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Website

Julien Audiffren
Senior Researcher

Google Scholar
Fribourg, Switzerland

Senior Researcher and Senior Lecturer (Maître assistant) at the University of Fribourg. My current research topics include Symbolic AI, Natural Language Processing (and LLMs) and ML applied to Healthcare. Lead researcher in multiple projects, in collaboration with both international companies (Airbus, Thalès, Engie, La Poste…) and public institutions (hospitals, Public Healthcare administration, Armasuisse . . .).

EDUCATION

Habilitation Thesis (Venia Legendi) in Machine Learning, *University of Fribourg*
SA 2024

Certificate in Graduate Teaching and Education Technology , *University of Fribourg*
June 2024

PhD in Mathematics, probability and statistics (Supervisor: Etienne Pardoux), *University Aix-Marseille, Ecole Normale Superieure Cachan*
Dec 2011

Master of Mathematics, *Ecole Normale Superieure Cachan*
Aug 2008

Aggregation of Mathematics and Computer Science, *ENS Cachan*
Aug 2007

Bachelor of Mathematics, *Ecole Normale Superieure Cachan*
Aug 2005

PROFESSIONAL EMPLOYMENT

Senior Researcher and Maitre Assistant (Senior Lecturer) — **Sept 2018 — Present**
Exascale Infolab and Copelab, University of Fribourg — *Fribourg, Switzerland*

Research Associate — **Sept 2014 — Aug 2018**
CMLA, ENS Paris Saclay — *Paris, France*

Postdoctoral Researcher — **March 2012 — Aug 2013**
LIS, Aix Marseille University — *Marseille, France*

SELECTED GRANTS

PEPS project FLAME
- Objective: Development of the theoretical framework for Operator Valued Kernels.
- Main PI : Hachem Kadri, Assistant professor at AMU.
- Role : Co-Writer of the project, researcher.
- Source : CNRS
- Amount : 60'000 €

SATT-IDF INNOV: Projet Smartcheck
- Objective: Development of a portable, robust and accurate system to quantify postural control and gait in older adults.
- Main PI : Nicolas Vayatis, Full Professor at Ecole Normale Superieure Cachan.
- Role : Lead researcher of the ML team, and Co-PI of the project extension
- Source : SATT
- Amount : 450'000 €

Armasuisse: Projet XML
- Objective: Extreme Multi-Label Classification and Technology Monitoring
- Role : Co-PI of the project
- Source : Armasuisse

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- Amount : 120'000 CHF

Armasuisse: Projet LLM Reasoning
- Objective: Reasoning Capabilities of LLM, with focus on law applications
- Role : Co-PI of the project
- Source : Armasuisse
- Amount :120'000 CHF

La Poste: LLM Multi-Agent framework
- Objective: LLM Multi agent framework for planning and routing
- Role : Co-PI of the project
- Source : La Poste
- Amount :60'000 CHF

Teaching Experience

Computer Science
- Introduction to Machine Learning   (Co-Instructor, Bachelor)
- Formal Methods   (Instructor, Bachelor)
- Social Media Analytics   (Co-Instructor, Master)

Mathematics
- Linear Algebra   (Instructor, Bachelor)
- Markov Chain and Martingales   (Teaching Assistant, Master)
- Probability   (co-instructor, Bachelor)
- Global Optimization   (Instructor, Graduate)
- Behavioral Game Theory   (co-instructor, Master)

Applied human research
- Quantitative Research Methods and Statistics   (Co-instructor, Bachelor)
- Introduction to human measures and their application (Co-instructor, Bachelor)

Advising and Monitoring

Humbert, Pierre   **2017 — 2021**
PhD Cosupervision

- CMLA, ENS Paris Saclay   Paris, France
- TOPICS : Multivariate analysis with tensors and graphs, Reinforcement Learning with application to anesthesia

Nicolai, Alice   **2018 — 2021**
PhD Supervision

- Centre borelli, ENS Paris Saclay   Paris, France
- TOPICS : Interpretable representations of human biosignals for individual longitudinal follow-up

Ostapuk, Natalia   **2020 — Now**
PhD coSupervision

- Exascale Infolab, Fribourg University   Fribourg, Switzerland
- TOPICS : NLP, LLMs and Extreme multi label classification

