

# Henrique S. Assumpção

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## Education

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### Universidade Federal de Minas Gerais

Jan 2020 - Dec 2024

*Bachelor Degree in Computer Science* (GPA: 93/100)

Belo Horizonte, Minas Gerais

- **Relevant Coursework in CS:** Data Structures (C,C++), Algorithms (C++, Python), Data Science (Python), Machine Learning (Python), Parallel and Distributed Systems (C,Python), Quantum Computing (Python), Operating Systems (C), Software Engineering (JS,Python).
- **Relevant Coursework in Mathematics:** Real Analysis, Linear Algebra, Rings and Modules, Group Theory, Topology, Graph Theory, Semidefinite Optimization, Calculus, Differential Equations, Probability, Discrete Mathematics.

## Research Experience

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### Applications of Abstract Algebra to Quantum Computing and Graph Theory

Mar 2023 - Ongoing

Advisor: [Prof. Gabriel Coutinho](#)

[DCC-UFMG](#), Brazil

- Works on novel problems related to quantum walks on graphs and bounds for invariants of graphs in association schemes and homogeneous coherent configurations.
- Studies advanced subjects in Pure and Applied Mathematics, such as Functional Analysis, Commutative and Non-Commutative Algebra, and Combinatorial Optimization.

### Money Laundering detection on banking networks

Aug 2021 - Feb 2022

Advisor: [Prof. Fabricio Murai](#)

[Inter S.A./DCC-UFMG](#)

- Developed *DELATOR*, a Graph Neural Network framework for detecting money laundering on large banking transaction networks. The framework outperformed all considered baselines with respect to AUC-ROC, and was successfully deployed by Inter's Anti-Money Laundering to detect multiple new cases of suspicious activity, which were then reported to the Brazilian authorities.
- Employed commercial grade development tools, such as AWS Sagemaker, GitLab, and Docker, in order to efficiently prototype a large-scale framework for usage in databases with hundreds of millions of samples from the banking industry.
- Co-authored a scientific paper published at *IEEE Big Data 2022*, and presented the findings to the scientific community during a conference in Osaka, Japan.

### Predictive Maintenance for industrial machinery

May - Jul 2021

Advisor: [Prof. Fabricio Murai](#)

[MINASLIGAS/DCC-UFMG](#)

- Constructed a Variational Autoencoder model in Pytorch for predictive maintenance on siderurgy machinery. The model outperformed all other baseline methods with respect to classification accuracy and AUC-ROC.
- Participated in 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](#)

- Developed a novel Recurrent Neural Network model in Pytorch for sentiment analysis on mental health online communities. The model predicts shifts in users' emotional tone based on their online posts, in order to further understand how interactions in online communities affect the emotional state of an individual. It significantly outperformed all other baseline methods with respect to the regression L1 loss function.
- Co-authored a scientific paper published at *Future Generation Computer Systems*, an international journal that allowed for greater disclosure of our work.

## Professional Experience

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### 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.
- Wrote for the non-profit organization AlandYou, creating educational articles on many AI-related topics with the purpose of reaching minority groups in the US.
- Worked with an international multicultural team following an agile development strategy, and acquired practical experience in performing research in an industry context, focused on developing methods to solve the company's needs.

## Publications

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### Conference Papers

- **Henrique S. Assumpção**, Fabrício Souza, Leandro Lacerda Campos, Vinícius T. de Castro Pires, Paulo M. Laurentys de Almeida, Fabricio Murai. [DELATOR: Money Laundering Detection via Multi-Task Learning on Large Transaction Graphs](#). In *IEEE International Conference on Big Data (IEEE BigData)*, 2022. An earlier version of the paper was also published in Brazilian Workshop on Social Network Analysis and Mining (BraSNAM), 2022, and won the **Best Paper Award**.

### 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.

## Skills

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**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)