

# Curriculum vitae

## Akke Mats Houben

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### Personal data

NAME: Akke Mats Houben  
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### Research interests

- Theoretical & conceptual neuroscience
- Self-organisation & pattern formation and dynamics
- Neuronal dynamics, adaptation & organisation
- A new materialist and neofinalist theory of cognition and behaviour

My main interest is to develop a view of cognition and behaviour based on conceptual and qualitative understanding of self-organisation in neuronal processes, through the development and analysis of theoretical and computational models in interaction with experiments and data analysis.

I want to investigate how different micro- and mesoscale neuronal dynamics and interactions give rise to large-scale network dynamics, with a special interest in the emergence and organisation of transient spatio-temporal activity patterns in neuronal systems. Ultimately, I wish to tie these principles and processes into the sensori-motor loop from which behaviour and cognition emerge.

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### Current position

2021-present **Doctoral student in physics**  
Departament de Física de la Matèria Condensada & Institute of Complex Systems  
University of Barcelona, Barcelona, Spain  
ADVISORS: Jordi Soriano & Jordi Garcia-Ojalvo  
FUNDING: NEU-CHiP (Horizon 2020, 964877 – NEUCHIP)

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### Publications

- C.F. López-Leon\*, **A.M. Houben\***, ... & J. Soriano. Emergent complex dynamics in neuronal cultures and its relation to neuroengineering and medicine. (in press)
- M. Montalà-Flaquer, ..., **A.M. Houben**, ... & J. Soriano. Rich dynamics and functional organization on topographically designed neuronal networks in vitro. *iScience* 25.12 (2022)
- A.M. Houben**. Frequency selectivity of neural circuits with heterogeneous discrete transmission delays. *Neural Computation* 33 (2021)
- A.M. Houben** & M.S. Keil. A calcium-influx-dependent plasticity model exhibiting multiple STDP curves. *Journal of Computational Neuroscience* 48.1 (2020)

### Preprints & submitted

- H.F. Po, **A.M. Houben**, ... & D. Saad. Inferring Structure of Cortical Neuronal Networks from Firing Data: A Statistical Physics Approach. [arXiv:2402.18788](https://arxiv.org/abs/2402.18788)

G. Menesse, **A.M. Houben**, J. Soriano & J.J. Torres. Integrated Information Decomposition Unveils Major Structural Traits of In Silico and In Vitro Neuronal Networks. [arXiv:2401.17478](https://arxiv.org/abs/2401.17478)

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## Conference, seminar & workshop presentations

### Talks

**A.M. Houben**, A.-C. Haeb, J. Garcia-Ojalvo & J. Soriano. Liquid state computing in neuronal cultures: effects of connectivity modularity on response separation and generalisation in numerical simulations and experiments. *2nd meeting of the Spanish chapter of the Complex Systems Society* 22-23 February 2024.

**A.M. Houben**, A.-C. Haeb, J. Garcia-Ojalvo & J. Soriano. Liquid state computing in neuronal cultures: effects of noise and connectivity modularity on response separation and generalisation in numerical simulations. *NOLTA* 26-29 September 2023

**A.M. Houben**, A.-C. Haeb, J. Garcia-Ojalvo & J. Soriano. Liquid state computing in neuronal cultures: effects of noise and connectivity modularity on response separation and generalisation in numerical simulations. *BARCCSYN* 25-26 May 2023

**A.M. Houben**, J. Garcia-Ojalvo & J. Soriano. Interplay of external noise and anisotropic connectivity on the dynamics of neuronal networks. *Mediterranean School of Complex Networks* 25 June-02 July 2022

### Poster presentations

**A.M. Houben**, A.-C. Haeb, J. Garcia-Ojalvo & J. Soriano. Computing in neuronal cultures: effects of noise and connectivity modularity on response separation and generalisation. *Symposium of the Barcelona Collaboratorium* 5-6 October 2023

**A.M. Houben** & M.S. Keil. Calcium influx dependent plasticity model. *BARCCSYN* 24-25 May 2018

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## Teaching & advisory experience

### Courses

2014-2015 Second-year C++ programming. Utrecht University of the Arts  
 2014-2015 First-year LISP & java programming. Utrecht University of the Arts

### Student advising

2023 Carmen Piñero Megías. Bachelor internship. Programming MEA data acquisition software  
 2023 Rui Gomez Umbelino. Bachelor internship. Robot - neuronal culture interfacing  
 2023 Stefan Dvoretzkii. Erasmus+ master thesis internship. Plasticity in neuronal culture simulations  
 2022 Guillem Guell Paule. Bachelor internship. Numerical simulations of neuronal cultures  
 2022 Marta Picco. Erasmus+ internship. Numerical simulations of neuronal cultures

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## Education

2017-2018 **Mres in behaviour and cognition**. University of Barcelona, Barcelona, Spain  
 2013-2017 **Ba (Hons.) in music and technology**. Utrecht University of the Arts, Utrecht, The Netherlands

## Additional courses

- 2017 **Neuronal noise and neural signals.** Berstein Center for Computational Neuroscience, Berlin, Germany
  - 2017 **Machine intelligence II.** Technical University of Berlin, Berlin, Germany
  - 2016 **Machine learning.** Utrecht University, Utrecht, The Netherlands
  - 2016 **Logic.** Utrecht University, Utrecht, The Netherlands
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## Working experience

- 2021-present **Doctoral student in physics.** University of Barcelona, Barcelona, Spain
  - 2019-2021 **Software engineer.** nTh Netrowk Technologies to Help, Padova, Italy
  - 2019-2020 **Neuronal data analyst.** Università degli Studi di Milano-Bicocca, Milan, Italy
  - 2016-2017 **Software developer.** DDL Diagnostics Laboratory B.V., Rijswijk, The Netherlands
  - 2015-2016 **Research intern.** Universitat Pompeu Fabra, Barcelona, Spain
  - 2014-2015 **Student delegate at participation council.** Utrecht University of the Arts, Utrecht, The Netherlands
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## Student awards & grants

- 2017 Double honors bachelor studies. Utrecht University of the Arts, Utrecht, The Netherlands
  - 2017 Jan van Scoral exchange grant. Utrecht University of the Arts, Utrecht, The Netherlands
  - 2015-2016 Erasmus+ traineeship grant. Utrecht University of the Arts, Utrecht, The Netherlands
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## Other skills & competencies

- Languages:** Dutch (mother tongue)  
English (C2)  
German (B1)  
Italian (B1)  
Spanish (A2)