Nicholas J. Conn, PhD

Entrepreneur • Inventor • Engineer • Coder

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Skills

General

- Project planning/management
- Grant and proposal writing
- Human subject testing
- Product development
- Literature review
- Anatomy and Physiology

Hardware

- Wearable devices
- Internet of Thing (IoT)
- Biomedical instrumentation
- Ultra-low power circuitry
- PCB layout and assembly
- Mixed signal embedded systems

Software

- Algorithm development
- Computational and data science
- Amazon Web Services (AWS)
- Signal and image processing
- Python, C, MATLAB, Java
- Docker, git, vim, Linux, MongoDB

Education

Microsystems Engineering – PhD **Rochester Institute of Technology** **Rochester, NY 2016**

Focus on cardiovascular disease (heart failure), ultra-low power medical instrumentation, biomedical signal processing, custom algorithm development, mathematical optimization, and IRB approved human subject testing.

- Successfully co-wrote a grant and received $1.6 million in funding from Google.
- Directly managed 7 engineers and a multidisciplinary team (e.g., co-ops, consultants, masters and PhD students).
- Dissertation – *"Fully Integrated Toilet Seat for Daily Monitoring of Cardiovascular Health"*
  - Discussed in detail under "Fully Integrated Toilet Seat" in the Projects section below.

Electrical Engineering – MS **Rochester Institute of Technology** **Rochester, NY 2012**

True sub-Nyquist compressed sensing of the photoplethysmography (PPG), 7.5-fold power consumption reduction.

- Specializing in signal processing, using low-power embedded systems, and pattern recognition.
- Thesis – *"A Comparison of Reconstruction Methods for Compressed Sensing of the Photoplethysmogram"*

Electrical Engineering – BS **Rochester Institute of Technology** **Rochester, NY 2011**

Biomedical option & German language concentration; multiple dean's list recipient.

- Study Abroad - Intensive linguistic and cultural studies in Marburg. Advanced proficiency in German.
- Research Grant - RISE Professional grant typically for MS and PhD students was provided by the German Federal Ministry for Education (DAAD) and Research in order to work in Berlin, Germany for 6 months.

Research and Projects

Fully Integrated Toilet (FIT) Seat for Cardiovascular Monitoring **PhD Graduate and Postdoc Research**

- From concept to subject testing in 6 months and to a deployable, in-home ready device in 1 year.
- Ultra-low-power cardiovascular monitoring system with < 5uW of idle power consumption.
- Interfaced with an industrial design team and hospital staff, including a cardiologist.
- Developed best-in-class ECG and PPG delineation algorithms.
- Managed and designed a MongoDB database deployed to Amazon Elastic Compute Cloud (EC2).
- Designed for manufacturing (DFM). Managed assembly and testing of 50+ devices.
- Custom over the air (OTA) firmware update/bootloader.

Author and Owner of NJC's MSP430 LaunchPad Blog **http://msp430launchpad.com**

- Developed guides and complete projects for beginners who are learning Texas Instrument's MSP430 family.
- Over 2 million lifetime views, 10,000 views per month.

Multidisciplinary Senior Design Project – *Group Lead* **Rochester Institute of Technology**

Non-Contact EEG (Electroencephalograph) System – Self-proposed and self-funded project

- Novel test fixture for verification. Custom test automation system for measuring SNR across frequency.
- MSP430 MCUs, Sigma-Delta ADC, I2C, UART, USB, low-noise analog circuitry, and voltage regulator circuitry.

Experience

Heart Health Intelligence **Founder and Chief Technology Officer** **Rochester, NY 2018 – Current**

- Developed business plan, profit and loss statements (P & L), pitch deck, and FDA and go-to-market strategy.
- First place at RIT Tiger Tank and NextCorps (sponsored by AlphaLab) Hardware Pitch Competitions.
- Wrote and submitted NIH STTR grant ($2.1M) in partnership with the University of Rochester Medical Center.

Rochester Institute of Technology **Postdoctoral Fellow** **Rochester, NY 2016 – Current**

- Algorithm development for stroke volume estimation and blood pressure estimation from ballistocardiogram.
- Co-authored NIH R01 grant for reducing heart failure hospitalizations (submitted) and multiple R21 grants.
- Machine learning algorithm for estimating body weight of a seated individual (TensorFlow).

Hardware Breakout LLC **Founder and Owner** **2014 – Current**

- Designed online store for development kits and breakout boards (wireless modules and MSP430 MCU).
- $20,000+ total sales with no customer complaints. Over 20 products including custom configurable PCBs.
- Developed custom Android application for interfacing with wireless (BLE) development board.

Hackaday **Technical Writer (Consulting)** **2014**

- Wrote posts that clearly and concisely describe the featured work, selected from a user submitted tip line.
- Generated 51 posts, resulting in more than 500,000 views (2014 to 2016).

Biotronik SE & Co. KG **Research and Development** **Berlin, Germany 2010**

- Designed and implemented a model of the electrical conduction system of the human heart for testing and verification of Implantable Cardiac Defibrillator (ICD) and pacemaker hardware and software.

Significant Journal Publications and Patents

- Conn, Nicholas J., Schwarz, Karl Q.; Borkholder, David A.; "*In-Home Cardiovascular Monitoring System for Heart Failure: Comparative Study"* JMIR Mhealth Uhealth 2019;7(1):e12419
- Conn, Nicholas J., Schwarz, Karl Q.; Borkholder, David A.; "*Nontraditional Electrocardiogram and Algorithms for Inconspicuous In-Home Monitoring: Comparative Study"* JMIR Mhealth Uhealth 2018;6(5):e120
- Borkholder, David A.; Conn, Nicholas J.; Haghpanahi, Masoumeh, *"Apparatus, System and Method for Medical Analyses of Seated Individual,"* US Patent Application No. 15/190,534, filed on June 23, 2016

Interests

- IEEE member (13 years): Medicine and Biology Society, Signal Processing Society, Circuits and Systems Society.
- Homebrewing beer, custom designed products for brewing, brewing theory, and fermentation sensors.
- DIY manufacturing: PCB reflow oven, laser cutting, 3D printing.
- Tea – Gardening – Cooking – Food – Snorkeling – International Travel – Language – Go – Music – Rubik's Cube