



TEXAS A&M
UNIVERSITY

Department of
Electrical & Computer
Engineering

TEXAS A&M
CORPS OF CADETS
LEADERSHIP
OPPORTUNITY

pg. 6

INTERDISCIPLINARY
COMPUTER
ENGINEERING
PROGRAM

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ELECTRICAL & COMPUTER

ENGINEERING



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Cover: The Electrical and Computer Engineering Student Ambassadors are a team of highly motivated and enthusiastic honors undergraduate students who are competitively selected to serve as representatives for the department. Ambassadors provide a peer-to-peer perspective to prospective students, freshmen and current electrical and computer engineering students.



Letter from the **Department Head**

Every year, the Aggie community experiences many major events and unforeseen challenges, and this year was no exception. If there is anything this past year has brought to my attention, it is that when the going gets tough, Aggies deliver.

Our faculty is hard at work continuing to grow our research enterprise, and the results of their efforts have followed. Several have been recognized by professional organizations and government agencies, including Dr. Dileep Kalathil, who was awarded a National Science Foundation's Faculty Early Career Development Award to address challenges of artificial intelligence evolution; Dr. P.R. Kumar who, with his long and storied career in the sector of wireless networks, was awarded the Institute of Electrical and Electronics Engineers (IEEE) Alexander Graham Bell Medal — one of the most prestigious honors that can be presented to an IEEE member; Dr. Le Xie, who was named an IEEE Fellow for his work in the areas of power systems and big data analytics; and Dr. JV Rajendran, who received an IEEE CEDA Kuh Early Career Award for his contributions to the field of electronic design automation. We also have faculty members who are actively participating in collaborative efforts to better society, including partnerships with the Army Research Laboratory and U.S.-India Collaborative for Smart Distribution System with Storage, which is focused on bridging the gap between smart grid, storage and renewable energy research and facilitating its subsequent adoption by utilities around the world in their distribution system operation and planning. From the culmination of his many years of teaching, Dr. Shankar Bhattacharyya published a new textbook on linear control systems, which is an area that he has dedicated most of his career to advancing.

I am also proud of our students, both undergraduate and graduate, who continue to excel and stand out among the crowd of engineers, further elevating our strong engineering program collegewide. One of our graduate students received the Nokia Bell Labs summer intern award for outstanding innovation for his reinforcement learning project during his summer 2021 internship. Our electrical and computer engineering student ambassadors are a team of highly motivated undergraduate students who are competitively selected to serve as representatives for the department and provide a peer-to-peer perspective to prospective students, freshmen and current electrical and computer engineering students. Again this year, our student ambassadors selflessly donated their time to attend the College of Engineering's Department Information Saturday event and inform their future peers of the opportunities and majors our department offers following successful completion of the common freshmen engineering year. This is another example of how Aggies help future Aggies make the right choices and continue their paths to success. In this publication, you will find many more examples of our students stepping out to accomplish great things.

Texas A&M was among the first to hold in-person classes in the recent fall semester and the results were positive, thanks to our faculty, staff and students who were responsive and participative in measures taken for the safety of all. Some of the situations the COVID-19 pandemic has brought upon us will persist, but we are learning to cope with these circumstances. We have managed to hold safe, successful in-person events such as a recent student event to bring attention to mental health due to isolation and prudently organized outdoor events such as our recent College of Engineering tailgate, which allowed us to share college and department accomplishments. We look forward to creating more opportunities for responsible gatherings to make us feel that we are operating under more normal circumstances. Given the history of COVID-19, it is hard to predict what awaits us in the future, but we have learned to adapt, and with the help of our great students and faculty, we will continue to do so successfully.

