Carolina Brum.

applied ml researcher · staff research scientist

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IEEE Senior Member

summary

Applied ML researcher spanning human–computer interaction, sensing, and LLM post-training. I've shipped research into products used by millions — in-air gesture recognition on the Pixel 4, Assistive Touch on the Apple Watch, and privacy-preserving Siri AI — and I lead projects end to end: concept, scientific rigor, user validation, and shipping.

experience

Staff Research Scientist · Apple

2021 — Now · San Francisco

- Led cross-functional collaboration between the autograder, foundation-model, and infra teams, obtaining exponential hill-climbing on world-knowledge question-answering for Siri AI.
- Led the human red-teaming initiative for generative-AI safety in Apple Intelligence, ensuring large-scale language and multimodal systems adhere to principles of trust and safety.
- Developed early-stage sensing and ML prototypes that laid the groundwork for new accessibility and health-monitoring features, aligning technical innovation with inclusive design.
- Played a central role in shaping the gesture vocabulary, informing user-study design and guiding feature validation for next-generation interaction paradigms.
- Designed and deployed novel ML models for large-scale gesture recognition on the Apple Watch — powering Assistive Touch and Quick Actions — achieving up to 40% latency reduction over baseline.

Senior Research Scientist · Chatham Labs › Facebook Reality Labs

2019 — 2020 · Toronto

- Designed and implemented a learning-based regression algorithm for real-time endpoint prediction, enhancing precision and responsiveness in virtual environments.
- Developed dynamic models of hand, head, and gaze behavior to advance predictive and immersive VR interaction paradigms.

Research Scientist · Google — Project Soli

2016 — 2018 · Mountain View

- Modeled gesture and interaction dynamics to support adaptive filtering and state estimation, improving real-time system responsiveness and contextual awareness.
- Developed algorithms to extract meaningful signals from high-dimensional spatiotemporal radar data, enabling precise interpretation of complex, real-world input streams.
- Designed end-to-end pipelines for filtering, prediction, estimation, and tracking of signals derived from human motion.

education

Postdoc in Machine Learning & Neuroscience

Safra International Institute of Neurosciences · 2015

Ph.D., Music Technology & Integrated Sensor Systems	McGill University | MIT · 2015
M.Sc., Mechanical and Metrology Engineering	Federal University of Santa Catarina · 2008
B.Sc., Electrical Engineering	Federal University of Santa Catarina · 2005
Technical High School in Electronics	Federal Institude of Technology (IFSul) · 1999

skills

methods

Retrieval-Augmented Generation · Gesture recognition · Prediction and estimation · Time series · Red teaming

domains

Human–computer interaction · Sensing technologies · Accessibility · Gesture Recognition · Generative AI safety

languages

English · French · Portuguese · Spanish

selected publications

01 Gunter, T. et al. **Apple Intelligence Foundation Language Models**. *arXiv, 2024*. ↗ paper

02 Xu, Xuhai, Gong, J., **Brum, C.** et al. **Enabling Hand Gesture Customization on Wrist-Worn Devices**. *CHI Conference on Human Factors in Computing Systems, 2022*. ↗ paper

03 Cheng, T., Park, J.W., Li, J., Ramey, C., Lin, H., Abowd, G.D, **Brum, C.**, Oh, H., Giordano, M. **PITAS: Sensing and Actuating Embedded Robotic Sheet for Physical Information Communication**. *CHI Conference on Human Factors in Computing Systems, 2021*. ↗ paper

04 Lapinki, M., **Brum, C.**, Berkson, E., Kepple, T., Scarborough, D., Paradiso, J. **A Wide-Range, Wireless Wearable Inertial Motion Sensing System for Capturing Fast Athletic Biomechanics in Overhead Pitching**. *Sensors Journal, 2019*. ↗ paper

05 Figueiredo, N., Felix, F., **Brum, C.**, Queiroz, M. **A comparative study on filtering and classification of bird songs**. *Proceedings of the 15th Sound and Music Computing Conference, 2018*. ↗ paper

06 **Brum, C.** and Wanderley, M.W. **Comprehensive Review of Sensors and Instrumentation Methods Used in Musical Expression**. *Sensors Journal, 2014*. ↗ paper

07 **Brum, C.** and Wanderley, M.W. **Multiple-model Linear Kalman Filter Framework for Unpredictable Signals**. *IEEE Sensors Journal, 2014*. ↗ paper

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