UNIVERSITY of DENVER

DANIEL FELIX RITCHIE SCHOOL OF ENGINEERING & COMPUTER SCIENCE

2019-2020 ANNUAL REPORT

FORWARD. FASTER.

Ritchie School of Engineering & Computer Science Leadership Team

INTERIM DEAN

Dr. Haluk Ogmen

ASSOCIATE DEAN

Dr. Breigh Roszelle

ASSISTANT DEAN

Ms. Suzanne Abler

CHAIR OF COMPUTER SCIENCE

Dr. Chris GauthierDickey

INTERIM CHAIR OF ELECTRICAL & COMPUTER ENGINEERING

Dr. David Wenzhong Gao

CHAIR OF MECHANICAL & MATERIALS ENGINEERING

Dr. Matt Gordon

DIRECTOR OF RESEARCH & INNOVATION

Dr. Kimon Valalvanis

DIRECTOR OF INCLUSIVE EXCELLENCE

Dr. Scott Leutenegger

DIRECTOR OF MARKETING, COMMUNICATIONS, & EVENTS

Mrs. Tali Koziol Thomason

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SCHOOL OVERVIEW

OUR MISSION

Advancing technical and scientific knowledge and capabilities to improve quality of life for our global society.

OUR VISION

We are a diverse learning and teaching community discovering creative solutions for healthy, global citizens living in a smart, sustainable world.

OUR VALUES

We believe:

- Students are the center of our academic programs
- Students gain deeper knowledge through experiential learning
- Inclusive excellence is essential to tapping into diverse talents, ways of thinking and working together
- Collaboration across disciplines, boundaries and fields can lead to breakthroughs and innovation
- Continuous innovation is essential to teaching and research
- Creative thinking is fueled by an inquisitive nature and a quest for discovery

FACULTY PROMOTIONS

DR. AMIN KHODAEI
Promoted to Professor

DR. YUN-BO YI
Promoted to Professor

2019-2020 FULL TIME FACULTY

49

26 TENURE TRACK
- 7 Computer Science
- 9 Electrical & Computer Engineering
- 10 Mechanical & Materials Engineering

13 TEACHING TRACK
- 7 Computer Science
- 3 Electrical & Computer Engineering
- 3 Mechanical & Materials Engineering

3 VISITING FACULTY
- 2 Computer Science
- 1 Electrical & Computer Engineering

4 RESEARCH SERIES
- 2 Electrical & Computer Engineering
- 2 Mechanical & Materials Engineering

3 PROFESSORS OF THE PRACTICE
- 2 Computer Science
- 1 Mechanical & Materials Engineering

ABET ACCREDITED

All of the engineering bachelor degrees are accredited by the Engineering Accreditation Commission of ABET. ABET is a nonprofit, non-governmental organization that accredits college and university programs in the disciplines of applied science, computing, engineering, and engineering technology.

AT A GLANCE

STUDENTS | 2019-2020

576	242	30	31
UNDERGRADUATE	GRADUATE	DOCTORAL	NON-DEGREE

161 ENTERING FIRST-YEAR STUDENTS IN FALL 2019

DEGREES AWARDED

107	86	14
UNDERGRADUATE	GRADUATE	DOCTORAL

UNDERGRADUATE CAREER PLACEMENT

88%	69%	4%	17%
REPORTED	EMPLOYED FULL TIME	EMPLOYED PART TIME	CONTINUING EDUCATION

Data is from Class of 2019. 2020 data not available due to the pandemic. 10% of students were seeking six months after graduation.

ACADEMIC DEGREES

- Applied Computing (BA)
- Bioengineering (MS)
- Computer Engineering (BS,MS)
- Computer Science (BS,MS,PhD)
- Electrical & Computer Engineering (PhD)
- Electrical Engineering (BS,MS,PhD) with an option in Mechatronic Systems (BS,MS,PhD)
- Engineering (MS, PhD) with with an optional Management Concentration (MS)
- Game Development (BA,BS)
- Material Science (MS, PhD)
- Mechanical Engineering (BS, MS, PhD)
- Mechatronics System Engineering (MS, PhD)

PROFESSIONAL MASTER'S DEGREES

- Cybersecurity
- Data Science

ONLINE

- Data Science

CORPORATE CERTIFICATES & MASTER'S DEGREE

Lockheed Martin

- Three Stackable Certificates
- Systems Engineering (MS)

RESEARCH CLUSTERS

- Artificial Intelligence and Data Science for the Public Good
- Biomedical Devices
- Cyber-Physical Systems and Cybersecurity
- Robotics/Mechatronics
- Smart and Sustainable Communities

STUDENT PROFILES

UNDERGRADUATE PROFILE

TOTAL ENROLLMENT **576**

ENROLLMENT BY MAJOR

- Applied Computing **15**
- Computer engineering **53**
- Computer science **225**
- Electrical engineering **48**
- Game development **28**
- Mechanical engineering **159**
- Exploratory (undeclared) **48**

