



Engineers' Forum

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HOPE TO WALK

CAITLIN McCONNELL

ASK AN EMPLOYER

ALEXANDER PESTOPOULOS

HOPPING INTO COMPUTING CAREERS

ARIANNA KRINOS

LEARNING TO SPEAK DATA

AKSHAY RAJENDRAN

AUTO-DRIVE

JIN TIAN ACTON

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Engineers'

Forum

LETTER FROM THE EDITOR

In this, the second issue of Engineers' Forum for the 2018–2019 academic year, we take a deeper dive into the student engineering experience at Virginia Tech. We hope that this issue will interest and inspire you, the reader, as you power through your year.

If you read on, you'll hear from writer Caitlin McConnell about Hope to Walk, a charitable organization that provides prosthetics to the less fortunate, and how a particular Virginia Tech student is giving back in partnership with their efforts.

Further, you will get a glimpse of a Virginia Tech-hosted design competition that took place in late September 2018. Delivering an exciting recount of the festivities is second-time writer Jin Tian Acton.

Also in this issue, Alex Petsopoulos gets up close and personal with one of our industry advertising partners, and provides insight into what students need to do to stack up to the competition for great internships.

Later, Akshay Rajendran breaks down data science in his article, which also chronicles the company he interned for in Summer 2018.

Finally, I offer a description of the Grace Hopper Celebration for Women in Computing, a three-day diversity conference held in Houston, Texas that hosted over 20,000

technologists in September 2018. Several Virginia Tech students were lucky enough to be fully funded to attend the "celebration".

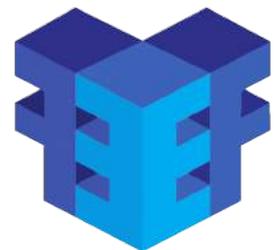
Thank you for picking up the November issue of Engineers' Forum. Without the support of our readers, we would struggle to bring you the latest in engineering!

Sincerely,



Arianna Krinos

Editor-in-Chief



VOLUME 39

NUMBER 4

On the Cover

Conference Floor from Grace Hopper
2018: Hopping into Computing Careers
Arianna Krinos

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Virginia Tech - Engineer's Forum



www.ef.org.vt.edu

Hope to Walk

Caitlin McConnell

Fellow Hokies: If you are looking for a way to change lives, I know just the way!

Hope to Walk is located in Christiansburg and is giving the gift of walking to as many people as possible. HTW is an organization that brings freedom and hope by designing and delivering low-cost prosthetic legs to individuals in developing nations who cannot afford them.

There are approximately 35 million individuals around the world in need of prosthetic or assistive devices, and 24 million of these people are living in developing nations where income is less than five dollars a day. Additionally, there is approximately one amputation every 30 seconds caused by disease, trauma, birth defects, or tumors. Unfortunately, the starting cost of a prosthetic leg is between \$3,000 and \$5,000, and can even exceed \$80,000. Amputations are 10 times more likely to occur in low income neighborhoods in the United States and in third world countries, where it is nearly impossible to afford the necessary equipment.

Allison Burns, a senior homecoming candidate, is partnering with Hope to Walk (HTW) to raise awareness in the Hokie community about the need for affordable and accessible



equipment for amputees, equipment that can change lives and bring hope to these individuals. HTW is a non-profit organization based in Christiansburg that has succeeded in designing a significantly cheaper prosthetic leg.

Allison discovered HTW during her sophomore year while doing a field study at VCOM in the International Outreach Department. Here, she met one of the co-founders of the organization, Michael Mabry, and was inspired by Hope to Walk's origin of seeing a need, creating a practical and affordable solution, and then meeting that need.

Allison is passionate about this organization because she has a heart to serve others in need, specifically through medicine. She stated that she has “been blessed to have had the privilege of going on several missions’ trips growing up and through college that have shaped her passions and goals of serving underserved populations on a global and local scale.”

Also, growing up, Allison had a kidney disorder that resulted in frequent trips to doctor offices and hospitals. Here she developed the desire to pursue medicine because of the care that she received, and it inspired her to help individuals that are not able to receive healthcare at all. She will continue to pursue her dream of medicine at VCOM beginning Fall 2019.

