# Henrique Assumpção

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## Education

**Masters Degree in Computer Science** Mar 2025 - Expected June 2026
*Universidade Federal de Minas Gerais* *Belo Horizonte, Brazil*

- **Advisors**: Prof. Gabriel Coutinho and Prof. Csaba Schneider;
- **Thesis subject**: Combinatorial parameters of Johnson graphs.

**Bachelor's Degree in Computer Science** Jan 2020 - Dec 2024
*Universidade Federal de Minas Gerais (GPA: 94/100)* *Belo Horizonte, Brazil*

- **Undergraduate Thesis**: Algebras, groups and graphs (Advisor: Prof. Gabriel Coutinho);
- **Relevant Coursework**: Algorithms (C,C++, Python), Machine Learning (Python), Parallel and Distributed Systems (C,Python), Software Engineering (JS,Python), Real Analysis, Linear Algebra, Abstract Algebra, Topology, Graph Theory, Semidefinite Optimization.

## Research Experience

**Quantum algorithms for finance** Jan 2025 - Dec 2025
*Advisor: Prof. Gabriel Coutinho, Scholarship: Fundep* *Inter S.A./DCC-UFMG, Brazil*

- Develops algorithms that leverage the power of quantum computers to solve complex financial tasks, such as portfolio optimization and fraud detection;
- Collaborates with a team of researchers from UFMG and industry experts from Inter in order to build efficient and robust algorithms to be deployed for usage in the banking industry.

**Graph Theory and Optimization** Mar 2023 - Jan 2025
*Advisor: Prof. Gabriel Coutinho, Scholarship: FAPEMIG* *DCC-UFMG, Brazil*

- Conducted research in graph theory and semidefinite optimization, obtaining novel results in applications for combinatorial problems;
- Developed algorithms for the analysis of clinical data of human brains, employing techniques from graph theory, linear algebra and optimization.

**Money Laundering detection on banking networks** Aug 2021 - Feb 2022
*Advisor: Prof. Fabricio Murai, Scholarship: Fundep* *Inter S.A./DCC-UFMG, Brazil*

- Created *DELATOR*, a Graph Neural Network framework in Pytorch and DGL for detecting money laundering on large banking transaction networks. The framework efficiently operated on a large-scale banking database with over $20$ million accounts and $100$ million transactions, and was successfully employed by Inter's Anti-Money Laundering team to detect new cases of suspicious activity;
- Co-authored a scientific paper published at *IEEE Big Data 2022*, and attended the conference in Osaka, Japan, in order to present the paper's findings to the scientific community.

**Predictive Maintenance for industrial machinery** May - Jul 2021
*Advisor: Prof. Fabricio Murai, Scholarship: Fundep* *MINASLIGAS/DCC-UFMG, Brazil*

- Constructed a Variational Autoencoder model in Pytorch for predictive maintenance on siderurgy machinery, leveraging structural information from time-series data in order to prototype an efficient model that yielded a $10\%$ increase in overall accuracy;
- Contributed to the development of a production-ready full stack application for predictive maintenance for the machinery from MINASLIGAS.

**Sentiment Analysis on Online Mental Health communities** Dec 2020 - May 2021
*Advisors: Prof. Fabricio Murai, Prof. Ana Paula Couto da Silva* *DCC-UFMG, Brazil*

- Developed a novel Recurrent Neural Network model in Pytorch for sentiment analysis on mental health online communities. The model efficiently and accurately predicted shifts in the emotional tone of online users, and outperformed all considered baselines by an average of $20\%$;
- Co-authored a scientific paper published at *Future Generation Computer Systems*, an international journal that allowed for greater disclosure of our work.

## Publications

### Conference Papers

- **Henrique S. Assumpção**, Fabrício Souza, Leandro Lacerda Campos, Vinícius T. de Castro Pires, Paulo M. Laurentys de Almeira, Fabricio Murai. DELATOR: Money Laundering Detection via Multi-Task Learning on Large Transaction Graphs. In *IEEE International Conference on Big Data* (IEEE BigData), 2022. Earlier version published in *Brazilian Workshop on Social Network Analysis and Mining* (BraSNAM), 2022.

### Journal Papers

- Bárbara Silveira, **Henrique S. Silva**, Fabricio Murai, Ana Paula C. da Silva. Predicting user emotional tone in mental disorder online communities. *Future Generation Computer Systems*, 2021.

## Professional Experience

**Data Science Instructor** Jun - Dec 2022

*Usiminas/DCC-UFMG, Brazil*

- Instructed multidisciplinary teams of professionals in developing useful software programs for applications at Usiminas, by employing data analysis and machine learning algorithms;
- Taught Python programming concepts and technologies in the context of data science, such as Numpy and Pandas, and technologies related to machine learning, such as Pytorch and Tensorflow.

**A.I. Research & Development** Mar - Aug 2021

*Plus Three, USA*

- Implemented NLP models for question answering and language generation on web applications;
- Researched novel methods for effectively integrating chatbots into the company's website;
- Wrote for the non-profit organization AIandYou, creating educational articles on many AI-related topics with the purpose of reaching minority groups in the US.

## Awards & Achievements

- Best Paper Award at the *XI Brazilian Workshop on Social Network Analysis and Mining* (BraSNAM), 2022.
- Achieved 2$^{nd}$ place in the admission test for Computer Science at *Universidade de São Paulo* (USP), 2020.
- Receive Honorable Mentions for public speaking and argumentation for four consecutive years at SINUM (United Nations model simulation at Marista Dom Silvério High School), 2015 - 2018.

## Skills

**Programming Languages**: Python, C++, C, Rust, JavaScript, SQL, Java, R, C#, Verilog, MATLAB, GNU Octave
**Technologies**: Pytorch, Tensorflow, Numpy, Scipy, Pandas, scikit-learn, Pytorch Geometric, DGL, StellarGraph
**MLOps**: AWS Sagemaker, AWS Elastic Inference
**DevOps**: GitLab CI/CD
**Backend Tools**: MySQL, SQLite, Docker
**Tools**: Linux, Git, LaTeX, Microsoft Excel, Microsoft Power BI
**Languages**: Portuguese (Native), English (C2), Spanish (B2), French (B1)