

# Josh Southern

An Applied Mathematician with experience in Machine Learning. I have strong skills in modelling time-series and complex systems.



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## Education

Msc Applied Mathematics, Imperial College London | Distinction | 2017 - 2018

Thesis: Information-theoretic analysis of EEG from a musical performance

Bsc Physics, University of Bath | First Class | 2014 - 2017

Thesis: An investigation of Bound States in the Absence of a Confining Potential

## Skills

Languages:

Experienced: Python (Numpy, Tensorflow, Keras, Sklearn, Pandas, Networkx...)

Some Experience: C++, R, Matlab

Other:

AWS, SQL, Postgres, Git

## Extra-Curricular

Tennis: Travelled Europe as a junior playing events and captained the school tennis team to seven national titles as well as runners up at the World Schools Championships. I continue to play at county level.

Volunteering: Went to South Africa as part of the Calabash Charity and taught in the local schools whilst building a netball court and a library.

Other Interesting things: A published poet. Currently part of Goodgym where we go on runs to places where we then help the community. Enjoy pub quizzes, poker and films.

## Work Experience

Since Sep'18 Machine Learning Researcher

Limbic, London

The first hire at an AI startup using machine learning to improve the Mental Health space. I was individually responsible for building the deep learning model which outputs an emotional state prediction from PPG data collected from a smartwatch. The model was built using Python and Keras and was shown to have state of the art accuracy. I then implemented this model as part of the Limbic app using AWS (Lambda and Sagemaker) and Postgres.

Jun-Jul'16 Data Collector/Statistician

IBM, Wimbledon

Interpreted point construction and analysed statistics at the All England Championships. Aided the technology on IBM Slamtracker which allows you to see the key statistics which are driving the outcome of the match. I continued this work by helping a research team at Imperial with trying to automate the process of data collecting in tennis.

## Projects

Jan'19

A Bayesian deep learning framework for end-to-end prediction of emotion from heartbeat.

Currently in review for the journal IEEE Transactions On Affective Computing

Used an LSTM-FCN to improve state of the art accuracy for predicting emotional valence from unimodal heartbeat data. Incorporated Bayesian considerations into the model using Monte-Carlo dropout in order to tune the accuracy and coverage.

Feb'19

End-To-End Prediction of Emotion From Heartbeat Data Collected by a Consumer Fitness Tracker

Peer-reviewed and accepted at ACII 2019 conference

Extended work on medical grade ECG devices to PPG collected from a smartwatch. Made statistical comparisons of the ECG and PPG time-series and used Transfer Learning to try and improve model performance

Oct'18

Quantifying togetherness in a musical concert via effective EEG networks

Peer-reviewed and presented at NetSci 2019 conference

Used tools from information theory (PMIME) to create a time-varying causal network between EEG time series. I then used network science approaches, particularly the Shannon entropy of the distribution of community sizes, to analyze differences in brain function for musicians when they are improvising and playing a set piece.

## Hacks

Regret Learning

Implemented a regret learning algorithm to approximately solve the Colonel Blotto Game. This a useful model for optimising the allocation of resources. Github: [.../jks17/colonelBlottoRegret](https://github.com/jks17/colonelBlottoRegret)

Computer Vision

Used open-source code as well as some of my own to swap my face onto some GIFs.

## References

references available upon request