

Nathan Trouvain

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Machine Learning and Data engineer.

Building simple and efficient tools to make AI techniques more accessible.

Experience

- 2024 - 2022** **PhD. research project @ Mnemosyne - Inria/IMN/LaBRI** Bordeaux, France
Modelling Action-Perception Mechanisms for Vocal Gestures with Hierarchical Reservoirs
Computational neuroscience research project, aiming at modeling vocal perception and production in songbirds, and eventually in humans. Generative models, LLMs and neuro-imaging data analysis.
- 2022 - 2020** **Research engineer @ Mnemosyne - Inria/IMN/LaBRI** Bordeaux, France
Open source software development for Reservoir Computing
Development of [reservoirpy](#), a Python library aimed at providing standardized Reservoir Computing tools. Software architecture, development, tests, documentation, deployment, public outreach (presentations, tutorials and scientific papers.)
- 2020** **Research internship @ Mnemosyne - Inria/IMN/LaBRI** Bordeaux, France
ML based automated annotation pipeline for bird songs
Development of an automatic birdsong annotation pipeline using machine learning tools (Reservoir Computing). Data visualization, dashboarding, semi-supervised learning.
- 2019** **Engineering internship @ Wiidii** Bordeaux, France
Building NLP tools for a multipurpose chatbot
NLP models (BERT, Flair) fine-tuning for intent categorization and named entity recognition (NER). Model serving within company micro-service architecture.

Software and projects

- > [reservoirpy](#)
A simple and flexible code for Reservoir Computing architectures like Echo State Networks. [1]
- > [canapy](#)
Automatic audio annotation tools for animal vocalizations.
- > [canarygan](#)
A Pytorch+Lightning reimplementation of Pagliarini et al. (2021): a generative model to explore songbirds vocal production capabilities. [2]

Education

- 2020** **Master degree - "Diplôme d'ingénieur" @ École Nationale Supérieure de Cognitique (ENSC)** Talence, France
Machine Learning, Computer Sc., Cognitive Sc.
- 2017** **"Classes préparatoires aux grandes écoles" @ Toulouse INP** Toulouse, France
Biology, Mathematics, Physics

Skills

- > **Programming:** Python, Python scientific stack (numpy, scipy, pandas...), Visualization and dashboarding (matplotlib, bokeh, panel), Pytorch/TensorFlow, HPC (Lightning, Slurm), Web development (HTML/CSS/SCSS, React.js), C#, R, GNU Linux.
- > **Software engineering:** SQL databases, ORM (SQLAlchemy), API development (FastAPI, Flask, Pydantic), CI/CD (Git, Github Actions, Docker), Testing (Pytest), Documentation (Sphinx).
- > **Design and typesetting:** \LaTeX /typst, Adobe Illustrator/Figma.
- > **Languages:** English (fluent), French (native).

Teaching

- > **Timeseries analysis and modelization**
[ENSC/ENSEIRB-MATMECA](#) | 2021-2024
Theoretical and practical courses. Master II level.
- > **Machine Learning**
[ENSC](#) | 2021-2024
Theoretical and practical courses. Master I level.

Academic services

- > **1st Open Science Workshop - Bordeaux Neurocampus**
Organizer | 2023
- > **AI4Industry workshop**
Mentor - scientific advisor | 2021-2024
- > **Peer-review**
CogSci 2022, ICANN 2021, ICANN 2020 | 2021-2024

Publications and presentations

- [1] N. Trouvain, L. Pedrelli, T. T. Dinh, and X. Hinaut, "ReservoirPy: An Efficient and User-Friendly Library to Design Echo State Networks," in *Artificial Neural Networks and Machine Learning – ICANN 2020*, I. Farkas, P. Masulli, and S. Wermter, Eds., Springer International Publishing, 2020, pp. 494–505. doi: [10.1007/978-3-030-61616-8_40](https://doi.org/10.1007/978-3-030-61616-8_40).
- [2] S. Pagliarini, N. Trouvain, A. Leblois, and X. Hinaut, "What Does the Canary Say? Low-dimensional GAN Applied to Birdsong," 2021. [Online]. Available: <https://hal.science/hal-03244723v2>
- [3] X. Hinaut and N. Trouvain, "Which Hype for My New Task? Hints and Random Search for Echo State Networks Hyperparameters," in *Artificial Neural Networks and Machine Learning – ICANN 2021*, I. Farkas, P. Masulli, S. Otte, and S. Wermter, Eds., Springer International Publishing, 2021, pp. 83–97. doi: [10.1007/978-3-030-86383-8_7](https://doi.org/10.1007/978-3-030-86383-8_7).
- [4] S. R. Oota, N. Trouvain, F. Alexandre, and X. Hinaut, "MEG Encoding Using Word Context Semantics in Listening Stories," in *Proc. Interspeech 2023*, 2023, pp. 5152–5156. doi: [10.21437/Interspeech.2023-282](https://doi.org/10.21437/Interspeech.2023-282).
- [5] S. Reddy Oota, N. Trouvain, F. Alexandre, and X. Hinaut, "Past Word Context Enables Better MEG Encoding Predictions than Current Word in Listening Stories." [Online]. Available: <https://inria.hal.science/hal-04154794>
- [6] N. Trouvain, D. Das, and X. Hinaut, "ReservoirPy sprint: Amélioration de ReservoirPy, un outil simple de reservoir computing." [Online]. Available: <https://hal.science/hal-04401731v1>
- [7] N. Trouvain and X. Hinaut, "Canary Song Decoder: Transduction and Implicit Segmentation with ESNs and LTSMs," in *Artificial Neural Networks and Machine Learning – ICANN 2021*, I. Farkas, P. Masulli, S. Otte, and S. Wermter, Eds., Springer International Publishing, 2021, pp. 71–82. doi: [10.1007/978-3-030-86383-8_6](https://doi.org/10.1007/978-3-030-86383-8_6).
- [8] N. Trouvain, N. Rougier, and X. Hinaut, "Create Efficient and~Complex Reservoir Computing Architectures with~ReservoirPy," in *From Animals to Animats 16*, L. Cañamero, P. Gaussier, M. Wilson, S. Boucenna, and N. Cuperlier, Eds., Springer International Publishing, 2022, pp. 91–102. doi: [10.1007/978-3-031-16770-6_8](https://doi.org/10.1007/978-3-031-16770-6_8).
- [9] N. Trouvain and X. Hinaut, "Reservoir Computing : de la théorie à la pratique avec ReservoirPy." [Online]. Available: https://sed-paris.gitlabpages.inria.fr/ai-community/slides/2022-03-22/SCAI-ReservoirPy_01.pdf
- [10] N. Trouvain and X. Hinaut, "Reservoir Computing : traitement efficace de séries temporelles avec ReservoirPy." [Online]. Available: <https://www.youtube.com/watch?v=CDzQ9giWTCs>