INTERNATIONAL REPRESENTATION

- INTERNATIONAL STUDENTS **57**
- COUNTRIES REPRESENTED **20**

FEMALE ENROLLMENT **136**

GRADUATE PROFILE

TOTAL ENROLLMENT **303**

ENROLLMENT BY MAJOR

- Bioengineering **7**
- Computer engineering **5**
- Computer science **27**
- Cybersecurity **16**
- Data science **117**
- Electrical & Computer engineering **8**
- Electrical engineering **6**
- Engineering **4**
- Materials science **6**
- Mechanical engineering **25**
- Mechatronic systems engineering **25**
- Non-Degree Seeking **24**
- Systems Engineering **33**

INTERNATIONAL REPRESENTATION

- INTERNATIONAL STUDENTS **78**
- COUNTRIES REPRESENTED **17**

FEMALE ENROLLMENT **86**

EDUCATION IS NOT THE FILLING OF A PAIL, BUT THE LIGHTING OF A FIRE. W.B. YEATS

2019-2020 HIGHLIGHTS

SCHOOL HIGHLIGHTS

- Conducted a school wide faculty search which resulted in the hiring of two tenure track faculty and three teaching faculty.
- **The Innovation Labs** created PPE (face shields, protective barriers, face mask dispensers, and dispensers for disinfection supplies) for classrooms and other spaces on campus.
- The Ritchie School was recognized for being a top school in the **ASEE Diversity Recognition Program with Bronze Award**.
- The Ritchie School hosted the Kickoff for **ChickTech** in January and over 50 middle school girls attended workshops to learn about STEM programs.
- The Ritchie School started a **limited series podcast** hosted by Dean JB Holston where he interviewed thought-leaders in the STEM community.
- **Ann Merchant**, deputy director for communications at the National Academy of Sciences visited the Ritchie School and presented about the Science & Entertainment Exchange Program.

GRADUATE

- The **KLab Team** will be collaborating with Commonwealth Edison Company to investigate how quantum computing can be applied to power system planning and operation with high penetration of Distribution Energy Resources including solar and energy storage.
- **Zohreh Hosseini**, current PhD candidate, was selected as the 2020 Colorado Winner of the NCWIT Award for Aspirations in Computing.

UNDERGRADUATE

- **Tau Beta Pi** initiated fifteen students over the course of the academic year.
- **Tim Bouraoui** developed a cutting edge device that will cut human brain samples into even, consistent pieces for research. The device was 3-D printed at the Innovation Floor.
- Despite the challenges of moving the **Senior Design** course and teams online due to the pandemic, the students flourished and held the Ritchie School's first Virtual Senior Design Symposium.

2019-2020 HIGHLIGHTS (CONTINUED)

FACULTY & STAFF HIGHLIGHTS

- **Dr. Chris GauthierDickey** appointed to Department Chair of the Computer Science department.
- **Paul Rullkoetter** was a top principal investigator ($1,000,000+).
- **Kevin Shelburne** was a top principal investigator ($500,000+).
- **Amin Khodaei** was a top principal investigator ($300,000+).
- **Kimon Valavanis and Matt Rutherford** received a patent for the Mobile Self-Leveling Landing Platform for Small-Scale UAVs (US 10,618.675; US 10,538,339; US 10,343,794).
- **Mohammad Mahoor** received a patent for Motor Task Detection Using Electrophysiological Signals (US 10,588,534).
- **Kimon Valavanis and Matt Rutherford** received a patent for Image Processing for Pose Estimation (US 10,540,782).
- **Matt Rutherford** is helping establish/contribute to new "Spit Lab" for rapid COVID-19 testing using saliva.
- **Mohammad Mahoor and PhD candidate Behzad Hasani's** paper on AffectNet won the 2019 IEEE Transactions in Affective Computing Award for most influential paper.
- **Haluk Ogmen** was chosen as the Interim Dean for the Ritchie School.
- **Rozhin Eskandarpour**, Postdoctoral Researcher, was elevated to an IEEE Senior Member.

GRANT HIGHLIGHTS

- **Maciej Kumosa and Monika Bleszynski** received a $60K grant from the Colorado Office of Economic Development and International Trade for "New Materials for Icing Prevention."
- **Casey Myers** was awarded a recent grant for "Stereo-Radiography Measurement of Foot-Shoe Motion."
- **Chadd Clary** received a grant for "Experimental Assessment of Micromotion Between Canal-Sparing and Stemmed and Humoral Components in Total Shoulder Arthoplasty."
- **Matt Gordon** received a grant for "Fragment vs. Concrete Composite Target Tests." This project will test ballistic resistance of concrete composite targets.