Sincerely,

Dr. Miroslav M. Begovic, FIEEE

Department Head and Moore Professor

BY THE NUMBERS

RANKINGS (U.S. News & World Report, 2022)

GRADUATE (Public)

#12 for Computer Engineering

#12 for Electrical Engineering

UNDERGRADUATE (Public)

#11 for Computer Engineering

#8 for Electrical Engineering

GRADUATE (Overall)

#22 for Computer Engineering

#20 for Electrical Engineering

UNDERGRADUATE (Overall)

#17 for Computer Engineering

#14 for Electrical Engineering

ENROLLMENT* (FALL 2021) *preliminary, 5th class day

1,500
Undergraduate

555
Graduate

DEGREES AWARDED*

(AY 2020-21) *preliminary

335 B.S. **198** M.S. **42** Ph.D.

DIVERSITY

21.1% Female Graduate Students

15.1% First Generation Students
(Undergraduate and Graduate)

FACULTY

71 Tenured/Tenure-Track faculty

11 Academic Professional
Track faculty

4 Distinguished
Professors

9 Chairs

6 Members of the
National Academies

14 Professorships

35 IEEE Fellows

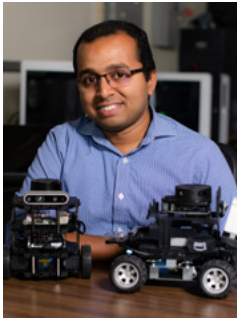
RESEARCH EXPENDITURES

\$27.85 MILLION
(CY 21 Total Expenditures)

RESEARCH LAB SPACE

52,375 Total Square Footage

NOTABLE FACULTY ACCOMPLISHMENTS



Dr. Dileep Kalathil

National Science Foundation's Faculty Early Career Development Award

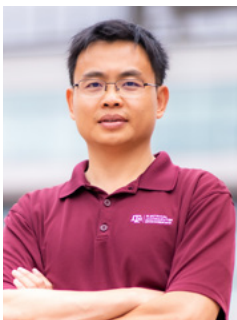
Kalathil is working to make the promises of the artificial intelligence evolution attainable by addressing the resiliency, scalability and data efficiency of the system. Kalathil will also utilize an experiential learning approach to integrate this reinforcement learning research into his educational curriculum.



Dr. P.R. Kumar

Institute of Electrical and Electronics Engineers Alexander Graham Bell Medal

The IEEE Alexander Graham Bell Medal is one of the Institute of Electrical and Electronics Engineers' (IEEE) most prestigious honors and is the highest award by IEEE in communications and networking. Kumar was recognized for his seminal contributions to the modeling, analysis and design of wireless networks.



Dr. Le Xie

Institute of Electrical and Electronics Engineers Fellow

Xie was recognized for his contributions to the economic and secure operations of power systems and big data analytics. He is also a Chancellor Enhancing Development and Generating Excellence in Scholarship Fellow and Presidential Impact Fellow, which are two of the most prestigious scholarly impact awards presented to Texas A&M University faculty.



Dr. Jeyavijayan "JV" Rajendran

Institute of Electrical and Electronics Engineers CEDA Kuh Early Career Award and Office of Naval Research Young Investigator Award

Rajendran received the IEEE CEDA Kuh Early Career Award for his contributions to secure and trustworthy integrated circuits in the field of electronic design automation. He received the Office of Naval Research Young Investigator Award for his research proposal to develop the next generation of tools to bolster hardware security.

Junior selected for Texas A&M Corps of Cadets leadership role

Andrew Bainbridge, a junior in the Department of Electrical and Computer Engineering, was named the 2021-22 deputy corps commander for the Texas A&M University Corps of Cadets.

The Corps is the largest, oldest and most visible student organization and leadership-training program at Texas A&M. As deputy corps commander, Bainbridge will be serving in one of three top senior leadership positions. A third-generation Aggie with a family history of Corps involvement and military service, Bainbridge is excited to continue a legacy of service and leadership.

"Getting this position is really exciting because I can make a larger impact on many people," Bainbridge said. "The current deputy corps commander passed on his rank to me and it said 'Be the Light.' That meant a lot to me because I'll be able to serve and be a resource for people throughout the Corps. I am in more of a support role, which I actually enjoy because I help other people find where they want to go. I am super excited and honored to be in this position."

As deputy corps commander, Bainbridge will assist and work closely with the Corps commander to establish policies and vision for the Corps and its cadets. He will also serve as a resource for numerous special units to help them accomplish their specific goals.

To earn this role, cadets must complete a thorough selection process that consists of an application and an interview with a panel of peers and staff.



All applicants are then evaluated on academic performance, performance in the Corps, success in previous leadership positions, peer and staff evaluations and their leadership vision for the future.

"The Corps does a good job of teaching life skills — time management, discipline, being able to work with other people," he said. "There are several benefits you can get from the Corps, whether you want to go into the military or not."

