

Alice Coucke

PhD, Head of Machine Learning Research

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Experience

Vocational

- April. **Head of Automatic Speech Recognition, Sonos, Paris**
2024–present Owing all aspects of ASR for Sonos Voice Control, from research to production.
Delivering state-of-the-art speech recognition models for the future generation of Sonos Voice Control, tailored to the Sonos ecosystem, and fit for embedded inference as a safeguard to user privacy:
- Project leadership: owner of the research roadmaps, large-scale evaluation procedures, cross-functional collaboration with product and platform teams, resources and budget tracking
 - People leadership & talent management: building, growing and supporting technical teams from the ground up
 - Strategic initiative: leader of Sonos' Fairness for speech technologies initiative (at the research [1] and equitable product design level)
- Nov. **Head of Machine Learning Research, Sonos, Paris**
2019–present Owing the scientific aspect of Sonos Voice Control's Research & Development activity.
Promoting a fruitful and ambitious scientific research environment in the machine learning team that boosts and supports our production goals: building a fully private voice control solution on Sonos speakers, shipped in production in May 2022 to millions of users.
- Technical leadership: large-scale ML evaluation, embedded speech to text, fairness, language modeling, speaker identification [2], directness classification
 - People leadership & talent management: co-designed our technical and behavioral interview process (hired around 15 team members), driving ML research continuous learning initiatives (R&D reporting with peer review cycles, internal workshops, scientific conference attendance)
 - AI/ML education for cross-functional partners: product and platform teams, executive leadership, external stakeholders (e.g. privacy NGOs, US Patent office, tech journalists) on key areas like privacy-preserving machine learning, LLMs and generative AI.
- Aug. – Nov. **Director of Machine Learning Research, Snips, Paris**
2019 Leading the long-term research explorations. Snips was acquired by Sonos in November 2019 to build their privacy-first voice assistant for music control [3], 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 [4, 5, 6, 7, 8, 9]. Released several open evaluation datasets for spoken language understanding and keyword spotting that have now become standard benchmarks in the field.

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. 9 accepted main track submissions.
- May 2022 **Spokesperson, Sonos Voice Control launch, NYC**
Technical spokesperson for the public launch of Sonos Voice Control. Gave interviews to several tech journalists in the public event Sonos organized in the US.

- 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.
- Jan.–March 2013 **Research Intern**, *Institut Curie*, Paris
Working on theoretical biophysics: theoretical model & numerical simulations to study the effect of cell migration on morphogenesis in biological tissues [14].

Computer skills

- Languages
- Python in production environments.
 - PyTorch
 - git and GitHub for code versioning and reviews

Education

- 2013–2016 **PhD in Statistical Physics**, *École Normale Supérieure*, Paris
High-dimensional inference with correlated data: statistical modeling of protein sequences beyond structural prediction [10].

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, providing a better interpretation of the central inferred parameters, up to now poorly understood [11]. Introducing a more precise procedure for the inference of generative models, which leads to further improvements on real, finitely sampled data [12, 13]. PhD 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).

Teaching Assistant for Biophysics at the M.Sc. level at ENS for 2 years.
- 2011–2013 **M.Sc. in Theoretical Physics**, *École Normale Supérieure*, Paris, *Cum Laude*
International Center for Fundamental Physics, a top-level international program, designed specifically for the best French and international students. 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 Frequent speaker at technical conferences (learn more 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 [15].
Debating	Secretary General of the <u>French Debating Association</u> tournament (2013-2015). In charge of organizing the annual tournament involving 24 universities at the national level.
Sports	Running and bike-packing.

Publications

- [1] Chloé Sekkat, Fanny Leroy, Salima Mdhaffar, Blake Perry Smith, Yannick Estève, Joseph Dureau, and Alice Coucke. Sonos voice control bias assessment dataset: A methodology for demographic bias assessment in voice assistants. *arXiv preprint arXiv:2405.19342*, 2024.
- [2] 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.
- [3] 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.
- [4] 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.
- [5] David Leroy, Alice Coucke, Thibaut Lavril, Thibault Gisselbrecht, and Joseph Dureau. Federated learning for keyword spotting. *arXiv preprint arXiv:1810.05512*, 2018.
- [6] 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.
- [7] 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.
- [8] 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.
- [9] 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.
- [10] Alice Coucke. High dimensional inference with correlated data: statistical modeling of protein sequences beyond structural prediction. 2016.
- [11] 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.
- [12] 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.
- [13] 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.
- [14] 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.
- [15] 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.