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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.

Postdoctoral Researcher | University of Edinburgh | UK   **Oct 2022 - July 2023**
- I 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**
- Supervised by Chris Ponting (Institute of Genetics and Cancer), Luigi Del Debbio (Higgs Centre for Theoretical Physics), and Ava 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 Bernard Nienhuis)
- Visited the **Niels Bohr Institute** in Copenhagen, Denmark, from 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 the role of science and technology in 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++)