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Abel Jansma

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Physicist with 5 years of international experience developing open source science & software in interdisciplinary teams, leveraging machine learning, causal analysis, and high-performance computing on large molecular data sets.

Work Experience

Postdoctoral Researcher | Max Planck Institute for Mathematics in the Sciences | GER **Sep 2023 - Present**
- In the group of Jürgen Jost, I work on higher-order information theory, (quantum) machine learning, and applications to biology.
- Also affiliated with Quantum Informatics at the University of Edinburgh.
- Deployed quantum machine learning code on QVMs (pyQuil, Qiskit) and QPUs (AWS Braket).

Postdoctoral Researcher | University of Edinburgh | UK **Oct 2022 - July 2023**
- Used machine learning and causal discovery to construct hypergraphs of genetic interactions and discovered novel and rare cell identities in populations of up to 100k transcriptomes.
- Lead R&D of the Stator software package, in an interdisciplinary team that combines fundamental research with practical applications in biomedicine.

Information Officer | SciPost | NL **Oct 2017 - July 2018**
- Expanded the editorial board, profiling and contacting potential new editors.

Junior Editor | SPUI25 | NL **Feb 2017 - July 2017**
- Co-organised and presented monthly academic & cultural events for a broad audience.

Distillation Engineer | Mediamatic | NL **Sep 2016 - Feb 2017**
- Designed, built, and demonstrated a bespoke 30 litre vacuum still for artistic and olfactory research.

Education

PhD in Biomedical AI | University of Edinburgh | UK **Sep 2018 - Dec 2022**
- Thesis: *Higher-order interactions in single-cell gene expression: Towards a cybergenetic semantics of cell state*
- Supervised by C. Ponting (Inst. of Genetics and Cancer), L. Del Debbio (Higgs Centre for Theor. Phys.), and A. Khamseh (School of Informatics).
- Graduated from the *Academy for PhD Training in Statistics* at the universities of Cambridge and Oxford.

MSc Theoretical Physics | University of Amsterdam | NL **Sep 2015 - July 2018**
- Thesis: E_8 *symmetry structures in the Ising model* (supervised by B. Nienhuis)
- Visited the Niels Bohr Institute in Copenhagen, Denmark (Feb to Aug 2016), to study nonequilibrium physics and the physics of machine learning.

BSc Physics and Astronomy | University of Amsterdam | NL **Sep 2012 - July 2015**
- Graduated with Honours/Cum Laude and a minor in Computational Science.

Propedeuse in Art and Technology | HKU University of the Arts | NL **Sep 2011 - July 2012**
- Work exhibited at various musea, galleries and festivals in the Netherlands, Germany, and Finland.

Selected Publications and Talks

- High order expression dependencies finely resolve cryptic states and subtypes in single cell data - Jansma et al. 2023
- The Information Theory of Higher-order Interactions - Dutch Institute for Emergent Phenomena, Institute for Advanced Study, NL, 2023 (invited talk)
- Synergy and Shannon Information: The information theory of higher-order interactions - DEMICS23, GER, 2023 (invited talk)
- Higher-Order Interactions and Their Duals Reveal Synergy and Logical Dependence beyond Shannon Information - A. Jansma, *Entropy*, 2023 (https://arxiv.org/abs/2205.04440)
- A Compositional Game to Fairly Divide Homogeneous Cake - A. Jansma 2023 (https://arxiv.org/abs/2301.02281)
- Complex networks in the mouse brain: Higher-order gene regulation and Boolean logic - IGC Biomedical Genomics meeting, UK, 2021 (talk)
- Cybergenetic in-and-outeractions: Searching for Strange Loops in Mouse Brains - Mathematical Quantum Physics Seminar, University of Innsbruck, AT, 2021 (invited talk)
- Higher-order Interactions on Information Lattices - Mathematical Quantum Physics Seminar, University of Innsbruck, AT, 2021 (invited talk)
- Model-free estimation of higher-order interactions - CSHL Biology of Genomes conference, US, 2021 (poster)
- Complex Gene Regulation: Higher-order interactions in single-cell expression data - European Mathematical Genetics Meeting, FR, 2021 (long talk)
- Complex Gene Regulation: Higher-order interactions in single-cell expression data - CSHL Network Biology conference, US, 2021 (poster)
- A maximally noncommittal physicist looks at genetic interactions - IGC Biomedical Genomics meeting, UK, 2020 (talk)

Awards

Protocol Fellowship | Ethereum Foundation | GER **Nov 2022 - March 2023**
- Collaboration with the Robust Incentives group and the Institute for Categorical Cybernetics (CyberCat).
- Analysed the compositional game theory of agents in complex cryptographic systems.

Science Communication Grant | Genetics Society | UK **April 2019**
- One of 10 (post-)doctoral researchers nationwide to be awarded funding for science communication training.

Technology Scholarship | ASML | NL **Sep 2015 - Sep 2017**
- Selected as one of 25 graduate students nationwide for a two-year professional development programme, focused on leadership in technology.

Volunteering

Co-host | Computational Biology Journal Club **Feb 2019 - March 2020**
- Hosted at the MRC Institute of Genetics and Cancer.

Beekeeper | Anna's Tuin en Ruigte **Oct 2017 - July 2018**
- Beekeeper at a public permaculture garden.

Reader | VoorleesExpress **Nov 2016 - Nov 2017**
- I read books to children to stimulate language development and promote reading.

Committee member | BetaBreak **Dec 2014 - Jan 2016**
- Moderated and organised public debates on science & society at Amsterdam Science Park.

Languages

Natural	Dutch (native), English (fluent), German (fluent), French (basic)
Programming	Python (SciPy, PyTorch, Qiskit, *etc.*), R, Nextflow, Git, Haskell, Processing (Java), Arduino (C++)