Hana Ulman
Research Data Scientist at Mile Two

EMPLOYMENT HISTORY/RELEVANT EXPERIENCE:

Research Data Scientist, Mile Two July 2022-Present
Associate Cognitive Systems Engineer, Mile Two July 2022 – November 2022
Cognitive Systems Engineering Intern, Mile Two May 2022 – July 2022
Full-Time

- GraphQL, SQL, R, Python, MATLAB, Data Analysis, Experimental Design, Meta Data, Signal Processing, Wearable Technology
- Team member on Air Force Research Laboratory (AFRL) funded, Cognitive Physiological Performance (CPP) effort, examining key indicators of performance decrement in distributed common ground systems (DCGS) personnel.
- Helped develop research strategy and analytic capabilities for the effort.

Graduate Research Assistant, West Virginia University. 2020- Present
Part-Time

- MATLAB, Python, R, JMP, Signal Processing, Machine Learning, Meta Data, AWS, Experimental Design, Statistics, Data Collection
- Examination of Wearable Pulse Electromagnetic Stimulation Frequency Device on Motor Processing Speed and Accuracy.
- Examination of Wearable Pulse Electromagnetic Stimulation Frequency Device on Sleep Quality
- Evaluating the Effects of Wearable Pulse Electromagnetic Stimulation Frequency Device Dosage on the Anxiety Cortex of the Brain Using Quantitative Electroencephalography
- Examining the Differences Between Float-REST vs. Dry Float Therapy on Recovery
- Understanding the State-to-State Changes in Cardiovascular Physiology of Marines During a HITT Championship
- Examining the Relationship Between Marines' Physiology and Performance Outcomes in the 2019 HITT Championships
- Using a q-EEG, Eye Tracking, and Cardiovascular Monitoring to Predict Marksmanship Performance in the Virtra Simulator.
- Examination of Women's Soccer, High Resolution Catapult Data
- Examining Cardiovascular Related Operational Readiness and Recovery in Navy Seals- Close Quarter Battles, Shoot House Data
- Heart Rate Gold Standard Testing of Popular Wearable Devices

Research for Credit, Aarhus University, Aarhus, Denmark Fall 2019
Paid

- MATLAB, Signal Processing, Wearable Technology, Electrocardiography
- Developed an electrocardiography (ECG) noise cleaning algorithm to calculate heart rate and heart rate variability in control and type I diabetic patients during various intensities of physical activity. Type I diabetes can be characterized by cardiac autonomic neuropathy due to hyperglycemia, which results in cardiovascular abnormalities with respect to heart rate and vascular dynamics. Wearable ECG devices

provide the opportunity for continuous and unobtrusive patient monitoring. However, as a person undergoes various physical activities, the anomaly detection algorithms must be able to characterize the impact of various types of movement on signal quality. Development of a noise cleaning algorithm that can properly address the dynamic changes in signal as a result of changes in physical activity is paramount in eventually characterizing the differences between type I diabetic and otherwise, healthy individuals.

NASA Summer Research Internship, Johnson Space Center, Houston, TX Summer 2018
Paid

- MATLAB, Python, Flask, Wearable Technology, AWS, Data Acquisition
- Real-time monitoring of extravehicular (EV) and intra-vehicular (IV) personnel in a hybrid reality environment via measurements of physiological, cognitive, and metabolic workloads. As NASA prepares to travel to the Moon and Mars, optimization of EV activities will be imperative due to an inherent communication latency between Mission Control on Earth and space, resulting in an increase in workload for astronauts. Therefore, the development, quantification, and validation of a hybrid-reality environment that simulates the possible physiological, metabolic, and cognitive demands is crucial in simulating a representative environment of lunar and Martian conditions. The platform that I aided in developing over the summer, will help enable a safe and proficient space exploration with respect to EVA execution. Raw heart rate data from a Polar H10 device was captured via harnessing the BLE signal using a Raspberry PI microprocessor. The information was piped through an API that enabled the manipulation and query of an AWS database in real-time. Data were then implemented into a visual display via Open Broadcasting Software which incorporated the visual and audio scenes of the subject in the virtual reality environment and the physiological data outputted by the wearable device. Future studies hope to explore the impact of various stressors (e.g., running out of oxygen in tank, tangled rope, etc.) on the performance of astronauts in circumnavigating various challenges associated with EVAs.