Throughout his time at Texas A&M, Bainbridge has learned that not everyone's academic and professional journeys will be the same. He has embraced the value of challenges in life and the opportunities they bring to discover more about himself moving forward.

"I think what is wonderful about the Corps is that it pushes you to challenge yourself and get out of your comfort zones," Bainbridge said. "My biggest piece of advice is just being willing to view those difficult times as opportunities and know that it's going to build you as a person. In terms of engineering, it's going to be tough. If you enjoy it at the end of the day, I think it's totally worth it."

Upon graduation, Bainbridge plans to follow his grandfather's footsteps and commission into the United States Air Force.

Ekeruche joins **Zachry Leadership Program** to continue mission of selfless service

Esu Ekeruche is a sophomore in the Department of Electrical and Computer Engineering. Moving from Nigeria to the United States at a young age brought a new perspective to her life and a passion for service and listening to others' stories. She is a member of the Zachry Leadership Program and the National Society of Black Engineers. She is also an electrical and computer engineering student ambassador and has contributed to the engineering student blog, Ingenium.

Q: What drew you to the Zachry Leadership Program?

A: I was intrigued by the Zachry Leadership Program because of its mission to build authentic leaders. They want to really help us lead authentically and be true to ourselves.

Q: Can you share your experience with the National Society of Black Engineers (NSBE)?

A: Having my sights on an engineering career, I thought it would be wise to get involved with an engineering community to find a support system and also learn more about the field. Since Texas A&M offers a general engineering program for freshman year, I talked to a few people in NSBE and they helped me figure out what specific engineering I might be interested in pursuing.

Q: How has your experience moving to the U.S. from Africa when you were younger impacted you?

A: I moved to the U.S. a few months before I turned 11. Even at that early age, it started to broaden my perspective. I was always a forward thinker, but it further accelerated my growth. I started learning even more about my identity in Christ and God's purpose for my life. I formed a closer relationship with my family, and I began volunteering in my community. There were some challenges, but relocating helped me think about what I would want to do in the future and started formulating my ideas and perspective of the world. It also made me more eager and open to listening to people's stories, which I have become very passionate about.

Q: Has anything surprised you coming to college?

A: As a freshman, I was overwhelmed with all of the people that were doing so many cool things. I remember thinking that I didn't really know what cool things I wanted to do yet. Since then, I have learned that while a lot of people are doing a lot of amazing things, we each have to find our own purpose and walk in that. It's been a fun experience to learn more about myself and how I fit in and contribute to my community.

Q: Why did you decide to study electrical engineering at Texas A&M?

A: I have said I wanted to be an electrical engineer for years now. Through the years, I found out that I really love math and I still do. My junior year of high school, I took a digital electronics class and I really enjoyed the class. Attending Department Information Saturday and completing the general engineering coursework freshman year helped me filter what aspects of engineering I was and wasn't interested in. I was also able to talk to some mentors who helped me decide that electrical is what I want to go for.

Q: What advice would you give to another student who has relocated to the U.S.?

