HIGH POINT UNIVERSITY

Webb School of Engineering

I.   Dean's introduction

From the Dean…

Welcome to the Spring 2021 newsletter bringing you the latest news from the Webb School of Engineering at High Point University. It has been a challenging year for everyone with a pandemic sweeping the world and forcing institutions, faculty and students to rapidly adjust to the uncertainty that accompanying it. HPU made the decision to open for face-to=face classes in the 2020-21 academic year and we successfully managed to delivery all classes in that mode and provide our students, as best we could, a near normal educational experience. The past Spring semester saw relatively few COVID cases on campus thanks to the diligence of faculty, staff and students in wearing masks, washing their hands frequently, and maintaining social distancing. We are grateful for everyone's cooperation and patience over what has been a challenging time. We are all looking forward to returning to normal now that several vaccines are available and being distributed.

However, not even a pandemic slows us down. Computer Science recently was approved to introduce 2 new programs: a BS in Cybersecurity and a BS in Data Science. The BS in cybersecurity will complement the existing BS in Computer Science with a concentration in cybersecurity which will continue.

We also welcome the Department of Mathematical Sciences into the Webb School of Engineering as of June 1, 2021. This comes about as a result of some minor academic restructuring. The Department of Mathematical Sciences offers 4 programs: Mathematics, Actuarial Science, Data Analytics and Statistics, and Mathematical Economics. These complement the existing programs in the School of Engineering, while the department simultaneously delivers courses which directly support the programs offers within the Department of Computer Science and the Department of Electrical and Computer Engineering.

You'll read about some more of the exciting things that are happening in the Webb School of Engineering as you browse through the newsletter. We always like to hear from alumni to learn

what they are doing and how they are using their degrees, If you have a story you would like to share, please contact me at moudshoo@highpoint.edu. We would like to feature some alumni in future newsletter.

Michael Oudshoorn

Dean, Webb School of Engineering

Reflections on a Year of a Campus and Coronavirus
by Dr. Lloyd Williams

The past year has undoubtedly been an unprecedented one that has had huge ramifications for how we all work, learn and play. Teaching and learning here at High Point has had to adapt to many of the challenges that living with COVID has imposed on all of us. The classroom has looked very different over the past year, online at first and eventually, although filled with students, socially distanced and masked. We all have dealt everyday with dramatic changes to how we learn, socialize and connect with friends. With a vaccine now being rolled out, it is interesting to take time to reflect on some of the lessons to be learned from living through a pandemic.

When students left campus for spring break in 2020, it would have been difficult to imagine that they would not return until the following fall. As we all now know, this is in fact exactly what happened and both students and faculty quickly found themselves scrambling to move classes online. It was interesting to see the changes that student's emotions went through as the pandemic went on longer than any of us would have thought possible. Initially there was some happiness, an extra week of spring break was a welcome surprise for many. As time went on it became starkly clear that everyone was going to be dealing with the effects of the Coronavirus for much longer than just a week.

The transition to online learning was initially just a stop-gap measure that would tide things over until everyone could safely return to campus. As the weeks of remote learning started to mount, it was interesting to see students gradually notice and miss the many things that are special about being a student here at HPU. They poignantly missed our beautiful campus. Our campus is an extraordinary

place at any time of the year, but it was bittersweet to think of all the beautiful flowers, trees and other fauna blooming in all of their spring glory, with almost no one there to see them.

Students also began to appreciate just how special the intimate small class sizes we enjoy at HPU are. There are many aspects of teaching, just one of them is conveying information about the material to students. This can be done by reading a textbook or sitting in a lecture. Students soon realized that while a lecture may take many forms, they are not all created equal. A professor can speak to a small class of students or can give that same lecture to an auditorium filled with 200 or more students. That very same lecture can be streamed online or recorded for students to watch later. While the same material is being presented through each of these modalities, students soon realized that there is something very special that occurs in the back and forth between class and professor that is only possible in a small intimate class.

These personal interactions don't only occur in the classroom. There is something special that happens to us all when we are surrounded by people who are constantly striving to be the very best they can be. It is not just the bronze statues of history's great thinkers and leaders that inspire us when we walk through campus, it is the entire community that inhabits our campus.