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Mondal, Manuel   **2023 — Now**
PhD Supervision

- Exascale Infolab, Fribourg University   Fribourg, Switzerland
- TOPICS : NLP and LLMs

Master TM   **Sept 2014 — Now**
ENS Paris Saclay and Fribourg university

- More than 20 Master theses supervised.
- Topics:applied probability, Multi-armed bandits, ML for human quantification

SCIENCE COMMUNICATION

Co-founder of the 13 Minutes Marseille, *Science Popularization*
Writer and Contributor to the Data Analytic Post, *Science Popularization*
Co-organizer of the AI Challenge For Industry 2019, *ML Challenge*
Contributor to the conversational Agents workshop, *Science Popularization and Communication*
Contributor to the Data Mining and Neuroscience workshop, *Science Communication*

PATENTS

- Procédé Multiparamétrique de Quantification de l'Equilibre , 2016, reference FR1660846
- Postural Control quantification and evaluation, US Patent US Patent App. 16/346,395
- Improved method for quantifying balance , 2020, reference US Patent App. 16/763,573
- System and Method for Predicting Depth of Anesthesia , 2021, reference EU Patent App. (pending) 0757-IDF38-EP

PUBLICATIONS

FIVE SELECTED PUBLICATIONS

1. Bloechle, J.-L., Audiffren, J., Le Naour, T., Alli, A., Simoni, D., Wüthrich, G. & Bresciani, J.-P. It's not all in your feet: Improving penalty kick performance with human-avatar interaction and Machine Learning. *The Innovation* (2024).

5. Ostapuk, N., Audiffren, J., Dolamic, L., Mermoud, A. & Cudré-Mauroux, P. *Follow the Path: Hierarchy-Aware Extreme Multi-Label Completion for Semantic Text Tagging* in *Proceedings of the ACM on Web Conference 2024* (2024), 2094–2105.

12. Audiffren, Julien. *Dichotomous Optimistic Search to Quantify Human Perception* in *International Conference on Machine Learning* (2021), 414–424.

32. Audiffren, Julien & Ralaivola, L. *Bandits dueling on partially ordered sets* in *Advances in Neural Information Processing Systems* (2017), 2129–2138.

35. Kadri, H., Duflos, E., Preux, P., Canu, S., Rakotomamonjy, A. & Audiffren, Julien. Operator-valued kernels for learning from functional response data. *Journal of Machine Learning Research* **17,** 1–54 (2016).

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All publications

1. Bloechle, J.-L., Audiffren, J., Le Naour, T., Alli, A., Simoni, D., Wüthrich, G. & Bresciani, J.-P. It's not all in your feet: Improving penalty kick performance with human-avatar interaction and Machine Learning. *The Innovation* (2024).

2. *Large Language Models in Cybersecurity* (Springer Cham, 2024).

3. Mondal, M., Dolamic, L., Bovet, G., Cudré-Mauroux, P. & Audiffren, J. *Do Large Language Models Exhibit Cognitive Dissonance? Studying the Difference Between Revealed Beliefs and Stated Answers* preprint (•, 2024).

4. Ostapuk, N., Audiffren, J., Dolamic, L., Mermoud, A. & Cudre-Mauroux, P. *Follow the Path: Hierarchy-Aware Extreme Multi-Label Completion for Semantic Text Tagging* in *Proceedings of The Web Conference 2024* (2024).

5. Ostapuk, N., Audiffren, J., Dolamic, L., Mermoud, A. & Cudré-Mauroux, P. *Follow the Path: Hierarchy-Aware Extreme Multi-Label Completion for Semantic Text Tagging* in *Proceedings of the ACM on Web Conference 2024* (2024), 2094–2105.

6. Audiffren, Julien. *ZOOM: using Optimistic Optimization to solve the Threshold Estimation Problem* (2023).

7. Audiffren, Julien, Bloechle, J.-L. & Bresciani, J.-P. Influence of mental workload on motion perception: A direct comparison of luminance-based and contrast-based stimuli. *Vision Research* **193,** 107977. ISSN: 0042-6989 (2022).