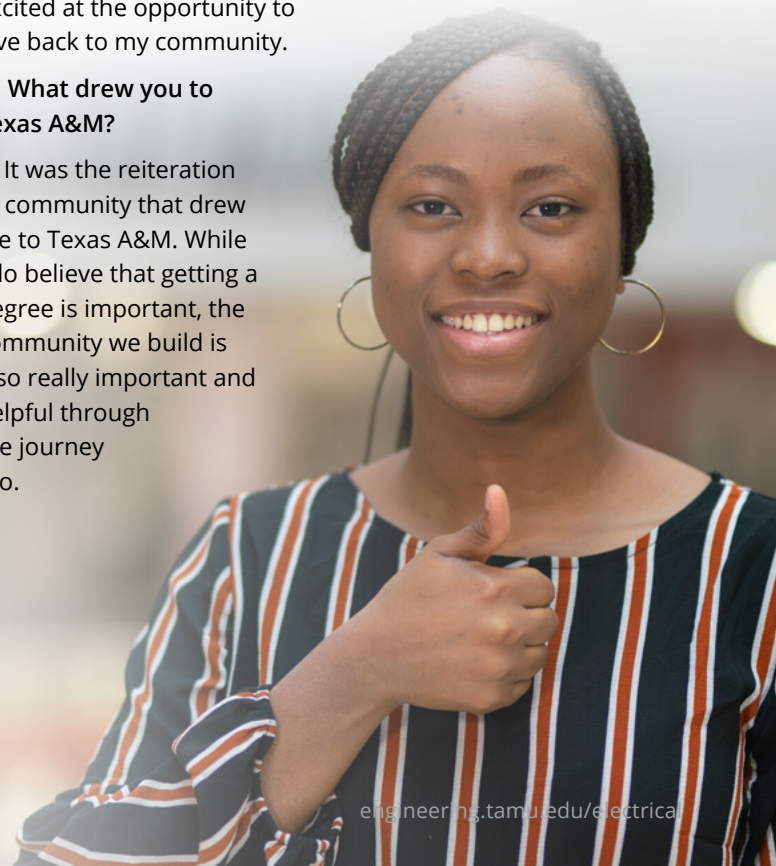
A: I would say you belong here and you are going to find your place here. I would also say that you do not need to rush the process. Be confident that you will find your place at Texas A&M and in whatever area you are studying. You might also sometimes feel like you have two homes, and there's beauty in embracing the entirety of your story.

Q: What is something you would like people to know about you that they might not know?

A: I like to write. I also enjoy problem-solving and community outreach and service. I've said I want to start a nonprofit foundation to educate children for a while now. While I'm still learning more about this passion on my journey with God, I'm always excited at the opportunity to give back to my community.

Q: What drew you to Texas A&M?

A: It was the reiteration of community that drew me to Texas A&M. While I do believe that getting a degree is important, the community we build is also really important and helpful through the journey too.



Texas A&M

AUTODRIVE CHALLENGE TEAM

*wins first overall during
final competition*

Texas A&M University's team, The 12th Unmanned, took first place in the overall dynamic event during the fourth and final competition milestone of the 2021 AutoDrive Challenge held in Ann Arbor, Michigan, June 5-14, 2021.

The AutoDrive Challenge began in 2018 after General Motors (GM) and the Society of Automotive Engineers International announced the inaugural competition, where eight university teams from across the U.S. and Canada, including Texas A&M, would compete to develop and demonstrate a fully autonomous passenger vehicle that can navigate an urban driving course by the end of three years. But due to the COVID-19 pandemic, the 2020 dynamic event was held virtually and postponed.





Computer science and engineering doctoral students Aaron Kingery (team captain), Shu-hao Yeh, Di Wang, Aaron Angert and Shuangyu Xie traveled to Michigan to participate in the year-four event. Yingtao Jiang and Suni Komadam, who are both master's students in the department, served as virtual programming support from College Station. Overall, more than 200 Texas A&M students from across the College of Engineering have contributed to the project, with more than 70 undergraduate and graduate students participating during its fourth and final year.

"It's just very rewarding after a lot of hard work to get back on schedule and actually meet the demands of the competition," said Kingery. "It was really satisfying to get there and have the vehicle actually perform. I'm so thankful for all of the people who put in a lot of time and effort into this project through the years," Kingery said.

While Texas A&M placed first in the competition, the road to the final challenge was not an easy one. After going through a series of major setbacks during the second year, followed by a global pandemic that forced team members to work virtually, the team overcame great obstacles and remained determined to win.

"After year two, we realized that the vehicle in its current setup really needed a shift in order to

perform in the way that the whole team wanted it to," Kingery said. "So, taking the lessons we learned from those first two years of the competition, we adjusted course and redesigned the structure of the car's software, which ultimately resulted in us doing the equivalent of four years of work in the last year."

This year's competition was held at the University of Michigan's Mcity, which is a testing facility that simulates various driving situations that a vehicle might encounter while driving in a typical urban area. During the event, the teams had to face two dynamic challenges to test the car's full capabilities and their technical competence.

The first event challenged the car's ability to interact with and respond to stoplights, a railway crossing, street signs and pedestrians. For the second challenge, the car's GPS sensors were turned off suddenly and the team had to demonstrate what they would do if the systems failed.

