Ashley Paige Stephenson

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Education

University of Washington, Seattle ***September 2019 – present***

Ph.D. in Computer Science & Engineering

University of Michigan, Ann Arbor ***September, 2012 – April, 2017***

BSE in Biomedical Engineering, Bioelectrical Track

Minor in Electrical Engineering, Systems Track

Experience

Graduate Research Assistant ***September, 2019– present***

Paul G. Allen School of Computer Science & Engineering, University of Washington

Advisers: Professor Luis Ceze (UW CSE), Karin Strauss, PhD (Microsoft Research and UW)

Research goals:

- Design molecular-electronic systems for new applications in IT (DNA data storage and computing) and health (automated molecular design)
- Combine microfluidic technology with machine learning to build a self-sufficient, intelligent platform capable of automated experimental execution and decision making based on real time sensing data collection/analysis
- Make microfluidic and hybrid molecular-electronic technology accessible through cost and resource-conscious engineering for applications ranging from point of care healthcare to education

See below position for further detail

Research Scientist ***October, 2017– September, 2019***

Paul G. Allen School of Computer Science & Engineering, University of Washington

Supervisors: Professor Luis Ceze (UW CSE), Karin Strauss, PhD (Microsoft Research and UW)

- Designed and developed a fully automated digital microfluidic (DMF) platform called PurpleDrop for applications in DNA data storage, synthetic biology, biochemistry and automated experimentation and discovery
- Demonstrated the first fully automated DMF implementation of Polymerase Chain Reaction (PCR), leading to a conference paper accepted to ASPLOS 2019
- Successfully stored, retrieved, and decoded files stored in DNA on the PurpleDrop platform, leading to publications in Nature Communications and IEEE Micro
- Conducted extensive materials science research and developed a novel process (patent pending) for modifying low cost PCB substrates used for fluid manipulation, greatly reducing the system cost compared to traditional microfluidic devices consisting of glass and silicon substrates, while enhancing Purple Drop reliability and durability
- Designed and assembled printed circuit boards (PCBs) and interfaced mechanical and electrical peripheral devices with the PurpleDrop hardware to enable a broad range of chemical and biochemical processes to be automated on board

- Applied skills in embedded systems and control theory to operate the device and interface with a microfluidics specific operating system and computer vision feedback system developed in conjunction with the PurpleDrop hardware
- Worked independently and collaboratively as a part of a diverse team of computer scientists, biologists, chemists, and engineers from UW and Microsoft Research, and served as a mentor to several undergraduate students
- Presented research at an international microfluidics conference
- Gave presentations/demonstrations to industry partners to generate project interest and support

NSF REU Researcher ***June, 2016 – present***

Center for Sensorimotor Neural Engineering (CSNE), University of Washington

PI: Professor Anat Caspi, *Paul G. Allen School of Computer Science & Engineering*

- Investigated the Myo™ Gesture Control Armband as a low cost assistive technology device for individuals with limited motor control and mobility
- Utilized signal processing techniques to purify electromyography signals and inertial measurement unit data for meaningful data analysis
- Explored the relationship between muscle force generation and signal strength, as well as inter-user and intra-user signal variability
- Investigated machine learning techniques to implement custom gesture recognition and enhance device sensitivity for applications in assistive technology such as prosthetics and robotic exoskeletons
- Presented research findings via oral and poster presentation sessions

Undergraduate Researcher ***September, 2015 – January, 2017***

Immunoengineering Laboratory, University of Michigan

PI: Professor James Moon, Biomedical Engineering and Pharmaceutical Sciences

- Conducted immunoengineering research aimed at treating immunological conditions, and diseases including HIV and cancer, using various synthetic biomaterials and nanotechnologies
- Investigated nanomedicine for cancer immunotherapy by testing gold nanoparticles as a mechanism to treat tumor cells, and exploring the synergistic effect of using these particles in conjunction with chemotherapy and immunotherapy
- Developed and utilized skills including nanoparticle design, synthesis and testing (in vitro and in vivo), cell culture, ELISA, laser applications, and animal research

Engineering Intern, Rapid Prototyping and Product Testing Departments ***June – August, 2012***

PACCAR Technical Center, Mt. Vernon, WA ***May – August, 2013***

- Worked in rapid prototyping and additive manufacturing including stereolithography and fused deposition modeling
- Took on full responsibility for rapid prototyping operations by second internship including part design using CAD software, customer file processing, part printing and processing, customer correspondence, and equipment maintenance
- Participated in product research and testing for several heavy duty truck systems (examples include aerodynamics testing, engine testing, durability testing, ergonomics, and environmental impact research)
- Constructed a graphical user interface using MATLAB to optimize engine testing processes

Research Assistant ***June – September, 2011***

Human Neuromechanics Laboratory, University of Michigan

PI: Professor Daniel Ferris, Biomedical Engineering

- Assisted with research involving pneumatically powered lower limb exoskeletons, myoelectric control of lower limb prostheses, ambulatory neuroergonomics, and electrical neuroimaging of brain processes during human gait
- Performed and analyzed high density electroencephalography (EEG); worked with human subjects; studied how locomotion affects cognitive processes using motion capture, biomechanical analysis, and EEG; utilized software including LabVIEW and motion capture programs; performed data analysis

Publications

PurpleDrop: A Digital Microfluidics-based Platform for Hybrid Molecular-Electronics Applications

Ashley Stephenson, Max Willsey, Jeff McBride, Sharon Newman, Bichlien Nguyen, Christopher Takahashi, Karin Strauss, and Luis Ceze. IEEE Micro, September 2020

A Full-Stack Platform for Accessible Microfluidic Automation with Multi-Level Feedback

Max Willsey, Ashley P. Stephenson, Christopher Takahashi, Pranav Vaid, Bichlien Nguyen, Christine Betts, Sharon Newman, Sarang Joshi, Karin Strauss, and Luis Ceze. International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS), April 2019

Hight Density Data Storage via Dehydrated DNA with Digital Microfluidic Retrieval

Sharon Newman, Ashley P. Stephenson, Max Willsey, Bichlien H. Nguyen, Christopher N. Takahashi, Karin Strauss, and Luis Ceze. Nature Communications, April 2019

Presentations

PurpleDrop: A Digital Microfluidic Platform for Automated Experimentation and Discovery

Poster presented at the 2019 Microsoft Research PhD Summit

> Ashley P. Stephenson, Max Willsey, Bichlien H. Nguyen, Christopher N. Takahashi, Karin Strauss, Luis Ceze

A Digital Microfluidic Platform for DNA Data Storage

Poster presented at the *Electrowetting 2018* conference in Enschede, Netherlands

> Ashley P. Stephenson, Sharon Newman, Max Willsey, Bichlien H. Nguyen, Christopher N. Takahashi, Karin Strauss, Luis Ceze

Puddle: A System for High-Level Microfluidic Programming

Poster presented by Max Willsey and Ashley Stephenson at the UW 2018 Industry Affiliates Annual Research Day

> Max Willsey, Ashley Stephenson, Chris Takahashi, Pranav Vaid, Bichlien Nguyen, Michal Piszczek, Christine Betts, Sharon Newman, Sarang Joshi, Karin Strauss, Luis Ceze

The Myo™ Gesture Control Armband as an Assistive Technology Device

Oral and poster presentations at the 2016 UW CSNE REU Research Symposium

> Ashley Stephenson, Anat Caspi