



2019 Issue 3 // Volume 115

# THE BRIDGE

The Magazine of IEEE-Eta Kappa Nu

## Graduate Education

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## Graduate EDUCATION



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**(Deadline: 30 June)**

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IEEE-Eta Kappa Nu (IEEE-HKN) was founded by Maurice L. Carr at the University of Illinois at Urbana- Champaign on 28 October 1904, to encourage excellence in education for the benefit of the public. IEEE-HKN fosters excellence by recognizing those students and professionals who have conferred honor upon engineering education through distinguished scholarship, activities, leadership, and exemplary character as students in electrical or computer engineering, or by their professional attainments. *THE BRIDGE* is the official publication of IEEE-HKN. Ideas and opinions expressed in *THE BRIDGE* are those of the individuals and do not necessarily represent the views of IEEE-HKN, the Board of Governors, or the magazine staff.

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# THE BRIDGE

The Magazine of IEEE-Eta Kappa Nu

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Sahra Sedigh  
Sarvestani  
Gamma Theta



Stephen Williams  
Iota Beta

## The theme of this issue is “Graduate Education: Advice from Professionals and Students.”

The theme of this issue is “Graduate Education: Advice from Professionals and Students.” As editors, we chose this topic because we are confident that every IEEE-HKN member values scholarship and is capable of reaching the pinnacle of leadership in their chosen profession. Graduate education builds on scholarship to facilitate and accelerate the journey towards professional leadership. In almost every country across the world, postgraduate qualification, i.e., a master’s or doctoral degree, is a requirement for a career in academia. In industry and government, these qualifications are typically required for positions with greater authority and more intellectually challenging work. With undergraduate qualifications alone, it could take years longer to advance to these desirable positions.

This themed issue presents multiple perspectives on graduate education. Each of our contributors shares the story of his or her graduate education, and you hear directly from them about their journey from motivation to graduation and employment – and the lessons they learned along the way. Our contributors are demographically and professionally diverse, and the insights they provide are impressive in breadth and depth. A highlight of the issue includes an article by Dr. Karen Panetta, President of IEEE-HKN and Dean of Graduate Education for the School of Engineering at Tufts University, who draws on both roles to inspire and inform.

Emily Hernandez and Katelyn Brinker, two recent winners of the IEEE-HKN Alton B. Zerby and Carl T. Koerner Outstanding Student Award are among our contributors. This award annually honors the most outstanding students in the IEEE-HKN designated fields of interest. Both of the awardees featured in this issue describe how they built on their excellence as undergraduates to succeed in graduate school. Wendy Fernandez, a 2019 Graduate Education for Minorities (GEM) Fellow, describes the role of service in inspiring her graduate education and professional ambitions. Each of our other contributors has a unique voice and story, and their accomplishments demonstrate not only the value of graduate education, but more generally, the scholarship, character, and attitude encouraged and rewarded by IEEE-HKN.

Many contributed to the creation of this themed issue. Special thanks go to each of our contributors; Dr. Emmanuel Oyekanlu, member of the magazine’s editorial board; Ms. Nancy Ostin, IEEE-HKN Director and Managing Editor of the magazine; and Ms. Stacey Bersani, our assistant managing editor who coordinated every aspect of the creation of this issue.

A plethora of funding mechanisms and distance education have made graduate education more accessible than ever. The rapid advances in our field make it increasingly critical. We hope that this issue inspires our readers to pursue graduate education. Each of the 263 chapters around the world is a home for IEEE-HKN members, including graduate students who are new to the institution. Enjoy the issue. May all of your efforts be fruitful!



Photo courtesy of IEEE-HKN Mu Nu Chapter in Turin, Italy.

## Why Should I Go to Graduate School?

*Dr. Karen Panetta, Epsilon Delta, IEEE-HKN President*

Why should I go to graduate school? It is a question I often hear from students who have “had enough” of school and just want to go out and make money, pay off debt, and start “living” as a human being.

Imagine not having to lose sleep anymore, having a focused work plan each day, and being able to support yourself and those you love. Don’t forget the best part: no more exams or demands from those evil professors who have never worked a real job in their life!

These are all the reasons I hear for not going back to school to pursue a graduate degree, but let’s dive a bit deeper and ask a few more questions.

First, to move ahead in your career, you need to always be learning. Now, that can be through company training and professional development workshops and not necessarily through a formal degree program. However, most companies are structured to pay based on an individual’s experience and degree attainment. This means that if you are in the workforce today and have five years of work experience under your belt, a student out of school who walks in with a graduate degree may be making as much as you or more. Is this fair? From the industry point of view, new hires have the latest and greatest skill sets and a master’s degree or Ph.D. is a metric that typically indicates that the individual has done something in-depth in a current hot-topic research area.

A master’s degree can be earned in as little as one year at many institutions. This is especially true for students who remain at their undergraduate institution for the master’s program. Compare this scenario to moving to a new institution which may be in a new city. You will need to get to know new professors and spend up to two years earning your master’s degree. Meanwhile you are panicking that you are losing out on two years’ worth of work experience and income.

The real reason to go to graduate school may not be financially motivated at all. It may be because you want to expand your skill set, change disciplines, or become more diversified so that you are qualified for broader opportunities rather than a discipline-specific job.



For example, students who have earned an undergraduate degree in biomedical engineering may elect to pursue a computer science master's degree. This complements their skill sets so that they are ready to capitalize on their expertise in one field while using the concepts learned in another field to create an entirely new career path.

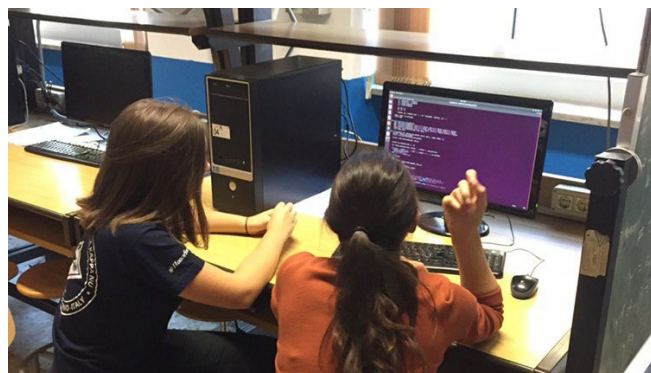


Photo courtesy of IEEE-HKN Mu Nu Chapter in Turin, Italy.

On the other hand, if your goals are to earn a Ph.D. in a specific field, then you will want to attend a graduate program that does go in depth into a discipline. This important decision is all about what your personal goals are! Going to graduate school because you just don't know what to do with your life is a recipe for disaster and misery!

Graduate work takes focus and passion. If the passion is not there, you will feel like a zombie going through the motions and feeling totally unfulfilled. This is why I often recommend that students do go out and get a real job! Find out what you like and don't like. If you discover some project that you are passionate about, you may want to go find a program that helps you further develop expertise and investigate the field in more depth. You may even discover an engineering management degree or MBA is more suited for your aspirations than earning another technical degree.

Companies support graduate education, which eliminates the fear of incurring more debt and it allows you more time to complete schooling at your own pace. I always recommend to undergraduate students that if they have time and space in their undergraduate program, to take additional courses. Go ahead and take more higher-level courses, even if you don't need them to graduate. Schools will

reserve or set aside these unused course credits so that you can transfer them into graduate school when you are ready.

Be careful though! You have to make sure you officially reserve them through your undergraduate institution before you graduate, so your transcript reflects that the courses were not used as credit

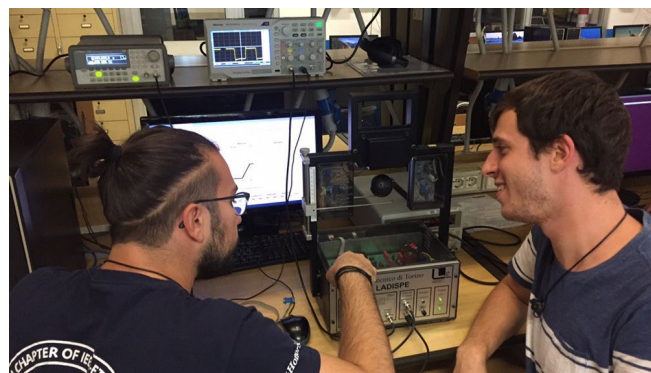



Photo courtesy of IEEE-HKN Mu Nu Chapter in Turin, Italy.

toward your undergraduate degree. Some graduate institutions will accept and transfer courses up to seven years after you take them. Be sure to take courses other schools find comparable to what they also offer. For instance, if you take a special topics in "brain psycho acoustics" course and there is no equivalent course at your graduate institution, they may not be so willing to transfer it in.

Keep the syllabus for all the courses you wish to transfer to another institution, so that you have the information ready when you matriculate into a new graduate program. Courses and instructors change dynamically, so you can't rely on the information being present on the website or in a bulletin, years after you took the course.

Some companies even offer students the opportunity to pursue a graduate degree full-time with full pay! This is the ultimate option. However, a company may have you sign a contract that after you graduate, you need to stay with that company for a specific period of time. Most companies support part-time students to attend graduate school and although it may take longer, you may have some of those additional undergraduate courses ready in reserve to help bring the time to your degree completion down significantly.

One of the great things about going to graduate school is the opportunity to interact with other professionals who are also working in industry. This cohort could give you an opportunity to meet someone at another company for which you want to work in the future. Many graduate programs have adjunct professors from companies lecturing at night, so again, you meet other professionals who may be your next professional colleagues!

