Heitor R. Guimarães

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Education

Institut National de la Recherche Scientifique (INRS) — Montreal, CA
Ph.D. Telecommunications — *2022 – 2026*
Advisor: Dr. Tiago H. Falk
Research Interests: Model compression and Speech Representation Learning

University of São Paulo (USP) — São Paulo, BR
M.Sc. Electrical Engineering — *2021 – 2022*
Advisor: Dr. Miguel Arjona Ramírez, Dr. Wesley Beccaro
Thesis: On Self-Supervised Representations for 3D Speech Enhancement

Aeronautics Institute of Technology (ITA) — São Paulo, BR
Data Science Specialization — *2018 – 2018*
Advisor: Dr. Hitoshi Nagano
Thesis: *Monaural Speech Enhancement through Deep Wave-U-Net*

Federal University of Rio de Janeiro (UFRJ) — Rio de Janeiro, BR
Computer and Information Engineering — *2013 – 2018*
Advisor: Dr. Ricardo Guerra Marroquim
Senior Project: *Music Information Retrieval: A deep learning approach.*

Publications

(i) **Guimarães, Heitor R.**, Arthur Pimentel, Anderson Avila, Mehdi Rezagholizadeh, Boxing Chen, and Tiago Falk. "RobustDistiller: Compressing Universal Speech Representations for Enhanced Environment Robustness." IEEE International Conference on Acoustics, Speech, & Signal Processing (ICASSP) (2023). [Link]

(ii) **Guimarães, Heitor R.**, Arthur Pimentel, Anderson Avila, Mehdi Rezagholizadeh, and Tiago Falk. "Improving the Robustness of DistilHuBERT to Unseen Noisy Conditions via Data Augmentation, Curriculum Learning, and Multi-Task Enhancement". Efficient Natural Language and Speech Processing (ENLSP-II) Workshop - NeurIPS (2022). [Link]

(iii) **Guimarães, Heitor R.**, Arthur Pimentel, Anderson Avila, Mehdi Rezagholizadeh, and Tiago Falk. "An Exploration into the Performance of Unsupervised Cross-Task Speech Representations for *In the Wild* Edge Applications". Abstract. Edge Intelligence Workshop (2022). [Link]

(iv) Arthur Pimentel, **Guimarães, Heitor R.**, Anderson Avila, Mehdi Rezagholizadeh, and Tiago Falk. "How Robust is *Robust wav2vec 2.0* for Edge Applications? An Exploration into the Effects of Quantization and Model Pruning on *In the Wild* Speech Recognition". Abstract. Edge Intelligence Workshop (2022). [Link]

(v) **Guimarães, Heitor R.**, Wesley Beccaro, and Miguel A. Ramırez. "A PERCEPTUAL LOSS BASED COMPLEX NEURAL BEAMFORMING FOR AMBIX 3D SPEECH ENHANCEMENT." Proc. L3DAS22: Machine Learning for 3D Audio Signal Processing: 16-20 (2022). [Link]

(vi) **Guimarães, Heitor R.**, Wesley Beccaro, and Miguel A. Ramírez. "Optimizing Time Domain Fully Convolutional Networks for 3D Speech Enhancement in a Reverberant Environment Using Perceptual Losses." 2021 IEEE 31st International Workshop on Machine Learning for Signal Processing (MLSP). (2021). [Link]

(vii) **Guimarães, Heitor R.**, Hitoshi Nagano, and Diego W. Silva. "Monaural speech enhancement through deep Wave-U-Net." Expert Systems with Applications 158 (2020): 113582. [Link]

(viii) Dias, Luciana & Bom, Clecio & **Guimarães, Heitor R.** & Faria, Elisângela & Albuquerque, Marcio & Albuquerque, Marcelo & Correia, Maury & Surmas, Rodrigo. (2016). Segmentation of Microtomography images of rocks using texture filter. Notas Técnicas. 6. 19-27. DOI 10.7437/NT2236-7640/2016.01.003. [Link]

Workshops, Presentations, and Talks

(i) "Improving the Robustness of DistilHuBERT to Unseen Noisy Conditions via Data Augmentation, Curriculum Learning, and Multi-Task Enhancement". (To be presented) Oral Presentation (**Spotlight**). Efficient Natural Language and Speech Processing (ENLSP-II) workshop - NeurIPS (2022). [Link]

(ii) "An Exploration into the Performance of Unsupervised Cross-Task Speech Representations for *In the Wild* Edge Applications". Poster Presentation. Edge Intelligence Workshop (2022).

