Engineering



Meet some of
our **COVID-19**
researchers

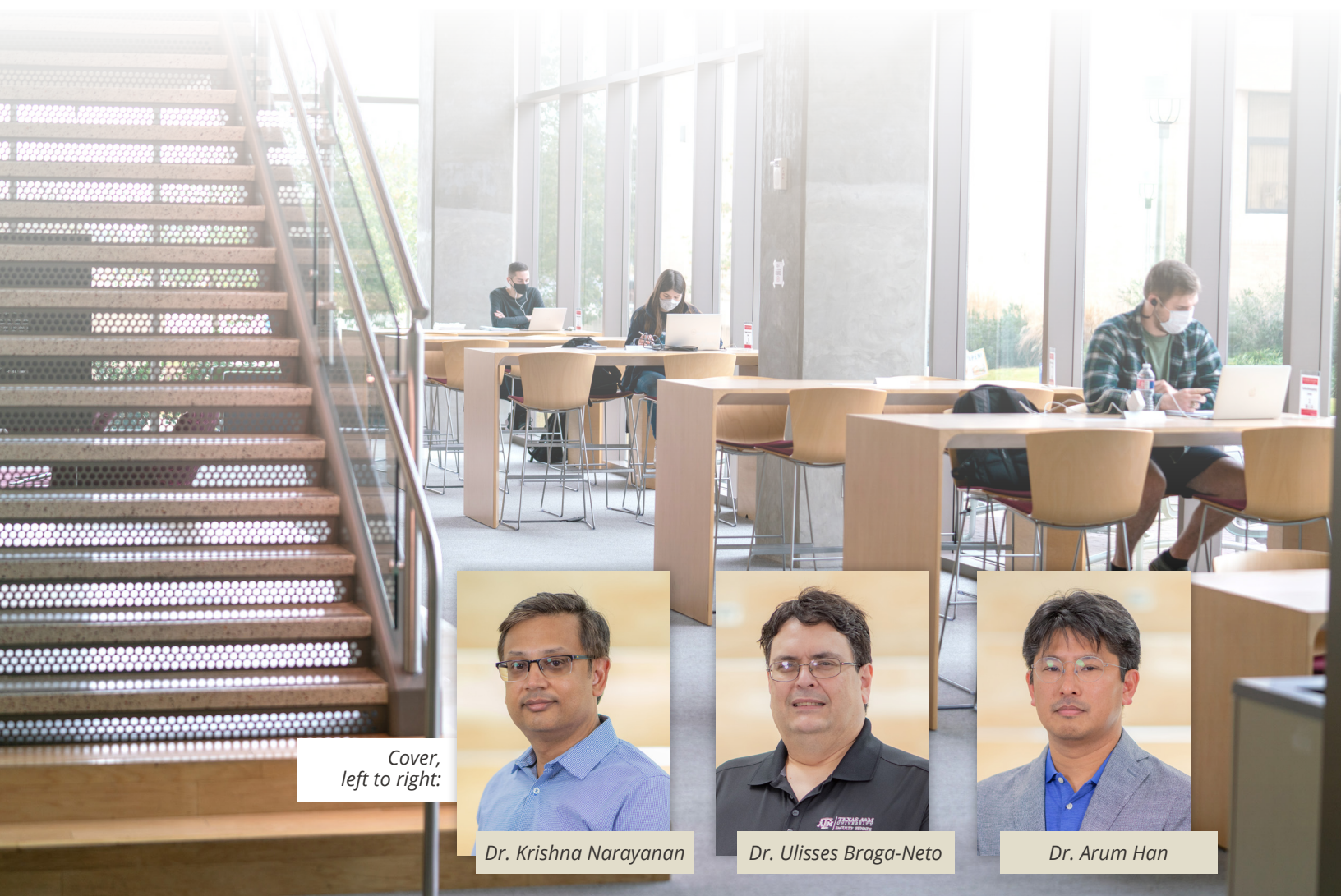
ELECTRICAL & COMPUTER

ENGINEERING

SPRING 2021 ■

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Cover,
left to right:



Dr. Krishna Narayanan



Dr. Ulisses Braga-Neto



Dr. Arum Han



Letter from the **Department Head**

The COVID-19 pandemic has brought unprecedented challenges upon higher education. Despite the unexpected shift in work habits and lifestyles we have all had to make around the world, I am proud to say that our faculty, staff and students have adapted to the circumstances and managed to maintain the strong sense of community for which Aggies have always been known. We do not take these circumstances lightly and will continue to remain cautious and attentive, while also looking forward to the day when we can get back to a fully normal operating environment. The challenges of COVID-19 have put all of the Texas A&M University core values of respect, excellence, leadership, loyalty, integrity and selfless service to the test, and Aggies have responded in unison.