Allison chose HTW for her homecoming campaign because she stated that she “loves that the organization has a sustainable, practical, and influential focus in their missions and service.” In the communities that HTW serves, they train locals on how to construct prosthetic legs so that they are being created beyond the few weeks that the mission trip team is present. This encourages and empowers sustainability within these communities and allows more people to be reached.

Hope to Walk is a relatively new organization that was founded in 2013 when Phil Johnson met Michael Mabry who shared a passion for helping others who were incapable of helping themselves. In April of 2014, they took their first trip to Honduras to assess the needs of amputee patients. They encountered over 50 patients in need in just five days, and knew this is where Hope to Walk would begin.



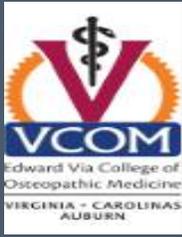
Applying thirty years of experience, Phil Johnson developed a prosthetic leg design that costs \$100-150, a fraction of the cost of standard designs. Each of the prosthetic legs are made to suit the specific needs of a patient.

The prosthetics are made of wood and a flexible rubber-

crepe material that allows the patient to walk easier. The prosthetic leg pylon is constructed using a one-inch wooden dowel that is bonded inside a PVC pipe that can be cut to any length. The Johnson Prosthetic Leg (JPL) socket is reinforced with fiberglass, and a coupler connects the socket to a neoprene sleeve or a fork strap that is used as a JPL suspension device.

HTW’s prosthetics are currently accessible to individuals in Honduras, Guatemala, Vietnam, and Haiti at no cost to the patients. They train locals in these communities to construct prosthetics to empower them and encourage sustainability. HTW is hoping to continue to expand as their ministry and partnerships grow.

Article continued on Page 10



The Impact of Low Cost Transtibial Tegucigalpa, Honduras

Michael R Mabry MS4, Phillip W Johnson COP, James Palmieri PhD,
Edward Via College of Osteopathic Medicine. International Outreach

BACKGROUND

As of 2012 the World Health Organization (WHO) estimates more than 30 million people lacked access to prosthetic and orthotic devices needed to function in society.¹ Eighty percent of this need is in developing nations. Studies suggest that low socioeconomic communities experience high rates of amputations.² Multiple barriers contribute to the decrease in access to prosthetic devices which includes high component costs, technician shortages, and ability to pay.

Causes of amputation varies depending on geography and is mainly due to complications from diabetes, war related injuries, and motor vehicle accidents.³ Rates of diabetes is increasing at an alarming rate and is the most common cause of lower extremity amputation.⁴ Up to 552 million adults and children are expected to develop diabetes by 2025. Another major cause of amputation is landmines which causes thousands of deaths and amputations in Africa, Asia, and the Middle-East each year.⁵ Because of the growing need and inability to access prosthetics, an ideal below knee (BK) prosthesis would be low cost and easily installed and repaired on site.

This study took place in Honduras where 15.96% of its population lives below the international poverty line of \$1.90 per day.(World Bank) **Standard BK devices in the United States and in Honduras range from \$3,000-\$15,000 retail. In this study we report an affordable \$100 BK prosthetic which allows amputees to better function socially and economically while becoming more productive within their family unit.** The purpose of this research is to investigate an affordable solution to help amputees on a large scale.

MATERIALS AND METHODS

The inventor of the **Johnson Prosthetic Leg (JPL, Patent Pending™)** (See Figure 1), Phil Johnson, from Blacksburg, VA, developed prototype devices in his prosthetic laboratory while working with Hope To Walk Inc. The **JPL** is comprised of wood bonded to a flexible rubber-crepe material which lines the **JPL**. This design has an inherent energy storing mechanism which assists the patient's gait and can be adjusted to fit any shoe size. The prosthetic leg pylon is constructed using a one-inch wooden dowel bonded inside a PVC pipe which can be cut to any length. The **JPL socket (See Figure 2)** is a medical casting sock impregnated and reinforced with fiber glass. Each is custom designed to the specific needs of each patient. A coupler is used to connect the socket to the pylon and a neoprene sleeve or a fork strap is used as the **JPL suspension device**.