The best reason to go to graduate school is to focus on your personal goals and to gain access to the best state-of-the-art educational resources. Those can be people, equipment, software, or networks and support services that enable your career advancement. When you are done, you will inevitably make more money, but you will also know that you are ready to take on any new challenge and pursue new opportunities as a leader. 



**Dr. Karen Panetta**, a Fellow of the IEEE, is the 2019 IEEE-HKN President. She is the Dean of Graduate Education for the School of Engineering and a Professor of Electrical and Computer Engineering and Adjunct Professor in Computer Science at Tufts University in Massachusetts. Dr. Panetta received a B.S. in Computer Engineering from Boston University, and the M.S. and Ph.D. in Electrical Engineering from Northeastern University in Boston. She is the Editor-in-Chief of the award winning IEEE Women in Engineering Magazine. She previously served as the Chair for IEEE Women in Engineering, overseeing the world's largest professional organization supporting women in engineering and science. Karen is currently a Member-at-Large on the Systems, Man and Cybernetics Board and has traveled around the globe to inspire youth to pursue engineering through her internationally acclaimed "Nerd Girls" Program, which shows how engineers and scientists are creating innovations for the benefit of humanity. Before joining the faculty at Tufts University, Karen was a Principal Engineer for Digital Equipment Corporation.



## Tradition Runs Deep with 115-Year-Old Eta Kappa Nu

In a shady spot under a large cottonwood, on the campus of the University of Illinois at Urbana-Champaign, our founders saw the need for an honor society – one that by invitation would recognize scholarship, attitude, and character. The vision was to promote the highest ideals of the engineering profession and form an organization where professionals and students help each other.

28 October 2019 marks the 115th anniversary of the founding of Eta Kappa Nu. It's the perfect time to raise awareness of the value that an IEEE-HKN Chapter brings to a university, show the many ways a chapter serves fellow students and the community, and encourage industry to support us. Today's IEEE-HKN students are the leaders of tomorrow.

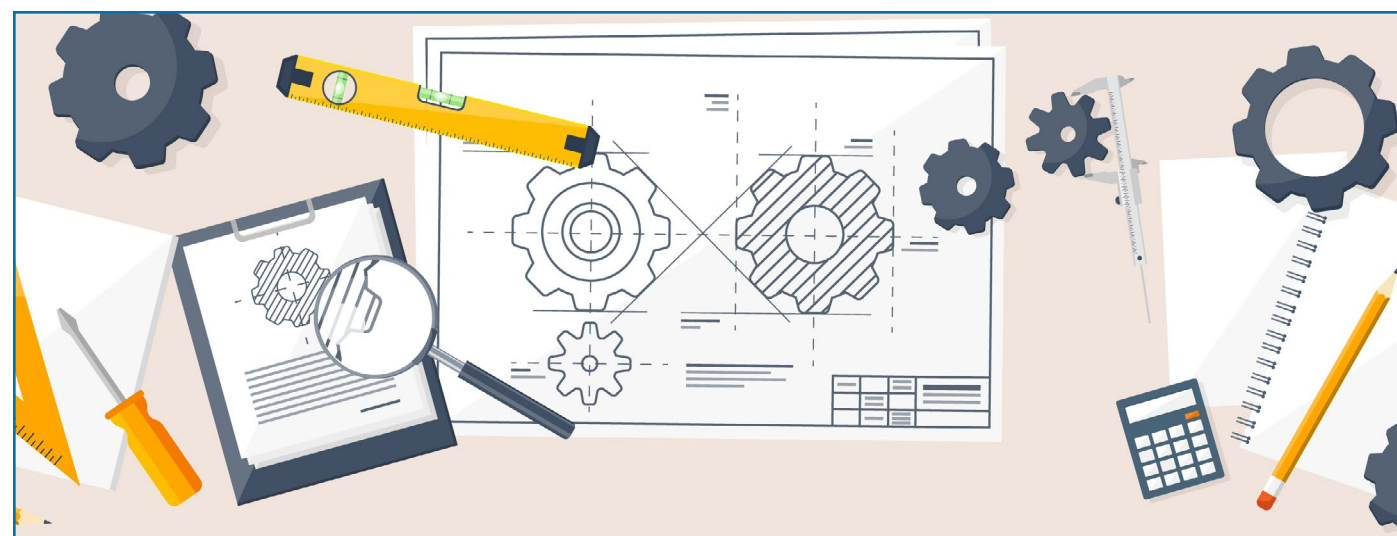
Chapters throughout the world are planning Founders Day events to mark this auspicious occasion. Some will hold social gatherings. Others will participate in a community service event. Others may tour the workplace of an alum to see what opportunities they may have. While others still will invite alumni to campus to discuss career paths, professional development and the things they don't teach you in engineering school.

If you are interested in helping your chapter or a chapter near you celebrate, please fill out the Alumni Reconnect Form on the HKN website. Your support just may be the one thing a student needs to envision a successful future. So this Founders Day, give back if you can. Once HKN, always HKN.



Tom Rothwell, (at right in photo), President of the Upsilon Chapter in 1954, devoted vast amounts of time and energy to Eta Kappa Nu for decades before his death a few years ago. Fondly remembered by all who knew him, Tom is shown here with an HKN Pledge Key and current HKN Governor At-Large John DeGraw, another devoted alum. The Key, the Crest, the Wheatstone Bridge and the Induction Pledge are traditions that are part of the fiber of HKN and remain strong symbols of the Honor Society 115 years into its existence.





## IEEE-HKN Senior Design (Capstone) POSTER COMPETITION

### Are you working on a Senior Design (Capstone) Project?

Enter a poster describing your project in the IEEE-HKN Senior Design Poster Competition. Abridged versions of selected posters will appear in an upcoming issue of *The Bridge*, with authors being recognized.

#### ELIGIBILITY

- The project should have been completed as part of your undergraduate coursework in a topical area of IEEE interest, and supervised by a faculty member.
- The work must have been conducted since 2018.
- Copyright must be available for all images and figures.
- Previously published work is eligible if reprint permission has been granted.

#### REQUIREMENTS

- Submissions should be in .PDF format.
- Your poster must include the following information:
  - Project Title
  - Names and affiliations of project team members (students)
  - Name and affiliation of faculty supervisor
  - An abstract that briefly describes the project
  - Motivation
  - Approach
  - Conclusions
  - Acknowledgments (optional)

**To enter, complete the submission form on the HKN website.**

Entries must be received by 20 March 2020

### HEAR IT FROM PROFESSIONALS:

## Lessons Learned and Advice for Graduate School

We asked our colleagues why they went to graduate school, when they began, any advice they have for students considering an advanced degree, and what they would do differently.



**Emmanuel  
Oyekanlu**

Beta Alpha

*Data Science Engineer, Comcast*  
Editorial Board Member of *The Bridge*

#### Education

- Drexel University, USA (PhD, Electrical Engineering)
- Blekinge Institute of Technology, Sweden (MSc., Signal Processing, Electrical Engineering, and Telecommunications)
- Ladoke Akintola Univ. of Technology, Nigeria (B.Tech, Computer Engineering)

#### Why did you go to graduate school?

I always wanted to help solve my country's challenges in the area of telecommunication and power system infrastructure. I deduced that studying all I could in those areas would enable me to impart my knowledge to other people. And collectively, we can solve those problems together.

#### Did you begin your graduate studies immediately after graduating with a bachelor's degree?

No. I had to work for some years before my MSc studies, then I worked for a few months before my PhD studies.

#### How did you fund your graduate study?

I got a Swedish government tuition-only scholarship for my MSc studies. I had to work during the night to augment my income and be able to pay for accommodation, etc. I used a combination of teaching assistantships and fellowships for my PhD studies.

#### What advice do you have for students considering or beginning graduate study?

- Try and find an advisor that has the same vision and general interest as you do. You can always identify such people by reading their published works.
- Be prepared to work hard and undertake challenges—more than is required of you.
- Find problems and studies in areas that you enjoy.
- When undertaking research challenges, know that it is all part of what will make your sojourn a success.
- I am a Christian, as such I found out that prayers supported with hard work help me a lot. It may do the same for you if you are religious.
- Try to find a balance between your studies and other areas of your life.
- Enjoy yourself, no matter what!

#### In hindsight, what do you wish you had done differently during graduate school?

I would have endeavored to publish more research works than I did. All that I published proved very valuable for my professional success later in life.





George D. Sworo

Lambda (MSc)  
Beta Alpha (PhD)  
Senior Software Engineer, Intel

Education

- University of Pennsylvania (BS and MS)
- Drexel University (PhD)

Why did you go to graduate school?

I was very interested in expanding my knowledge in the field of wireless communications and building on the basics I had learned in the master's program. I felt that a rigorous PhD program would satiate that desire and passion.

Did you begin your graduate studies immediately after graduating with a bachelor's degree?

I was privileged to benefit from the University of Pennsylvania's sub-matriculation program that offered me the chance to graduate with both a bachelor's and master's degree in five years. This really helped me in making the right decision on the area of research I wanted to pursue during my doctoral studies.

How did you fund your graduate study?

I was blessed to be offered research and teaching assistantships throughout my graduate studies. Additionally, I was able to gain some industry experience during this period through summer internships.

What advice do you have for students considering or beginning graduate study?