At the end of the fall 2020 semester, we were able to offer an in-person commencement ceremony, which was conducted with the highest of safety precautions in place in order to keep everyone properly distanced while also celebrating the notable achievement that is graduation.

Despite the circumstances over the past year, our faculty members accomplished great things and continually pushed the boundaries of technology and innovation. They continued to pursue large research projects to make a tangible, positive impact in our world and were recognized for their work in our field. They are also continuing to find innovative ways to maintain effective instruction under the challenging circumstances. Over the past year, two of our young faculty were awarded the significant Faculty Early Career Development (CAREER) Award from the National Science Foundation (NSF). In addition to participating in cutting-edge research and bringing in large grants, our faculty invest in the research experience and education of undergraduates, which you will see in this publication. We also sadly lost one of our prominent faculty members who made a lasting impact in our lives and left a legacy of extraordinary leadership, generosity and respect in our department.

As we enter the second year of operating under unusual circumstances, I am certain that we are moving toward a brighter future where we can embrace new opportunities and tackle new challenges together.

Dr. Miroslav M. Begovic, FIEEE

*Moore Professor
ECEN Department Head*

Notable Faculty Accomplishments



Dr. Karan Watson was selected as a 2020 recipient of the Beville A. Watford Inclusive Excellence Award. Presented by the Women in Engineering ProActive Network, this impactful award honors those who actively support and bolster the success and inclusion of women of color in engineering at the undergraduate, graduate and professional levels.



Dr. Yang Shen received the Faculty Early Career Development (CAREER) Award from the National Science Foundation (NSF). He is using this work on computational methods to unravel how proteins interact in living systems, which will allow for a better understanding of how biological systems work. This can ultimately lead to the development of therapeutics to combat diseases or illnesses.



Dr. Dileep Kalathil received the NSF CAREER Award and is working to make the promises of the artificial intelligence evolution attainable by addressing the resiliency, scalability and data efficiency of the system.



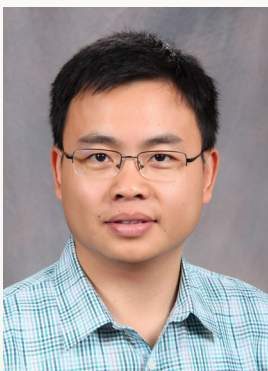
Dr. Michel Kinsy was presented the Computing Research Associate Widening Participation Inaugural Skip Ellis Early Career Award. This honor goes to individuals who have made significant research contributions in computer engineering and have contributed to the profession, especially in outreach to underrepresented demographics.



Dr. Chanan Singh was named a 2020 foreign fellow of the Indian National Academy of Engineering (INAE). INAE presents fellowships to individuals who have demonstrated eminence in their own chosen area and achieved outstanding accomplishments in engineering and technology. He was also named a 2021 University Distinguished Professor, which is the university's highest faculty honor.



Dr. Nick Duffield was named a 2020 fellow by the Association for Computing Machinery for his contributions to network measurement and analysis. The fellows program recognizes the top 1% of members for outstanding accomplishments in computing and information technology.



Dr. Le Xie was honored as a 2020 Chancellor Enhancing Development and Generating Excellence in Scholarship Fellow. The fellowship was created to honor, incentivize and boost mid-career faculty who are making significant marks in their discipline.

BY THE NUMBERS

RESEARCH LAB SPACE

52,375 Total Square
Footage

RESEARCH EXPENDITURES

\$23.39 MILLION
IN 2020

NSF CAREER AWARDS: 4 (SINCE 2016)

ENROLLMENT*

(FALL 2020)

1,449 Undergraduates

579 Graduates

**preliminary*

FACULTY

14 Professorships

71 Tenured/Tenure-
Track faculty

3 Distinguished
Professors

11 Academic
Professional Track
faculty

6 Members of the
National Academies

9 Chairs

32 IEEE Fellows

DEGREES AWARDED (2019-2020)

293 Bachelor's

197 Master's

37 Ph.D.

RANKINGS

by U.S. News & World Report.

