

Charles Westphal

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Education

Ph.D. in Computer Science, University College London 2021–Present
Advisors: Prof. Mirco Musolesi, Prof. Stephen Hailes
M.Sc. in Physics, University of Leeds 2019–2020
77% (1st class)
Thesis: *Discrete Chaotic Functions as a Means of Encryption*
MChem in Chemistry, University of Manchester 2014–2018
74% (1st class)

Research Interests

- Feature Selection, Engineering, and Interpretation
- Multivariate Information Theory
- Reinforcement Learning
- Variational Inference

Publications

Conference

- **Charles Westphal**, Stephen Hailes, and Mirco Musolesi. *Feature Selection for Network Intrusion Detection*. To appear in *SIGKDD'25*, 2025.
- **Charles Westphal**, Stephen Hailes, and Mirco Musolesi. *Partial Information Decomposition for Data Interpretability and Feature Selection* To appear in *AISTATS'25*, 2025.

Preprints

- **Charles Westphal**, Stephen Hailes, and Mirco Musolesi. *Mutual Information Preserving Neural Network Pruning*.
- **Charles Westphal**, Stephen Hailes, and Mirco Musolesi. *Information-Theoretic State Variable Selection for Reinforcement Learning*.

Technical Skills

Programming Languages: Python, MATLAB, R

Tools & Frameworks: PyTorch, Scikit-learn, numpy, Pandas, TensorFlow, Git

Machine Learning: Computer Vision (as shown in pre-print: Mutual Information Preserving Neural Network Pruning), Reinforcement Learning (as shown in pre-print: Information-Theoretic State Variable Selection for Reinforcement Learning), Feature Importance and Selection (as shown in Feature Selection for Network Intrusion Detection), Variational Auto Encoders, Deep Learning, Recurrent Architectures, Transformer Architectures

Projects

Feature Selection for Network Intrusion Detection 2024

GitHub Repository

Published code for experiments in our upcoming KDD paper, *Feature Selection for Network Intrusion Detection*. This project includes:

- Two methods for estimating mutual information, both of which have the ability to incorporate temporal dependencies via Long Term Short Memory Networks, Gated Recurrent Units, or Temporal Convolution Networks.
- Feature selection and evaluation pipeline, that supports our method and the chosen baselines.

Work Experience

Research Analyst, Analysys Mason, Cambridge, Cambridgeshire 2020–2021

- Conducted mathematical modeling to predict trends in the telecom industry.
- Authored articles on network technologies, industry trends, and regulatory updates.

Quality Control Scientist, Ardex, Haverhill, Suffolk 2018–2019

- Developed rigorous, standardized diagnostic methods through data analysis.
- Presented technical methods to an international board of directors.

Awards & Honors

University of Leeds - Head of School's UK Excellence Scholarship 2019

University of Leeds - Member of CyberASAP team, reached final stage 2019

Community Service

Reviewer 2024
SIGKDD'24

References

Prof. Mirco Musolesi
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University College London
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Prof. Stephen Hailes
Professor of Computer Science
University College London
Email: s.hailes@ucl.ac.uk