The students were led and supported by GM advisor Matthew T. Boyle; project leader Dr. Dezhen Song from the Department of Computer Science and Engineering; Dr. Jian Tao from the Department of Electrical and Computer Engineering; and Dr. Debijoti Banerjee, Dr. Swaroop Darbha and Dr. Swaminathan Gopalswamy from the J. Mike Walker '66 Department of Mechanical Engineering.

COMPUTER ENGINEERING PROGRAM

Computer engineering at Texas A&M University is jointly administered by the Department of Computer Science and Engineering and the Department of Electrical and Computer Engineering. This interdisciplinary program approaches both computer hardware and software from an engineering perspective.

Computer engineering students benefit from both departments' strengths. In particular, this program encapsulates both an emphasis on digital very large-scale integration circuits and systems, and microprocessor interfacing and systems design; and computer system architecture and design. It also focuses on computer networks, computer architecture, artificial intelligence, computer

graphics, robotics, real-time computing, computer languages, and large-scale hardware and software systems.

Students get a strong foundation in mathematics, physics and chemistry. They also take courses in electrical circuits, electronics, digital circuits, computer architecture ranging from mobile and embedded architectures to big-data servers, interfacing, computer systems, programming languages, data structures, analysis of algorithms, operating systems and software engineering.

The curriculum is designed to cover the engineering aspects of both hardware and software from a total computer systems perspective.



A platform to connect with peers

From podcast student host to engineering student representative, Drew DeHaven is focused on making an impact on other students – and letting their voices be heard.

DeHaven, a senior in the Department of Electrical and Computer Engineering, joined the Student Engineers' Council (SEC) in 2019 and is now a part of the legislation committee, which bridges the gap between students and faculty in the college by relaying the perspective of the engineering student body to the college administration. Each year, the committee drafts an Engineering Student Survey for all engineering students and presents the results to the dean, associate deans, department heads and program directors of the college.

"I think getting to present these results to faculty and leadership is a very important job, and I'm really glad I've gotten a chance to be on the committee that gets to do that."

Continuing his desire to hear from his peers, DeHaven is the first student host of the Texas A&M Engineering: SoundBytes podcast segment "Just a SEC" which, in partnership with the SEC, focuses on conversations about lessons in leadership, best practices for growing a professional network and highlighting the transition between education and industry. He and fellow student Ritika Bhattacharjee co-host "The Study Break," which explores the Texas A&M engineering community through conversations about students' lives and experiences in the College of Engineering.

"Everyone really does have an interesting story to tell and

a unique experience, and our job is to get that story out of them," DeHaven said. "That's something we've had to grow in as our roles as hosts, as well as getting authentic conversations and getting people to share those really interesting stories."

As a senior in electrical engineering, DeHaven gets to explore his interest in electricity and magnetism and his passion to build and design.

"With electrical, I can design anything from entire power grids that help support states or nations, or I could work on the smallest of devices that get made trillions and trillions of times, such as transistors," he explained. "I like the scale that it offers."

Last summer, DeHaven took his interest in design and completed a virtual internship with Texas Instruments, where he served in an application engineering role. He worked on the radar team that built and designed radars for use in industries such as health care, automotive and industrial.

Looking ahead, DeHaven is still deciding whether to pursue a master's degree with a focus on signal processing or to pursue employment within industry.

"At the end of the day, what I have enjoyed the most about my time at A&M is all of the many opportunities for friendship and personal development," he said. "I hope that anyone who reads this remembers to seize the day and live boldly and purposefully. Life happens fast; don't forget to make it interesting."





TEXAS INSTRUMENTS INTERNSHIP OPPORTUNITY

Leo Predanic has always been drawn to the analog sector of electrical engineering. This interest led to a special opportunity to complete a summer internship with one of the largest recruiters of students from the Department of Electrical and Computer Engineering — Texas Instruments (TI).

During the internship, Predanic worked alongside the design verification team on pre-silicon design projects, which focus on the design of the integrated circuits (IC) before they are fabricated and ultimately undergo the manufacturing process. One of his team's responsibilities was to run simulations on the IC designs to ensure that despite inevitable variability during the manufacturing process, they would function as expected.

Due to an initial lack of confidence in his programming skills, a couple of his assigned projects were daunting at first but ended up being notably fulfilling. Over the summer, his confidence in his programming abilities grew exponentially and the tools he used will stay with him throughout his academic career and future professional endeavors.