PUBLIC

GRADUATE

12TH for Computer Engineering

12TH for Electrical Engineering

UNDERGRADUATE

14TH for Computer Engineering

9TH for Electrical Engineering

OVERALL

GRADUATE

22ND for Computer Engineering

20TH for Electrical Engineering

UNDERGRADUATE

20TH for Computer Engineering

16TH for Electrical Engineering

There are **four** Texas A&M University graduates serving as CEOs of Fortune 500 companies. One of the four is a former student from the Department of Electrical and Computer Engineering.

TRACKING COVID-19

Tracking the spread of COVID-19 is vital for public health decision making. To this end, Dr. Ulisses Braga-Neto is working with undergraduate and doctoral students in the Department of Electrical and Computer Engineering at Texas A&M University to model the spread of COVID-19 and estimate its true prevalence from incomplete and noisy testing data.

Tracking COVID-19 on campus

Senior Durward Cator III is working with Braga-Neto, professor in the department, on a model to track the spread of COVID-19 on Texas A&M's campus using its evolution over space and through time.

The model Cator is using is based on a campus SEIR (susceptible, exposed, infected and recovered) model. The model can generate population plots of the susceptible, infected and recovered individuals on campus. Cator explained that the probability of a contact infection is not directly shown but can be approximately inferred from the graphs. These probabilities can be changed based on factors such as mask wearing and social distancing.

In his model, Cator can account for student behavior, such as movement between buildings and building proximity, to accurately simulate and track the spread of COVID-19 on campus.

Cator began this project when he applied for and was accepted in the Online Research Experience for Undergraduates (O-REU) program over the summer. Shortly after joining the program, Braga-Neto approached Cator with the idea for this project and he was immediately intrigued.

"(The O-REU program) has definitely been a useful experience," Cator said. "I am glad that I did it and I'm happy to continue working on (this project) and hopefully do something useful for the campus and create something everyone can use."

While Cator and Braga-Neto are still running simulations, their ultimate goal is to gather real campus data and then integrate that data into the model to allow them to deploy this tool for campus use.

Expanding to the state of Texas

Doctoral student Yukun Tan is working with Braga-Neto on a similar project, but instead of focusing on the spread of COVID-19 on campus, his research focus encompasses the entire state of Texas.

Tan began this research project after the high second round of reported cases in Texas in June. Prior to tackling this project, he was working with Braga-Neto on signal-processing and machine-learning tools for a gene regulatory network interface, and wanted to use the expertise from that area to explore and predict epidemic-related issues.

Braga-Neto explained that the gene regulatory network project and the COVID-19 model project are similar in that at any given time there is a state of a gene to assess, and for the COVID-19 model, there is a state of an individual to look at, for example whether they are infected or not infected.

"It is a very practical project," Tan said. "If we do well we could not only get the prediction of our current and future situation, but also obtain the guidance of how to prevent and control the epidemic in reality."

One thing that sets Tan's work apart from the campus simulations Cator is running is that Tan can apply the real-world data provided by all the counties in Texas to his model.

For the campus, state and nation, finding a way to accurately track the spread of COVID-19 is the first step in understanding and overcoming the pandemic. Fortunately, researchers at Texas A&M are already hard at work to help solve this problem.



MINIMIZING IMPACT

Combining her love for STEM with her desire to help in the fight against climate change, electrical engineering junior Alyssa Brown has taken part in undergraduate research with a focus on power electronics to help her achieve her goal of aiding in this fight.

For as long as she can remember, electrical engineering junior Alyssa Brown has enjoyed math and science. More recently, she has become painfully aware of the effects of global warming on the world. Combining her love for STEM with her desire to help in the fight against climate change, she decided to pursue a degree in the Department of Electrical and Computer Engineering at Texas A&M University.

"I wanted to do something where I could make an impact on the environment but still be within the realms of math and science and I figured electrical engineering was the best route to do that," Brown said. "I wanted to be part of the industry that could make a difference in power production and renewable energy."

To get a head start on accomplishing her goals, Brown has been working on research with Dr. Prasad Enjeti, TI Professor III in Analog Engineering. In fact, she is currently enrolled in his graduate-level course on power electronics as an undergraduate student and is working on a project in his class to design an AC to DC power adapter with built-in features to make it similar to a typical "brick" on a laptop charger.

"Dr. Enjeti provided some specifications for the project but gave my partner and I design liberty for the most part," Brown said. "This project is very similar to something power electronics engineers would be working on at companies like Dell, Microsoft, Apple and many others since we are also taking into consideration the cost of materials and trying to optimize the design with this in mind."

