Jack Boynton

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EDUCATION

University of Vermont: Burlington, Vermont *Expected: May 2022*
Bachelor of Science, Biomedical Engineering – Systems and Network Biology Concentration.
Doubling minoring in computer science and chemistry.

Champlain Valley Union High School: Hinesburg, Vermont
Graduated: June 2018

RELEVANT COURSES

Calculus, MATLAB, Java, Differential Equations, Linear Algebra, Organic Chemistry, Discrete Structures, Advanced Programming in C++, Signals and Systems, Data Structures and Algorithms, Statistics for Engineering, Computer Vision, Brain-Computer Interfaces, Biomedical Instrumentation.

SKILLS

Design Software: AutoCAD, SolidWorks, Fusion360
Programming Languages: C++, Bash, Java, Python3, MATLAB, OpenCV, lldb,
Applications: Google Cloud, Amazon Web Services, TensorFlow 2.0, Pandas, Keras, NumPy, Sci-kit Learn, Matplotlib, Class-Activation Mapping, Signal Filtering, Linux, Docker, Fourier Transformation, Deep Reinforcement Learning, Temporal Difference Learning.

EXPERIENCE

University of Vermont Dept. of Computer Science: Vermont   1/20 – present

1. *12-Lead Imbalanced ECG Heartbeat Classification Using Time-Series ResNet:*
   - Developed a complex data-augmentation scheme for balancing skewed 9-class 12-lead ECG heartbeats. Implemented an asynchronous peak-finding algorithm for multi-channel matrix operations. Modified existing Keras ResNet-64 time series residual model for use on 12-lead ECG signals. Performed in-depth analysis of model results using class activation mapping and confusion matrices to provide explanations to incoherent classification abilities. Compared model classification signatures with tactics for manual ECG analysis by domain cardiac electrophysiologist.
   - Established interdisciplinary relationships with members of the healthcare workforce, as well as, in the computer science and engineering fields.
2. *Reduction of Clinically Insignificant ICU ECG Alarms using Ensemble Machine Learning:*
   - Led a project aiming to dramatically reduce the number of clinically insignificant ECG alarms in the ICU, both reducing strain on patients as well as clinical staff.
   - Applied a ResNet-64 model architecture connected to an LSTM block for temporal attention to 10 seconds of post-alarm labeled data, aiming to both reduce the time after alarm to classification, as well as, increasing the accuracy of the model.

Old Brick Store: Charlotte, Vermont   5/17 - 8/18

- Operated small country store, serving customers and basic accounting tasks.
- Developed valuable customer support skills as well as developing professional relationships with coworkers.

PROJECTS   ***Applied Deep Reinforcement Learning to Mario Kart Wii:*** Developed a custom deep ResNet reinforcement learning model for control of Wii Mario Kart. Implemented serial/GPIO communication from Raspberry Pi 4 for software emulation of a Nintendo GameCube controller to drive karts around track, optimizing the time took to complete. Applied OpenCV to the streaming and analysis of Wii video output as the only input to the reinforcement learning agent. (10/20 – present)

Applied Convolutional Neural Networks to Segment Medical MR Images: Implemented a 3D fully convolutional neural network (FCN) in Python TensorFlow 2.0 for the automatic segmentation of the menisci, femur, tibia, and related cartilage in compressed and non-compressed knees. Model was trained on 3D image stacks which were processed using Gaussian noise filters, and model was updated through manual re-segmentation and training of uncertain regions of the knee. (5/20 – present)

Developed a Working Prototype for a Mobile Application to Order from Old Brick Store: Implemented a thermal printer for real-time order placement. Designed and hosted a web server to provide a GUI for orders to be placed online. (8/17 – 6/18)

Mini-Maker Faire: Led local students in the development of an autonomous water vessel that measures and records water quality information to notify surrounding beaches of blue green algae plumes. (Summer 2016 - Summer 2018)

Vermont Aerial Solutions: Started small aerial photography business that utilized a drone to capture images for local real-estate companies and individuals. Learned important marketing and consumer relation strategies. (8/16 – 10/17)

ACTIVITIES   ***Marketing Director,*** Biomedical Engineering Society, University of Vermont 8/20– Present

Member, Institute of Electrical and Electronics Engineers (IEEE), University of Vermont
9/18—Present