8. Audiffren, Julien & Bresciani, J.-P. Model Based or Model Free? Comparing Adaptive Methods for Estimating Thresholds in Neuroscience. *Neural Computation* **34,** 338–359. ISSN: 0899-7667 (Jan. 2022).

9. Bargiotas, I., Wang, D., Mantilla, J., Quijoux, F., Moreau, A., Vidal, C., Barrois, R., Nicolai, A., Audiffren, J., Labourdette, C., *et al.* Preventing falls: the use of machine learning for the prediction of future falls in individuals without history of fall. *Journal of neurology,* 1–14 (2022).

10. Humbert, P., Oudre, L., Vayatis, N. & Audiffren, Julien. Tensor Convolutional Dictionary Learning With CP Low-Rank Activations. *IEEE Transactions on Signal Processing* **70,** 785–796 (2022).

11. Audiffren, J. *Quantifying Human Perception with Multi-Armed Bandits* in *20th International Conference on Autonomous Agents and Multiagent Systems* (2021).

12. Audiffren, Julien. *Dichotomous Optimistic Search to Quantify Human Perception* in *International Conference on Machine Learning* (2021), 414–424.

13. Legrand, F., Eychene, J.-M., Audiffren, J., Klein, A., Labourdette, C., Nicolaï, A., Sandron, F. & Vidal, P.-P. Description of Participants in the "Atout Age Mobility" Prevention Workshops at the University Hospital Center of La Reunion: A Prospective Study. *The journal of nutrition, health & aging,* 1–9 (2021).

14. Legrand, F., Eychene, J.-M., Audiffren, J., Klein, A., Labourdette, C., Nicolaï, A., Sandron, F. & Vidal, P.-P. The 5P program, personalized and participatory primary prevention pathway: Rational and design of a clinical trial in general practice. *Contemporary Clinical Trials Communications* **22,** 100786. ISSN: 2451-8654. https://www.sciencedirect.com/science/article/pii/S2451865421000879 (2021).

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15. Luggen, M., Audiffren, J., Difallah, D. & Cudre-Mauroux, P. *Wiki2Prop: A Multi-Modal Approach for Predicting Wikidata Properties from Wikipedia* in *Proceedings of The Web Conference 2021* (2021).

16. Nicolaï, A., Limnios, M., Trouvé, A. & Audiffren, Julien. A Langevin-based model with moving posturographic target to quantify postural control. *IEEE Transactions on Neural Systems and Rehabilitation Engineering* **29,** 478–487 (2021).

17. Quijoux, F., Nicolaï, A., Chairi, I., Bargiotas, I., Ricard, D., Yelnik, A., Oudre, L., Bertin-Hugault, F., Vidal, P.-P., Vayatis, N. & Audiffren, Julien. A review of center of pressure (COP) variables to quantify standing balance in elderly people: Algorithms and open-access code. *Physiological Reports* **9,** e15067 (2021).

18. Humbert, P., Audiffren, J., Oudre, L. & Vayatis, N. *Low Rank Activations for Tensor-Based Convolutional Sparse Coding* in *ICASSP 2020-2020 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)* (2020), 3252–3256.

19. Legrand, F., Eychene, J., Nicolai, A., Audiffren, J., Klein, A., Labourdette, C., Oudre, L., Vayatis, N., Vidal, P. & Sandron, F. Impact du programme de prévention'Atout Âge'sur le risque de chute par la mesure objective de la vitesse de marche. *L'Année Gérontologique* **34,** p–20 (2020).

20. Vidal, P.-P., Vienne-Jumeau, A., Moreau, A., Vidal, C., Wang, D., Audiffren, J., Bargiotas, I., Barrois, R., Buffat, S., Dubost, C., *et al.* An opinion paper on the maintenance of robustness: Towards a multimodal and intergenerational approach using digital twins. *Aging Medicine* **3,** 188–194 (2020).

21. Bargiotas, I., Audiffren, J., Vayatis, N., Vidal, P.-P., Yelnik, A. P. & Ricard, D. Local Assessment of Statokinesigram Dynamics in Time: An in-Depth Look at the Scoring Algorithm. *Image Processing On Line* **9,** 143–157 (2019).

