

BEHIND THE BITS

A CLOSE-UP VIEW OF UAT STUDENT INNOVATIONS



ISSUE 11

YOU WISH IT, UAT MAKES IT POSSIBLE.

In high school, Garren Koller started an underwater robotics club with the hope of participating in the RoboSub competition. While he may not have met that goal in his earlier years, Garren's dream followed him to college.

While attending UAT, Garren spoke with faculty about the possibility of attending RoboSub. UAT one-upped Garren's idea by creating an underwater robotics class to accomplish that goal. The class is taught by Joseph Horne, who is also their coach for the competition.

Ke'Ondrae Mell, Brandon Michelsen, and John McIntosh, fellow classmates of Garren's, share a similar interest in robotics. While Garren is the lead, they all work as a team and don't rely on one designated person directing the others.

The prototype (photographed) is made up of a kit of PVC pipe, fill pumps, wires and cables. The prototype can swim around and be programmed using microcontrollers. Originally, PLC was used to program the motors, however they were replaced by motor controllers.

The final competition robot will be fully autonomous and about three times larger than the prototype. Currently, the team is using full detail CAD modeling to concept designs.

For full autonomy, a series of sensors and computer vision will be used, with the possibly of cameras being implemented to add visual capabilities. Once programmed, the robot will be completely hands off and able to navigate itself through underwater courses.

The team attributes the skills needed to create their underwater robot to programming, electrical skills, fabrication skills, embedded systems and developing firmware for small embedded computers.

While the future for this robot is a strong presence at RoboSub 2020, there are many opportunities for autonomous navigation in robotics.

Autonomous navigation is a big part of robotics right now. There is a great deal of research being conducted concerning part of a subfield of research called SLAM (simultaneous localization and mapping). Government is funding projects like the Defense Advanced Research Projects Agency (DARPA) challenges because the navigation portion has huge applications to search and rescue, military, space exploration and any kind of robotics subfield that requires autonomous navigation.

To learn more about UAT's Creation & Simulation degree programs, check out uat.edu/BTB/creation



TEAM

Garren Koller
Robotics and Embedded Systems,
Digital Maker and Fabrication

Ke'Ondrae Mell
Robotics and Embedded Systems,
Digital Maker and Fabrication

Brandon Michelsen
Robotics and Embedded Systems

John McIntosh II
Robotics and Embedded Systems



UNDERWATER ROBOTICS HEADS TO ROBOSUB 2020

JUNIOR ACHIEVEMENT FINANCIAL LITERACY GAME

Financial literacy—what does it mean? Browsing the Internet, you’ll come across articles about how high schools graduate students who know how to write, read and do math, but they are lacking core life skills, financial literacy included. Young adults go off on their own and they don’t know how to pay bills, get insurance, loans or budget for buying a house.

In partnership with Junior Achievement of Arizona, professor Derric Clark brought financial literacy to UAT with the purpose of creating a game that focused on financial literacy education for the next generation. UAT and Junior Achievement’s goal is for every school in the Valley to have access to the financial literacy game. The concept behind the financial literacy game is to integrate it into classrooms to support the financial literacy curriculum that schools are starting to implement.

The group started as a small team of six people, but quickly grew to over 30 members. With a concept in mind, the team got to work identifying game identity, theming and game play.

When nailing down the style of the game, the team addressed the audience and restraining forces—the game had to be compatible with existing public-school equipment and the curriculum needed to be approachable for all levels of learners. Working with the given constraints, the team created a Chromebook-compatible game with 200 polies max for every scene. The cartoon-styled game is similar in appearance to Farmville and Graveyard Keeper, which was popular with students and one of Derric’s recommendations.

“We wanted to ensure that even though we were trying to put so much educational information into this, it was actually going to be appealing to those playing it, and that it was going to be fun,” says Kieli Adkins.

Core mechanics come from tycoonizing the gameplay, which is having the player constantly manage resources. From that core idea stemmed many systems that designers then mapped.

After the overall platform was established, the educational element was incorporated. The team had to figure out what kind of systems work with educational material, but also embrace the fun tycoon aspect. Thus, the team decided to go with the interactive gameplay. This plays out as a one-shot take where the player isn’t removed from the game experience and results in the gameplay being similar to a quest system that delivers the education.

