Corentin Nélias

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Research Experience

Postgraduate researcher 2023 - Now

Faculty of medicine - Anatomy and cell biology *Heidelberg, Germany*

- Developed a software for the analysis of calcium imaging data to study in vivo signals in live glial cells.
- Developed deep learning models & strategies for calcium images denoising and segmentation.

Postgraduate researcher 2018 - 2022

Max Planck institute for Dynamics and Self-organisation *Goettingen, Germany*

- Performed data analysis of musical sequences.
- Developed a toolbox for categorical timeseries analysis.
- Implemented several modules for timeseries analysis (stationary and nonstationary).
- Trained neural networks (transformers and LSTMs) to generate and analyze melodies and harmonic backgrounds.

Graduate researcher March - August 2017

CEA of Grenoble - Nanoscience and cryogenics institute *Grenoble, France*

- Studied the stability and electronic structure of stackings of bidimensional materials using the framework of Density Functional Theory (DFT).
- Developed a tool unfolding simulated band structures of materials with hexagonal lattices back to the correct Brillouin zone.
- Cluster usage and parralel computing.

Academic assistant Februar - March 2016

Max-Planck institute for solid state physics *Stuttgart-vaihingen, Germany*

- Setup of a workbench (using LabVIEW) for low temperature magnetic measurments

Undergraduate researcher April - July 2015

INSA of Lyon - Nanotechnology institute of Lyon *Lyon, France*

- Performed conductance and stress measurments on ferroelectric samples.

Education

PhD in physics: Data analysis of musical timeseries 2018 - 2022

Supervised by Prof. Theo Geisel, Max Planck Institute for Dynamics and Self-organisation *Göttingen University, Germany*

Master in Materials science: Theoretical study of bidimensional materials 2017

Supervised by Dr. Pascal Pochet, CEA Grenoble *INSA of Lyon, France*

First year of master in solid-state physics 2016

Erasmus exchange, University of Stuttgart *Stuttgart, Germany*

Bachelor in engineering sciences: Characterization of ferroelectric materials 2012 - 2015

Supervised by Prof. Brice Gautier, Nanotechnologies institute of Lyon (INL) *INSA of Lyon, France*

Conferences Contributions

Micro-timing deviations and swing March 2020

Talk at Symposium on dynamics of biological systems and data science *Mandarfen*

Deep neural networks in natural language processing August 2019

Talk at 2nd Symposium on Collective Dynamics and Learning in Neural Networks *Adelsberg*

Teaching and Supervision Experience

Supervision:

Machine learning for chord identification in MIDI sequences April - October 2020
A. Untucht, Bachelor thesis. Co-supervised with Prof. Theo Geisel. *MPIDS, Göttingen*

Tapping strength variability in sensorimotor experiments on rhythmic tapping July 2022 - February 2023
B. Schulz, Master thesis. Co-supervised with Prof. Theo Geisel. *MPIDS, Göttingen*

Timeseries analysis of microtiming deviations in jazz July 2022 - April 2023
Ming Shi, internship and Bachelor thesis. Co-supervised with Prof. Theo Geisel. *MPIDS, Göttingen*

Tutoring:

Classical field theory September 2019 - Februar 2020
Continuum mechanics, electromagnetic fields and special relativity. *University of Göttingen*

Mathematical methods for physics September 2019 - March 2020
Essential mathematical tools for physics: differentials, integrals, linear algebra etc. *University of Göttingen*

Publications

Downbeat delays are a key component of swing in jazz
Nelias, C., Sturm, E. M., Albrecht, T., Hagmayer, Y.,& Geisel, T. (2022). Communications Physics, 5(1), 1-9.

CategoricalTimeSeries. jl: A toolbox for categorical time-series analysis.
Nelias, C. (2021). Journal of Open Source Software, 6(67), 3733.

Stochastic properties of musical timeseries.
Nelias, C., Geisel, T. accepted for publication - nature communications

Tapping strength variability in sensorimotor experiments on rhythmic tapping
Nelias, C., Geisel, T. accepted for publication - chaos

Software Development

I have developed, or had significant contributions to several timeseries analysis packages for the Julia language, all of which can be accessed on GitHub.

- CategoricalTimeSeries.jl
- MusicManipulations.jl
- DCCA.jl
- DetrendedFluctuationAnalysis.jl
- ChangePointDetection.jl

Specialized Skills

Programming Languages: Python (advanced), Julia (advanced), C++ (intermediate), R (beginner), Matlab (beginner).
Specific packages: PyTorch (advanced).
Web development: HTML, CSS, Javascript (intermediate).
Electronics: Circuit soldering, transistor commutation and amplification, arduino programming (intermediate).
Languages: French (native speaker), English (full proficiency), German (full proficiency).

Other Interests

Music: Arranging, composition & interpretation. I obtained the degree of *musical studies* at the INSA of Lyon, and play guitar & saxophone at a semi-professional level in different ensembles.