Have an idea of what you are passionate about and search for advisors whose research interests align with that passion. And of course ask about their research and work styles to make sure they are compatible with you.

In hindsight, what do you wish you had done differently during graduate school?

Networked more during conferences.



Jayant Apte

Data Scientist,  
HPV Precision Analytics

Education

- Vidyalankar Institute of Technology, India (B.Sc, Electronics & Telecoms Engineering)
- Drexel University (PhD)

Why did you go to graduate school?

I always wanted to be a scientist, so going to graduate school was a natural step.

Did you begin your graduate studies immediately after graduating with a bachelor's degree?

Yes.

How did you fund your graduate study?

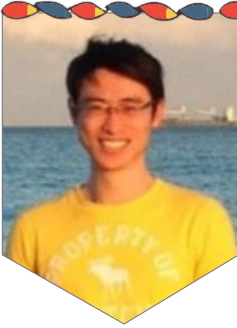
For the first six months of graduate school, I was in the MS program and funded through my parents' savings. During those six months I joined my eventual PhD advisor's laboratory as a volunteer. After working with my advisor for six months and excelling in courses taught by my advisor, I was offered a PhD position, which was funded through research and teaching assistantships. For one summer I was funded through an internship.

What advice do you have for students considering or beginning graduate study?

1. When choosing a research problem, try understanding the broad vision that makes solving that problem important, along with some sense of the market impact it can have in the industry.
2. When approaching potential advisors, learn to write good emails that maximize the probability of getting a response – this includes using good English and doing background research.
3. Have a good idea what you intend to pursue as career after graduate school.

In hindsight, what do you wish you had done differently during graduate school?

I wish I had paid more attention to lifestyle choices and work-life balance. I also wish I had engaged more with peer researchers at conferences.



Ji Wang

Beta Alpha  
Machine Learning Engineer,  
Essenlix Corporation

Education

- Drexel University (PhD, Electrical Engineering)

Why did you go to graduate school?

I believed that undergraduate study alone was not enough for finding a job I would want. I also wanted to learn more theory and applications than I had as an undergraduate.

Did you begin your graduate studies immediately after graduating with a bachelor's degree?

Yes.

What advice do you have for students considering or beginning graduate study?

Choose your adviser and research carefully. This will influence not only your five years of study, but also your future work.

In hindsight, what do you wish you had done differently during graduate school?

I wish I had published more papers.



Jie Ren

Beta Alpha  
Senior Engineer, Huawei Technologies

Education

- Tsinghua University, China (B.Sc, Electrical & Electronics Engineering)
- Drexel University (PhD)

Why did you go to graduate school?

I wanted to better understand myself, identify my talents, and learn how to have a successful career. Undergraduate studies alone can't fully answer those questions.

Did you begin your graduate studies immediately after graduating with a bachelor's degree?

Yes. I guess I was not ready to work at that moment.

How did you fund your graduate study?

Mostly through research assistantships, as well as some teaching assistantships.

What advice do you have for students considering or beginning graduate study?

Graduate study is like tuning a generative adversarial network, let it run for some time; don't give up too early.

In hindsight, what do you wish you had done differently during graduate school?

Read more papers, spent less time on League of Legends.





Marco Janko

Beta Alpha  
DSP System Engineer,  
Cirrus Logic

Education

- Universidad ORT Uruguay (B.Sc, Electrical Engineering)
- Drexel University (PhD Electrical Engineering)

Why did you go to graduate school?

To learn about engineering, and then to create knowledge in engineering-related fields

Did you begin your graduate studies immediately after graduating with a bachelor's degree?

No, I spent about a year working in industry before moving to graduate school

How did you fund your graduate study?

I was appointed as a teaching assistant and a teaching fellow, which covered the costs of tuition.

What advice do you have for students considering or beginning graduate study?

You should be passionate and committed to the objective of getting your degree. If you have focus and a good advisor, your experience will be a very good one.

In hindsight, what do you wish you had done differently during graduate school?

I think I should have had a clear research focus before starting graduate school, and I should have pushed myself into learning writing and reading skills to a high standard. These are fundamental to earning a PhD.



Sahra Sedigh Sarvestani

Beta  
Associate Professor of ECE and  
Associate Chair for Distance  
Education, Missouri University of  
Science and Technology  
Co-Editor-in-Chief of *The Bridge*

Education

- Purdue University, USA (MS, Electrical Engineering) (PhD, Electrical and Computer Engineering)
- Sharif University, Iran (BS, Electrical Engineering)

Why did you go to graduate school?

I was genetically predisposed, given that both of my parents were professors. On a more serious note, I learned through undergraduate internships that an undergraduate degree would qualify me only for jobs that were less challenging and had less potential for professional advancement.

Did you begin your graduate studies immediately after graduating with a bachelor's degree?

Yes.

How did you fund your graduate study?

Through research and teaching assistantships, a fellowship, and working in industry (towards the end of my PhD).

What advice do you have for students considering or beginning graduate study?

Choose your advisor carefully. Ensure that your working styles are compatible, and that you understand your advisor's expectations.

In hindsight, what do you wish you had done differently during graduate school?

I wish I had spent more time on creating relationships with graduate students from other laboratories.



Simon Begashaw

Beta Alpha  
Antenna/Wireless Engineer,  
Apple

Education

- Villanova University (B.Sc)
- Drexel University (MS and PhD)

Why did you go to graduate school?

During my undergraduate studies, I became fascinated with wireless communications systems through some of the courses I took. Subsequently, I worked in the telecommunications industry and my interest in the field grew. I wanted to be on the "cutting edge" of the field, working on developing the next generation of wireless technologies. I quickly realized that most of the research and development roles in industry required graduate degrees and experience with independent research. Hence, graduate school was the logical path for pursuing a career in developing wireless technologies.

Did you begin your graduate studies immediately after graduating with a bachelor's degree?

No. After earning my bachelor's degree, I worked in the telecommunications industry as a Radio Frequency (RF) Engineer for over two years.

How did you fund your graduate study?

My graduate studies were funded through research and teaching assistantships that covered the cost of my tuition and living expenses.

What advice do you have for students considering or beginning graduate study?

For students beginning graduate study, I would advise them to voraciously read academic research papers in their field. One of my mentors in graduate school had a practice of reading one academic paper per day. Start out with the seminal or most cited papers in your field.

In hindsight, what do you wish you had done differently during graduate school?

I wish I had been more of a self-starter earlier in my graduate school career instead of waiting for guidance from my advisor or more senior graduate students. It took me some time before I realized that the PhD was ultimately my degree and I had to take control of the research direction.



Stephen Williams

Iota Beta  
Professor and Chair of EECS,  
Milwaukee School of Engineering  
Co-Editor-in-Chief of *The Bridge*

Education

- University of Missouri (BS, MS, and PhD)

Why did you go to graduate school?

I wanted to have a career as an engineering educator.

Did you begin your graduate studies immediately after graduating with a bachelor's degree?

I took a full-time engineering job immediately after graduating with a BSEE. I took one year off from school while starting my first job. Then I started going to graduate school at night while working my day job.

How did you fund your graduate study?

My employer paid the tuition for my MSEE. I left industry to pursue a PhD, full-time. My PhD tuition was funded through a research assistantship.

What advice do you have for students considering or beginning graduate study?

Write down the reasons you are going to graduate school, beyond earning a degree. What technical area(s) are you interested in? Look at the research publications in those fields. Make contact with faculty who are active in those fields.

In hindsight, what do you wish you had done differently during graduate school?

My research work could have been more collaborative. With the knowledge I have now, I could have formed a network of related researchers that would have enriched my research, improved my education, and served to launch my post-doctorate career. I would have worked with my PhD advisor to try to make this happen.





Vibhor Nigam

Lambda  
Senior Data Scientist,  
Comcast, Philadelphia

Education

- Kalinga Institute of Industrial Technology (KIIT), Bhubaneswar, India (B.Sc)
- University of Pennsylvania (MSE, Robotics)

Why did you go to graduate school?

I was always interested in robotics and wanted to learn more about the fundamentals of how robots work. During my undergraduate studies, I was participating in various robotics competitions, which further piqued my interest. The University of Pennsylvania has one of the best robotics programs in the world. Thus, when I got the admission there were no second thoughts.

Did you begin your graduate studies immediately after graduating with a bachelor's degree?

No, I worked for two years in industry as a systems engineer, which kind of gave me a good perspective of what corporate life is like.

How did you fund your graduate study?

Through educational loans and part-time jobs.

What advice do you have for students considering or beginning graduate study?

Have a proper plan to chart out the entirety of your master's study. Two years is not enough time to explore and figure it out. Also build networks with your fellow graduate students.

In hindsight, what do you wish you had done differently during graduate school?

I went for a major switch from mechanical engineering to the machine learning/AI side in robotics, which requires knowledge of the fundamentals of computer science. In hindsight, it would have been better to take some time to carefully plan my coursework and build up fundamentals.



Yohan Seepersad

Beta Alpha  
Senior Product Engineer,  
Lam Research

Education

- University of West Indies, St. Augustine Campus (B.Sc, Electrical Electronics & Communication Engineering)
- Drexel University, USA (PhD, Electrical Engineering)

Why did you go to graduate school?

I love science; it seemed like the natural course to follow for someone who enjoys studying and learning about new things.

Did you begin your graduate studies immediately after graduating with a bachelor's degree?