Neuroscience Research Internship, West Virginia University, Morgantown, WVSummer 2017
Paid

- JMP, Mice Behavior Research, Experimental Design
- I was selected as one of eight undergraduate students across the nation to participate in WVU's Neuroscience Summer Undergraduate Research Internship. Throughout the summer I worked in the Rodent Behavior Core at WVU, analyzing the impact of ambient temperature fluctuations on the sensori-locomotor behavior of C57BL/6 mice. I also learned how to conduct popular rodent behavior tests including, but not limited to, 'Forced Swim Test', 'Hot-Plate Test', 'Open Field Test', 'Morris Water Maze', and 'Dark / Light Avoidance Task'.

EDUCATION AND TRAINING:

PhD West Virginia University, Biomedical Engineering Jan. 2020 - Present

Dissertation: "Development of a Physiological Monitoring System for Credibility Assessment"

Committee Members: Dr. Jessica Allen (chair), Dr. Scott Galster (research advisor), Dr. Robert Cutlip, Dr. Donald Adjeroh, Dr. Natalia Schmidt

Qualifying Examination Passed 5/21/2021
Candidacy Examination Passed 12/6/2021

BS West Virginia University, Biomedical Engineering Aug. 2015 – Dec. 2019
Minored in Biology

COMPUTER HARDWARE/SOFTWARE EXPERIENCE: *(if applicable)*

- MATLAB, R, Python, Power BI, SQL, Tableau, Excel, Photoshop, JMP, Git

INSTRUMENTATION AND RELATED SKILLS: *(if applicable)*

- Signal Processing, Machine Learning, Artificial Intelligence, Data Analytics, Statistical Analysis, Deep Learning, Computer Vision, Physiology, Human Performance, Applied Research

PROFESSIONAL SOCIETIES: *(if applicable)*

- **Vice President** of the Chemical and Biomedical Graduate Student Organization

PUBLICATIONS:

Published:

Rentz, L. E., **Ulman, H. K.,** & Galster, S. M. (2021). Deconstructing commercial wearable technology: Contributions toward accurate and free-living monitoring of sleep. *Sensors*, *21*(15), 5071.

Stone, J. D., **Ulman, H. K.,** Tran, K., Thompson, A. G., Halter, M. D., Ramadan, J. H., ... & Hagen,
J. A. (2021). Assessing the accuracy of popular commercial technologies that measure resting heart rate and heart rate variability. *Frontiers in Sports and Active Living*, 37.

Currently In Review:

Ulman, H.K., Thomspon, A.G., Galster, S.M. (2022). Development of a biomonitoring temporal segmentation capability and applications within the human operating system. *IEEE Access.*

Ulman, H.K., et al. (2022). Intra-session heart rate variability trends during Float-REST and dry-float modalities. *International Journal of Psychophysiology.*

AWARDS AND HONORS: *(if applicable)*

2nd Place at the Danish Technology Medicine Sciences Conference Oct. 2019
Type I diabetes -- insulin dependent diabetes, is a chronic condition that affects over 20 million individuals worldwide. One of the most serious complications of type I diabetes is cardiac

autonomic neuropathy (CAN), which is characterized by damage to the autonomic nerve fibers that stem from the spinal cord and innervate the heart and its respective blood vessels. The onset of CAN can be determined by cardiovascular abnormalities with respect to heart rate and vascular dynamics. Wearable devices provide the capability to effectively monitor an individual's health in the free-living environment. To do so requires intricate signal processing techniques to remove unwanted noise and disruptions, while simultaneously maintaining the integrity of the signal. Over the fall semester at AU, I developed a noise cleaning algorithm to process raw ECG signals and calculate HR and HRV metrics in control and type I diabetic patients during various physical activities. I presented my research at the national conference and won 2nd place among hundreds of other contestants.

Gilman Scholarship Apr. 2019
Award to study abroad internationally, at Aarhus University, Aarhus Denmark for the Fall 2019 semester. While abroad, I took the following graduate coursework: Data Science in Bioinformatics, Statistical Analysis of Neuroimaging Data, and Neuroanatomy, Neurotransmission, and Brain Disease. In addition to successful completion of these coursework, I conducted research for credit in the Cardiovascular Experimental Laboratory at Aarhus University, under the supervision of Dr. Peter Johansen

US Patent:
Thompson, A.G., **Ulman, H.K**., Galster, S.M. "Biosensor Data Segmentation, Analysis, Reporting, and Visualization Toolkit" Unites States Patent, *Patent Pending,* Submitted Oct. 5, 2021.