



Keynote Presenters

Kay Howell, Regina Ratkovich, Kalina Scarbrough, and Alaina Washington



Kay Howell - President of the Heath Integrated Business & Engineering (IBEP) Engagement Committee, Communications Secretary and Mentor for the Society of Women Engineers (SWE), 1794 Honors Scholar, Founder & CEO of Girls Can STEM, The University of Tennessee (UT). Kay is a first-generation college senior from Chattanooga, Tennessee, double majoring in Industrial & Systems Engineering (ISE) and Mathematics with concentrations in Education and Business. In high school, Kay played lacrosse, competed in math competitions, and led the first all-female FIRST robotics team in the state of Tennessee (go FIRST robotics!). She has always been passionate and proactive about inspiring the next generation of women in STEM, whether that is providing academic resources to underrepresented students, planning STEM activities for young girls, or hosting a podcast to amplify the voices of women and their allies in STEM. Due to her advocacy and passion for serving the community, Kay has been recognized as the University of Tennessee Chancellor's 2021 Rising Woman of the Year.



Regina Ratkovich is an Honors Leadership Program Scholar, Industrial and Systems Engineering Ambassador, and vice president of volunteering and outreach of the Society of Women Engineers at the University of Tennessee. Regina is a senior majoring in industrial engineering and minoring in engineering entrepreneurship and leadership studies at the University of Tennessee. She is from Huntsville, Alabama, which is home to the US Space and Rocket Center and the Rocket City Trash Pandas. Regina is a proud second-generation half-Taiwanese immigrant. She has been very involved in volunteering all over Knox County, whether it's volunteering at urban farms that fight food insecurity or teaching second graders about economics and business concepts, Regina is passionate about serving the community. She is also dedicated to encouraging young people to challenge themselves and consider pursuing careers in engineering.



Kalina Scarbrough is a 1794 Honors Program Scholar, founder of Engineers Without Borders UTK Student Chapter, and IISE Ambassador for the Society of Women Engineers. Kalina is a senior majoring in industrial engineering and minoring in reliability and maintainability at the University of Tennessee. She was born and raised in Knoxville, TN. She has always been very passionate about outreach locally and globally, which led her to starting the student chapter of Engineers Without Borders. She has led many large outreach projects including ones based out of India and South America. Her favorite type of volunteer work is that which includes helping children meet their highest potential. After graduation she will be joining the PepsiCo family as a Supply Chain Engineering Associate.



Alaina Washington is a Haslam Scholar, part of NAE Grand Challenge Scholars Program, Tickle College of Engineering Women in Engineering ambassador, Tomorrow's Engineers Today logistics chair, and mentor with the Society of Women Engineers at the University of Tennessee. Alaina is a sophomore from Chattanooga, Tennessee. She is majoring in industrial engineering with a minor in reliability and maintainability engineering at the University of Tennessee. During high school, she completed her Girl Scout Gold Award project, where she advocated for scoliosis awareness in underrepresented communities. Alaina also served as the president of her school's Science Olympiad team, where they attended regional and state competitions. Currently, she is the logistics chair for Tomorrow's Engineers Today, an engineering outreach event for K-12 girls. Alaina finds joy in volunteering within her communities, empowering the future of women engineers, and challenging others to become the best versions of themselves.

Keynote Activity

You Can Be a STEM Superhero, too!

Lindsay Young Auditorium, 1st floor, Hodges Library

Join a group of current STEM students for an interactive keynote presentation discussing the individual set of superpowers each of them possesses. When you take a group of people and put their superpowers together, you can not only encourage one another to reach your highest potential, but also use the combined power of the group to give back to others. In such a diverse world, it's important to utilize people with different strengths and superpowers in order to make a greater positive impact. The world is a system, and everyone plays an important role in the development of this system. It is important for everyone to utilize their skills to help make the world a better place. Let's change the world, together!