Yes, I graduated from the University of the West Indies in June of 2010 and started graduate school in the fall of 2010.

How did you fund your graduate study?

I was a teaching assistant for all five years of the PhD, an experience I would not trade for anything. Between that and a few research assistantships, I was able to have my degree fully funded.

What advice do you have for students considering or beginning graduate study?

Do not rush into an area or project early on. Take enough time to find a project and an advisor that fit well with your interests, even if they are not well-defined at the time. It will make the research enjoyable and your graduate student years unforgettable.

In hindsight, what do you wish you had done differently during graduate school?

Taken more classes outside of my department, even if they were audits for no credit.



Katelyn Brinker

Gamma Theta  
IEEE-HKN Student Governor  
(B.S. EE & B.S. CpE 2017, M.S. EE 2019)  
IEEE-HKN Outstanding Student  
Award Recipient

Katelyn Brinker is a PhD student in electrical engineering at Iowa State University supported by a NASA Space Technology Research Fellowship. She graduated from the Missouri University of Science and Technology with bachelor's degrees in electrical engineering and computer engineering in May of 2017 and with a master's degree in electrical engineering in July of 2019. She was inducted into the HKN Gamma Theta Chapter in spring of 2016 and has since served as Bridge Correspondent, Coordinating Secretary, and President of her chapter. Currently, she is serving as a Student Governor to the HKN Board of Governors.

My path to graduate school:

As an undergraduate, I was often told that I should consider going to graduate school and I often felt unsure that getting a graduate education would be the right next step for me. This uncertainty stemmed from my a) not completely understanding the different options I would have for graduate school (M.S., thesis, non-thesis; M. Eng.; PhD; etc.), b) not knowing what I wanted to do with my career, and c) not being confident in my ability to succeed in a graduate school setting.

These doubts were chipped away, though, by a collection of extracurricular experiences, undergraduate research, and an internship at the Southwest Research Institute (SwRI). As an undergraduate, I was heavily involved in the Mars Rover Design Team (the world champions of the University Rover Challenge in 2017!), IEEE, and HKN. I also worked as a Peer Writing Consultant at the Missouri S&T Writing Center for

three years. In my junior year, I started doing undergraduate research with Dr. Reza Zoughi in the Applied Microwave Nondestructive Testing Laboratory, which then gave me the opportunity to get involved with the IEEE Instrumentation and Measurement Society. Through these experiences and with encouragement by mentors and professors, I started to realize that I wanted a research-based career. By the end of my summer 2016 internship at SwRI, I was convinced that I wanted to do a thesis-based master's degree with my undergraduate research advisor, Dr. Zoughi. Because I was already involved in undergraduate research and knew my future advisor, I was able to apply as a senior to the NASA Space Technology Research Fellowship (NSTRF) and the NSF Graduate Research Fellowship Program (GRFP). I was very fortunate to be selected for the NSTRF for my master's study. The fellowship funded my tuition, research materials, and conference travel on top of providing me with a student stipend and allowing me to do research at NASA Centers for 10 weeks a year.

At the end of my senior year, I was also selected as my HKN chapter's nominee for the IEEE-HKN Alton B. Zerby and Karl T. Koerner Outstanding Student Award. In my application I was able to write about these extracurricular, internship, and research experiences and I was honored to be a co-recipient of the 2017 award. Receiving this honor provided me with a big confidence boost going into my master's degree that helped me tackle the imposter syndrome I felt, especially at the start of my graduate education.

In starting my master's degree in electrical engineering, I didn't think I was going to pursue a Ph.D. I had funding for two years through NSTRF and wasn't ready to commit to a Ph.D, but after doing research at my university, presenting my work at a conference and receiving the best student paper award, and doing research at NASA Langley Research Center in the summer of 2018, I realized that I did want to earn a Ph.D. So, in the fall of 2018, I applied for two more years of funding from NSTRF and was fortunate enough to receive it.

In May I defended my master's thesis and now I am pursuing my Ph.D at Iowa State University with my undergraduate/master's advisor, Dr. Zoughi, and the support of NSTRF. Concurrently, I am working as a NASA Pathways Intern at NASA Goddard Space Flight Center in the Telecommunication Networks and Technologies Branch. I credit making it this far to the experiences I had during my undergraduate career with IEEE, HKN, and the Mars Rover Design Team and to the skills and research passion I've gained through graduate school. One day, I hope my education and experience will lead me to my dream of working for NASA full-time.





## Emily Hernandez

Gamma Theta

Stanford (MS)

IEEE-HKN Outstanding Student

Award Recipient

Editorial Board Member of *The Bridge*

Emily Hernandez was born in Fort Worth, TX and raised in Germantown, TN. She completed her undergraduate degree at Missouri University of Science & Technology (Missouri S&T) where she graduated Summa Cum Laude (4.0 GPA) with a Bachelor of Science degree in Electrical Engineering and Minors in Mathematics and Cognitive Neuroscience. She subsequently earned her Master of Science in Electrical Engineering from Stanford University. While at Missouri S&T, Emily held several leadership positions including: Bridge Correspondent for Eta Kappa Nu; Electrical Division Lead and President of the Missouri S&T Robotics Design Team; and Secretary of the Missouri S&T Chapter of the Society of Hispanic Professional Engineers. She was also an Honors Academy Fellow, part of the Chancellor's Leadership Academy, a member of the Society of Women Engineers (SWE), and IEEE.

Emily's extensive volunteer activities include service events designed to attract minorities and women to careers in science, technology, engineering, and math (STEM). In Missouri, she served as a Student Diversity Program Mentor, tutored students as a Peer Learning Assistant in the Learning Enhancement Across Disciplines Program. In California, she has been a mentor for Third Street Community Center's Expanding Your Horizons engineering design program that focuses on introducing Hispanic students to STEM.

Emily worked as a Design Engineer Intern at Garmin International for two years, and also served as a Signal Integrity Undergraduate Intern at Intel Corporation and Design Intern at Molex High Performance Cable. She has held undergraduate research positions in the Electromagnetic Compatibility Laboratory, and as an Undergraduate Research Experience Fellow in the Applied Computational Intelligence Laboratory at Missouri S&T. During graduate school, she held a research assistantship in the Stanford University Power Electronics Laboratory. She currently works full-time at Cellink Corporation, a flexible circuit start-up in San Carlos, CA.

### My path to graduate school:

I first considered going to graduate school after my sophomore year in college. I had spent the summer interning at Intel, and everyone I worked with had their Ph.D. I had always assumed I would complete my BSEE and go into industry, so the idea of staying in school longer was unexpected. My mentors at Missouri S&T encouraged me to look into undergraduate research projects to see if grad school was a path I could see myself seriously pursuing. I received funding support from the university to conduct an undergraduate research project and also connected with the Electromagnetic Compatibility (EMC) Lab to work on a signal integrity project with a team of Dr. James Drewniak's graduate students. Working with those students and seeing how much research drives innovation in industry was exciting to me. As I approached the end of my undergraduate studies, I also realized I wasn't ready to stop learning and growing my technical skills and made the decision to pursue an advanced degree.

Although I was unsure if I wanted to pursue a career in academia or industry, I applied directly to Ph.D. programs because I knew they had the best fellowship funding options, and I wanted to make sure I was setting myself up for success with either career path option. The application process involved more writing than I expected and a massive amount of research about professors and laboratories at various campuses. I limited my number of applications to five

and spent as much time as I could trying to find the right research fit for me. Even with all my preparation, I still found my interests changing as I met with professors and research groups during visit days. After meticulously weighing the pros and cons of my top two schools, I selected Stanford University, mainly because I determined the research fit with the SUPER lab (power electronics) to be the best for me.

As is true for most students, the transition to graduate school required some adjustments for me. Adapting my work style to the different pace of quarters versus semesters and a very different instructional style, along with balancing research, studying, and social activities took some time. Fortunately, my colleagues in the SUPER lab and my faculty advisor were supportive and helpful in this process.

I applied for the IEEE-HKN Alton B. Zerby and Karl T. Koerner Outstanding Student Award just prior to my undergraduate graduation and after I selected Stanford for graduate school. I was encouraged to apply by the HKN advisor at Missouri S&T, Dr. Steve Watkins, who was also one of my letter writers for graduate school. Receiving the award at the Electrical and Computer Engineering Department Heads Association (ECEDHA) meeting provided me with invaluable opportunities to meet EE department chairs from around the country. I enjoyed engaging with them, learning about their programs, and discussing opportunities to encourage more females and minorities to pursue EE degrees. I was also given additional opportunities to represent HKN by attending events in the San Francisco area, which provided me with further networking opportunities.

### Did you begin your graduate studies immediately after graduating with a bachelor's degree?

Yes.

### How did you fund your graduate study?

In addition to my guaranteed research assistantship from Stanford, I received a diversity fellowship from the university that provided extra funding for my first summer, funds for research supplies, and a diverse network of other graduate students across the university.

### What advice do you have for students considering or beginning graduate study?

My first piece of advice is to know that graduate school is fundamentally different than undergraduate studies. Your job will be your research, you'll take fewer classes each term, and your grades won't matter as much as being able to quickly learn the material and apply it to your research.

Second, how you and your advisor interact will have a big impact on your success in graduate school. Choosing an advisor should be about more than just liking the research he or she does. Look for someone who is willing to invest time in you and whose personality doesn't clash with yours, as well as someone who will enable you to pursue your ideas and not just work on theirs. Talk to some of the professor's current students to find out what type of advisor he or she is. If you are more successful when left alone to work, having an advisor who checks in on you daily may not work for you.

