

Alice Coucke

Head of Machine Learning Research

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Experience

Vocational

- Nov. 2019–present **Head of Machine Learning Research, Sonos, Paris**
Promoting a fruitful and ambitious scientific research environment in the machine learning team that boosts and supports the production goals of the Sonos Voice Experience department: building a fully privacy voice control solution on Sonos speakers.
My interests are around embedded machine learning, privacy, and fairness.
I hold several roles: I own the scientific aspect of the **R&D project management** in the machine learning team, I am a **technical project lead** in several key areas (embedded speech-to-text, fairness) and a **machine learning product manager** (in charge of the delivery of machine learning assets) for the next generation of our product. I also had and continue having **individual contributions** as a research scientist on a variety of topics, such as fairness, natural language processing, keyword spotting, speaker identification [1], directedness classification.
- Aug. – Nov. 2019 **Director of Machine Learning Research, Snips, Paris**
Leading the long-term research explorations. Snips was acquired by Sonos in November 2019 to build their privacy-first voice assistant for music control [2], launched in June 2022.
- 2017–2019 **Senior Machine Learning Scientist, Snips, Paris**
Developing spoken language understanding solutions on small devices typical of IoT applications. Designing embedded, private-by-design systems with performance on par with cloud-based commercial solutions. Focusing on natural language understanding, wake word detection. Leading the effort in publishing scientific papers [3, 4, 5, 6, 7, 8].

Miscellaneous

- Sept. 2022 **Special session lead organizer, Interspeech 2022 conference**
Proposed and co-organized the Special session Inclusive and Fair Speech Technologies to discuss biases, propose mitigation methods, and increase academic and industry collaborations on the fairness of speech systems.
- 2019 **Invited AI expert, Council of Europe**
Educating on AI fairness as an AI expert, invited by the Council of Europe. Focus on gender equality implications of AI. Gender Mainstreaming Team meeting (Strasbourg, June 2019) and Committee of Equality and Non Discrimination (Paris, September 2019).
- 2018–2020 **Executive board member, Réseau Recherche et Innovation en Audiovisuel et Multimédia (RIAM), Centre National du Cinéma et de l'image animée**
Sitting at the board of the CNC-RIAM as an Artificial Intelligence specialist. RIAM provides financial grants to innovative R&D projects in production, processing, distribution, and publication of images and audio. It is a partnership between CNC and BPI France.

Internships

- Jan.–March 2013 **Research Intern, Institut Curie, Paris**
Working on theoretical biophysics under the supervision of Jean-Francois Joanny to develop a theoretical model based on active gel theory and perform numerical simulations to study the effect of cell migration on morphogenesis in biological tissues. This eventually lead to a publication [13].

Feb.–Aug. **Visiting Research Scholar**, *American Museum of Natural History*, New York City
2012 Working on computational astrophysics under the supervision of Prof. Mordecai-Mark Mac Low to study supernova-driven turbulence in the interstellar medium.

Computer skills

- Languages
- Proficiency using Python in production environments
 - Proficiency using PyTorch
- Other
- Routinely using git and GitHub for code versioning and reviews
 - Experience with Jenkins and Docker for continuous integration

Education

- 2013–2016 **PhD**, *École Normale Supérieure*, Paris
High-dimensional inference with correlated data: statistical modeling of protein sequences beyond structural prediction [9].

My PhD work mainly focused on developing global statistical inference methods based on the maximum entropy principle with undirected graphical models and their application to genomic data, in the context of protein structure prediction. Through an extensive study on both artificial and biological data, I provided a better interpretation of the central inferred parameters, up to now poorly understood [10]. I presented a new and more precise procedure for the inference of generative models, which lead to further improvements on real, finitely sampled data [11, 12]. This PhD work was conducted in the Theoretical Physics lab of ENS, under the supervision of Remi Monasson and was codirected by Martin Weigt from the lab of Computational and Quantitative Biology of Université Pierre & Marie Curie (Paris).
- 2011–2013 **M.Sc. in Theoretical Physics**, *École Normale Supérieure*, Paris, *Cum Laude*
Focus on mathematics and statistical physics.
- 2010–2011 **B.Sc. in Physics**, *École Normale Supérieure*, Paris, *Cum Laude*
Statistical physics, mathematics, astrophysics, condensed matter physics, quantum mechanics.
- 2006–2009 **Prépa MPSI-MP***, *Lycée Henri IV*, Paris
Intensive scientific training for the challenging “Grandes Écoles” national exams.