Brown hopes to earn her doctoral degree in electrical engineering and is excited that she has the opportunity to pursue research as an undergraduate student. Undergraduate research has provided an avenue for Brown to hone her skills and knowledge of power electronics, even if she hasn't taken a course covering the subject yet.

Renewable energy is one of the most effective tools in the fight against climate change. Power electronics can increase the efficiency of renewable energy sources such as wind and solar power. Brown is eager to contribute in this area and her work as an undergraduate student is setting her up for a future filled with possibilities.



Q&A

with computer engineering senior
NADA KORTAM

Nada Kortam is a senior in the Department of Electrical and Computer Engineering. She is a member of the International Student Mentors Association and the founder and president of the Engineering at Galveston Student Association. Kortam shares her passion for helping others and her experiences of being an international student, as well as a student who originally started her academic career at Texas A&M University at Galveston.

How did you get involved in the International Student Mentors Association?

One of my friends last spring told me about her involvement with the International Student Mentors Association. She invited me and my roommates to get together with her and her mentee, and her mentee was really nice; she was from Norway. I just thought it was really cool that you get to have someone that is not from the U.S. and you get to mentor them throughout that semester. I applied that day and later got an interview with them and was accepted. Last semester I had a mentee; he was from India and a graduate student in mechanical engineering. It was really fun to just get to know someone not living here and get to know about his culture. He watched his first American football game here at (Texas) A&M. It was just really cool mentoring someone from outside of the U.S.

Where are you from originally?

I am originally from Egypt. We moved to the U.S. in 2011. I didn't really have someone to help me through the transition because it's literally like a culture shock. I wish someone was there for me, so that's one of the reasons why I did it too. When I moved here, I didn't speak English very well. I just kind of had to learn by myself, but people from other countries who already speak English don't have that much of a transition.

What led to your decision to establish the Galveston Student Association?

I started as a freshman in Galveston and then transferred to College Station as a sophomore. My friends and I were just sitting one day in the Galveston library and I said, "I think it would be cool if we just started a club that unites us over here and helps people who are from Galveston to transition to the College Station campus," because we didn't really have someone to ask. We officially started the club last semester because it took some time to get adjusted and see how we could help other students. We have community events in College Station for anyone who is here now to attend and we also always try to communicate with the people in Galveston through the professors. Last semester, we also did a panel in Galveston to hear their questions and we answered them to the best of our ability.

Why did you choose to study electrical and computer engineering?

At the beginning of my freshman year I wanted to study just electrical engineering and then once I came here and attended Department Information Saturday and did more coding, I realized I wanted to do computer engineering because it combines electrical engineering and computer science. I like programming but I didn't like programming to the point where I wanted to do straight-up computer science – same with electrical engineering. I didn't want to do all hardware; I wanted to do a mix of both. I just thought it was interesting to understand both levels and how they communicate with each other. I'm happy with my decision. I really like coding but I also really like the hardware. I didn't realize how much I liked hardware until I started this major.

What is one piece of advice you would give to an international student coming here for the first time to Texas A&M?

I would say don't be scared of the changes. People behave differently based on the environment they are in. Don't try to change too much to fit in because there are people like you everywhere. Don't change your values or morals because you see someone doing something else. Also try to understand where people are coming from, especially so they can also understand where you are coming from.

What is one piece of advice you would give to a student starting in Galveston but transitioning here to College Station?

I would say manage your time better because classes here are farther away from each other. Know how to get to class and take buses if you need to, don't get scared of the sizes of the classes and try to make relationships with your professors and go to office hours. Also, try to utilize as many resources as you can and find a good group of friends. A lot of people will already have a group of friends because they established that freshman year, but also keep your Galveston group kind of close and try to keep up with them as much as you can even though you will be in different majors. My roommates also went to Galveston and we are the best of friends because we went through the same experience together and no one else did. Anytime I meet someone who went to Galveston, even though I didn't know them while I was there, we know each other – we see each other. I've made friends here that were from Galveston but we didn't know each other at the time. We just have that connection.



Q&A

with electrical engineering senior **MATIJA JANKOVIC**

Matija Jankovic is a senior in the Department of Electrical and Computer Engineering at Texas A&M University. He transferred to Texas A&M from the University of Western Australia in Perth, Australia, in fall 2019. Upon moving across the seas – an experience that he described as both nerve-wracking and exciting – he has joined the Texas A&M Undergraduate Research Program and Engineering Honors Program.

Why did you choose to study electrical engineering?

I chose to study electrical engineering because I enjoy having the ability to design and build electronic devices that can be utilized in many industries. Also, it is a highly relevant field in the future of technological space and has many different areas of specialization.