To build upon that, the team created an event system that allowed for educational moments to occur during the gameplay, then centralized everything around minigames. The original model of the minigames removed the player from the experience, so the team decided to incorporate everything into the gameplay.

This resulted in UI clicking solely for menus and confirmations, while everything else is based on visual cues. The visual cues included lighting and many small mechanisms like highlighting objects, particles and player feedback. The player is also able to customize their experience, such as changing their character color. Rider was used as the main source to write the code, in addition to C# coding and Unity 2019.

The game is like a slice of life simulator. The minigames are similar to jobs. Players accomplish tasks to earn a paycheck and then must decide what to do with the resources. This is where practical utilization of the tutorials comes in. The player is taught how to manage their resources and practice in a simulated environment, rather than letting them go off into the real world and do it.

PLAYERS LEARN HOW TO MANEUVER THROUGH A BANK ACCOUNT, HOW TO BUDGET, PAY BILLS AND GET INSURANCE.

While this game was made specifically for K-12, it can be utilized as a learning tool for anyone who wants to learn about finances. Plus, the players aren’t the only learners. The team remarked that making this game was a crash course in finances for them as well, “it’s truly amazing how much you may not know about life skills, every person on this project has learned something throughout this game,” says Justine Grauel.

“My favorite day is sitting down and telling everybody, okay here is a mortgage, here is how you do this. Cause I’ve done it, I had to go through it, but my first time I had no idea what I was doing,” says Derric Clark, “I just had to figure it out as I was doing it because no one ever taught me either.”

Just as it takes a village to raise a child, it’s taken an entire team of UAT students working together to create a much needed, practical educational tool for school kids.



MEMBERS PICTURED:
KIELI ADKINS
DAVID SCHAFERS
JUSTINE GRAUEL
NICK HODES
KENNETH FRUEH
MIGUEL HERNANDEZ
JONATHAN CAMPBELL
PETER TIBBALS
TYLER KING
NAOMI LAW-KOMEGAY
ABDULAI SALLAH
RALEN WATSON-DAVIS
KYLE DAVIS
RUTH LUIS
ETHAN PAGE
DANIEL MCWHORTER



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Game Art and Animation > uat.edu/BTB/GAA

TEAM

Professor and Lead: **Derric Clark**
Project Lead: **Tyler Ann Cook**, MS Game Production and Management, Game Design
Project Manager and Project Lead: **Justine Grauel**, Virtual Reality, Game Art and Animation

Art Leads:
Jonathan Campbell, Game Design, Game Art and Animation
Kieli Adkins, Game Art and Animation, Game Programming
Andrew Van Winkle, Game Art and Animation

Programming Leads:
Miguel Hernandez, Advancing Computer Science, Virtual Reality, Game Design
Ethan Page, Game Programming

Design Leads:
Tyler King, Game Design
Kyle Davis, Game Design
Alex Schlegel, Game Design

Artists:
Nick Hodes, Game Design, Game Art and Animation
Kenneth Frueh, Game Design
Ruth Luis, Game Art and Animation
Naomi Law-Komegay, Game Design, Game Art and Animation
Ian Favreau, Game Art and Animation
RaLen Watson-Davis, Game Art and Animation
David Schafers, Game Art and Animation
Addison Buettner, Game Design
Sidney McKnight, Game Art and Animation
Justan Griffin-McClinton, Game Design
Jeff Watanabe, Game Art and Animation
James Goddard, Game Art and Animation, Game Programming
Jake Rigsby, Game Design
Daniel McWhorter, Game Art and Animation

Programmers:
Abdulai Sallah, Game Programming
Nathan Scott, Game Programming
James Fisher, Game Programming
Sean Murphy, Game Design
Amanda Kimball, Advancing Computer Science

Designers:
Peter Tibbals, Game Design
Nicholas La Macchia, Game Programming
Tousean Woodard, Game Design
John Kvassey, Game Design, Game Programming
Alex Pabon, Game Design

Business Technology:
Renee Grauberger, BS Business Technology



What happens when you bring together innovation, creativity and a bunch of nerds? It’s better than the candy—it’s a student-led multimedia production company running at UAT!