Finally, if you find someone whom you want to be your advisor, discuss your goals and expectations early. Professors are too busy to try to guess what you want from an advising relationship.

### In hindsight, what do you wish you had done differently during graduate school?

I wish I had explored options to work with additional labs. After I selected an initial research project of interest in the SUPER lab, I let myself be tied exclusively to that project. I convinced myself that I needed to make this particular project work with that particular lab, or that I shouldn't do research at all. As time went on, and I realized my interests were taking a different direction than my lab's, I should have reached out to more professors in different areas of EE to see if I could find a better fit. Instead, I chose to stop with my Master's Degree. I don't regret this choice, because it led me to a job I thoroughly enjoy; however, exploring additional options may have led me down a different path. ♦





## Wendy P. Fernandez

Beta Pi  
GEM Fellow

Wendy Fernandez is an alumna of the engineering dual-degree program at Hostos Community College. She graduated in 2014 as class Valedictorian, with an associates degree in science. She subsequently transferred to the City College of New York, where she earned a bachelor's degree in electrical engineering in May 2019, and was recognized as a City College Great Grad and Salutatorian of the school of engineering. For graduate study, she was awarded a GEM Fellowship, a national fellowship that helps minorities to go to graduate school, and is attending Columbia University in pursuit of a master's degree in electrical engineering. Her graduate study will be fully sponsored by Columbia University and Intel Corporation.

As an undergraduate, Wendy worked with researchers from several institutions such as Hostos Community College, Massachusetts Institute of Technology (MIT), City College of New York, and Columbia University. Her research has been recognized with the best poster presentation award and honorable mentions in undergraduate national conferences such as the Annual Biomedical Research Conference for Minority Students (ABRCMS), Society for Advancement of Chicanos/Hispanics and Native Americans in Science Conference (SACNAS), Columbia University Undergraduate Symposium; as well as the best demo award in the 3rd ACM/IEEE International Conference on Internet of Things Design and Implementation. She also published a

research paper at the 7th Annual IEEE International Conference on CYBER Technology in Automation, Control, and Intelligent Systems.

In addition to research, as an undergraduate, she was involved with extracurricular activities and volunteering, both on- and off-campus. She served as the president of the IEEE-HKN chapter at City College for the 2017-2018 academic year. Wendy was also part of the Colin Powell Fellowship in Leadership and Public Service at City College, a two-year intensive program for undergraduate students to prepare fellows for lives of public service and active citizenship. She also participates in volunteer work to promote underrepresented minorities in STEM fields. She has been an invited speaker for Engineering Conversation Day, Accelerated Study in Associate Programs (ASAP), and Women in STEM panel, all at Hostos.

### My path to graduate school:

My motivations for graduate study were mentoring other students and my passion for research. I completed my first research project as a sophomore at Hostos Community College. It was my first real exposure to research and the process involved in answering a scientific question. At first, I was nervous and constantly doubting myself. As a first-generation college student and an Hispanic woman in STEM, I thought that a research lab was not the place for me. However, I was lucky to have a supportive research advisor who always motivated me. Because of that, I gave poster and oral presentations from my first research project on and attended conferences. I discovered that I love to answer difficult questions and share my results with my community. Thanks to my research advisor's support, I was able to find what I am passionate about and go for it. I want to continue my education so I can keep answering difficult scientific questions but also, to become a mentor and encourage underrepresented minority students to do STEM.

From the personal side, I hope to develop my mentorship skills by working with undergraduate students and encouraging them to do research. One of my goals as a graduate student is to supervise a

research project or independent study for an undergraduate student from a non-research-focused institution or community college. I also want to share available opportunities for underrepresented minority students in STEM. In partnership with the Louis Stokes Alliances for Minority Participation (LSAMP) chapter at the City College of New York, I am organizing an information session about the GEM Fellowship and the application process. From the technical side, I hope to gain deeper understanding of analog and RF integrated circuits design and research novel architectures to strengthen hardware security.

Before applying to graduate school, I spent a whole year debating between a direct Ph.D. program or earning a master's first. I knew that I want to do research, become a professor, and mentor students. However, internally I was conscious of my desire to explore options like industry before deciding on an academic career. I decided to do a master's first as a GEM fellow, so I can learn more about industry thanks to the two internships program, and also continue preparing myself for a Ph.D. program. This summer I was able to intern at Intel Corporation, my GEM sponsor. I gained better insight about the industry and learned firsthand the differences between academia and industry, all of this while adding to my work experience.


To prepare for graduate school, a lot of self-awareness is needed. In my case, I first asked myself the following questions: Why do you want to go? Which topic do you feel passionate about? Do you see yourself working in academia, industry or both? Is this the right timing for you? Which program is the best option? Then, I created a spreadsheet of schools with programs that align with my research interests. For each school, I added deadlines, GRE requirements, names of professors I was interested in working with, available funding, etc. A piece of advice regarding the GRE, schedule your exam ahead of time, study for at least three months and take it as soon as possible. You don't want to be dealing with the GRE, school applications, and other responsibilities of your senior year all at the same time. Finally, it is important to look for

funding opportunities. In my case, I was looking for opportunities that would sponsor a master's program. That's how I found out about GEM.

I learned about the GEM fellowship through one of the GEM GradLabs. Every semester GEM organizes GradLabs at several universities around the country, where they expose underrepresented students to the benefits of research and technology careers. Some of the topics covered are:

1. "Why Graduate School?"
2. "How to Prepare for Graduate School?"
3. "Understanding the GEM Fellowship", and
4. "Voices From the Field: Real Life Research and Internship Experiences"

Attending the GradLab was my first step in applying to GEM and I highly recommended it to anyone who wants to apply. The application is split into two sections. Section I, due around the middle of October, is basic personal information such as GPA, education history, research history, etc. The second section, due in early November asks for a personal statement, three letters of recommendation, selection of three GEM companies, and selection of least three GEM universities for graduate school. In January, I learned that I was accepted as a potential GEM fellow and I started the interview process with the GEM companies that I selected in my application. After the interview process, I was selected by Intel Corporation (my GEM company). Finally, the last step is to be accepted by April 15th by a GEM University, in my case Columbia University.

For me, the GEM Fellowship is an opportunity to simultaneously explore graduate school and industry. It's allowing me to continue my passion for learning and research by earning a master's degree, and includes two internships at a top tech company - Intel Corporation. I am confident that after completing my fellowship, I will have a clearer idea of which one, industry or academia, is the right fit for me. I highly recommend the GEM fellowship to other students who like me are undecided between industry or academia but want to continue their education. This is the perfect opportunity to explore both sides of the spectrum. 





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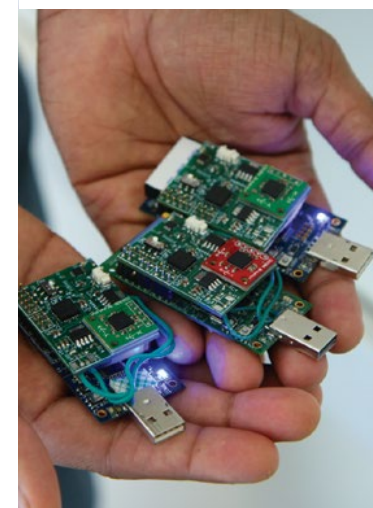
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## Dr. Karen Panetta

Epsilon Delta  
IEEE-HKN President

Dr. Panetta is the Dean of Graduate Education for the School of Engineering at Tufts University. She is also a Professor of Electrical and Computer Engineering, and Adjunct Professor of Computer Science and Mechanical Engineering. She earned her BS in Computer Engineering at Boston University, and her MS and Ph.D. degrees in Electrical Engineering from Northeastern University in Boston, MA. Before joining the faculty at Tufts, Dr. Panetta was a Principal Engineer at Digital Equipment Corporation. She has been recognized with numerous awards for teaching and mentoring, including the NSF PAESMEM Award, which was presented to her by U.S. President Barack Obama at the White House.



### How has Eta Kappa Nu (IEEE-HKN) impacted your life? Your career?

HKN has been the conduit that has connected my passions for using my skills to benefit humanity and help people and communities around the world. It has kept me educated in the latest technologies and has opened many opportunities in unique and impactful projects. The biggest impact is meeting other HKN volunteers, especially students, and watching their careers grow and flourish.

### What inspired you to choose the engineering field?

My father wanted me to be an engineer, because he saw I had an aptitude for math and science. He also wanted me to have a career that provided financial stability and independence.

### What do you love about engineering?

Engineering can be applicable to every field and discipline and can help solve every problem. People imagine and dream of ideas that seem like science fiction, yet, we can make the fiction a reality.

### Whom do you admire and why?

I have always admired fictional characters that helped me to stay innovative and keep my strength to believe in my abilities. I call them the first ladies of "magic." Jeannie from "I Dream of Jeannie," portrayed by Barbara Eden; Hermione Granger from the "Harry Potter" series, portrayed by Emma Watson in the movies; and Samantha from "Bewitched," portrayed by Elizabeth Montgomery. I loved magic and wanted to make magical things happen with my engineering skills, even though others may laugh at us and try to make us hide our power.

### In your opinion, what has been the greatest change in engineering since you were a student?

The Internet! Information at your fingertips, access to people around the world and engaging information dissemination.