Breakout Sessions + Locations

Program Your Own Superhero

Presented by Amir Sadovnik, asadovnik@utk.edu

Session 1 – Hodges 128

Computer science has become an extremely important subject in today's digital society. However, many students do not have an opportunity to engage with the subject until they reach college level education, at which point they may have already decided that it is not for them. This leads to a lack of diversity in the field. The goal of this presentation is to introduce middle and high school students to computer programming. More specifically, students will be introduced to the Processing programming language through a set of tasks with the final goal of creating their own superhero computer game. This presentation will be mostly interactive. Although it will involve some actual programming, it will consist of small and relatively simple tasks, which will allow even students with no previous programming experience to participate while also allowing students with experience to perform more advanced tasks. Therefore, it should be appropriate for students in both middle and high school. Mostly, students will learn how to change the appearance of the game by changing the character and background, and how to add functionality by extending certain code blocks to allow the superhero to move more freely.

Amir Sadovnik is an assistant professor of electrical engineering and computer science. He received his PhD from the School of Electrical and Computer Engineering at Cornell University. Prior to arriving at UT, Sadovnik was an assistant professor at Lafayette College in Easton, PA. He spent four years mostly teaching undergraduate level courses in addition to working on undergraduate research. His current research in the field of computer vision has been mostly driven by the way humans understand and interact with images. This human centered view has led him to work on new and exciting projects, which utilize tools from different fields (such as computer vision, signal processing, natural language processing, machine learning, etc.) and apply them in new ways.

STEM, The Superpower That Drives Surgical Innovation

Presented by R. Edward Betcher MD FACOG, rebetcher@gmail.com

Session 2 – Hodges 129

Surgeons have reached the limits of what their hands can directly accomplish when operating on patients. During this session we will explore how STEM helps surgeons to operate through millimeter incisions and has developed innovative tools we use to heal patients with less pain and shorter recoveries. Our objectives will include demonstrating how problem solving skills related to STEM play a role in surgery and exploring the latest robotic technology used to operate along with its history and future. The students will attempt tasks on a laparoscopic trainer to demonstrate how physics, trigonometry, and geometry play key roles in how we operate on patients.

Dr. Betcher is the Chief of Gynecology for the Department of Obstetrics & Gynecology at Ochsner Health/LSU Health-Shreveport. He received his Doctor of Medicine from the University of Mississippi. He interned at The University of Tennessee Health Sciences Center in Memphis, followed by OB-GYN residency at Carilion Clinic in Virginia. He is board certified and has a focus practice designation for Minimally Invasive Gynecology Surgery. He has been practicing for more than 25 years both in private practice and academic medicine. He was one of the first OB-GYN surgeons to utilize robotics for surgery. He is involved nationally within the minimally invasive community and speaks, teaches, and researches ways that surgery through small incisions can improve women's lives.

Introduction In How to Become a STEM Teacher

Presented by Nick Kim, nkim2@utk.edu

Session 3 – Hodges 213

This session will promote how to become a STEM teacher. We will discuss the 4-year university track as well as the community college track. VolsTeach Noyce Scholars will talk about scholarships as well. There will be personal

testimonies as well as a question and answering portion. In addition, we will offer voluntary 5-minute teach sessions where they can get some feedback about their teacher presence.

Dr. Nick Kim taught at West High School for seven years after graduating from the UT Master's program in 2011 where he taught students from 9th to 12th grade algebra to calculus. In addition, he also coached girls and boys soccer at West High School. Currently, Nick is a first-year, post-doctoral research associate concentrating on STEM Education for the Center for Enhancing Education in the Math and Sciences (CEEMS). His research interests include mathematics teacher recruitment and retention as well as other topics such as family STEM nights to participation structures such as presentation group/individual roles in mathematics classrooms.