BunchOfNerds (BON) started out as a club for students to network and create projects. V Greffin, game design major and CEO of BunchOfNerds, wanted to get to know some of the artists and programmers around campus and wanted to work on small projects. Eventually, the club started working together to focus on single, large projects. That slowly developed into making the club official by turning it into a company. V, Bailey Neilson, Ricardo Martinez, Sabrina Peterson and Abby Palmer make up the executive team.

The company was started because the members wanted to have fun, continuing that as part of the company culture is another goal. They also want BON to be a self-sustained company, so that the creators can focus on creating and not worry about needing another stream of income.

V’s mom was actually the one who came up with the name. During a phone call, she said, “you’ll figure out something, you’re all just a bunch of nerds.” BunchOfNerds stuck and grew from there.

One of V’s friends asked, “what if I don’t want to work on video games, can I still join BunchOfNerds?” V agreed and from there it developed into a multi-media production studio, where BON doesn’t just focus on video games, but encompasses any form of media, including novels, cartoons and animations. Any form of entertainment that members are interested in, BON will support and release it—the possibilities are endless.

Most companies focus on one form of media, there are several companies that do multiple; however, BON wants to do all of it. BON is now made up of eight departments and growing. These include FireTape, The Burn Pile, Campfire Comics, Firelight Libraries, Hearthfire Tabletop, Key Flames, Play With Fire and SomethingExtravagant.

Learning what it takes to make a company was one of the hardest aspects. The team conducted many hours of research and trial and error to learn what’s necessary to obtain sales, become an LLC, gain licensure to legally sell in Arizona, trademarking and trade naming.

In addition to the legal aspects, letting people know that BON existed proved to be challenging. BunchOfNerds is active on social media, including Facebook, Twitter and Instagram, but they also participate in Founder’s Hall yard sales by selling branded sunglasses and talking to anyone that comes their way. “In general, we all wear our BunchOfNerds merchandise,” says Bailey, “that way it’s just there and people ask about it.”

UAT staff and faculty are more than willing to help BunchOfNerds. Faculty such as Scott Beemer, Matthew Marquit, Dapzury Valenzuela and Derric Clark often gave the team business advice.

TEAM

Bailey Nielsen, Web Design, Business Technology
V Greffin, Game Design
Ricardo Martinez, Game Programming, Robotics and Embedded Systems
Sabrina Petersen
Abby Palmer

Other members:
Jenn Walbaum
Chloe Main
Nancy Paltz
Natalie Johnson
Sydney Brown
Kim Martin
Lily Valles
James Cortezano
Josue Espinoza
Victoria Cleere
Allison Akins
Jordan Brown
Alex Bautista
Maddie Johnson
Rheana Salgado
Joey Chilton
Isabelle Main



THE OPPORTUNITIES AT UAT ARE ENDLESS.

What will you do while you’re here? uat.edu/BTB/nerds



TEAM

Brandon Michelsen, Robotics and Embedded Systems, AS Advancing Computer Science, AS Artificial Intelligence
Garren Koller, Robotics and Embedded Systems, Digital Maker and Fabrication
Ke'Ondrae Mell, Robotics and Embedded Systems, Digital Maker and Fabrication

UAT staff, faculty and students are always looking for new ways to innovate. Recently, the University bought the Segway Loomo platform with the intention of having Robotics and Embedded Systems and Advancing Computer Science students program it. Enter Brandon Michelsen.

Luckily, Brandon was available, so UAT authored the Loomo project to Brandon and fellow teammates, Garren Koller and Ke'Ondrae Mell.

The main idea behind the project is for Loomo to be a transport vehicle. During events, it'll have a cart follow behind it to deliver things to event attendees. More utilization methods are in the works, including follow mode, where the Loomo follows a person around, and autonomous navigation mode, where there'll be set paths that the Loomo follows around.