This research was approved by the Edward Via College of Osteopathic Medicine (IRB 2014-033). Amputee patients were seen at the James Moody Adams Baxter Clinic (JMA), a free primary care clinic in Tegucigalpa, Honduras. All patients in this study signed an IRB approved consent prior to being assessed by an American Board Certified prosthetist. There was no financial cost to the patients and after receiving their legs were instructed to follow up where a survey would be administered.



FIGURE 1. JOHNSON PROSTHETIC LEG (JPL)



FIGURE 2. JPL COMPONENTS

RESULTS

In this research 307 amputee patients were surveyed and 95 received new amputations. **Diabetic infection caused 118 amputations** and accounted for 95. Of these, 58 patients received the **JPL**. **100%** of follow-up surveys were obtained from 9 patients. **JPL** users used for 6 months; 88% reported wearing their prosthesis at least 7 days per week, 78% reported an increased ability to provide for their family while 44% obtained a steady paying job for the first time. **Based on the results of the patient follow-up surveys, improved self-esteem and enhanced quality of life.**

CAUSES OF AMPUTATIONS

- Diabetic Infection
- Non-Diabetic Infection
- Trauma
- Other

How many days per week did patients use their prosthetic leg?

Days	Frequency	Percent
2-3	2	22.2
6-7	7	77.8

Increased ability to provide financially for their family?

Response	Frequency	Percent
Yes	7	77.8
No	2	22.2

After wearing the \$100 Johnson Prosthetic Leg, all patients and family members surveyed reported they would recommend the JPL to other amputees in need of a prosthesis.



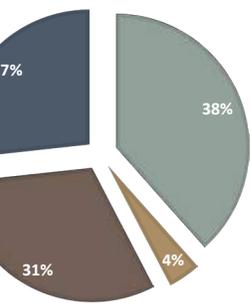
FIGURE 3. A PATIENT WEARING THE JPL

Prosthetic Devices in Honduras

Dean Sutphin PhD, Brian Dickens DO, ... Department. Blacksburg, VA 24073



and 153 had below knee ... while traumatic injuries ... **Johnson Prosthetic Leg** and ... ranged from 3 -18 ... 8-12 hours daily. Of these ... financially for themselves ... since losing their limb. ... **all patients reported**



many hours per day ... patients use their ... prosthetic leg?

Hours	Frequency	Percent
1	1	11.1
8	8	88.9

increased ability to ... maintain steady ... employment?

Response	Frequency	Percent
4	4	44.4
5	5	55.6



PATIENT WHO BENEFITTED FROM THE JPL STANDING WITH HIS FAMILY

DISCUSSION

Globally, the rates of amputation and patients needing prosthetic devices are increasing at a alarming rate. We have found through patient interviews that when a patient is unable to purchase a prosthesis after losing a leg, they often lose their job and may resort to begging or are forced to stay at home. This research was initiated with these patients in mind in an attempt to develop a viable solution to help amputees who lack access to prosthetic devices.

The JPL has had several modifications to improve patient outcomes. Three modifications were implemented and the current version has lasted over 18 months. In this study the cause of amputation was not recorded for 82 patients and methods have been implemented to improve medical history collection in the future.

In addition to its low cost, the ease of construction was key in this design. Future research will focus on developing training programs to equip personnel in other nations to ultimately help amputees in their nation. If this model of training others to manufacture, install, and repair JPL devices is shown effective, this model could increase the availability of low cost prosthetic devices to amputees throughout the world.

CONCLUSION

This preliminary study suggests that the Johnson Prosthetic Leg, which costs \$100 rather than \$3,000-\$15,000, can increase an amputee's ability to earn an income and enhance quality of life. **By alleviating financial barriers that restrict access to prosthetics, the JPL is a feasible solution that may help amputees on a large scale.**

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MORE INFORMATION

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SOURCES

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- (5) Andersson, Neil et al. Social cost of land mines in four countries: Afghanistan, Bosnia, Cambodia, and Mozambique. BMJ. 1995 September 16;311(7007):718-21.

There are many ways to get involved in this organization.

- Join the more recently developed research team, primarily in the Mechanical Engineering department, that is working specifically on creating a knee prosthetic.
- Donate money to Hope to Walk! If you donate \$200 through their website, HTW will give a prosthetic "In Honor Of" an individual or group.
- Join them on one of their mission trips-- no experience required! They have a trip going out nearly every month this upcoming year.