There is a saying that you only truly appreciate what you have after it is gone. All of us have had chances to varying degrees to experience the absence of so many things after over a year of living in a global pandemic. While there has certainly been a sadness that has come from the experience of those absences hopefully, we have also gained newfound appreciation for those things that have been absent from our lives.   We are all very fortunate to experience whatever is the amount time we will inhabit the campus of HPU. As we reflect on the past year, let us all appreciate the privilege it is to spend time here on the campus of HPU.

III.   DEPARTMENTAL NEWS

Dr. Yong Wei joins Webb School of Engineering as Professor of Computer Science

We welcome Dr. Yong Wei who has joined the Department of Computer Science as a Professor of Computer Science. Dr. Wei has developed and taught a wide spectrum of computer science courses, including in engineering computing, digital signal processing and machine learning. He has worked with students on many research projects and published with them in IEEE international conferences. With over twenty papers published in prestigious journals and international conference proceedings, his research interests include computer vision, machine learning, and their applications in exobiology, cyber security, and computational physics and chemistry. His current ongoing research includes a collaborative project on developing deep learning models for exobiology with NASA and a project on malware identification using recurrence plots.

Introducing CELF - A Different Approach to Cybersecurity Skills Mastery

by Julia Quintos

Currently, there's a massive shortage of workplace cybersecurity skills, and this shortage is having a very real impact on global organizations. Experts estimate that by the end of 2021, a business will fall victim to a ransomware attack every 11 seconds. Moreover, the total number of malware infections has been on the rise for the last ten years. In the past year, we've seen several high profile cyberattacks, including the hacking of Washington, D.C.'s Metropolitan Police Department, an attack on Microsoft's Exchange Server that affected millions of their clients, and a Twitch data leak that included the company's source

code and internal company documents. With cyberattacks on the rise year on year, the demand for cybersecurity professionals is higher than ever. However, there remains a significant shortage of competent information security workers ready to take these roles. The number of unfilled positions has risen by 50% since 2015.

The Cybersecurity Engineering Learning Facility (CELF) was born out of addressing this professional skills gap. While traditional cybersecurity labs rely on overly structured simulations that lack real-world urgency and randomness, CELF takes a more hands-on, active, and realistic approach. If a traditional cybersecurity lab is a carefully curated theme park, CELF is a sandbox.

CELF is designed to be both challenging and stimulating. For example, while a traditional lab would have students execute steps to engineer two computing systems and connect them, CELF abandons stepwise procedures. Instead, using their current knowledge, skills, and ability, CELF students are permitted to build systems in any order they see fit.

The unique approach put forward by the CELF lab allows students the freedom to develop new and endless pathways to each goal. It empowers students to reach the end goal (securing an environment) rather than working through a series of approved steps. This approach is much closer to how cybersecurity works in the real world, where locking hackers out and protecting valuable information is the ultimate goal.

The alarming reality is that nefarious hackers are always sharpening their skills and adapting to changing business environments. So it's a game of cat and mouse. And if the next generation of engineering and tech professionals don't harbor the required skills, we'll surely see increasingly destructive cyberattacks in the coming years. With CELF, students have the opportunity to master these skills.

MAKERSPACE: Limited Only by Imagination

by Dr. Claire McCullough, PE

With the completion of the Makerspace in the Webb School of Engineering, students at High Point University have a variety of resources that enable them to design and build many different types of projects, beginning with the Introduction to Engineering Design class in the first semester of freshman year. The main portion of the Makerspace includes several 3D printers, which are capable of using more than the usual ABS plastics, such as materials with wood or metal content to allow the prints to be stained like wood or polished like metal, and dissolvable support materials to allow for more sophisticated shapes to be printed.

The new addition of a vacuum former with an 11x17 inch work surface will also allow fabrication of complex, concave shapes that can be difficult with a 3D printer. The Makerspace includes two full electronics set ups, with state of the art equipment, including four-channel oscilloscopes, function generators, multi-meters, and power supplies, if students want to work on circuits and electronics projects in a more informal setting, than in the electronics labs. Students also have resources for soldering electronics in this space. A computer-controlled sewing machine with embroidery capability allows students to develop items such as wearable technology or wearable art. The second portion of the Makerspace, the Fabrication Lab, or "Fab Lab" has equipment for larger fabrications, including band saws, a drill press, routers, sanders, grinders, & Dremels. A computer controlled router allows fabrication of complex shapes in wood & hard plastics. A circuit board router will give students the ability to fabricate their own printed circuit boards for electronic projects. The computer controlled laser cutter gives students the capability to cut and etch wood and acrylic and etch some types of metal. With all the equipment and materials available in the Webb School of Engineering, what students can create is limited only by their imagination.