In addition to participating in project management, Brandon has been working on the autonomous and follow mode portion of the project. Garren has been instrumental in the mechanical portion of the project, which includes attaching the cart to the Loomo. Ke'Ondrae has been heading up the communication between Loomo and the cart, so that breaks and other necessary functionalities can be controlled.

So far, the team has been developing an Android application, which provides a camera feed for navigation. Currently, the robot is able to navigate by detecting a person and following them.

The team created a unique, one-piece, 3D-printed hitch that attaches between the Loomo and the cart, with attachment points on both. The hitch itself rotates, so that if

the Loomo bumps into anything, the cart doesn't detach or break the hitch. When attaching to the cart, the main concern is getting the hitch mechanism in place. There are also electrical communication elements needed to add break lights to the cart.

This particular project keys into advancing social robotics. Social robots are autonomous robots that interact and communicate with people by following social behaviors and rules accompanying its role. There are actually many elements of Loomo that have been premade

for social robotics. It has different sounds and voices that can be programmed, in addition to programmable facial expressions. All of these features are in place to help people feel more comfortable around it.

Brandon's goal is to make it more interactive with people. The Loomo has directional microphones; this means it can pick out directional sounds relevant to itself. Ideally, the Loomo has the potential to recognize peoples' voices and determine where they are. "So, you could be standing off in the corner of a room and you can call for it to come to you using your voice and it will pick that out, turn towards you, and then move towards you," explains Brandon, "I think that would be kind of a neat aspect for the social robotics part of the project, and I think it would be something interesting to work on."

While the technology being adapted for the Loomo won't necessarily be a part of a rescue mission, in terms of robots interacting with people, it's definitely part of the future. The Loomo can now tell jokes and recite UAT's mission statement!

Brandon's passions really do lie with advancing robotic technology. After graduating from UAT, Brandon would like to join the modern space race or educate the next generation of technology innovators. "I'm really interested in education, particularly, bringing STEAM (science, technology, engineering, art, and mathematics) education to rural areas, because I grew up on a farm and we didn't really have much in the way of STEAM," says Brandon, "Being able to come here and learn more about technology and engineering, and those fields—I find it really cool and I'd like to bring more opportunities to younger students in the rural areas."

PROGRAMMING A SOCIAL ROBOT TO HELP AROUND CAMPUS



A photograph of two men in a laboratory or workshop setting. The man on the left, wearing a dark blazer, is looking at a small device on a table. The man on the right, wearing a green jacket, is looking at a blender. On the table are various electronic components, including a small circuit board and a USB drive. The background is dark with some red light patterns.

Securing the IoT Enviro

Smart watches, Google Home, Nest, all of these are popular IoT devices. This sought-after technology allows consumers the ability to transfer data over a network without requiring human-to-computer interaction. In effect, it allows you to have a smart home, or an IoT environment. Andrew Maddox (Network Security) and his team, Dylan Crockett and Brandon Jackson, are helping create such an environment at UAT. At face value, this may seem fairly simple, but when you consider the potential security issues, implementation becomes a lot more complicated.

The goal is to completely transform the Cyber Security Lab into an IoT environment. Andrew's team is specifically working on securing the IoT environment. "A lot of IoT environments, IoT houses, are not as secure as they could be," Andrew explains, "There are instances where they're marked as unsecure. So, bringing in a security aspect is a huge goal for this."

Andrew's team is one of many working on different aspects of the IoT environment. The three-semester project is just closing up with semester one. Semester one focused on planning and getting all the physical components in place. At this point, network security works closely with network engineering. The team had to set up the physical devices first to then be able to secure the physical devices.

Physical components include the entire physical aspect of the server, the switch functioning, the routers and the segmentation of the network. This completes the core of what is needed for the IoT devices to function.

Creating an environment that cannot be attacked and infiltrated is the goal for the second and third semesters. The team started with network segmentation and turning the current network into a somewhat secure format. With UAT's current IP ranges, the IoT Environment is connected to the main structure of UAT, but on a different subnet. Currently, there are two access points, one for the IoT environment, and one that's public facing, used by students. The team is trying to provide an instance where they have multiple access points that are on different IP ranges. By providing that segmentation, users can't jump around and access the IoT environment and cause harm.