As part of Allison's campaign, she and HTW are planning to host workshops in spring 2019 to raise support for this organization and get fellow Hokies involved.

As Hokies, we strive to live by our motto, Ut Prosim, That I May Serve. There are many ways that one can get involved and make a difference in the lives of people around the world, and even here in the local community. Hope to Walk is changing lives every day. In the words of Allison herself, "Together we can help transform lives by giving the gift of walking!"

Get involved and help change the world today!

If you are interested in learning more or volunteering, visit:
<https://hopetowalk.org/>



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Ask an Employer

Alexander Petsopoulos

So, what does your company do?

I had the opportunity this past week to speak in depth with an employer of a large, multinational engineering conglomerate about what he is looking for when he comes to career fairs at Virginia Tech looking to hire young talent. Mr. Jim Eriksen, a Propulsion Staff Engineer at the Aerospace division at Honeywell International Incorporated, reached out to the Forum not long after he was asked the aforementioned question “So, what does your company do?” by several Hokies at the recent Engineering Expo. He equates this question with “I am not interested in working for your company,” and felt there was a significant disconnect between employers and prospective student employees that needed to be addressed. Mr. Eriksen was gracious enough to share his input on the college hiring process, and here are a few ways that you can stand out when interacting with engineering employers like Honeywell:

Go beyond academics

To quote Mr. Eriksen, “When Honeywell comes to Virginia Tech for the Career Fairs we know we’re going to speak with high quality candidates. What distinguishes Virginia Tech students from those at other universities is their understanding

of practical application, going beyond the academics.” While working hard in course work and maintaining a high GPA is often key to securing an internship or long-term career, also important to employers are the attributes that come from ongoing “hands on” projects outside the classroom.

Find a project that excites you and get involved, <https://eng.vt.edu/> is a great place to start. Two exciting examples are Formula SAE, a Ware Lab design team that designs a formula-one race car to compete with each year, and RockSat-X, a design team out of Space@VT where you can get involved in designing and building a real spacecraft that gets launched each August on a sounding rocket out of NASA Wallops Flight Facility.

Show genuine interest, but keep it real

For employers, the interview process begins at the career fair when the first introduction is made. Mr. Eriksen notes, “As much as we’re trying to seek out the very best, it’s equally important to understand the students’ level of interest in Honeywell.” Genuine interest in the company with which you are speaking is key in developing a positive impression. Develop a plan of which companies you want to speak with before a career fair, then take some time and research what products or services



each company offers.

However, it is important to not go overboard by memorizing too many company facts and figures.

When asked what he looks for in an ideal candidate, Mr. Eriksen responded, "I look for evidence of genuine passion rather than tightly rehearsed answers." Speak with the employer about how their company's products or services get you excited about engineering, and what sort of contributions you could see yourself making at that company if hired. Preparing good questions beforehand are a great way to show your interest in the given company.

Develop a strong, yet concise resume

Keep your resume to one page. One page, that's it. A resume should have the right level of content so it can be quickly reviewed by employers, yet still enable them to understand your profile. Mr. Eriksen says, "Too much detail is almost as bad as not enough." For help with writing a professional resume, head over to Smith Career Center, right across from McComas Hall, where their professional staff members are available Monday through Friday from 12-3 pm for drop in resume reviews. It's included in tuition for all VT Students, and there's no appointment required!

Accurately present the best version of yourself

To succeed at career fairs, Mr. Eriksen recommends preparing with short statement (30 seconds or less) that relays your interests, career objectives, and graduation date. When speaking with employers, discuss your interests and accomplishments so they align with what's highlighted on your resume. Also, try and tailor your introduction to the company with which you are speaking. For example, if you are approaching a software development company, be sure to highlight any computer programming experience and mention which languages you are most competent in.

Show off your skills

Employers like to see how the students can collaborate with team members. If it fits the conversation, highlight a time you took creative approach to solving a problem, and incorporate your flexibility to work with change. Demonstrating leadership skills, from organized roles, to how you can influence an outcome, is a key attribute Mr. Eriksen looks for when speaking with students.

