ECE at Iowa State 2018

Impact Report

The future is what we do.
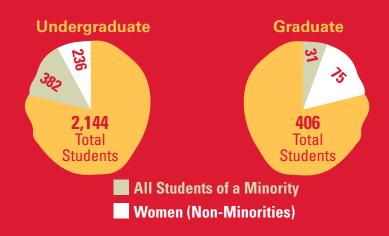
IOWA STATE UNIVERSITY
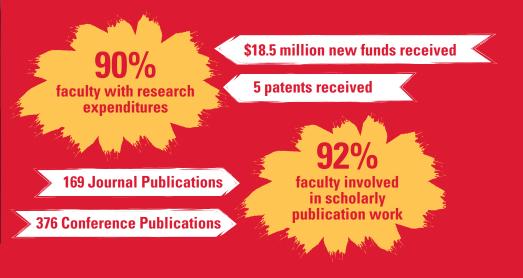### Department of Electrical and Computer Engineering

The Department of Electrical and Computer Engineering at Iowa State University is steadily on the rise. Our enrollment has reached an all-time high of 2,550 students, with an increase in women and underrepresented minorities. This year, our faculty have been awarded over $18 million in new, highly competitive and innovative research projects. We have two new National Science Foundation CAREER Award winners, bringing the total to 21. Some of this year's research highlights include development of innovative ECE curriculum design and delivery techniques, design of faster and safer next generation network protocols, realization of smarter and secure energy infrastructures, design of efficient mechanism for on-chip wireless power, fabrication of nanoscale sensors to detect Alzheimer's disease and an engineering approach to combine drugs for personalized cures.

This year we embarked on developing a new strategic plan for the department. Our plan, rooted in diversity and inclusion, was built from the bottom up, with input from a variety of voices within and outside our department, including students, faculty, staff, alumni and our External Advisory Council. The strategic plan shall carry us to a brighter future, including a new B.S. degree program (pending Board of Regents approval) in Cyber Security Engineering. We believe the cyber security problems of tomorrow require a workforce trained in an engineering approach to solving these problems. While this undergraduate major is new, we at Iowa State have been teaching and researching cyber security since 1995, making it one of the oldest programs in the country. Here at Iowa State ECE, our faculty, staff and students are the spark, the energy, the catalyst – the generators of ideas. Demand for ECE graduates is ever growing, and Iowa State ECE graduates are among the best!

Professor and Palmer Department Chair
Electrical and Computer Engineering
Iowa State University

Undergraduate

236
382
2,144 Total Students

Graduate

31
75
406 Total Students

■ All Students of a Minority
□ Women (Non-Minorities)

2,577 Students Enrolled

90% faculty with research expenditures

$18.5 million new funds received

5 patents received

169 Journal Publications

376 Conference Publications

92% faculty involved in scholarly publication work

$13.6M in Research Expenditures

2018 U.S. News Rankings:

EE: 23rd Public/39th Overall
CE: 23rd Public/43rd Overall

EE: Up 3 spots from 2017
CE: Up 11 spots from 2016

23

23 U.S. News Public Schools EE/CE Ranking

56 Total Faculty Members

49 Tenured/Tenure Track
7 Non-Tenure Track

21 NSF CAREER Awards

24 Endowed/Named Professorships

4 Professional Society Awards

30 Professional Society Fellowships

Students

3 Student Best Paper Awards

3 Research Excellence Awards

90+ Undergraduates engaged in research

Degrees Awarded 2017-18

339 Bachelor of Science

84 M.S. and M.Eng.

31 Ph.D.

92 Senior Design teams

432 graduate students:

196 Ph.D.

236 M.S.

ECE: The future is what we do.

I am a PROBLEM Solver

Sarah Huber, EE alum and Tesla employee

I AM AN ADVENTURER

Logan Kinneer, SE senior

I AM A SUCCESS

Imran Maszeri, SE sophomore

I AM IMAGINITIVE

Resy Verma, CE grad student

I AM INNOVATIVE

Parker Bibus, CE junior

Our 2,144 undergraduate students are studying...

557 Electrical Engineering

802 Computer Engineering

785 Software Engineering

Neelam Prabhu Gaunkar is a Ph.D. student. She is also a two-time IBM Fellowship winner and a recipient of the Graduate Teaching Excellence Award, the Zaffarano Award and the ASNT Fellowship Award.

Eta Kappa Nu (HKN) is a mentoring program dedicated to connecting freshmen to underclassmen in ECE. The upperclassmen help freshmen with networking, resumes and classes, building their background for the future.

IT-Olympics is a two-day event and is a competition for high school students in the areas of robotics, game design and cyber defense. One main goal of IT-Olympics is to spark an interest for students in continuing down the path of STEM fields.