As far as the software aspect goes, securing the server was a huge portion, because the server is running many of the processes that are vital to the function of the IoT environment.

The next step is software oriented—a scope of well-versed individuals, known as red teamers, will be hacking the IoT environment looking for weaknesses and to see what Andrew's team hasn't secured.

As the team lead of security implementation, Andrew participated in the fail demand securing of the server, setting up the server, and the physical aspect of building the infrastructure. Firewalls are a huge part of securing any Linux Windows device. And so, providing fail demand, making sure ports aren't open, installing the software needed for security—all of these ensure a secure environment and prohibit an unwanted individual from accessing the network.

Fail demand is a protection for the SSH. The server has SSH abilities which allows students to communicate with the server by going into the terminal without having to physically use the server. The fail demand program activates when someone tries to use brute force to enter the server (which involves sending numerous requests trying usernames and passwords). Fail demand puts these requests into a jail of sorts, so that they can't use brute force to access the system.

Being able to secure an actual environment in a way that hasn't been done before, was a huge opportunity for Andrew. "I was thinking, this is awesome, this is going to increase not just my knowledge, but give me access to things I hadn't had access to previously," says Andrew. "Being able to pursue my knowledge and being able to involve myself in this project was just a huge opportunity."

There's a big stigma around security within the growing popularity of IoT environments. Providing a security aspect that hasn't been provided before is vital for UAT.

"With every emerging technology, there's always going to be hiccups, especially on the security end of things," Andrew remarked. "Getting to have an interaction with this technology and being able to plan and contribute to what could possibly change security measures in the future, that's a big deal."



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PICTURED: ANDREW MADDOX, BRANDON MICHELSEN

TEAM MEMBERS

- Aaron Cooper**, Advancing Computer Science, Robotics & Embedded System
- Andrew Maddox**, Network Security
- Brandon Michelson**, Robotics & Embedded Systems
- Dylan Crockett**, Network Security
- Garren Koller**, Robotics & Embedded Systems, Digital Maker & Fabrication
- Ke'Ondrae Mell**, Robotics & Embedded Systems, Digital Maker & Fabrication

The team also obtained help involving infrastructure information from Jeff Verbus in IT during the project.



HOT COURSES GIVE YOU A COOL EDGE

Stay up to speed with UAT's cool courses for the latest technology trends and advancements.

UAT students will learn and explore the future of mobile development with **React Native**. React Native helps users create real and exciting mobile apps with the help of JavaScript only, which is supportable for both Android and iOS platforms. At the end of the course, students will have created an Android or iOS app.

In **Space Expedition**, students build a self-funded stratospheric satellite program that is developed by UAT, operated by students and fosters partnerships with K-12 schools and small businesses.

Students identify and address security threats, attacks and vulnerabilities in **Security + Certification**.

Learn narrative design by defining the characters of the game, the world and the events with cool course **Writing for Interactive Games**.

To prepare for a life of creating technologies, UAT students use agile approaches, including scrum, as the backbone of essentially all of their project development activities. **Agile Technology** instructs students in agile methodologies, terminologies, and roles. Students will practice agile within this course to prepare them for team projects throughout their time building at UAT and in their careers after graduation.

In **Industry Innovations**, students will explore methods that have been used to innovate while exploring a new proprietary framework. Students will test the framework in real-time as they complete the class assignments and projects.

Animal Diversity inspires students to appreciate the diversity of the animal kingdom and also inspires a passion for animals. The best way to Foster appreciation for animals is through hands-on, in-class live animal demonstrations. Students will get up close to some of the Phoenix Zoo's ambassador animals!

Conservation & Zoos exposes students to conservation-related issues and the various threats facing wildlife, such as habitat loss and wildlife trafficking. Students also learn about zoo conservation initiatives and how a number of zoos, like the Phoenix Zoo, are working to combat extinction and protect wildlife. In-class animal demonstrations supplement the lectures and Foster greater understanding and appreciation of wildlife!

Comic Art History is a whirlwind tour through the art, how visual stories are told and the literary elements of comics. Students will start by learning the parts of a comic and how they tell their stories, then explore the earliest visual narratives from the Bayeux tapestry to Trajan's Column to see what they have in common with contemporary comics. From there, students will see the modern comic evolve from broadsheets to early newspaper comics, and eventually to the comic books we know and love today.