HPU Minds

By Dr. Michael Oudshoorn

The HPU Minds student group has recently started a new project to explore controlling devices through thought. Initially, the students will use commercially available EEG headsets to detect electrical activity in the wearer's brain and convert that into instructions to control a Sphero robot. This will provide some experience in controlling a device by thought before the project evolves to consider more complex devices such as wireless vehicles (remote control car), drones, or a robotic arm.

There are lots of options for different students to get involved in different aspects of the project. Neural nets and AI can be used to train the system to work with individuals including those who may have suffered brain injuries. Interesting questions can be asked and answered/verified by the students: is the language used to "think" instructions important – the concept of "left" is language independent? Are there differences in the brain that affect control as a human ages – does a 7-year old and an 87-year old think differently or control the device differently? Can we train the system to work properly for people with brain injuries? While the answer may be known to such questions, students can get some hands-on experience validating the results and posing hypotheses of their own. Once students can control a device such as a Spero robot which has a well-defined application programmer interface (API), then they are interested in building a remote-controlled car – the device and the API – from scratch. What 10-year-old would not want a thought-controlled toy? There are also many options and opportunities for interdisciplinary undergraduate research projects that could come out of this.

Steve Wozniak is the Innovator in Residence and serves as a mentor/sounding board for the HPU Minds student group. Wozniak met virtually with virtually with the HPU Minds group on April 14 to brain-storm ideas with him with respect to options and approaches to consider regarding how to control the devices, how to measure success, how to debug the system, how to build the system both in terms of hardware and software, etc. The session was highly interactive with students asking Wozniak many probing questions and receiving sage advice and suggestions. Dr. Oudshoorn, who facilitated the sessions, noted that the students were encouraged and enthused by Wozniak who reminded students that the most rewarding outcomes are a result of a little hard work. Wozniak also encouraged the students to "keep it fun". The project is not for a grade. But is a great way to put into practice what they have learned in classes, and to collaborate in an interdisciplinary team.

Senior Madison D'Ostuni, the previous President of HPU Minds, noted that some of the key takeaways include taking the project step by step and Woz's definition of ethics. Woz explained how this project has many applications in the real world, but first we have to start small. Building our headset, correctly position the headset on the user, and getting the headset communicating with the sphero are all beginning steps, yet their own successes. Woz also explained the importance of ethics to him. He stated, "Truth equals ethics", noting if we as students are honest and tell the truth throughout our research, we will be conducting ourselves ethically.

The best part about our meeting with Woz was his enthusiasm for the project. He explained how after speaking with Dr. Oudshoorn he ordered himself a headset with electrodes to tinker with. Woz could not emphasis enough how if you do what you love you'll never feel like you've worked a day in your life. He told us to fill our team with an array of students who are both enthusiastic about the project and driven to learn more outside of the classroom.

After the HPU Minds group has accomplished their initial goals, they would like to progress the project to controlling something like a mechanical arm and exploring how to make it move with thought control. They hope that technology can be used for anyone with a disability. D'Ostuni also reported, "I have a friend with spina bifida who has to use a wheelchair, and if she can use the thought controlled legs, she'd be able to walk. We want to explore reading brainwaves, and looking at not only any correlations between age & gender, but also if language and brain injuries affects brainwaves. I have had two severe concussions and my brainwaves may look different than someone who has not had a brain injury. The results may be different for everyone who has had brain damage." The team is looking forward to hit the ground running and work on an interdisciplinary project.

Interested students in Neuroscience, Computer Science, and Engineering are collaborating to work on the project.

A Sphero BOLT robot is pictured above.

An EEG headset.

Electrical and Computer Engineering Industrial Advisory Board

by Dr. Claire McCullough, PE

In order for an engineering program to provide its students with the best possible education and prepare them for professional practice, it is necessary to have input from industry on what skills and abilities they regard as critical for professional success, so that we are able to produce the engineering graduates that they would eventually want to hire.

