

# Nicholas “Brent” Burns

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Recent Ph.D. graduate of Computer Engineering with experience in software development, machine learning, and electronics. University instructor of computer engineering, embedded systems, microcontrollers, C programming, and electronics. Lead graduate student researcher of the *SmartCare Project* – a multi-discipline health technologies project involving machine learning, Python, neural networks, data analysis, electronics, sensing technologies, and embedded programming. For more project details please visit my personal webpage: <https://crystal.uta.edu/~burns/>

## EDUCATION

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### *The University of Texas at Arlington*

**Ph.D.** in Computer Engineering (BS to PhD) **August 2020**

- Supervisors: Dr. Gergely Záruba and Dr. Manfred Huber
- Dissertation: [Learning Health Information From Floor Sensor Data Within A Pervasive Smart Home Environment](#)

**B.S.** in Computer Engineering **May 2013**

## EXPERIENCE

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### *The University of Texas at Arlington*

**Ph.D. Project Researcher** **August 2013 – August 2020**

*Python, Keras, Tensorflow, C#, MATLAB, Z-Wave*

- Created a multi-stage sensor calibration and machine learning program that extracts high-resolution contact points from a low-resolution smart floor using a Convolutional Autoencoder in order to perform low-cost Gait Analysis, person identification, and activity tracking for in-home healthcare for the elderly
- Designed a recursive clustering technique to segment individual footfalls and walking segments
- Using these methods, discovered comparable results to a high-resolution off-the-shelf walking mat
- Aided in the construction of a sensor-rich health-monitoring Smart Apartment for the elderly through floor sensor installation, Z-Wave home automation sensor network integration, and C# programming

**Senior Lecturer Faculty** **August 2016 – May 2019**

*C, Microcontroller Programming, Circuit and PCB Design*

- Guided students in the theory and application of electronics, circuit design, C programming, and microcontrollers in two courses: *Electronics for Computer Engineering* and *Embedded Systems I*
- Topics included: microcontroller C programming, op-amps, transistors, amplifiers, and circuit design

**Graduate Teaching Assistant and Lab Instructor** **January 2014 – May 2020**

*C, Microcontroller Programming, Circuit and PCB Design*

- Assisted professors in the above-mentioned courses through grading, lab instruction, and supporting students by debugging circuits, debugging microcontroller C programs, and whiteboard lectures

**Undergraduate Research Positions** **March 2011 – August 2012**

*C, C++, Circuit Design*

- Overhauled existing circuitry and microcontroller software for a semi-autonomous assistive wheelchair as part of an undergraduate research program
- Assisted graduate students in labeling training data for an AI-driven sign language project

## TECHNICAL SKILLS

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**Programming Languages:** Python, C, C++, C#, Java, MATLAB, PIC and microcontroller programming

**Electrical and Hardware:** Circuit and PCB design, Soldering, Microcontrollers, Amplifiers, EAGLE, LTSpice

**Machine Learning:** Keras, TensorFlow, NumPy, SciPy, scikit-learn, Neural Networks, CNNs, Autoencoders, PCA, Hierarchical Clustering, Classification, Regression

## PERSONAL PROJECTS

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In-depth project details are located at my personal webpage: <https://crystal.uta.edu/~burns/projects.html>

### **Nixie Tube Clock** | *C, PIC Microcontroller Programming, High Voltage, PCB Design*

- Designed and built a personal Nixie Tube clock, along with the high-voltage circuitry, using a custom built PCB and operated by a PIC microcontroller coded in C

### **LED Panel Weather App** | *Python, Raspberry Pi, PCB Design*

- Built a personal weather information display coded in Python and controlled by a Raspberry Pi that grabs current data from a weather API that automatically updates throughout the day

## PUBLICATIONS

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- N. Burns, K. Daniel, M. Huber, G. Záruba. **Extracting Foot Contact Points and Gait Characteristics from a Low-Resolution Smart Floor Using Convolutional Autoencoders and Hierarchical Clustering**, (*publication pending, under review*)
- N. Burns, K. Daniel, M. Huber, G. Záruba. **An Automatic Calibration Technique for Force Sensors in a Dynamic Smart Floor Environment**, (*publication pending, under review*)
- G. Záruba, M. Huber, K. Daniel, N. Burns. **SmartCare – An Introduction**, In *IEEE International Conference on Pervasive Computing & Communication (PerCom 2017)*, Kona, Big Island, Hawaii, 2017.
- G. Záruba, M. Huber, K. Daniel, P. Sassaman, N. Burns. **PESTO: Data Integration for Visualization and Device Control in the SmartCare Project**, In *IEEE International Conference on Pervasive Computing & Communication (PerCom 2016)*, Sydney, Australia, 2016.

## CONFERENCES ATTENDED

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- **PerCom 2017** **March 2017**  
Kona, Big Island, Hawaii
- **PerCom 2014** **March 2014**  
Budapest, Hungary
- **PerCom 2013** **March 2013**  
San Diego, CA

## SCHOLARSHIPS, AWARDS, AND LEADERSHIP EXPERIENCE

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- Cyneta Networks Award – Outstanding Teaching Assistant **Spring 2016**
- Beta Theta Pi – Chapter President **2011**
- UTA’s Freshman Honors Scholarship **2007 – 2008**  
1100 SAT/24 ACT and High School Top 20%