### I wish I had known...

That taking risks and trying new ventures was a great thing to do and I didn't need to take conventional jobs.

### Best advice for new graduates...

Find good mentors and become a mentor for someone else.

### From your perspective, what's the next BIG advance in engineering?

Deep space exploration and asteroid mining for new resources.

IEEE-HKN



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- the new IEEE Standard 1876 – a standard for networked smart learning objects for online laboratories that defines methods and techniques for offering laboratories as a service (LaaS) over the web,
- the new ABET Cybersecurity Engineering Program Criteria, which help to guarantee that any undergraduate cybersecurity engineering degree program meets accepted standards,
- and special issues of IEEE Transactions on Education (Vol. 61 Issue 4, 2018) and IEEE Latin American Learning Technology Magazine (manuscripts being accepted for publication in 2020), focused on learning science to help ensure success and equity in education for all students within the socio-culturally diverse student body.

We welcome your contributions to our community and hope you can benefit from the dialog the society helps to foster. If you are already working as an educator—or if

you are a student considering a future as an educator—then we encourage you to join us if you do not already belong to our Society. We hope you will consider us part of your professional network as you progress through your career.

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## A Glimpse into Our Professional World

**Pedagogy:** the theory and practice of education

**Learning science:** multidisciplinary research into how humans learn

**Learning engineering:** using the results of learning science to build products and experiences that help humans learn more effectively

**Learning technologies:** tools that enable information delivery and assessment of students, including networks, applications, learning management systems, and computer-aided learning software

**Learning management system:** large-scale software products that deliver curriculum, track student progress, assess students through testing, and deliver grades and feedback to students

**Curriculum:** how material to be learned is organized and presented as modules across the timeline of student engagement in learning

**Active learning:** integrating student-centered activities into learning experiences to engage and involve students with the material they are studying

**Flipped classroom:** a technique that requires students to study material before class and then apply their knowledge immediately through problem solving in class

**MOOC:** Massively Open Online Courses are web-hosted courses designed for the masses and delivered remotely to sometimes millions of people simultaneously

**Project based learning:** a form of active learning where large projects form the basis of discovery, knowledge application, and solution



From left to right: Sandro Sartoni, President of the Mu Nu Chapter in Turin, Italy; IEEE-HKN Director and *The Bridge* Managing Editor Nancy Ostin; Editors-in-Chief Dr. Stephen Williams and Dr. Sahra Sedigh Sarvestani, and Davide Bisso, also of the Mu Nu Chapter.

# COMPSAC and HKN — Perfect Together

IEEE-HKN had a strong presence at the 2019 COMPSAC held 15-19 July in Milwaukee, WI, USA. COMPSAC is the IEEE Computer Society Signature Conference on Computers, Software, and Applications. It is a major international forum for academia, industry, and government to discuss research results and advancements, emerging challenges, and future trends in computer and software technologies and applications.

IEEE-HKN Mu Nu Chapter President Sandro Sartoni and Chapter Vice President Davide Bisso held a workshop, explaining to participants what an HKN chapter does, an overview of programs, and the impact chapters and members have on the community, a university and their peers. Nancy Ostin, IEEE-HKN Director, presented the Outstanding Chapter Award to the Mu Nu Chapter of Torino, Italy, and highlighted the number of workshops the Chapter held, the community service hours it logged, its growth, and the fun and community spirit that resulted from having HKN at Mu Nu.

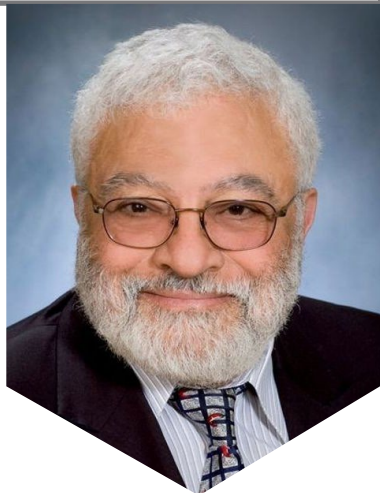
Also during the conference, Eta Chapter member and Faculty Advisor for Mu Nu, Dr. Paolo Montuschi, officiated a Professional Member induction ceremony. Dr. Eddie Custovic, Dr. Edmundo Tovar and Dr. Dejan S. Milojicic are the newest members of HKN's Mu Nu Chapter. Milwaukee also served as a meeting place for the Editors-in-Chief of *The Bridge*. Dr. Stephen Williams and Dr. Sahra Sedigh Sarvestani joined Nancy Ostin to plan the exciting and informative issues to be produced in February and May 2020.

HKN offers a hearty thanks to the IEEE Computer Society for its partnership and help in making all of this possible.



Welcome to our newest professional members. From left to right: Dr. Edmundo Tovar; Dr. Dejan S. Milojicic; Dr. Eddie Custovic.





## HKN Board Member and IEEE Volunteer Dr. Mo El-Hawary

Our dear friend and former IEEE-HKN Board of Governors Member Mohamed "Mo" El-Hawary passed away on Friday, July 26, 2019 in Halifax, Canada.

Dr. El-Hawary was a Professor of Electrical and Computer Engineering at Dalhousie University in Halifax. He had a B.Sc. in Electrical Engineering, Distinction and First Class Honors, University of Alexandria, Egypt, 1965, and a Ph.D. in Electrical Engineering, University of Alberta, Edmonton, 1972, where, from 1970-72, he was an Izaak Walton Killam Memorial Fellow. He was Associate Professor of Electrical Engineering at the Federal University of Rio de Janeiro for two years, and in 1974 he joined the faculty at Memorial University of Newfoundland, becoming Chair of the Electrical Engineering Program in 1976.

Dr. El-Hawary founded the Lambda Theta Chapter at Dalhousie University in 2012 and served as a member of the IEEE-HKN Board of Governors in 2014, 2015 and 2016. He chaired the HKN Globalization Committee and helped to onboard more than a dozen HKN Chapters in Regions 7-10. He cherished having had the opportunity to educate, mentor and foster the careers of countless students in the field of electrical engineering over his long and distinguished career.

In addition to serving on the HKN Board, he was a member of the Board of Directors and Secretary of IEEE, and President of IEEE Canada. He served on the IEEE Publication Services and Products Board, Fellows Committee, Power Engineering Society (PES); and as IEEE Press Board Chairman, System Operations Committee Chair, and Vice President of Development for the IEEE Canada Foundation. He was the recipient of the IEEE Canada W. S. Read Service Award in 2010. In 1999, IEEE awarded him the EAB Meritorious Achievement, Power Engineering Educator of the Year, and IEEE Canada General A.G.L. McNaughton Gold Medal.

He is survived by his wife, Ferial, an IEEE Life Fellow and also a dedicated volunteer; a daughter, Elizabeth "Bette;" two sons, Rany "Ron" and Robert "Bob;" eight grandchildren, and two sisters.

*Contributions in memory of Dr. El-Hawary can be made to IEEE-HKN or to the Juvenile Diabetes Research Foundation.*



Dr. Teofilo Ramos (left), IEEE Region 9 Director and Faculty Advisor of the Lambda Rho Chapter, and Enrique Tejera, IEEE-HKN Region 7-10 Governor, congratulate Mu Psi Chapter President Luz Maria Sanchez Reyes.

## IEEE-HKN Welcomes 263rd Chapter, Mu Psi

Mu Psi, the 263rd chapter of IEEE-HKN, was installed on 16 August 2019 at the Universidad Autónoma de Querétaro, Querétaro, Mexico. Mu Psi is the third IEEE-HKN Chapter in Region 9 and second chapter in Mexico.

IEEE-HKN Region 7-10 Governor Enrique Tejera (second from left in photo above) officially installed the Chapter and inducted the Charter Members. Dr. Tejera was joined by Teofilo Ramos (left in photo above), IEEE Region 9 Director and Faculty Advisor of the Lambda Rho Chapter from Tecnológico de Monterrey in Monterrey, Mexico.

### Officials from the Universidad Autónoma de Querétaro included:

- Dra. Margarita Teresa de Jesús García Gasca, Rectora de la Universidad
- Dr. Aurelio Domínguez González, Secretario Académico de la Universidad
- Dr. Manuel Toledano Ayala, Director de la Facultad de Ingeniería

### Chapter Officers installed were:

- **President:** Luz María Sánchez Reyes
- **Vice President:** Emmanuel Silva González
- **Treasurer:** Aldo Francisco Muñoz Vargas
- **Secretary:** Luis Fernando González Nieto
- **Faculty Advisors:** Dr. Juvenal Rodríguez Reséndiz, Dr. Manuel Toledano Ayala and Dr. Saúl Tovar Arriaga



Mu Psi is the second IEEE-HKN Chapter in Mexico.



(left to right): Governor Enrique Tejera; President Luz María Sánchez Reyes; Dr. Teofilo Ramos.



## CHAPTER BEST PRACTICE: BOOSTING MEMBERSHIP AND EXCITEMENT

### H.A.R.D. Hack: Hash out. Analyze. Research. Design.

Keshav Rungta, Kappa Psi Chapter '18

Every year, Kappa Psi, the HKN chapter at the University of California, San Diego, helps put on H.A.R.D. Hack, a 24-hour hardware-centric hackathon for nearly 200 students at the Jacobs School of Engineering. This event is very special in the UCSD community because it provides an environment not only for students to code, but also to be able to get hands-on with hardware, building everything from robotic cars to smart fridges and smart street lamps. Teams come in groups of four to five students from all different backgrounds to compete by building a hardware project in 24 hours.