What advice would you give to another student looking to transfer to the Texas A&M College of Engineering?

I would say to research all the amazing opportunities Texas A&M Engineering has to offer and see whether one of them really appeals to you. These opportunities include research, professional events, industry talks, a large organization base and countless others. If you're looking for a school that incorporates education and research, while also valuing hands-on experience and the communication aspect of the classroom, you should definitely consider Texas A&M.

How would you describe your undergraduate research project?

I have been working in Dr. Roozbeh Jafari's Embedded Signal Processing Lab (ESP Lab) since my first semester at Texas A&M in fall 2019. Dr. Jafari's lab was formed to investigate how embedded processing and sensing systems that use advanced signal processing techniques

can improve medical care and health care. The ESP Lab has many projects that are multidisciplinary, incorporating the areas of biomedical engineering, computer engineering, computer science and electrical engineering. My particular research concerns a cuffless wearable system that can measure blood pressure continuously. With cardiovascular disease as the leading cause of death worldwide, and high blood pressure being directly correlated to that, this research is highly relevant and has the potential to make a positive impact in this area.

What inspired you to participate in a research project as an undergraduate student?

I decided to join the ESP Lab and participate in their research because it was something that I thought would be interesting, innovative and challenging. I also thought it would be a good way to apply the theories and ideas I learned in my coursework to a practical situation. I wanted to engage in an area of electrical engineering that I hadn't particularly known about and something that wasn't commonly thought of as an area of electrical engineering. Participating in undergraduate research is also a good introduction to graduate school, so doing this gave me some idea what the research aspect of a Master of Science would look like.

What are your career aspirations and future goals related to your degree?

My career aspirations include working in the semiconductor industry and applying the knowledge related to my degree to make a positive impact. I have come to have an interest in wearable systems through my research, so I would like to use the research experience I'm gaining in the ESP lab to further my knowledge in this area. I would eventually like to complete a master's degree in electrical/electronics engineering.



SELFLESS SERVICE

The legacy of Dr. Edgar Sanchez-Sinencio



Dr. Edgar Sanchez-Sinencio, TI Jack Kilby Chair Professor and Distinguished Professor in the Department of Electrical and Computer Engineering at Texas A&M University, passed away on Nov. 20, 2020.

Sanchez-Sinencio had been a professor and researcher in the College of Engineering since 1984 and leaves behind a legacy of selfless service, extraordinary leadership, generosity and respect.

He was an unwavering supporter of the department, college and the university, as well as his fellow faculty and current and former students. This year, he made arrangements to create a number of scholarships to maintain and enhance the future of young researchers in analog and hybrid electronics. In addition, with generous help and support of his friends and former students, Sanchez-Sinencio created the Edgar Sanchez-Sinencio and Yolanda F. de Sanchez Chair, which will be used to support the teaching, research, service and professional development activities of the holder.

"Edgar is no longer with us, but his storied career and legacy, created through the success of his research and careers of his students as well as the new endowments in support of the young researchers, will continue to feed the future successes and preeminence of Texas A&M that Edgar was an essential part of," said Dr. Miroslav Begovic, department head and Moore Professor.

Sanchez-Sinencio was the director of the Analog and Mixed-Signal Center and co-author of six books on different topics such as radio-frequency (RF) circuits, low-voltage low-power analog circuits and neural networks. His interests included the area of ultra-low power analog circuits, RF circuits, harvesting techniques, power management and medical electronics circuit design.

"His exemplary and inspired research in analog and hybrid microelectronics has found fertile ground for applications in some of the major U.S. corporations, which gladly employed his students, supported his research and considered Texas A&M a major supplier of the best trained workforce in that area," Begovic said.

Sanchez-Sinencio served in many esteemed capacities of the Institute of Electrical and Electronics Engineers (IEEE), including life fellow. He was a recipient of a Honoris Causa Doctorate by the National Institute for Astrophysics, Optics and Electronics, Mexico, in November 1995, which was the first honorary degree awarded for microelectronic circuit-design contributions. He was a co-recipient of the 1995 Guillemin-Cauer Award for his work on cellular networks, a recipient of the Texas Senate Proclamation for Outstanding Accomplishments in 1996 and a co-recipient of the 1997 Darlington Award for his work on high-frequency filters. He was also a recipient of the IEEE Circuits and Systems Society Golden Jubilee Medal in 1999 and the prestigious IEEE Circuits and Systems Society 2008 Charles A. Desoer Technical Achievement Award.





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