Languages

French Native
English Bilingual

Activities and Awards

- Outreach I am a frequent speaker at technical conferences. See the full list on my personal homepage.
- Award Palmarès des 100 Français qui font l'Intelligence Artificielle by Usine Nouvelle in February 2018, “start-up” section.
- Datathon Member of the winning team at the DAT-ICU Datathon organized the AP-HP, the public organization regrouping all the hospitals of Paris in January 2018. This work led to the preprint [14].
- Debating Secretary General of the French Debating Association tournament. In charge of organizing the annual tournament involving 24 universities at the national level.
- Culture Organizer of the Arab Week at École Normale Supérieure in 2015. I contributed to the organization of a week of conferences with world-class speakers and artists.

Publications

- [1] Julien Balian, Raffaele Tavarone, Mathieu Poumeyrol, and Alice Coucke. Small footprint text-independent speaker verification for embedded systems. In *ICASSP 2021-2021 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, pages 6179–6183. IEEE, 2021.
- [2] Alice Coucke, Joseph Dureau, David Leroy, Voice Experience Machine Learning Director, and Sébastien Maury. On-device voice control on sonos speakers. *Sonos Tech Blog*, 2022.
- [3] Alice Coucke, Alaa Saade, Adrien Ball, Théodore Bluche, Alexandre Caulier, David Leroy, Clément Doumouro, Thibault Gisselbrecht, Francesco Caltagirone, Thibaut Lavril, et al. Snips voice platform: an embedded spoken language understanding system for private-by-design voice interfaces. *arXiv preprint arXiv:1805.10190*, 2018.
- [4] David Leroy, Alice Coucke, Thibaut Lavril, Thibault Gisselbrecht, and Joseph Dureau. Federated learning for keyword spotting. *arXiv preprint arXiv:1810.05512*, 2018.
- [5] Alice Coucke, Mohammed Chlieh, Thibault Gisselbrecht, David Leroy, Mathieu Poumeyrol, and Thibaut Lavril. Efficient keyword spotting using dilated convolutions and gating. *arXiv preprint arXiv:1811.07684*, 2018.
- [6] Alaa Saade, Alice Coucke, Alexandre Caulier, Joseph Dureau, Adrien Ball, Théodore Bluche, David Leroy, Clément Doumouro, Thibault Gisselbrecht, Francesco Caltagirone, et al. Spoken language understanding on the edge. *arXiv preprint arXiv:1810.12735*, 2018.
- [7] Stéphane d’Ascoli, Alice Coucke, Francesco Caltagirone, Alexandre Caulier, and Marc Lelarge. Conditioned query generation for task-oriented dialogue systems. *arXiv preprint arXiv:1911.03698*, 2019.
- [8] Stéphane d’Ascoli, Alice Coucke, Francesco Caltagirone, Alexandre Caulier, and Marc Lelarge. Conditioned text generation with transfer for closed-domain dialogue systems. In *Statistical Language and Speech Processing: 8th International Conference, SLSP 2020, Cardiff, UK, October 14–16, 2020, Proceedings 8*, pages 23–34. Springer, 2020.
- [9] Alice Coucke. High dimensional inference with correlated data: statistical modeling of protein sequences beyond structural prediction. 2016.
- [10] Alice Coucke, Guido Uguzzoni, Francesco Oteri, Simona Cocco, Remi Monasson, and Martin Weigt. Direct coevolutionary couplings reflect biophysical residue interactions in proteins. *The Journal of chemical physics*, 145(17):174102, 2016.
- [11] John P Barton, Eleonora De Leonardis, Alice Coucke, and Simona Cocco. Ace: adaptive cluster expansion for maximum entropy graphical model inference. *Bioinformatics*, 32(20):3089–3097, 2016.
- [12] Francesca Rizzato, Alice Coucke, Eleonora de Leonardis, John P Barton, Jérôme Tubiana, Rémi Monasson, and Simona Cocco. Inference of compressed potts graphical models. *Physical Review E*, 101(1):012309, 2020.
- [13] Edouard Hannezo, Alice Coucke, and Jean-François Joanny. Interplay of migratory and division forces as a generic mechanism for stem cell patterns. *Physical Review E*, 93(2):022405, 2016.
- [14] Jean-Baptiste Escudié, Alaa Saade, Alice Coucke, and Marc Lelarge. Deep representation for patient visits from electronic health records. *arXiv preprint arXiv:1803.09533*, 2018.