

Arthur Cancellieri Pires

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WORK EXPERIENCE

- **Railway Laboratory (Lafer)** On-site
January 2022 - Present
 - **Technical Leadership:** Served as the technical lead for VALE's predictive maintenance program using IRVs, defining research priorities, translating stakeholder needs into ML research topics, and coordinating technical execution across a 15-person team (undergraduate, Master's, and PhD).
 - **Data Engineering / ML Pipeline:** Built an end-to-end ML workflow (ETL, feature engineering, training, evaluation, reporting) for track defect detection, processing 30k+ multi-sensor time windows/day in a daily batch pipeline; maintained code in Git and reviewed results with maintenance engineers.
 - **Time-Series Anomaly Detection / Data Quality:** Developed deep learning models and batch checks to detect sensor faults and data-quality anomalies, achieving 91% precision on internally labeled events and reducing data-issue detection latency from 3 months (manual review) to 1 day.
 - **Fault Localization / Diagnostics:** Built a diagnostic workflow using weak labels (data-quality score) and latent-space analysis to interpret anomaly clusters, linking them to specific sensors/channels and response signatures to support maintenance investigation.
 - **Sequence Modeling (Transformers):** Built transformer-based reconstruction models and a repeatability metric that maps residuals to calibrated anomaly probabilities to produce location-level defect likelihood scores with minimal ground truth; used Optuna study tracking to tune and compare model variants.
 - **Applied Data Analysis (Maintenance Limits):** Supported EFVM maintenance engineering by redefining dynamic response-based maintenance limits and procedures; communicated results in regular reviews with maintenance engineers and stakeholders at multiple management levels, with recommendations adopted for field use.
- **Railway Laboratory (Lafer)** On-site
June 2020 - January 2022
 - **Master's Researcher (VALE partnership)**
 - **Technical Leadership:** Acted as the technical lead for the AI research group, mentoring 5 junior researchers and coordinating ML experiments and data analysis on IRV datasets across multidisciplinary teams from two universities.
 - **Supervised Learning (Regression):** Developed deep learning models to estimate vertical track geometry from IRV data, achieving 98% R^2 .
 - **Optimization (Genetic Algorithms):** Developed a wheel-rail profile optimization methodology using IRV data and genetic algorithms; field-tested a wear-optimized profile, reducing wear by 20% while maintaining fatigue performance and improving the L/V ratio by ~35%.
 - **Data Analysis / Decision Support:** Analyzed wheel reprofiling limits and recommended changing the EFVM threshold from 3 mm to 2 mm based on the wheel-profile optimization study, increasing projected wheel life by at least 29% (current profile) and 50% (proposed); recommendation adopted.

SKILLS SUMMARY

- **Languages:** Python, SQL, MATLAB
- **Frameworks:** PyTorch, scikit-learn, Optuna, pandas, NumPy, SciPy
- **Tools:** Git, Docker, PostgreSQL, MySQL, SQLite
- **Cloud:** Microsoft Azure
- **OS:** Linux, Windows

EDUCATION

- **State University of Campinas (UNICAMP)** Campinas, Brazil
Expected February 2026
 - *PhD in Mechanical Engineering*
 - **Research focus** Deep-learning-based track defect detection for railway condition monitoring using instrumented railway vehicle data
- **State University of Campinas (UNICAMP)** Campinas, Brazil
Jan 2022
 - *Master's in Mechanical Engineering*
 - **Research focus** Deep-learning-based estimation of vertical track geometry from instrumented railway vehicle data
- **Federal University of Espírito Santo (UFES)** Vitória, Brazil
May 2020
 - *Bachelor's Degree in Mechanical Engineering*
 - **Research focus** Machine-learning-based prediction of wheel-rail L/V ratio to assess margin to Nadal's derailment criterion