Bringing Anatomy to Life with the Anatomage 3D Virtual Anatomy Table and Visible Body

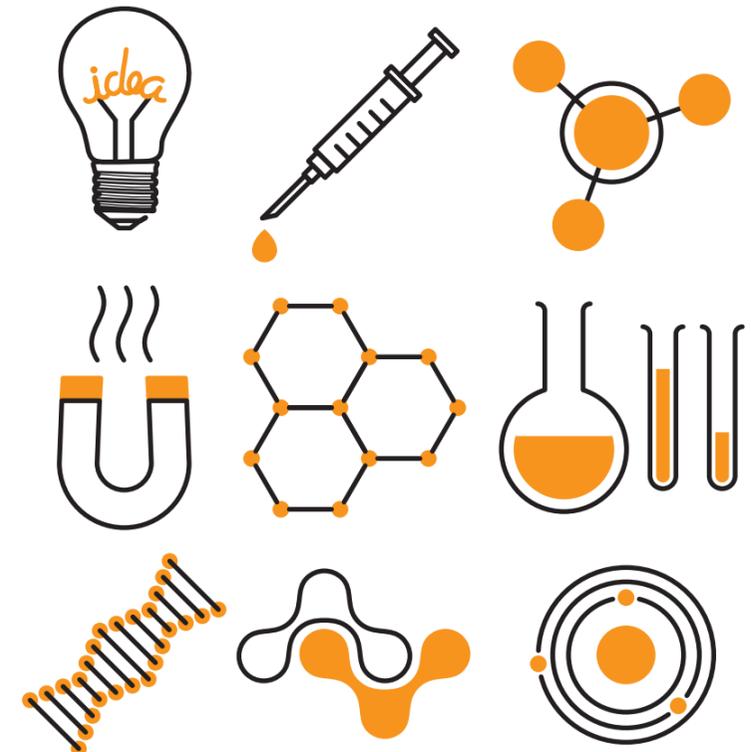
Presented by Melanie Dixon and Niki Kirkpatrick, hslibs@utk.edu with Bethany Ledyard (bward27@vols.utk.edu), Drew Borucki (dborucki@vols.utk.edu)

Session 4 – Hodges 211

Experience anatomy in a new way with the Anatomage 3D Virtual Anatomy Table and Visible Body platforms. Participants will learn how UT Libraries has implemented the Anatomage Table and Visible Body platforms to support student learning in anatomy and physiology. Participants will also see both the Anatomage Table and Visible Body in action and get the opportunity to interact with these innovative learning tools. Participants will be able to interact with both the Anatomage Table and a touchscreen monitor using the Visible Body software.

Melanie Dixon serves as a health sciences librarian for the University of Tennessee, Knoxville Libraries. Melanie provides instruction and research support for the College of Nursing and the Departments of Audiology and Speech Pathology, Nutrition, and Public Health. Melanie is a senior member of the Academy of Health Information Professionals (AHIP) and has earned the Consumer Health Information Specialization (Level II) through the Medical Library Association. Melanie has previously served as president for the Knoxville Area Health Sciences Library Consortium (KAHSLC).

Niki Kirkpatrick serves as a health sciences librarian for the University of Tennessee, Knoxville Libraries. Niki provides instruction and research support for the College of Nursing, and the Departments of Audiology and Speech Pathology, Nutrition, and Public Health. Niki is a provisional member of the Academy of



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Health Information Professionals (AHIP) through the Medical Library Association. Niki serves as past president for the Knoxville Area Health Sciences Library Consortium (KAHSLC) and serves as the chair of the Honors & Awards Committee for the Southern Chapter of the Medical Library Association (SC/MLA).

Bethany Ledyard (*bward27@vols.utk.edu*) is a first-year graduate student working towards a Master's in Information Science. She is particularly interested in library science and wants to be a high school librarian somewhere in Knoxville. Bethany is thrilled to be a student again after 8 years teaching high school English, but her teacher side is always right under the surface, ready for any chance to meet and educate young people. To use high school labels, she's been a jock, a band geek, a teacher's pet, a class clown, the first one to class, and the last one to turn in every assignment. Presenting is Bethany's ideal gig because she can teach without having to grade (her least favorite thing in the world).

