Cillian Hourican

Postdoctoral Researcher · Computational Science Lab, University of Amsterdam

c.j.hourican@uva.nl · cillianhourican.com · in/cillian-hourican · CillianHourican · 0009-0002-3161-0736

Mathematician and computational scientist working across statistics, machine learning, networks and information theory. I build rigorous models of complex, interconnected systems — higher-order interactions and causality in health and ageing — and explain them clearly. Currently a postdoctoral researcher in the Computational Science Lab at the University of Amsterdam; PhD defense scheduled for 27 November 2026.

EDUCATION

2022 – present **PhD in Computational Science**
University of Amsterdam
Dissertation: *Dynamic Symptom Networks to Study Multimorbidity* — at the intersection of information theory, network science and causality. Supervised by Dr. Rick Quax. **Defense scheduled for 27 November 2026.**

2021 **MSc Computational Science** (GPA 8/10)
University of Amsterdam
Thesis: non-intrusive uncertainty quantification of a 3D in-stent restenosis model using active learning and adaptive surrogate modelling.

2018 – 2019 **Research Student, Optimisation & Machine Learning**
Trinity College Dublin
Online convex optimisation and bandits; deep-learning coursework (CNNs, image classification).

2018 **BA (Mod.) Mathematics** First-Class Honours
Trinity College Dublin
Final-year project: estimating social networks with stochastic block models and multiplex networks.

PUBLICATIONS

1. **Hourican, C.**, Peeters, G., Melis, R.J.F., Kok, A., van Schoor, N.M., Wezeman, S., Lees, M., Olde Rikkert, M.G.M., & Quax, R. (2026). *Interpreting higher-order dependence in multimorbidity using cohort data: a partial information decomposition approach.* PLOS Computational Biology. doi:10.1371/journal.pcbi.1014386
2. Peeters, G.*, **Hourican, C.***, Lees, M., Quax, R., Melis, R., Kok, A., van Schoor, N.M., & Olde Rikkert, M. (2026). *Symptoms provide predictive information on daily functioning beyond signs and diseases in middle-aged and older adults, particularly those with multimorbidity.* Age and Ageing. doi:10.1093/ageing/afag046 (*joint first authors)
3. Li, J., Bosch, J.A., Rydin, A.O., **Hourican, C.**, Koloi, A., Tassi, S.C., Mishra, P.P., Mishra, B.H., Kähönen, M., Lehtimäki, T., Raitakari, O.T., Laaksonen, R., Keltikangas-Järvinen, L., Juonala, M., & Quax, R. (2025). *A multilayer network analysis of cardiovascular–depression comorbidity reveals symptom-specific molecular biomarkers.* Psychological Medicine. doi:10.1017/S0033291725102109
4. **Hourican, C.**, Li, J., Mishra, P.P., Lehtimäki, T., Mishra, B.H., Kähönen, M., Raitakari, O.T., Laaksonen, R., Keltikangas-Järvinen, L., Juonala, M., & Quax, R. (2024). *Efficient search algorithms for identifying synergistic associations in high-dimensional datasets.* Entropy. doi:10.3390/e26110968
5. Gehlen, J., Li, J., **Hourican, C.**, Tassi, S.C., Mishra, P.P., Lehtimäki, T., Kähönen, M., Raitakari, O., Bosch, J.A., & Quax, R. (2024). *Bias in O-information estimation.* Entropy. doi:10.3390/e26100837
6. Koloi, A., Loukas, V.S., **Hourican, C.**, Sakellarios, A.I., Quax, R., Mishra, P.P., Lehtimäki, T., Raitakari, O.T., Papaloukas, C., Bosch, J.A., März, W., & Fotiadis, D.I. (2024). *Predicting early-stage coronary artery disease using machine learning and routine clinical biomarkers improved by augmented virtual data.* European Heart Journal — Digital Health. doi:10.1093/ehjdh/ztae049
7. **Hourican, C.**, Peeters, G., Melis, R.J.F., Wezeman, S.L., Gill, T.M., Olde Rikkert, M.G.M., & Quax, R. (2023). *Understanding multimorbidity requires sign–disease networks and higher-order interactions, a perspective.* Frontiers in Systems Biology. doi:10.3389/fsysb.2023.1155599

RESEARCH & PROFESSIONAL EXPERIENCE

Apr 2026 – present
Postdoctoral Researcher
Computational Science Lab, University of Amsterdam
Higher-order interactions, networks and causality in health and complex systems.

2017
Summer Research Student
Trinity College Dublin
Changepoint-detection algorithms: frequentist and Bayesian (Gibbs sampling) approaches.

2016
Summer Research Student
LM Ericsson, Ireland
Graph-theoretic methods for self-organising networks.

TEACHING

2023 – 2025 **Introduction to Computational Science** — MSc, teaching assistant
University of Amsterdam

2022 / 2023 **Scientific Data Analysis** — BSc Informatica, teaching assistant
University of Amsterdam

2021 – 2023 **Seminars Computational Science** — MSc, co-organiser & teaching assistant
University of Amsterdam

2019 – 2021 **Modelling System Dynamics** — MSc, teaching assistant (Vensim, AnyLogic)
University of Amsterdam

2017 – 2019 **Statistics & Probability tutorials** — BSc, teaching assistant (R)
Trinity College Dublin

STUDENT SUPERVISION

Daily supervisor

- **Jacco van Wijk** (MSc, 2023) — *Predicting the Accuracy of Dynamic Bayesian Network Structure Learning Algorithms*.
- **K. Ullah** (MSc, 2026) — *Survival of the Fittest Structure: Evolutionary Learning of Synergistic Dependencies*.
- **N. Kashyap** (MSc Information Studies, 2024) — *Predictive Modeling of Symptom Reports and Changes in Functional Outcomes in Elderly Suffering from Multimorbidity*.
- **Jay Sitabi** (BSc Informatica).
- **Jasper van Willigen** (BSc Informatica).

Second supervisor / assessor

- **Johanna Gehlen** (MSc, 2023) — *Bias in O-Information Estimation* (led to a peer-reviewed publication in Entropy).
- **Noah van de Bunt** (MSc, 2023) — *A Bayesian Network Study to Uncover Bridging Mechanisms Causing the Comorbidity of Major Depressive Disorder and Cardio-Metabolic Diseases*.
- **D. Klein Leunk** (MSc Computational Science).
- **Leon Kuiper** (MSc Computational Science).
- **Sofia Tété Garcia Ramos Nunes** (MSc Computational Science).
- **Seda den Boer** (MSc Computational Science).

TALKS & CONFERENCES

- **Oral** — "Removing unnecessary hyperedges in information-theoretic hypergraphs through O-information", NetSci, Vienna, 2023.
- **Poster** — International Conference on Network Science (NetSci), 2025.
- **Poster** — Dutch Computational Science Day (DUCOMS), Utrecht, 2023.
- **Poster** — Dutch NetSci, Delft, 2023.
- **Participant** — Gateway to Global Aging research hackathon, USC, 2023.
- **Attendee** — Decomposing Multivariate Information in Complex Systems (demics23), Dresden, 2023.

TECHNICAL SKILLS

Languages	Python, R
Methods	Machine learning & deep learning · statistical & predictive modelling · uncertainty quantification · surrogate modelling
Fields & tools	Network science · information theory · causal inference · complex systems · Vensim · AnyLogic