Dress for the job you want...

While it's often advised to wear a suit and tie to all professional events, Mr. Eriksen remarks that isn't always necessary. "As far as dress code, it's always recommended to have a neat appearance. Wearing a suit is only expected at the interview. We understand that students are managing busy schedules between class, labs and outside work so your time is most appreciated."

Be persistent but patient

Following up after a career fair is almost more important than the career fair itself. When asked about the importance of continued communication post-career fair, Mr. Eriksen responded, "I do take note of students that follow up with questions showing continued interest in Honeywell."

Job's aren't just for upperclassmen

While many employers are looking for juniors and seniors when they come to hiring fairs, Mr. Eriksen pointed out, "1st and 2nd year students are always recognized for showing interest and coming to the information sessions." On a personal note, I can affirm that this really does work. I am only a freshman here at Tech, but I managed to secure an internship for this summer by attending Engineering Expo, and then proceeding to send north of 15 emails to various employers with which I spoke. The trick is, you only need one of them to respond, so after 14 rejections, the Naval Research Laboratory in Washington, D.C. figured I was worth a shot, and offered me an internship for this summer!



Grace Hopper 2018

Hopping into Computing Careers

Arianna Krinos

From September 26 to 28, 2018, sixteen students from quantitative departments at Virginia Tech, including Computer Science in the College of Engineering, attended the Grace Hopper Celebration of Women in Computing, an international conference for promoting diversity in computing. The students, comprising both undergraduate and graduate students who applied for the conference and were selected to attend, spent three to four days in Houston, Texas. This year, four of the attendees were supported by the Division of Computational Modeling and Data Analytics in the Academy of Integrated Science through funds provided by Luther and Alice Hamlett. The gathering of professionals was the largest turnout in the history of the event, with over 20,000 associated attendees. The conference was so large that it spanned the George R. Brown Convention Center and adjacent Hilton hotel.

Among the activities available to students at the Grace Hopper Celebration were technical talks in the field of computer science, mentorship activities and hands-on sessions, a massive career fair with some of the most influential technology giants in the industry, on-site interviews, and an Open Source Day, a daylong event dedicated to coding for the greater good. Several

Virginia Tech graduate students also presented their computer science research, including Negin Forouzesh, who won third place of a total of 200 participants in the graduate poster competition.

While open to students of all grade levels and professional stages, the Grace Hopper Celebration is particularly useful for seniors hoping to land a job next year. The on-site interview process coincides perfectly with the fall hiring session, and many companies come to the conference specifically looking to hire a sizable number of capable engineers and scientists. During the career fair, held in a massive exposition hall, students had the opportunity to peruse hundreds of technology firms, government labs, universities (for graduate programs), and more. The brightly-lit conference hall had ceiling fixtures from which to hang massive company marquees, which signaled hiring hopefuls to visit some of the well-recognized names. Among these were Microsoft, Google, Facebook, eBay, Disney, Capital One, and many other behemoths. Also present were some less obvious players, like Target, Nordstrom, and Spotify. With the growing demand for capable computing professionals, many companies have a need for computer scientists to join their



At left: Students participate in a discussion about their experiences at the end of the Grace Hopper Celebration

Below: Virginia Tech student attendees of the Grace Hopper Celebration pose in front of the Computer Science department's exhibition booth





team. This is especially true as data analytics becomes more important for interpreting consumer trends and engaging with company client base.

Because of the support offered by the department and others, all of the attendees were asked to help staff the booth hosted by the Department of Computer Science. Undergraduates and graduates alike rotated through the booth to answer questions from prospective students, conference attendees drawn to pursuing a Masters or PhD in computer science. Virginia Tech's Department of Computer Science supports the Grace Hopper Celebration at the platinum department level, enabling recruitment efforts during the conference. The Masters in Information Technology program similarly supports the conference, making for a strong Virginia Tech showing with two staffed booths.

Before and after the conference, Virginia Tech students submitted their resumes to a conference-wide professional networking database. By submitting their resumes, they gained access to a variety of resources – they were contacted by companies and graduate schools before, during, and after the conference to learn about their skills. Some of these companies

offered interviews to students for full-time positions and internships based on what they saw in the database. This was the case for senior attendee Aimee Maurais, a double major in Mathematics and Computational Modeling and Data Analytics (CMDA) in the College of Science.