22. Humbert, P., Dubost, C., Audiffren, J. & Oudre, L. Apprenticeship Learning for a Predictive State Representation of Anesthesia. *IEEE Transactions on Biomedical Engineering* (2019).

23. Minvielle, L. & Audiffren, Julien. NurseNet: Monitoring Elderly Levels of Activity with a Piezoelectric Floor. *Sensors* **19,** 3851 (2019).

24. Nicolai, A. & Audiffren, Julien. *Estimating Center of Mass Trajectory in Quiet Standing: a Review* in *2019 41st Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)* (IEEE, 2019), 6854–6859.

25. Rettig, L., Audiffren, J. & Cudré-Mauroux, P. *Fusing Vector Space Models for Domain-Specific Applications* in *ICTAI* (2019).

26. Smirnova, A., Audiffren, J. & Cudre-Mauroux, P. *APCNN: Tackling class imbalance in relation extraction through aggregated piecewise convolutional neural networks* in *2019 6th Swiss Conference on Data Science (SDS)* (IEEE, 2019), 63–68.

27. Bargiotas, I., Audiffren, J., Vayatis, N., Vidal, P.-P., Buffat, S., Yelnik, A. P. & Ricard, D. On the importance of local dynamics in statokinesigram: A multivariate approach for postural control evaluation in elderly. *PloS one* **13** (2018).

29. Nicolai, A. & Audiffren, Julien. *Model-space regularization and fully interpretable algorithms for postural control quantification* in *2018 IEEE 42nd Annual Computer Software and Applications Conference (COMPSAC)* **2** (IEEE, 2018), 177–182.

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30. Smirnova, A., Audiffren, J. & Cudré-Mauroux, P. Distant supervision from knowledge graphs. *Encyclopedia of Big Data Technologies,* 1–7 (2018).

31. Audiffren, Julien & Kadri, H. *M-power regularized least squares regression* in *2017 International Joint Conference on Neural Networks (IJCNN)* (IEEE, 2017), 1080–1086.

32. Audiffren, Julien & Ralaivola, L. *Bandits dueling on partially ordered sets* in *Advances in Neural Information Processing Systems* (2017), 2129–2138.

33. Audiffren, Julien, Bargiotas, I., Vayatis, N., Vidal, P.-P. & Ricard, D. A non linear scoring approach for evaluating balance: classification of elderly as fallers and non-fallers. *PLoS one* **11** (2016).

34. Audiffren, Julien & Contal, E. Preprocessing the Nintendo Wii board signal to derive more accurate descriptors of statokinesigrams. *Sensors* **16** (2016).

35. Kadri, H., Duflos, E., Preux, P., Canu, S., Rakotomamonjy, A. & Audiffren, Julien. Operator-valued kernels for learning from functional response data. *Journal of Machine Learning Research* **17,** 1–54 (2016).

36. Audiffren, J., Barrois-Müller, R., Provost, C., Chiarovano, É., Oudre, L., Moreau, T., Truong, C., Yelnik, A., Vayatis, N., Vidal, P., *et al.* Évaluation de l'équilibre et prédiction des risques de chutes en utilisant une Wii board balance. *Neurophysiologie Clinique/Clinical Neurophysiology* **45,** 403 (2015).

37. Audiffren, J., Valko, M., Lazaric, A. & Ghavamzadeh, M. *Maximum entropy semi-supervised inverse reinforcement learning* in *Twenty-Fourth International Joint Conference on Artificial Intelligence* (2015).

38. Audiffren, Julien & Kadri, H. *Online Learning with Operator-valued Kernels* in *ESANN* (2015).

39. Audiffren, Julien & Ralaivola, L. *Cornering Stationary and Restless Mixing Bandits with Remix-UCB* in *Advances in Neural Information Processing Systems* (2015).

40. Audiffren, J. & Pardoux, E. Muller's ratchet clicks in finite time. *Stochastic Processes and their Applications* **123,** 2370–2397 (2013).

41. Audiffren, Julien & Kadri, H. *Stability of multi-task kernel regression algorithms* in *Asian Conference on Machine Learning* (2013), 1–16.

REFERENCES

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