Drew Borucki (*dborucki@vols.utk.edu*) is a first year graduate student in the Master's of Social Work program. She received her Bachelor of Science in Criminal Justice and a Bachelor of Arts in Psychology with a Sociology minor from Winona State University in Minnesota. While she does not have past experience with health sciences, she loves being a part of it and working with the anatomy table. After completing her master's degree, Drew hopes to work as either a victim's advocate or social worker in a police department or women's shelter to help victims of domestic violence or sexual assault.

Introduction to Coding: Python and Data

Presented by Matthew Lane, mlane42@vols.utk.edu

Session 5 – Hodges 212

Code and software permeate every day life, yet high school curricula neglect to cover even introductory materials concerning these. The purpose of this course is to offer a basic understanding of what code is, what it is not, and how to write basic programs using Python. Students will start the course by learning a theoretical approach to code, and then move into the more concrete skills such as how to create variables and lists, use loops, conditionals, and functions. Coding will be performed on Google's Colab Notebooks, an online resource leveraging cloud infrastructure to facilitate coding via any device. Though the introduction of the course focuses on "what" code even is, the remainder of the session is a live demonstration and walk through for students to write their own programs along with the presenter.

Matthew Lane is a graduate student currently pursuing his PhD in data science and engineering through the Bredesen Center for Interdisciplinary Studies and Oak Ridge National Laboratory. Prior to his tenure as a graduate student,

Matthew built websites and mobile applications ranging from financial infrastructure to field data collection applications for Bayer Crop Sciences. Matthew additionally taught as an adjunct instructor at the University of Missouri St. Louis.

Saving the Day - the Engineering Way!

Presented by Anne Skutnik, askutnik@utk.edu

with Betsy Chesnutt (bchesnut@utk.edu)

Session 6– Hodges 258 (Mary Greer Room)

This presentation will allow students to learn about multiple engineering disciplines and the engineering design process through interactive activities. Students who participate in this presentation will be divided into groups and given the following scenario: a supervillain has taken control of Neyland Stadium during a UT football game. How will they use their engineering superpowers to save the day? Students will then be given supplies to utilize their superpowers as they defeat the villain. Students will walk through the engineering design process as they design their solution to save the day! We will divide students into groups of 4-5. They will be given supplies to create an engineering project that aligns with a specific discipline and superpower (e.g., using static electricity to float balloons mirrors the power of telekinesis). They will be given some instructions on how to create the project but there will also be flexibility to come up with their own solution with the materials provided. All of this will be scaled down: we will have a small tabletop area with a 3D-printed "supervillain" that can be easily knocked down during the process of building the engineering project.

Anne Skutnik is the engagement and outreach coordinator for Tickle College of Engineering Academic and Student Affairs. Betsy Chesnutt is a lecturer in the Engineering Fundamentals program.

Hulking Out: Radiation in our Everyday Lives

Presented by David Raji, draji@vols.utk.edu

with Mairead Montague (mmontagi@vols.utk.edu), Carlotta Ghezzi

(cghezzi@vols.utk.edu), Izzy Lindsay (ilindsay@vols.utk.edu)

Session 7– Hodges 202E

We're exposed to radiation every day, from natural sources like the sun to man-made radiation like dental x-rays. While we won't develop super strength from radiation exposure, it plays a key role in medicine, archeology, agriculture, security, and energy production. This session will explore different types of radiation and how they occur, how we are exposed in our everyday life, and

how we can measure the radiation around us. We will explore radiation starting with an overview of the causes of radiation. We'll understand the stochastic nature of radiation through a candy-based demonstration (Skittles and M&Ms). We'll discuss normal sources of radiation exposure, and everyone will calculate their annual radiation dose. Finally, we'll show radiation "in action" using a cloud chamber demonstration.

David Raji is a graduate student research assistant at the University of Tennessee, Knoxville, where he is currently pursuing his PhD. His primary project focuses on wide-area sensor networks to map dispersed radioactive contamination. Before coming to UT, David did his undergraduate studies in nuclear engineering at the Georgia Institute of Technology. Outside of school and work, David enjoys hiking, playing chess, woodworking, and film photography.