“I got access to companies that I didn't know about and wouldn't consider working with...I got to interview with MIT Lincoln Laboratory, which I didn't know existed before Grace Hopper,” according to Maurais.

Many students reported similar surprise with the breadth of opportunities available, whether it be through a session about jobs available with a PhD in Computer Science, or a little-known company offering great educational benefits and location. The Grace Hopper experience is so highly valued by the Department of Computer Science that they fully fund ten students, and so regarded by CMDA that they support four.

The 2019 Grace Hopper Celebration for Women in Computing will be held Orlando, Florida. Contact the individual departments for more information about how to attend – the application process opens during the summer term.

Learning to Speak Data

Akshay Rajendran

Few haven't heard of data science these days, a buzzword of sorts that has quickly become a big deal in industry and popular culture. It has caused websites like Udemy to skyrocket in popularity. With all the media hype, data science looks like the perfect job, with many opportunities, huge job satisfaction and enormous financial benefit. In this article, I hope to describe what data science is and show how an actual company, Advance Auto Parts, uses it, based on my summer 2018 internship.

Data science has had many definitions, and many words have been used to describe it. One definition that I find very useful is that data science is the use of quantitative methods used to find key insights that either a company, organization or person can use to better themselves. This can be through something like a simple linear regression that can be used to find the relationship between two variables. An example of this would be the famous Walmart Pop-Tart issue, in which they found that any time there was a big storm coming, Walmart stores nearby would seemingly run out of strawberry Pop-Tarts. Since 2004, Walmart has used data science tools like predictive technology to mine through large data sets and find what customers want before huge storms. Through these algorithms, Walmart showed

that people were most likely to buy food that did not need much preparation or need to refrigerated before a storm, a category strawberry Pop-Tarts clearly fit. Many machine learning algorithms are actually deeply rooted in computer science. Through the use of AI machines, we can continue to advance many fields, including medicine, retail, and academia.

With all this confusion about what data science even is, why is there still (and so quickly) a high demand from companies and interest from workforce members? Mainly, because a lot of organizations and companies that are hiring data scientists don't have clear expectations of what the company wants from a data scientist. Many companies who are hiring data scientists for the sake of hiring them recognize the need for data scientists, but don't know what to do with them. Often times, companies end up using data scientists as either analysts or coders. Another issue that continues to come up when discussing data scientists is the lack of good senior data scientists or leaders within the data science team. While there is a plethora of entry-level data scientists, every department needs a leader who can clearly guide the team and overall company in the right direction. These problems are being addressed in both masters and undergradu-

ate programs. These programs are offering strong foundations in coding classes such as Python, and giving students (regardless of background) proper knowledge in math and statistics. These will help anyone learn proper data science skills. For undergraduate students at Virginia Tech, there is the Computational Modeling and Data Analytics Program (CMDA), which helps students view the world through data and understand key methods to gain insights from those data. CMDA draws from multiple existing fields, including Computer Science, Statistics, and Math.

Now I want to dive into how data science is being used in the by a major auto parts retailer: Advance Auto Parts. A big thing to note is that the auto parts industry has been relatively untouched by technology. AAP is embracing Artificial Intelligence by using it to track traffic count within stores, the vehicle make/models in the parking lots near stores, and customer purchases, through both online sales and in-store purchases. Using data, they can essentially track subtleties and nuances that really could help them retain customers and help as many people as possible fix their cars. Some subtleties and nuances that are often useful to collect are found by viewing the purchasing habits of customers to see how much one product is bought

in either a specific store or region. Using those data, they can stock their stores with the necessary amount of specific parts needed in each store.

Data scientists at Advance Auto Parts also use data to help the corporate office and other employees. During my time at Advance Auto Parts, I personally looked over diversity reports that helped Human Resources really look at whether they were hiring a diverse group of individuals in each department. Another project that the data scientists helped with in the company was looking at weather data and exploring the effects that weather has on the company sales on 3 different parts: E-commerce, Professional customers, and DIY (Do-It-Yourself) customers.

Hopefully, this short article has showcased what the coming revolution of data science really is, and the power it can wield in any industry.