The Electrical and Computer Engineering department at High Point University has formed an Industrial Advisory Board of industry leaders to provide this critical input. The role of the Industry Advisory Board in the Electrical and Computer Engineering Department is to assist and advise the Department in its efforts to achieve excellence in all engineering programs through the following activities:

1. Advise regarding issues related to our instructional, applied research and service activities

2. Participate in the Department's assessment process through:
   - Review and evaluation of strategic goals, plans, and new initiatives.
   - Real-world input for the program's curriculum, educational objectives and learning outcomes.

3. Provide support in expanding and strengthening mutually beneficial relationships with industry, present and former students, and government agencies.

4. Advocate for engineering programs at HPU where appropriate.

5. Other assistance could include evaluation of student design projects, participation in mock interviews to aid students in job searches, presentations to students, and recruitment of students for summer internships, co-op positions and permanent employment.

We welcome all the members of the Industrial Advisory Board, and look forward to working with them as we continue to develop our engineering programs.

Michael Solomon

Mike Solomon is the Economic Development Director for North and South Carolina for the Timmons Group in their Greensboro office. The Timmons Group is a full service consulting firm with 17 offices and 700 engineers that provides civil engineering, planning, environmental and transportation engineering and all aspects of site development. Mike is a professional engineer registered in four states and is also a licensed real estate broker. As the director of economic development he is actively involved in locating and assessing development sites throughout the state.

Charles L Bowman II PE

Charles Bowman is the founder of CB2 Structural Engineers PLLC. Charles is a graduate of North Carolina State University and brings 28 years of structural design engineering experience to the advisory board. His primary work responsibilities include structural engineering design and project management of new building structures in addition to investigation and review of existing buildings. Charles is a licensed professional engineer in North Carolina, South Carolina and Virginia and is nationally certified via the Structural Engineering Certification Board.

Robert A. Herrick P.E., CIH

Soon after his graduation in Iowa State, he took the opportunity to join the US Public Health Service. At this time this was the only federal agency directly concerned with air and water pollution management. This became his career, which narrowed first to air pollution control in heavy industry and later to indoor air quality, where the majority of the assessment scientists had non-engineering backgrounds. His primary professional society involvement for the past 40 years has been with ABET, the accreditation agency for BS and MS STEM education, where the educational experience prepares graduates to be assets to the community as well as to the profession.

Tyler R. Berrier, P.E.

Tyler Berrier is a North Carolina native, who brings a record of exceptional leadership and a proactive mindset to High Point. Berrier is currently the Assistant Director of Electric Utilities for the City of High Point, where he manages operations pertaining to the electrical transmission and distribution systems. Berrier is a registered professional engineer in the state of North Carolina and has more than 17 years of experience in engineering, operations management and contract administration.

Hannah Callahan

Hannah Callahan is the HR Generalist at ZIEHL-ABEGG, Inc. in Greensboro, NC. ZIEHL-ABEGG is a German manufacturer of fans and motors for commercial and industrial applications. Their fans can be used in HVAC units, refrigeration applications, data center cooling, clean room facilities, agriculture facilities and renewable energy sources.

Teresa Hart

Teresa Hart, PE, CPM is a registered professional engineer, certified public manager, and Associate Vice President for Johnson, Mirmiran, and Thompson (JMT). JMT is a full-service planning, engineering, and architectural firm with offices strategically located throughout the United States including Charlotte and Raleigh, NC. Teresa is the Raleigh Office Manager, responsible for client service delivery of planning, highway design, structural design, construction engineering inspection, survey, and financial performance. Her past service to the state of NC includes the appointment to Director for the North

Carolina Division of Public Transportation to lead the state's program to promote Intercity, Urban and Rural public transportation, light rail, and policy development at the highest levels.

Johgre Hinton

Johgre Hinton has 10 years of electric utility experience. Hinton serves as the manager of Carolinas Customer Delivery Complex Centralized Design for Duke Energy. In this role, he is responsible for underground facility designs for subdivisions and multi-family units, the design for oil spill prevention, control and countermeasure of distribution facilities in the Carolinas, design of distribution-distribution substations and the oversight of method of service evaluations for above standard deliverables for large commercial and industrial customers. Hinton holds a Bachelor of Science degree from North Carolinas State University in Civil Engineering and a Master of Business Administration from the University of North Carolina at Chapel Hill – Kenan-Flagler Business School.