- **Yun-Bo Yi** received a grant from the National Science Foundation for "GOALI: Mechanical Properties of Metal-Free Friction Materials and Their Effects on Thermal-Mechanical Instabilities." This project will investigate the mechanical properties of next generation metal-free friction materials and their effects on thermal-mechanical instabilities. Copper and other heavy metals in modern friction materials are essential due to their superb capacity of heat dissipation, but there have been concerns that remnants of these metals can cause environmental contamination. Graphite, carbon and ceramic are considered a potential replacement for metals in friction materials. However, implementation of these new materials may cause other issues, such as thermal-mechanical instabilities.
- **Rui Fan** received a grant from Battelle National Labs, subaward from the Department of Energy for "Data-Driven Approaches Bridging Protection Gaps in Power System." This project will assist in the development of advanced data-driven algorithms to bridge existing protection gaps in power. A protection gap describes inadequacies in protection schemes used to reduce likelihood of equipment damage and ensure personal safety. Traditional protection schemes mainly rely on commercial relays to issue tripping commands when certain preset thresholds are exceeded. However, it is sometimes very difficult to determine accurate thresholds. In this way, the resilience and reliability of power systems will be further enhanced.
- **Paul Rullkoetter** received a grant for "In Vivo Evaluation of Femur-Pelvic Positioning."
- **Kevin Shelburne** received a grant for "In Vivo Evaluation of Medial-Pivot Cruciate-Sacrificing TKA Kinematics, Loading and Mechanics."
- **Siavash Rezazadeh** received a grant from the University of Michigan, subaward from the National Science Foundation, for "NRI: FND: COLLAB: Optimal Design of Robust Compliant Actuators for Ubiquitous Co-Robots." The project seeks to establish a robust convex optimization framework for the design of series elastic actuators (SEAs) that are energy-efficient and safe across a variety of tasks. Unlike rigid actuators, SEAs can store and release mechanical energy for greater efficiency and absorb shocks for greater safety during human interaction. A convex formulation of SEA design problem is developed in this project, which guarantees finding the global optimum performance point. The global optimality then is used in this sub-project to understand when and for what types of tasks an SEA can increase efficiency and robustness.

2019-2020 HIGHLIGHTS (CONTINUED)

GRANT HIGHLIGHTS (CONTINTUED)

- **Breigh Roszelle, Matt Gordon, and Michael Caston** received a grant from the Florida Institute of Technology for "Development of 'tools' for fostering entrepreneurial mindset through making."
- **Bradley Davidson and Kevin Shelburne** received a grant for the "Running/ Endurance Performance" project.
- **Zhihui Zhu** received a grant from the National Science Foundation for "Collaborative Research: CIF: Small: Deep Sparse Models: Algorithms and Analysis." Deep convolutional networks have boosted the development of machine learning tools with impressive success, often obtaining state-of-the-art performance in a variety of applications and across many different fields. Unfortunately, however, this impressive evolution in practical algorithms has not been accompanied by a sound theoretical understanding of the fundamental ideas behind these tools and their performance. This project aims to undertake a thorough study of multilayer sparse models, broadening the understanding of its related optimization and learning problems, and providing a rigorous study of its connection to deep learning approaches.

Keep up-to-date on Ritchie School news and events by following us on:

SPECIAL THANKS TO JB HOLSTON

From 2015-2020 JB Holston served as the Ritchie School's Dean. His passion for our students' success, initiative to drive innovation, and creativity will be missed. While we could try to sum up his experience that is best left to JB. Below is an excerpt from JB's resignation announcement.

"I've enjoyed working these last five years with so many wonderful colleagues at the University, which is tremendously positioned to continue to be a vital innovation engine in the decades ahead.

Students inspire our work. Ritchie students have spent time with the Grand Challenge Scholars program in Washington D.C. and London, with faculty on summer immersive learning trips in Germany and France, and on structured exchange programs in Scotland and Australia. One great example of our innovation progress was Wanderlift, a multi-disciplinary DU student start-up chosen to compete as one of five student start-ups from the U.S.A. against teams from Europe and China.

Fun things we've done include taking 200 local high school students from underrepresented schools to see 'Hidden Figures'; witnessing 90 intermediate and middle school students working with DU students and faculty through Girls with Gadgets; talking with the thousands of attendees of the regional First Robotics competition each year; and seeing firsthand the enthusiasm of our women students returning from the Grace Hopper Conference thanks to great philanthropic support.

I won't forget the leaning towers of cardboard that extended from the floor to the ceiling in the atrium of our building during student competitions. It's been wonderful to see our community rally around our students and faculty from Iran, Iraq and Saudi Arabia these last two years. And I've enjoyed the multi-player game competitions in the innovation floor, and seeing autonomous vehicles roaming everywhere each Spring.

Helping everyone accelerate forward, faster, as the School's strategic plan is called, has been extraordinarily rewarding."

WE WISH YOU THE BEST OF LUCK IN YOUR NEW ROLE LEADING THE GREATER WASHINGTON PARTNERSHIP AS THEIR CEO. THANK YOU!

GET INVOLVED WITH THE RITCHIE SCHOOL

CONNECT WITH OUR DEVELOPMENT AND ENAGEMENT TEAM

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AN INVESTMENT IN KNOWLEDGE ALWAYS PAYS INTEREST.

BENJAMIN FRANKLIN

Thank You for Your Continued Support of the Ritchie School!

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