DEGREES

ON CAMPUS

- Advancing Computer Science
- Advertising Art
- Artificial Intelligence
- Business Technology
- Data Science
- Digital Maker and Fabrication
- Digital Marketing
- Digital Video
- Game Art and Animation
- Game Design
- Game Programming
- Human Computer Interaction
- Network Engineering
- Network Security
- Robotics and Embedded Systems
- Technology Forensics
- Technology Studies
- Virtual Reality
- Web Design

ONLINE

- Advancing Computer Science
- Advertising Art
- Business Technology
- Data Science
- Digital Maker and Fabrication
- Digital Marketing
- Game Art and Animation
- Game Design
- Game Programming
- Human Computer Interaction
- Network Engineering
- Network Security
- Robotics and Embedded Systems
- Technology Forensics
- Virtual Reality
- Web Design

MASTER OF SCIENCE

- Cyber Security
- Game Production
- Software Engineering
- Technology Innovation
- Technology Leadership

READY SET GO »

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The UAT admissions process should begin as early as your sophomore year in high school. This can be a great benefit to you, since it allows you to create a relationship with an advisor from the University who can help guide you every step of the way. In addition, applying early gets you access to:

- > More scholarship opportunities
- > Notification of scholarship eligibility when you apply
- > Select your spot in the dorms
- > Better class choices
- > Campus events
- > Student news

WHO'S ADMITTED TO UAT?

UAT welcomes exceptional students who are passionate about learning in every phase of their life. Just as important in the admissions process is your aptitude for technology. For instance, a good student who has been programming and building websites or advanced robots is of more interest to UAT Admissions than someone who has not demonstrated an aptitude for technology, but has top grades and test scores. In other words, we're looking for future technology innovators and patent holders!

SO... WHAT'S NEXT?

Prospective students can apply online at **UAT.edu/apply**. Admissions requirements and the online application are both found on this page. Soon after your application has been received and reviewed by our Acceptance Committee, you will be notified of your acceptance status. If you need help or advisement with the application process, or if you just have questions, please contact our Admissions Office at 800.658.5744.

SPRING 2020 SEMESTER
January 6 – April 24

SUMMER 2020 SEMESTER
May 11 – August 21

FALL 2020 SEMESTER
September 8 – December 22

APPLY

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TECH TANK

Tech Tank is UAT's version of *Shark Tank* where students pitch their hypothetical business ideas to a panel of real-world entrepreneurs, business owners and potential investors. The goal is to see which student can give the best pitch, be the most prepared and sway the panel to invest in their idea.

This year, four projects were entered into Tech Tank by students from three different BUS200 classes, which is the course this event is tied to. "As the creator of this event I was very happy with the presentations and the preparedness of the students' presenting," remarks Dr. Mark Smith, "They held their own, answered tough questions and took the criticisms well under pressure."



GOLD AWARD WINNER
Ace of Spades presented by **Christopher Hernke**, Artificial Intelligence

Ace of Spades came out of Professor Cimarossa's class. The project is an entertainment-based bar and restaurant. The main selling point is a POS system built off hard plastic playing cards that can track the tabs of the customers. Users can set limits for bill size and order and pay from the POS kiosk systems with these individually linked cards.



SILVER AWARD WINNER
Demeter's Watch presented by **Marissa Williams**, Game Art & Animation

Demeter's Watch came from Professor Valenzuela's class. The project is a home gardening sensor that attaches to an application with the purpose of tracking plants' health. This sensor notifies the user when their plants need water, soil, sunlight, etc.



BRONZE AWARD WINNER
Eyes Breaker presented by **Marc Benson**, Advancing Computer Science

Eyes Breaker came from Professor Vita-More's class. The project is a social interaction application that allows introverted and socially anxious people find others like themselves who are in close proximity and who are looking for conversation. The app prompts the user with common interest points and offers suggestions on how to "break the ice" and start a conversation.



TECH
TANK

Interested in seeing more
Tech Tank projects?
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