Mairead Montague is a fourth-year graduate student in nuclear engineering. She received her BS in Nuclear Engineering from UC Berkeley in 2018 and her MS from UT Knoxville in 2019. Mairead has been performing in-residence research at ORNL in their physics division. Her research is in developing detector systems to help support international nuclear security objectives by monitoring spent nuclear fuel. Mairead is also a founding member of the UTK NE Department's Nuclear Engineering Graduate Student assembly, where she is in her third year serving as the vice president.

Carlotta Ghezzi is an international graduate student at the University of Tennessee. She comes from Italy, where she graduated with a bachelor's in engineering physics and a master's in Nuclear Engineering at Politecnico di Milano. She has always been passionate about medical physics until she discovered nuclear reactors and fell in love with them. Her current research area is nuclear fuel performance modeling, but her interests include everything that is related to nuclear power plants and reactors. She loves the environment of universities and research, especially at UT, where there are endless possibilities for discussions, ideas, and creativity.

Izzy Lindsay is a first-year graduate student at the University of Tennessee in Nuclear Engineering. She is from Western Pennsylvania originally and did her bachelor's degree at Purdue University in Indiana. She currently works in reactor safety and accident analysis in Dr. Brown's group. She chose nuclear engineering because of its promise of clean energy for the future. In her free time outside of class, she enjoys running, baking, playing instruments, and taking care of her plants.

Superpowered Guessing

Presented by Adrian Del Maestro, Adrian.DelMaestro@utk.edu

with Harini Radhakrishnan (hradhakr@vols.utk.edu)

Session 8– Hodges 127

Fermi problems are large quantitative questions that can be answered using estimation and approximations techniques (e.g. how many times does a human heart beat over the course of five years?). In this session, we will demonstrate the superpower of using rough estimation to come up with reasonable answers to BIG questions. We will discuss examples of where estimation skills are crucial in scientific research.

Professor Del Maestro received his PhD in physics from Harvard University, where his research focused on quantum phase transitions in superconductors. He performed postdoctoral research at the University of British Columbia and the Institute for Quantum Matter—a joint research venture between Johns Hopkins and Princeton University. He was a faculty member in the physics department at the University of Vermont from 2011-2020. In 2020 he moved to the University of Tennessee, Knoxville, as a professor of Physics & Astronomy, with a joint appointment in the Min H. Kao Department of Electrical Engineering and Computer Science. His research involves the application of high-performance computational tools to understand how collective and cooperative states of matter can be harnessed for future quantum technologies.

2022 BOSS Exhibitors

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Department of Nuclear Engineering
Department of Physics and Astronomy
Office of Undergraduate Admissions
Society of Women Engineers (SWE)
Seed Library
Tuskegee NEXT EAA
UT Libraries – GIS
UT Libraries – Mapping
UT Libraries – Studio

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The 2022 B.O.S.S. Team:

Thura Mack (co-chair), Laura Knight (co-chair), Michelle Brannen, Christy Urquieta Cortes, Val Hodge, Brittany Norwood, and Megan Venable.

The 2022 CAPS (UT College and Persistence Service) Team:

Johnathan Curry, Director, Pre-College Upward Bound
Leigh Ann Elkins, Director, Math & Science Center
Charles White, Director, Academic Enrichment Upward Bound

Share your BOSS experience by using #BigOrangeSTEMSaturday and tagging @UTKLibraries!

9:00 - 9:15 AM Welcome and Daily Schedule

9:15 - 9:30 AM Breakfast snack and transition to first session

9:30 - 10:00 AM Breakout Sessions #1
(See session descriptions inside program)

10:00 - 10:15 AM Short Break

10:15 - 10:45 AM Breakout Sessions #2
(See session descriptions inside program)

10:45 AM Exhibition Area Opens
(See exhibitor list inside program)

10:45 - 11:15 AM Lunch Group #1 - room 209
Exhibits Group #2

11:15 - 11:45 AM Lunch Group #2 - room 209
Exhibits Group #1

11:45 - 12:45 PM Keynote Activity

12:45 - 1:00 PM Closing Remarks and Survey