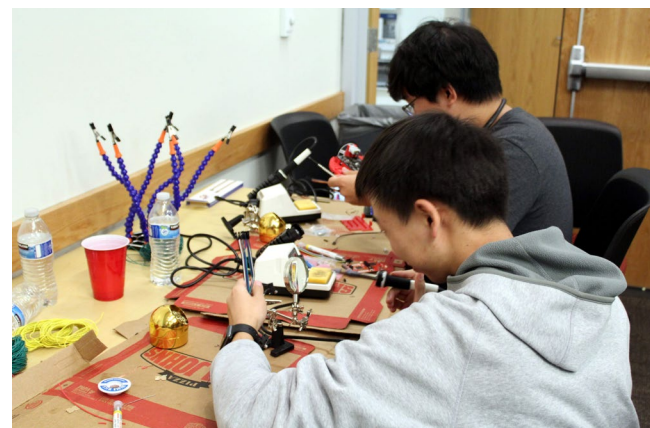
Parts Distribution was fun chaos.  
We had many volunteers help out with this!

*This article discusses how the chapter helped carry out the H.A.R.D Hack and how sponsoring this friendly competition could serve as a "Best Practice" for HKN chapters looking to engage more students in an effective, fun way.*

#### The Set Up:

H.A.R.D. Hack planning begins 6-8 months before the event, with a core team of 7-10 committee members built up from IEEE and HKN members and officers. The first thing to do is finalize the time and venue for the event. Weekly meetings are required to keep up with the various tasks to organize a successful event. The size of the event to aim for will depend on your school size and how much experience the committee has with planning large events, but this was our 3rd time hosting the event, and it has grown dramatically in the past few years to incorporate nearly 200 students this year. Anything larger than 200 students will be eligible to be hosted in partnership with Major League Hacking (MLH), but applications will need to be filled out to be eligible for that.

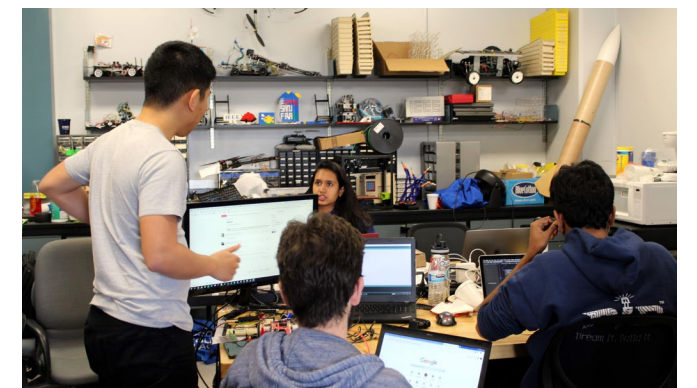
Obtaining support and sponsorships for this event are key to a successful event. Qualcomm loaned many Dragonboard 410c for hacker use. Linaro provided mentorship and workshops. Lab41 sponsored a database called VOICES (Voices Obscured in Complex Environmental Settings). Texas Instruments sponsored many robotic kits. The IEEE SCSS sponsored other hardware parts. Reaching out to these companies and organizations helps add diversity to the event.



Qualcomm hosted a Dragonboard 410c workshop before the hackathon to help students get oriented with the device.

Since H.A.R.D. Hack was a hardware hackathon, we needed a way to manage parts. We set up CHEQROOM to help keep track of which team had which parts. We had many sensors, microcontrollers, motors, wheels, cameras and more in our stash. One note is to schedule at least one experienced hardware EE person to help with parts distribution.

Food for the event came from many different vendors. We had bagels for breakfast, pizza, sandwiches, pastries, and midnight milk tea. We had extra volunteers to help transport the food during meal times.



Everyone hard at work on their projects! We had a soldering station, electrical engineering equipment, and project space facilities for hackers to use.



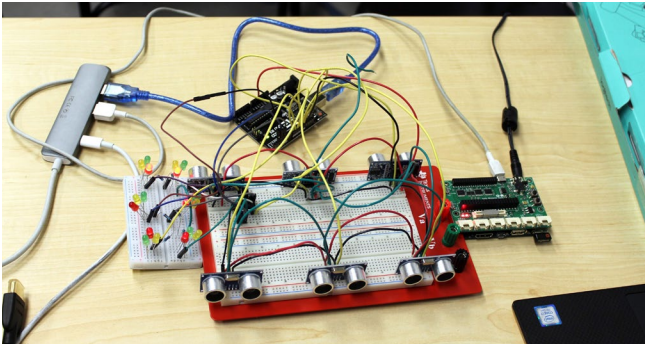
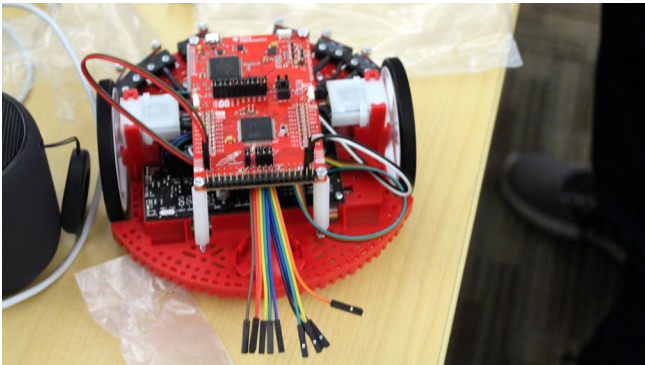


Judging a facial detection project.

The Event:

The event starts with an opening ceremony, during which the chapter orients students with the flow of the event and announces the theme and sponsored prizes. This year, the theme was Public Utilities. Students were encouraged to build projects to help improve the quality of public life.

While hacking, mentors and sponsor engineers walked around to chat with students about their



From cars to parking sensors - projects used a wide range of possible microcontrollers, hardware, and sensors!

projects. We set up HelpQ to enable mentors to reach hackers who need help as soon as possible. This worked pretty well! We wish we had also set up a Slack channel for everyone to join, as this would have enabled faster communication outside of email. Thus, in the future, we plan to look into software that can integrate all of this (parts checkout, HelpQ and Slack) into one.

Near the end of the 24 hours, hackers are required to submit a DevPost and documentation for judges to review their projects. The judging committee consisted of professors, company sponsors and HKN alumni. The committee went around the demos to see and ask questions of each group. Prizes are awarded to the teams at the closing ceremony.


Some of the outstanding projects consisted of a trash sorter using computer vision, and a Bluetooth parking permit authentication system.

Final Thoughts:

H.A.R.D. Hack was not something developed overnight. The H.A.R.D. Hack committee begins planning for the next event a good 6 months in advance: booking rooms, finalizing schedules, and arranging for media, sponsors, and manpower.

The planning committee consisted of seven people who collaborated closely through weekly meetings and Slack messages. The event could not have happened without the 72 volunteers, mentors, judges, and the committee’s dedicated leadership.

This event enabled many students, who normally would not have access to hardware, to be able to realize one of their dreams, make friends, and learn something new, all in less than a weekend.

Next time you see a Hackathon, think about how you might add a hardware component to it. 



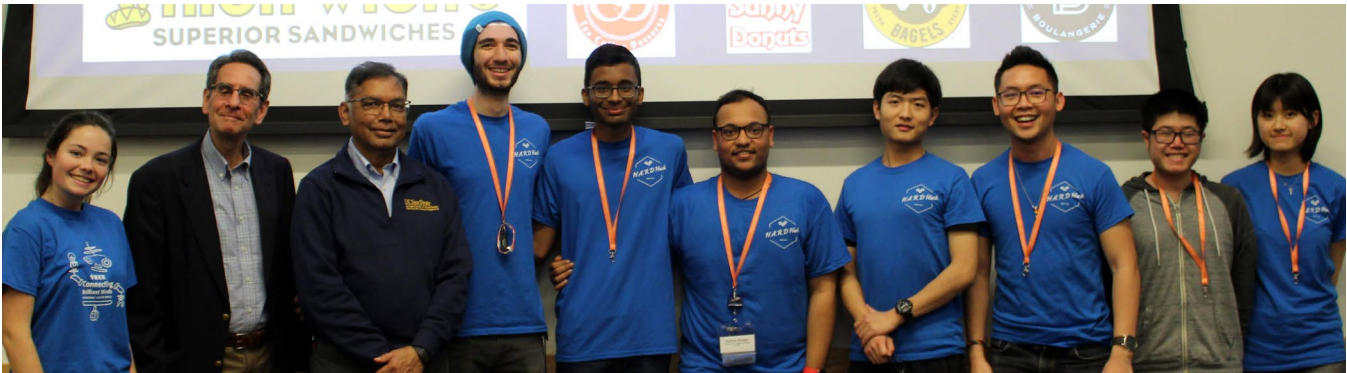
**Keshav Rungta** is an aspiring roboticist, studying his 3rd year of electrical engineering at UC San Diego. He was born and raised in Kolkata, India where he went to La Martiniere for Boys high school. As a child, Keshav was inspired to enter the field of engineering by his father, who instilled in him the passion to learn about new technology and showed him the satisfaction of being able to fix things around the house. Now, Keshav dreams to create new autonomous technology that would improve the human lifestyle. He is currently working on a radar system for autonomous driving that works in all weather conditions. He is chair of the Kappa Psi chapter of IEEE-HKN, where he hosts around 8-10 workshops every quarter. He was one of the lead committee members for H.A.R.D. Hack and responsible for managing the volunteers, hardware, and room arrangements. In addition to HKN and school, Keshav loves to play the guitar, sing, paint, and hang out with his friends whenever he gets a chance.