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Auto-Drive

Jin Tian Acton
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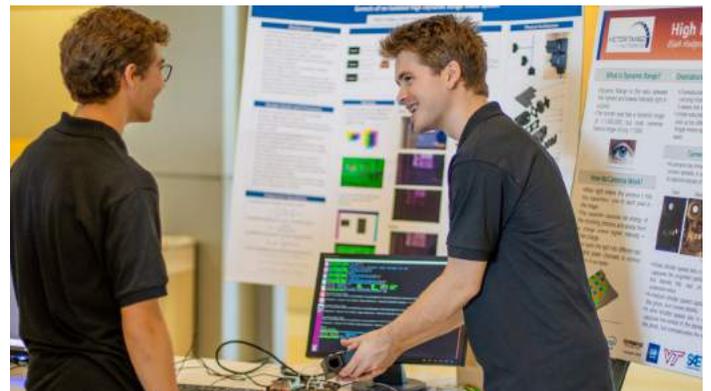
Self-driving car featured at Auto-Drive Day from sponsor Torc Robotics

On Sept. 28, 2018, Virginia Tech hosted Auto-Drive Day in Goodwin Hall. Auto-Drive is a 3-year long competition that challenges students from different universities to build a level 4 autonomous vehicle by the Society of Automotive Engineers standards. (Essentially, this is a car that could drive on its own). General Motors sponsors this event, and invites many universities to apply to compete. After the end of the application process, a few of the universities are selected and given a Chevy Bolt as their starting point. Virginia Tech was one of the few universities selected, and represents the university in this competition as the team, Victor Tango. In these 3 years, the team, along with business partnerships, are tasked with turning their Chevy into a self-driving car.

Each year the teams are given a milestone competition that they are challenged with. Each of these challenges gets progressively more difficult until you have reached the final stage. The first year's challenge was to build a car that could handle static (Non-moving) obstacles, such as stop signs. Virginia Tech placed 3rd out of 9 total competing teams last year, and is coming up on the second year's challenge. This year, they will be challenged on their ability to drive up to 25mph, and

handle dynamic obstacles, which are moving objects like moving pedestrians. Finally, by the end of the third and final year of the competition, the goal is to have a self-driving vehicle.

Building a self-driving vehicle involves a lot of different people and teams working on a variety of things. Victor Tango, has about 50 undergraduates on 6 different sub-teams Software integration, mapping, validation, path planning, hardware, perception, and engagement. According to Caroline McDonald, the team's project manager, "The hardware team is more mechanical and electrical based. The other teams are software



Victor Tango Team members show off their technology to prospective students



development, so we're working with sensor data, computer vision, and deep learning." While the teams work on different aspects of the project, they also are interconnected. For example, the mapping team works on "higher level navigation," according to one member, Anthony Folino. Anthony further explained that the team works to "Take that address, break it down into a city, state, address, and then we find out the location of the search." From there, the path planning team takes over to figure out the route(s) in which the car can get to its destination.

Victor Tango also partners with TORC, a software company that works with sensors for autonomous vehicles. This company has grown to around 80 people, originally starting off as only Virginia Tech students. TORC competed in the DARPA Urban Challenge in 2007, receiving 3rd place and was one of 6 teams that completed within the given time. Since this company started off as Virginia Tech students, a lot of these engineers want to help out with the newer engineers. While the company doesn't do the work for the team, they are able to provide what they have learned through their own experiences.

Auto-Drive day filled Goodwin with many VT students, as

well as those from the high schools and middle schools nearby. In addition to hopes of recruitment, the event also served as a way to engage with the younger generations. The engagement team works to educate the community about autonomous vehicles, as well as get new sponsors and gain new members. In addition to events such as this, the engagement team uses social media, and videos/interviews to help demonstrate to the community the work they have done. The team hopes to recruit a variety of new members, including those from mechanical engineering, CS, ECE, and even Technical Writing majors. Students who participate have the opportunity to receive research credit for their time, or just volunteer. If you are interested, please reach out to autodrive@vt.edu. They are currently accepting resumes if you are interested in applying!

Below: AutoDrive personnel pose in front of sponsor car from Torc Robotics



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