Neural Networks on Track Gait Analysis for Fatigue Classification

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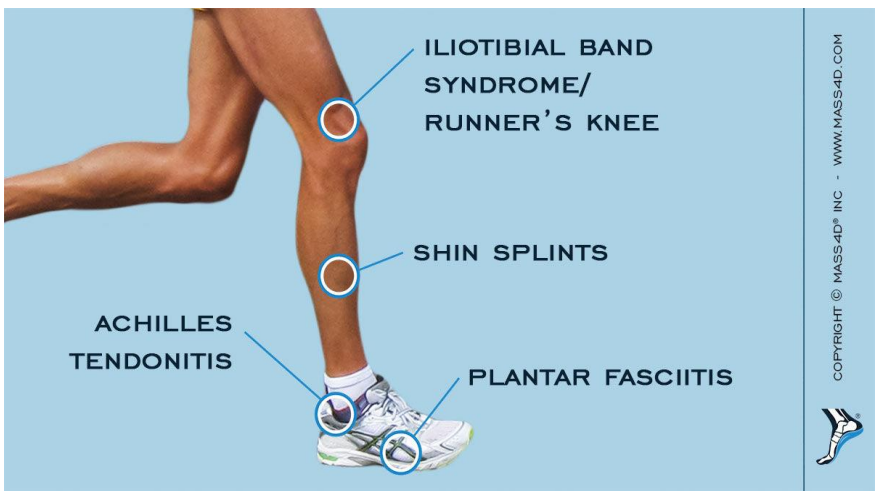
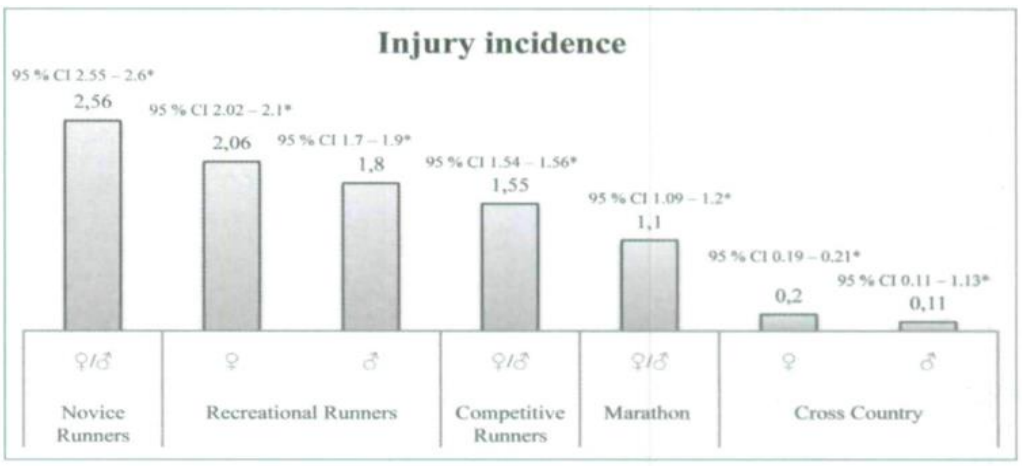
MOTIVATION

- Since the Covid-19 pandemic, running has increased in popularity
- Musculoskeletal injuries increase in parallel; fatigue primary culprit [1]
- Statistics show injuries are prevalent within novice level runners
- Continuous extraneous activity intensify injuries or can cause permanent damage
- Data is expensive and time-consuming
- Improve machine learning (ML) algorithms



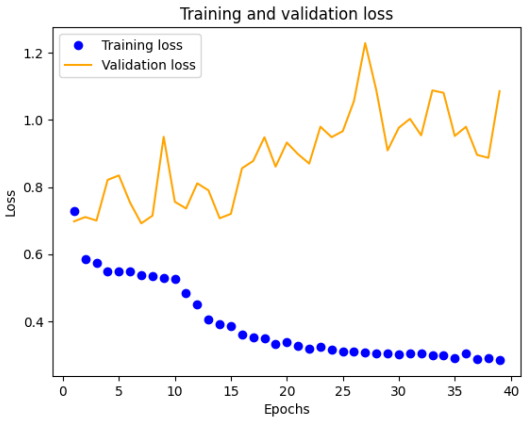
Types of Running Injuries; https://mass4d.com/blogs/clinicians-blog/the-epidemiology-of-marathon-running-injuries