It is also important to get a healthy dose of milk tea and friends at a hackathon!



The winners of H.A.R.D. Hack with Professor Dr. Paul Siegel (left), Professor Dr. Rakesh Kumar (second from left), and Hamna Khan, President of the ECE Alumni Board (right).



The whole planning committee with the two faculty advisors, Professor Dr. Paul Siegel (second from left) and Professor Dr. Rakesh Kumar (third from left).



# 83 Chapters Receive 2018 Key Chapter Recognition

Congratulations to the 83 HKN chapters that achieved Key Chapter Recognition for 2018! Each of the chapters submitted their Annual Chapter report, reported their election, update their officers and took part in signature events, such as the Student Leadership Conference and Founders Day.

See if your chapter was recognized:

- Alpha, Univ. of Illinois at Urbana-Champaign

Beta, Purdue University

Beta Alpha, Drexel University

Beta Chi, South Dakota School of Mines & Tech.

Beta Delta, University of Pittsburgh

Beta Epsilon, University of Michigan

Beta Gamma, Michigan Technological University

Beta Lambda, Virginia Tech

Beta Mu, Georgia Institute of Technology

Beta Nu, Rensselaer Polytechnic Inst.

Beta Omega, University of Connecticut

Beta Rho, West Virginia University

Beta Tau, Northwestern University

Beta Theta, Massachusetts Institute of Technology

Beta Upsilon, University of Kentucky

Beta Xi, University of Oklahoma

Delta, Illinois Institute of Technology

Delta Beta, Lamar University-Beaumont

Delta Epsilon, Ohio University

Delta Eta, University of Massachusetts-Amherst

Delta Iota, Louisiana State University

Delta Kappa, University of Maine

Delta Lambda, Duke University

Delta Nu, University of Alabama

Delta Omega, University of Hawaii at Manoa

Delta Pi, Colorado State University

Delta Xi, Air Force Institute of Technology

Epsilon, Pennsylvania State University

Epsilon Alpha, Cleveland State University

Epsilon Eta, Rose-Hulman Institute of Tech.

Epsilon Kappa, University of Miami

Epsilon Omicron, University of Delaware

Epsilon Sigma, University of Florida

Epsilon Theta, California State University-Long Beach

Epsilon Xi, Wichita State University

Gamma Alpha, Manhattan College

Gamma Beta, Northeastern University

Gamma Delta, Worcester Polytechnic Institute
- Gamma Epsilon, Rutgers University

Gamma Iota, University of Kansas

Gamma Nu, Texas Tech University

Gamma Rho, South Dakota State University

Gamma Tau, North Dakota State University

Gamma Theta, Missouri University of Science and Technology

Iota, University of Missouri-Columbia

Iota Chi, Oakland University

Iota Gamma, University of California, Los Angeles

Iota Phi, United States Military Academy

Iota Upsilon, University of Washington

Iota Zeta, California State University, Chico

Kappa, Cornell University

Kappa Alpha, Northern Illinois University

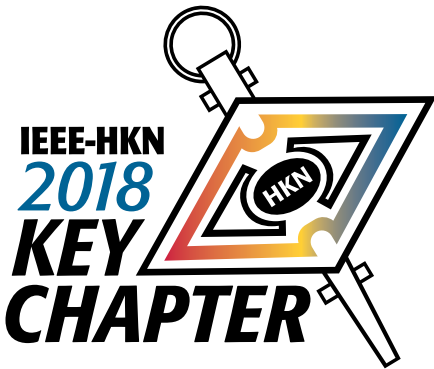
Kappa Epsilon, State University of New York-Binghamton

Kappa Lambda, University of Memphis

Kappa Nu, University of North Florida

Kappa Psi, University of California, San Diego

Kappa Theta, University of Wisconsin-Platteville



- Kappa Upsilon, University of Texas San Antonio

Lambda Lambda, American University-Sharjah

Lambda Mu, Texas A&M Qatar

Lambda Omega, National University of Singapore

Lambda Upsilon, Embry-Riddle Aeronautical University-Daytona Beach

Lambda Zeta, University of North Texas

Mu, University of California, Berkeley

Mu Alpha, UCSI University-Kuala Lumpur

Mu Iota, Seattle University

Mu Mu, Wentworth Institute of Technology

Mu Nu, Politecnico Di Torino

Mu Omicron, Christopher Newport University

Mu Pi, G.H. Raison College of Engineering

Mu Rho, Valparaiso University

Mu Tau, Waseda University

Nu, Iowa State University

Sigma, Carnegie-Mellon University

Tau, University of Cincinnati

Theta Mu, SUNY at Stony Brook

Theta Omega, University of the Pacific

Theta Rho, William Marsh Rice University

Theta Zeta, University of Colorado-Denver

Zeta Eta, Brigham Young University

Zeta Iota, Clemson University

Zeta Lambda, Prairie View A&M (University of Texas)

Zeta Omega, University of California-Irvine



The Beta Mu Chapter of the Georgia Institute of the Technology achieved Key Chapter status in 2018.



Members of the Lambda Zeta Chapter from the University of North Texas, another 2018 Key Chapter, stand with their school's HKN monument.



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# John McWilliams

Nu  
Senior Member

## Connecting with Future Leaders through IEEE-HKN

John McWilliams' active relationship with IEEE has delivered both professional and personal benefits. Working largely on international projects during the first half of his 40-year engineering career, John enjoyed exposure to a diverse range of colleagues and ideas as well as the opportunity to better understand standards and the organizations, like IEEE, working to develop them.

Now working domestically and serving as an ABET program evaluator for electrical engineering programs, "my primary involvement with IEEE is with the Engineering Accreditation Commission for the Accreditation Board for Engineering and Technology (ABET)," said John, "but I'm also a member of several societies and IEEE Eta Kappa Nu (HKN), where I participate on two committees."

Upon reconnecting with HKN, John learned that the Student Leadership Conference was being held at Iowa State University (ISU) in Ames, IA, US, which stirred poignant memories. "I was initiated into the Nu Chapter of HKN at ISU in 1976 and I remember that the \$30 initiation fee wasn't in my budget," he shared. "My donation to the IEEE-HKN Student Leadership Fund was my way of helping another student with a limited budget."

According to John, "my work with IEEE-HKN and ABET keeps me connected to current and future leaders in electrical engineering. The future engineers will bring entrepreneurial talents and engineering skills to jobs that may not currently exist," he said. "Donating is my way of giving back to a profession that's helped me lead an interesting life and encouraging those who will follow after me."

John concluded: "I strongly recommend that IEEE members support IEEE and its programs, including HKN, as a way to support our profession's future leaders."

You can choose to directly support [IEEE-HKN](#) or any of the strategically identified IEEE initiatives that help meet the world's most pressing challenges and help us to realize the full potential of IEEE.



My work with IEEE-HKN and ABET keeps me connected to current and future leaders in electrical engineering. The future engineers will bring entrepreneurial talents and engineering skills to jobs that may not currently exist.

John McWilliams



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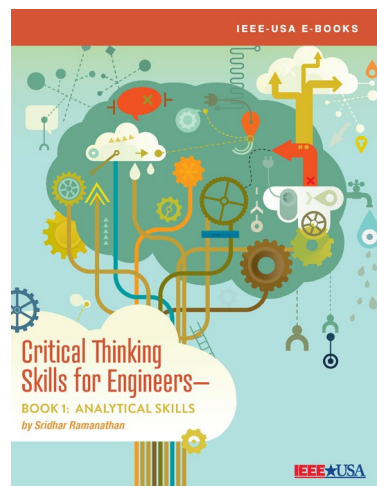
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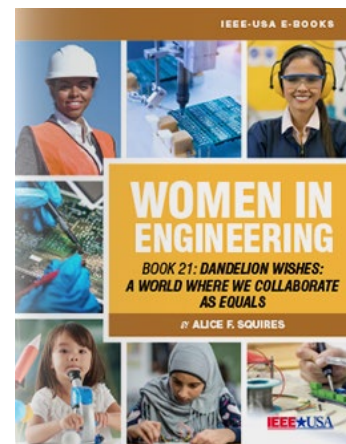
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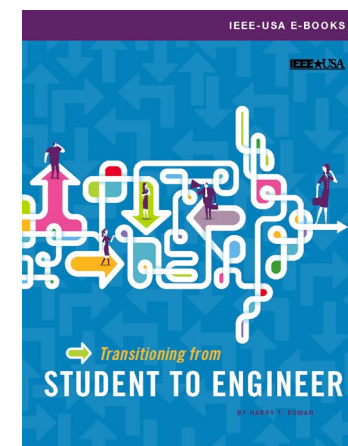
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**Georgia C. Stelluto** is IEEE-USA's Publishing Manager; Manager/Editor of IEEE-USA E-BOOKS; InFocus Department Editor for IEEE-USA InSight; and Co-Editor of the IEEE-USA Conference Brief.





# IEEE Eta Kappa Nu Launches IEEE-HKN Career Center



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