

CU

CUENGINEERING 2020



FEATURES

12

Biomedical boost New degrees will be ene-opening and in:

New degrees will be eje-opening and inspirational for students, program director says.

16

DNA: Goldmine for hackers? Security measures for genetic data storage lag behind those built into consumer products.

20

Academia meets activism

ARMOR student group says we can all play a role in helping to stop superbugs.

/cueng T*k3uineering @CUEng T*k3uineering

@CUEng T*k3uineerindUniversity of Colorado Boulder College @KeithMolenaar



ALUMNI PROFILES

24

Genomics + machine learning Bioscience startup earns computer science alumnus a spot on Forbes 30 Under 30 list.

26

Engineering a medical career Problem-solving skills from her engineering education help alumna succeed as a doctor.

STUDENT PROFILES

14

A path back to teaching

Veteran Brodie Hoyer is on the fast track to a PhD in hope of returning to West Point.

34

Western Buffs

Partnership program proves to be the best of both worlds for Gunnison students.

RESEARCH

18

Special delivery Delivering life-saving medical treatments effectively is just as important as discovering them.

28

Biomedical breakthroughs Check out brief updates on some new CU Engineering

Check out brief updates on some new CU Engineering biomedical research advances.



Computer science celebrates 50 years, pC T*k3uge

4 CUENGINEERING



CUENGINEERIMEWS





Brodie s goal was clear in that he wants to the people are excited to come to the lab an instructor, Rentschler said. When you rand are passionate about their research, committed and know why you re doing what over said. you re doing, you II make it happen.

Many skills Hoyer acquired as a leader in the He said there are no shortcuts to receiving military translate well to his research.m of d1ide the body. PhD at CU Boulder. Hoyer is doing what most do in about half the time.

Bill Doe, a research development of cer with the College of Engineering and Applied

Science, went through a very similar program 30 years ago and also graduated from West Point. He said Hoyer is a clear leader among his peers, an intelligent, diligent and humble engineer of deep character.

Hoyer s research investigates how microtextured surfaces interact with soft tissue, particularly useful in improving the ef ciency of medical robots inside the gastrointestinal tract.

Imagine treads on a small mobile robot, Hoyer said. We re trying to predict what qualities those treads need in order to move ef ciently and without damaging tissue."

The lab group aims to model how these treads create traction, so they can predict how a robot will move inside the body.

It s always energizing to be in an environment



DNA: Goldmine for hackers By Josh Rhoten

Genetic data is some of the most valuable master s student Arya Thaker said. This is personal information we have. But protections solutely the kind of work I or any student and assurances around its collection and pursuing cybersecurity would love to do storage lag behind those built into consumeras a career. products, like Social Security numbers.

Shifting that dynamic to favor user security centers all along the Front Range, including is a problem that students in the Technologyat Colorado State University, CU Anschutz Cybersecurity and Policy Program are exploring as part of a graduate capstone each stop, they conducted interviews and project funded by GeneInfoSec. The goal is to research and document potential securitymeasures and problems that may not have vulnerabilities in this area, starting with the genetic sequencing machines used to collect and process this data through the What they fnd will be collected into a interconnected ecosystem of labs and serversomprehensive report a sort of state of where it is stored and accessed.

Thaker and his team visited sequencing Medical Campus and industry providers. At gathered data to understand existing security been considered at all.

the union of interest to many parties working in this area.

Their work could eventually help protect those

who have willingly shared their DNA to better understand their ancestry and those who need for heightened security genetic testing to help with treatment of racharing of personal genetic information diseases or cancer. has become common. According to MIT

Technology Review, consumers purchased "This project is a very good opportunity for us the same number of at-home DNA tests to apply the skills we have learned during the 2018 as in all previous years since program and also contribute comprehensivel 2012 combined.

If that trend continues, companies like 23andMe could house the genetic information of more than 100 million people within two years. That total doesn t include those who shared data for medical reasons.

It also means there s more incentive for bad actors to try to access the data. Genetic information can be used to identify personal traits like height and ethnicity or diseases you are predisposed to. It can even be used to simulate your face or voice.

Securing that information is vital, since it could be used to tailor a disease to attack only certain portions of the population or to fnd and hack into people s bank accounts.

TCP students looking at those possibilities found that potential protections required consideration of health privacy standards in addition to traditional cybersecurity concerns, which start with hardware in each lab space.

'Setting the tone'

\v5t5chTstartTxit((Thatdv4si4BQ4dd. 15132BQt1370>(55302)Y392005740Q5740Q68901003947UC5V4(TJ/51240r %Spbang<9D304)\$T*-US







AT THE DOCTOR'S OFFICE Keep in mind that antibiotics can treat only bacterial infections.



Women's Group in Bend, Oregon, where wondrous mountains are never far away. If

Imaging technique allows earlier diagnoses of osteoarthritis

Associate Professor Corey Neu | Mechanical Engineering

Neu is working with colleagues at the University of Colorado Anschutz Medical Campus to detect early osteoarthritis, allowing younger patients to seek treatment earlier and possibly ward of the most severe treatment plans. To do this, his team is determining whether functional imaging methods which focus on assessment of cartilage health and elasticity in the knee can predict osteoarthritis in humans. Early prediction would allow patients to begin treatments like physical therapy or minimally invasive arthroscopy long before something as serious a joint replacement is their only option. To do the work, Neu will be leveraging a state-of-the-art MRI scanner and focusing on patients younger than 45 who will be undergoing ACL reconstruction. That is because those with ACL



Real-time imaging of living tissue Professor Rafael Piestun | Electrical, Computer and Energy Engineering

Controlling the process by which light waves travel

Improving cancer detection and therapy

Professor Wounjhang Park | Electrical, Computer and Energy Engineering Park s lab is using plasmonic nanostructures



Western) \ H Z

Partnership program helps students engineer their own CU experience

In 2018, the CU Boulder College of Engineering and Applied Science launched a partnership program with Western Colorado University s Paul M. Rady School of Computer Science and Engineering. The program allows students to earn Bachelor of Science degrees in computer science or mechanical engineering as graduates of CU Boulder. They complete their frst two years as Western students, and the balance of their education as CU Boulder students, all while remaining on the Western campus in Gunnison, Colorado.

Forty students enrolled in the inaugural class in fall 2019, and they re already making their mark.

We are fortunate to have these talented students as part of our CU Engineering community, Interim Dean Keith Molenaar said. "We look forward to working with them on th journey to becoming professional engineers and scientists.

Here is a look at two of the standout students of the Class of 2023 who are taking advantage of the opportunity to get their CU Boulder degrees in a smallschool atmosphere.



Working in aerospace has been at the top of Victoria Bowen's list for a while.

While searching for the right college to get



David Gupta (ArchEngr' 85)

CEO, SDI DEAA: Industry & Commerce

David A. Gupta founded IT consultancy and managed services provider SDI Presence in 1996 and today continues to lead the frm as chief executive of cer. The company









Steven Vogel (MechEngr'12) credits the College of Engineering and Applied