(iii) "Optimizing Time Domain Fully Convolutional Networks for 3D Speech Enhancement in a Reverberant Environment Using Perceptual Losses." Oral Presentation. IEEE 31st International Workshop on Machine Learning for Signal Processing (MLSP). (2021).

(iv) Porosity and Absolute Permeability estimation through Image Processing. Oral Presentation. "XXII undergraduate research fair of the Brazilian Center for Research in Physics (2015)".

(v) 3D visualization and processing of high-resolution microtomography images of rocks. Oral Presentation. "XXI undergraduate research fair of the Brazilian Center for Research in Physics (2014)"

(vi) Characterizing high-resolution geological reservoir images. Oral Presentation. "XX undergraduate research fair of the Brazilian Center for Research in Physics (2013)".

Honors & Awards

- Finalist, spotlight oral presentation (top 8 out of 70+ papers) at the ENLSP Workshop at NeurIPS - 2022
- Scholarship for International Students INRS - 2022
- 2nd place in the L3DAS Challenge, Task 1 (Speech Enhancement) - 2021
- Scholarship from the Foundation for Supporting the Development of Scientific Computing - 2013 - 2015
- 5th place in the IEEExtreme 6.0 (Regional - Brazil) - 2012

Work Experience

Itaú-Unibanco — São Paulo, SP
Senior Data Scientist — *Jun 2018 – May 2022*

Itaú-Unibanco is the largest private bank of Latin America. Worked on a department called Business Incubator, responsible to push forward the analytical environment of the company.

- Developed a wide-range of classical ML models, from conception to deploy, for the credit card business impacting more then 20MM users. Achieved over US$ 60MM in revenue.
- Developed a **voice biometric system for fraud detection** in Payroll loans based on the SincNet model.
- Implemented a tool based on contextual embeddings to understand the client's necessities on chat and commercial Whatsapp with his account managers to direct business actions.
- Guided business analyst to become Data Scientist through in-company talks and lectures.

General Electric — Global Research Center (*GRC*), Rio de Janeiro
Data Scientist Intern — *Aug 2015 – Aug 2017*

- Conception and Implementation of algorithms, written in Python, for asset location on indoor environments (factories, buildings, etc.)
- Developed tools for anomaly detection, in Python and R, to understand the behavior of a Blowout Preventer (BOP) and analyse the pump efficiency on Petrolleum extraction using Machine Learning

CBPF (Brazilian Center for Research in Physics) — Urca, Rio de Janeiro
Research Assistant (Undergraduate) — *Jun 2013 – Aug 2015*

- Developed scientific vizualition tools for Digital reconstructed Rocks, on stereoscopic 3D environment using NVIDIA's GPUs. Programming Languages and Softwares: C++, Python and ParaView/VTK
- Implemented the Kozeny–Carman method to estimate permeability through computer vision. Compared to commercial softwares, our tool improved the time performance by 36 times, with the cost of an acceptable 9% relative error.
- Recipient of a Scholarship from the Foundation for Supporting the Development of Scientific Computing

Additional Information

Journal Reviewer Expert Systems with Applications
Conference Reviewer IEEE MLSP 2021, IEEE ICASSP 2023

Invited Talk On the usage of Neural Networks for Speech Enhancement. *Itaú Data Science Meetup*. (2022).

Teaching Experience

- **Lecturer at Ada Bootcamp** - Deep Learning. 2020 - 2022.
- **Teaching Assistant at UFRJ** - Undergraduate course EEL890 - Big data. 2016.

Diversity and Inclusion Member of the Black in AI (BAI) affinity group

Extracurricular activity Member of the Formula SAE - Responsible for the implementation of a telemetry system and data analysis of a small formula-style car. Our team achieved 5^{th} place in 2015 competition's.

Skills

Programming: Python, Javascript, C++, Java

Toolkit: PyTorch, Keras, Scikit-Learn, Pandas, Numpy, Matplotlib

OS & Virtualization: Linux, Windows, Docker

Language: English (C1), French (A1), and Portuguese (Native)