"One of the things that I didn't know going in was how much some of the skills, such as programming, that I had already picked up during my time at A&M were used by engineers in the industry."

Having run into many challenges along the way, Predanic explained that the most rewarding aspect of this internship was seeing his projects come to fruition before his eyes.

"It's hard to see the big picture of the final machine compared to just your little gear," he said. "If you had asked me four months ago if something like that was possible, I would have said, 'I really don't know.' But seeing how all the pieces are integrated and come together to finally work — from inception to final product — was one of the most impressive things."

During his internship, Predanic was also able to shadow some of the other engineers on the design verification team and see firsthand what they do on a daily basis as these designs are prepared for fabrication. He also was able to attend kickoff meetings for other projects and see how the company plans projects from start to finish and executes them as successfully as possible.

"Those are all things that I never would have heard of at school," Predanic said. "The sheer scalability of a company like TI was extremely eye-opening and far more impressive than I could have imagined."

COMPUTER ENGINEERING SENIOR TAKES ADVANTAGE OF COLLEGE, UNIVERSITY OPPORTUNITIES

Haoning Wang is a senior studying computer engineering at Texas A&M University. With a strong work ethic and an eagerness to dive into new experiences, he has found himself a part of many different opportunities within the university throughout his academic career.

Wang has been involved with the Corps of Cadets since he joined Texas A&M as a freshman. He credits the Corps with building up his leadership skills and broadening his perspectives. His early involvement with the Corps has served as a catalyst for the other activities outside of his coursework in which he has participated.

During his sophomore year, Wang participated in the ENDEAVR (Envisioning the Neo-traditional Development by Embracing the Autonomous Vehicles Realm) Smart City Project, a nonprofit organization led by a multidisciplinary group of Texas A&M professors. The project is dedicated to preparing small communities to tackle future challenges by enabling them to become smart cities. The idea of ENDEAVR is to train the next generation of Aggie engineers to work with diverse stakeholders, perform sophisticated analyses and make decisions under complex, and often uncertain, situations. This program allowed Wang to work with students in other majors

across campus in a team setting to execute road flooding prediction utilizing their different skill sets.

The following year he pursued two separate undergraduate research opportunities, one through AggieE_Challenge, and the other as part of Human Factors and Machine Learning Lab under Dr. Tony McDonald, assistant professor in the Wm Michael Barnes '64 Department of Industrial and Systems Engineering.

AggieE_Challenge is designed to engage

engineering undergraduate students with multidisciplinary team research projects related to engineering challenges facing our society. As part of it, Wang participated in the Disaster Informatics Solutions challenge under Dr. Ali Mostafavi, associate professor in the Zachry Department of Civil and Environmental Engineering.

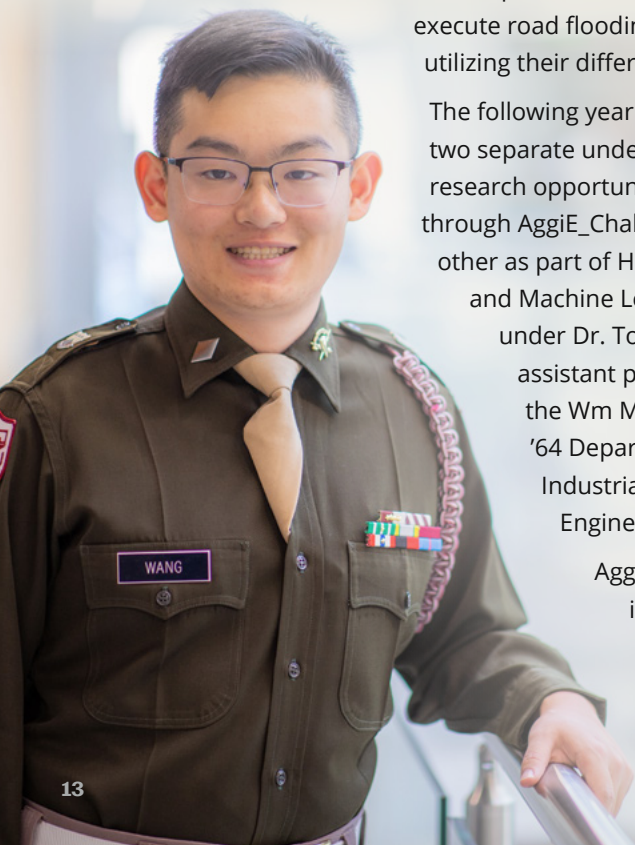
“AggieE_Challenge was a rewarding experience because I got to work on something that had a real-world impact while also expanding my skills in terms of coding,” Wang said. “In the Human Factors and Machine Learning Lab, I was able to apply the skills taught in my coursework to analyzing cyclist overtaking behavior in simulated driving.”