The Institute of Electrical and Electronics Engineers (IEEE) in ECE is a student-run organization that is also part of the national professional organization. The members meet weekly to help students learn about computer and electrical engineering-related careers.
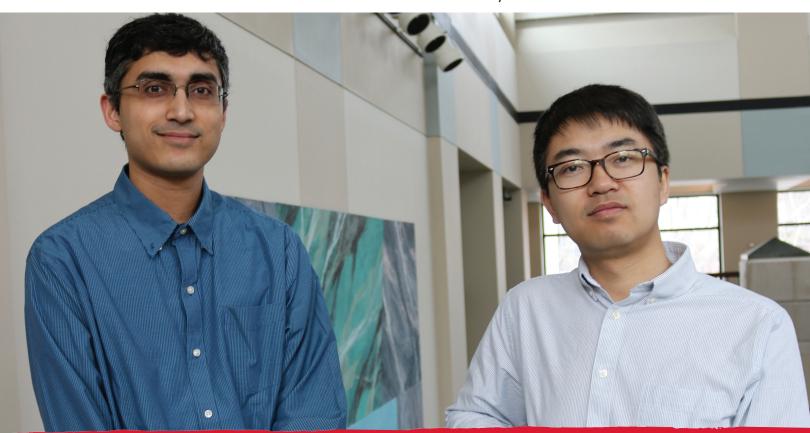

Cyber Defense Competitions are fast-paced, real-world competitions challenging students. Teams must build and secure a network providing required services in a limited amount of time. The networks are then attacked and the team is scored based on security of their network.

24 Average H-Index

2018 CAREER Award Winners

Chinmay Hegde

- Working toward **bridging the gap** between practical aspects of analyzing social network **graphs, transportation networks and artificial intelligence systems** and the theoretical tools for understanding and analyzing these graphs
- Received a grant for furthering advances in **graph learning and interference**
- "The award is an important milestone in the career of any junior faculty in **STEM**, such as myself," Hegde said. "The support provided by NSF will be very useful to me in terms of **building and sustaining** my research and educational program."

Neil Gong

- Developing security analytics using graphs to **better protect systems** from malicious websites or networks
- Will test different capabilities to **evade detection and develop methods** to recognize attacks and create attacker-resistant link prediction algorithms with techniques to add noise to confuse attackers
- "I am proud to have won this award," Gong said. "I thank the **department and university** for supplying our team with enough resources to support the beginnings of our research. We will be developing adversarially robust **graph-based machine learning** methods to enhance the security of computer and network systems."

18 IEEE Fellows

- **1** ABET Fellow
- **1** Royal Academy of Engineering Fellow
- **1** Institute of Electrical Engineers Fellow
- **1** American Institute of Ultrasound in Medicine Fellow
- **1** American Institute of Ultrasound in Medicine Fellow
- **2** American Society for Engineering Education Fellows
- **3** American Physical Society Fellows
- **3** American Association for the Advancement of Science Fellows

$13.6M
in Research Expenditures
with $18.5 million new funds received

3,290 Average Google citations per faculty

Engineering Education Research

RED/RIDE

- Recent **innovations in teaching and learning** in core ECE courses
- **X-teams:** Collaborative cross-functional teaching structure involving ECE faculty, engineering education experts, design faculty, industry practitioners
- Early evaluation indicates **increases in student interest, autonomy and support**

S–STEM/ECSEL

- Received **$4M** toward providing scholarships, leadership development for **students in EE, CE, SE**
- Currently have **61 scholars** active in the program
- Close integration with ISU's Program for **Women in Science and Engineering**
- New introductory **leadership course** in ECE: CE/EE 301X

ISU ECE New Faculty Hires

Mohamed Selim, lecturer, computing and networking systems

Mai Zheng, assistant professor, computer systems

Research Highlights

CyNet
Hongwei Zhang, Ahmed Kamal and Arun Somani received an NSF award to develop End-to-End Software-Defined Cyberinfrastructure (CyNet) for Smart Agriculture and Transportation.

Structured High-dimensional Data Recovery
Namrata Vaswani and Chinmay Hegde received an NSF award to develop provably correct and fast algorithms for data recovery from slow-changing dynamic scenes.

Design of Miniature, Low-Cost, Field Deployable Sensor to Advance Phenotyping
Liang Dong's team received a USDA award to develop wearable sensors to advance plant sciences and agricultural research.

Mitigating Evasion Attacks to Deep Neural Networks
Neil Gong received an NSF award to develop region-based classification techniques for mitigating evasion attacks in deep neural networks.

Data Generation for Interdependent Power Systems
Zhaoyu Wang received an NSF award to study modernizing of energy systems by laying the data foundation for future research in interdependent critical energy infrastructure.

Best Paper Award
Neil Gong, Yong Guan and their students received the Best Paper Award from the IEEE Systematic Approaches to Digital Forensics Engineering (SADFE) for their paper entitled "A Dynamic Taint Analysis Tool for Android App Forensics."

Tribocharging
Jaeyoun Kim and Rana Biswas published work on tribocharging in the Nature Communications.

Effective Drug Combinations
Santosh Pandey's team published work on effective drug combinations for Caenorhabditis elegans nematodes in Science Advances.

Practical Coded Caching
Aditya Ramamoorthy received an NSF award to investigate practical issues in the deployment of coded caching in networks.

Research Centers
Microelectronics Research Center
Electric Power Research Center
Information Assurance Center