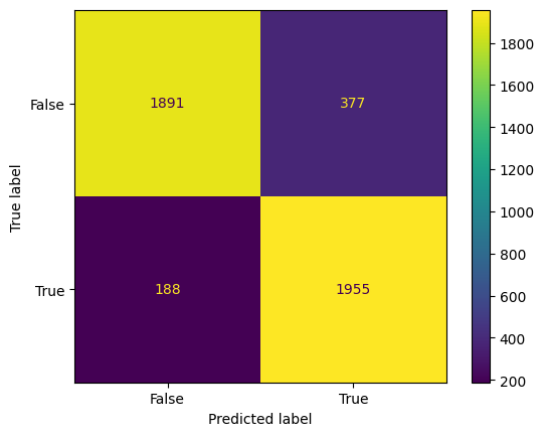


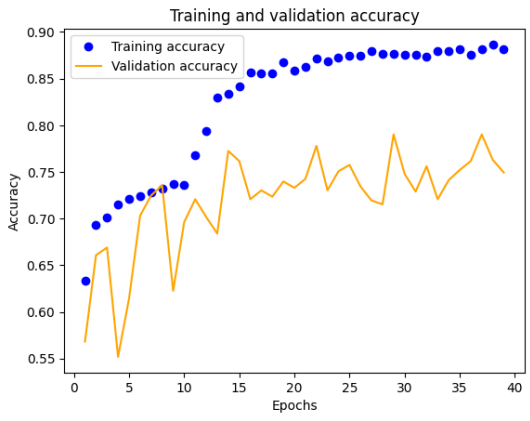
Injury incidence for different running levels. [2]

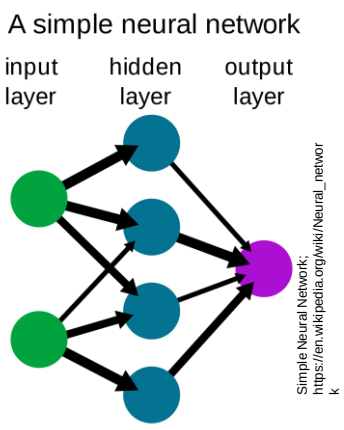
PRELIMINARY RESULTS

- ML & Auto ML for feature selection & feature extraction
- Feature set reduced from ~1500 to 16 for track data
- Simple classical Neural Network (NN)









Simple Neural Network; https://en.wikipedia.org/wiki/Neural_network

PROJECT AIM

Research in detecting fatigue to prevent musculoskeletal injury

Explore performance of neural network (NN) for fatigue classification

Implement simple quantum ML algorithm

ONGOING RESEARCH

- Compare time windows vs. stride segmentation of the data
- Examine track data vs. treadmill data
- Improve performance of classical NN

FUTURE RESEARCH – QUANTUM NEURAL NETWORKS

- Quantum computing improves processing power
- Expand NN to hybrid Quantum Neural Network (QNN)

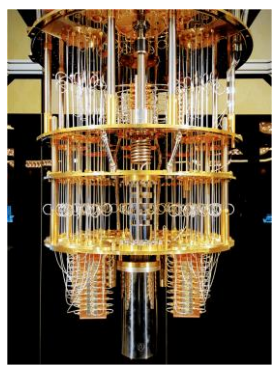


Fig 8: Quantum computer developed by IBM (photograph by Lars Plougmann via Flickr)

ACKNOWLEDGEMENT

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[3] C. Buckley, "Classifying Running Fatigue using Wearable Sensor Technology".

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