In summer 2021, Wang completed a 12-week internship with General Motors (GM), where he worked as a design release engineer intern under GM's Electronic Components and Subsystems Function. In this role, he used skills obtained through his computer engineering coursework to evaluate the data from suppliers to ensure that what they were offering would be beneficial for use in future vehicles.

“(Texas) A&M offers a variety of opportunities, both within the College of Engineering and outside,” Wang said. “I think one of the strongest points about A&M is that you're not just siloed with the College of Engineering for four years. There are so many opportunities here at A&M to grow your hard skills as well as your soft skills in terms of communication, leadership and character development.”

Each of these experiences has built upon one another to create a unique and fulfilling academic experience. By stepping out of his comfort zone and pursuing vastly different opportunities at every turn, Wang has proven that sometimes the need to succeed is the motivation to continue putting yourself out there, even when it might seem daunting.

“I think what drew me to study at Texas A&M is obviously that it has a really fantastic engineering program,” Wang said. “Students who graduate from A&M go into a variety of industries and are a part of some of the best companies in the world. I feel that if you do come to A&M to study engineering, you'll have as many opportunities offered to you as you desire.”



Recent *Student Competition* Successes



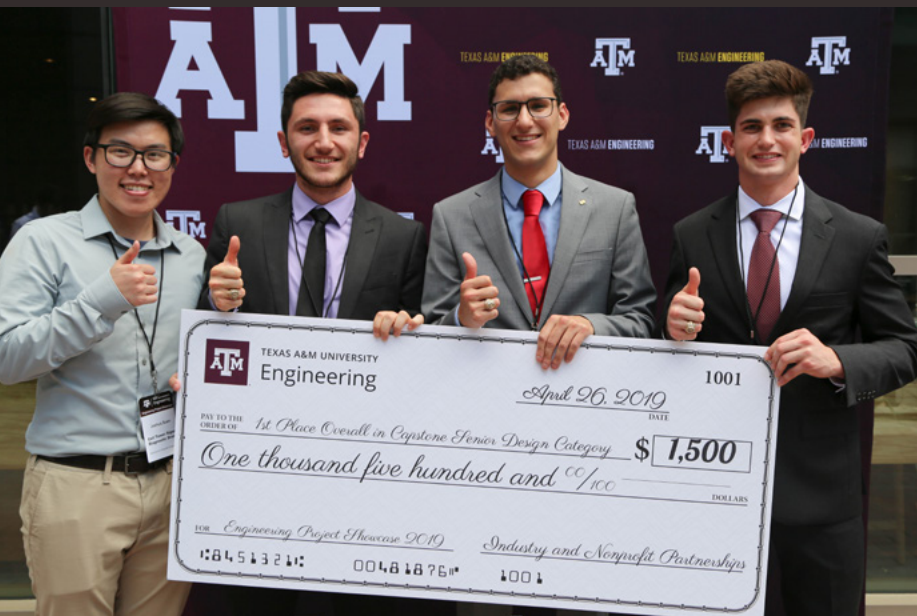
Cybersecurity Awareness Worldwide

*Second place in 2019,
Third place in 2018*

SICK Inc. TiM\$10K challenge

*First place in 2019,
Second place in 2021*





Engineering Project Showcase

First place in 2021,
First place 2019

The University of Texas at Dallas ExCELLENCE in Senior Design Showcase:

Step Forward Award
2021



This year, our students are preparing to participate in the Cybersecurity Awareness Worldwide competition, the Texas A&M Engineering Project Showcase and the Raytheon Technologies Quadcopter Challenge.

Learn more about our Capstone Program: tx.ag/ECENcapstone



TEXAS A&M UNIVERSITY
Department of Electrical
& Computer Engineering