Veronica Wallace

Veronica McGriff Wallace, PE has 31 years of experience in the Transportation field. Veronica currently works for the City of Charlotte in the Engineering and Property Management Department – Engineering Services Division. In her current position, she effectively and efficiently manages the Engineering Services Division staff and resources to implement transportation projects that meet City goals. Her team provides quality services to many groups across the City that include the City Manager's Office, Charlotte Department of Transportation, Neighborhood and Housing Services, Economic Development, Building Services and Cemeteries. She previously led a multi-disciplinary team (West Strategy Team) of professionals responsible for developing and implementing a strategy for delivering successful Community Investment Plan projects. She is a registered Professional Engineer and is an active member in the American Society of Civil Engineers (ASCE).

IV.   STUDENT PROFILE

MARCUS DEKNATEL

1. What are you studying at HPU?
Computer Science and Data Analytics & Statistics

2. Why did you choose HPU?
I was very excited to be a part of a program that was rapidly developing. This might've been a double edged sword at another university, as certain foundations were not yet set in stone. However, after meeting with the faculty within my field of study, my worries faded and my excitement grew from their extrusive ambition.

3. What interests do you have outside of your major?
A few of my passions include rock climbing and backpacking. While bouldering, I enjoy the challenge of putting both mind and body to the test to solve complex routes through brute force and technique. Previously, I have gone on 4 major backpacking trips in the Rockies, the

Great Lakes, and the A.T., along with numerous other trips. One day, I hope to become a 46er and ascend all 46 of the Adirondack high peaks.

4. What are some of the challenges that you have faced or overcome this semester?

Despite challenges that have come with being a student during the covid-19 crisis, High Point University has managed to continue to offer its students many excellent opportunities. With these opportunities comes countless ways to get involved in academic, professional, and extracurricular activities . My main challenge is trying to balance my time between prioritizing my academics, utilizing professional opportunities such as research and job applications, and pursuing passions outside of the classroom. HPU has given me the skills and opportunities to create an amazing future it is up to me to choose to be extraordinary.

5. What do you hope to do with your degree when you graduate?
Like my fellow peers, at this point in my education my greatest hope is for a job. For someone in a growing industry with a high probability of being employed out of college this seems like a low expectation. However, it is not that my dreams are falling short, but that I do not want to contain them within a single statement. Instead I will claim that as my only certainty from which I will build my future off of. With my HPU degree I can shoot for the moon, and I know I will land among the stars.

6. Are you involved in any activities on campus? In what capacity?
I am a student athlete who competes for the Ultimate Frisbee and Ballroom Dance teams. I am also currently in the process of founding the rock climbing club on campus which has given me the opportunity to serve as a senator within the student government. My faith is something that is also very important to me and I continue my spiritual journey through fellowship with Young Life.

7. What advice would you like to share with your peers or with future students?

Confidence and empathy will foster many great relationships and if given the opportunity, always help someone out. The connections and relationships you are building here and now will serve you in the future both in professional and personal ways.

GRACE CROCKETT

1. **What are you studying at HPU?**

   Double major in Computer Science and Marketing and double minor in Sales and Business Administration.

2. **Why did you choose HPU?**

   I chose HPU because I knew that compared to other universities, there would be customizable opportunity for individual growth. It was really important for me to be in a place where I could equally learn in and outside the classroom alongside a strong community of likeminded students. As I plan to conclude my time as an undergraduate, I am so grateful for all of the wonderful experiences that I got to participate in that I know could not be had anywhere else.

3. **What interests do you have outside of your major?**

I originally came to HPU as a violin performance major in addition to business and CS, and while that is no longer part of my academic focus, it is still something I continue to participate in. As someone who has taken classes within every department HPU offers (I tend to have many interests that I want to explore), I have found that there is so much opportunity to discover new passions as well as develop existing ones.

