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# Abel Jansma

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**SUMMARY**

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

**WORK EXPERIENCE****Postdoctoral Researcher | Max Planck Institute for Mathematics in the Sciences** **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** **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** **Oct 2017 - July 2018**

- Expanded the editorial board, profiling and contacting potential new editors.

**Junior Editor | SPUI25** **Feb 2017 - July 2017**

- Co-organised and presented monthly academic & cultural events for a broad audience.

**Distillation Engineer | Mediamatic** **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** **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).
- Completed APTS programme in mathematical statistics at the universities of Cambridge and Oxford.

**MSc Theoretical Physics | University of Amsterdam** **Sep 2015 - July 2018**

- Thesis:  *$E_8$  symmetry structures in the Ising model* (with Bernard Nienhuis)
- Visited the **Niels Bohr Institute** in Copenhagen from Feb to Aug 2016 to study nonequilibrium physics and the physics of machine learning.

**BSc Physics and Astronomy | University of Amsterdam** **Sep 2012 - July 2015**

- Graduated with Honours/Cum Laude and a minor in Computational Science.

**Propeduse in Art and Technology | HKU university of the Arts** **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, 2023. (invited talk)
- Synergy and Shannon Information: The information theory of higher-order interactions - DEMICS23, 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, 2021 (talk).
- Cybergenetic in-and-outeractions: Searching for Strange Loops in Mouse Brains - Mathematical Quantum Physics Seminar, University of Innsbruck, 2021 (invited talk).
- Higher-order Interactions on Information Lattices - Mathematical Quantum Physics Seminar, University of Innsbruck, 2021 (invited talk).
- Model-free estimation of higher-order interactions - CSHL Biology of Genomes conference, 2021 (poster).
- Complex Gene Regulation: Higher-order interactions in single-cell expression data - European Mathematical Genetics Meeting, 2021 (long talk).
- Complex Gene Regulation: Higher-order interactions in single-cell expression data - CSHL Network Biology conference, 2021 (poster).
- A maximally noncommittal physicist looks at genetic interactions - IGC Biomedical Genomics meeting, 2020 (talk).

## AWARDS

### Protocol Fellowship | Ethereum Foundation

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.

### Technology Scholarship | ASML

Sep 2015 - Sep 2017

- Selected as one of 25 graduates 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 whose parents were not able to.

### 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++)