4. **What are some of the challenges that you have faced or overcome this semester?**

    While in person learning has certainly been a blessing, this semester has still seen the effects of Covid in the classroom. Learning how to remotely navigate group projects and learning how to virtually do so many things that used to require a hands-on component was definitely a challenge to overcome, however, I think that it ultimately brought us all together in a way that couldn't happen face to face. I felt like we all had to rely on each other in order to adapt to each change together. This semester has been particularly special since this is the last semester of my senior year, and while there have been some inevitable disappointments with the elimination of some experiences due to covid regulations, it has been one of the most rewarding semesters of my time at HPU.

5. **What do you hope to do with your degree when you graduate?**

    Currently I plan on going into Technology Consulting as my ultimate goal is to find an outlet that combines both of my degrees. Since the fields of business and computer science have so many overlapping elements, I want to either go into areas of consulting or data analytics in order to fully apply the knowledge I've gained at HPU.

6. **Are you involved in any activities on campus? In what capacity?**
    I am a part of the HPU minds team, Professional Selling Club, Alpha Kappa Psi (professional business fraternity), and the Business Fellows on campus.

7. **What advice would you like to share with your peers or with future students?**
    I would encourage students to go after every opportunity you can because you never know what will come out of it. Additionally, don't be afraid to fail, especially when it comes to trying new things. So many unexpected blessings can arise out of these learning situations and you end up growing so much more as a person through it. I have found that so many of my proudest moments have come about from opportunities that I went into blindly and ended up leaving with friends, mentors, and unforgettable experiences.

TAYLOR COX

1. **What are you studying at HPU?**
   Computer Engineering

2. **Why did you choose HPU?**

In searching for a local option to obtain my chosen degree, I found that HPU far exceeded my expectations. I was intrigued by the emphasis on life skills and fascinated by how comfortable I felt on campus. The small size offered me the rare opportunity to know my professors personally, which has made it much easier to address challenges and has made the whole experience more rewarding. I can't imagine being anywhere else.

3. **Describe your transition to college.**

I was homeschooled until college. HPU was a perfect fit for me, and I adjusted much more easily than most would expect. I entered with confidence and excitement and was greatly rewarded by enjoyable classes, thoughtful people, and a beautiful environment. With such a time-consuming degree plan, I'm glad I didn't jump into too many other things at first. You'll

always hear "get involved", but try to avoid putting so much on your plate that you're overwhelmed. You can always expand.

4. What interests do you have outside of your major?
I deeply enjoy engaging in anything artistic - specifically music, writing, drawing, and photography. I'm a longtime fan of music label Monstercat, and keeping up with their weekly livestreams helps me to have scheduled time to relax and focus on something that inspires me.

5. What are some of the challenges that you have faced or overcome this semester?
One challenge I anticipated this semester was finding time to spend with new friends while staying focused on learning. Most days, I end up doing both at once. It definitely helps that my closest friends are also in the engineering program, where we have a strong sense of community driven by our desire to help and motivate each other. The engineering spaces on the second floor of Couch Hall are perfect for studying and relaxing together, and to me it feels like another home.

6. What do you hope to do with your degree when you graduate?
 I often hear that "the job you want might not even exist yet", and I think that's especially true for my field. While I may not yet have a specific career plan, I'm interested in lots of developing tech, such as autonomous cars and delivery drones. I think keeping my mind open for now is valuable. The future is full of possibilities and I'm excited to be part of it. Whichever area(s) I choose to focus on, I'm confident that my skills will put me in high demand, and my experiences at HPU will help me stand out even more.

7. Are you involved in any activities on campus? In what capacity?
While I try not to involve myself in so many things that I get distracted from my studies, I do regularly attend church and Bible study on campus. It has helped me to find community outside of engineering and has led me to nice people with whom I can discuss my faith and struggles. I also try to keep my eyes open for fun opportunities to briefly get my mind off homework, such as food truck events, movie showings at the Wanek Cinema, art nights in my residence hall, and Fulldome Fridays at the planetarium.

8. What advice would you like to share with your peers or with future students?
Don't be afraid to ask for the help you need. The resources at HPU are too exceptional to not take advantage of. Also, don't focus on the pressure to have your life planned out right now. It's totally fine not to know yet what you want to do, and college is a great place to explore different avenues of interest. Be eager to learn, and remember that you CAN succeed - that's what made my transition so smooth.