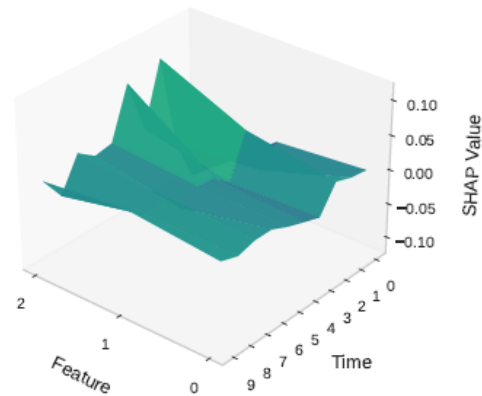


Master Thesis

Explainable Failure Analysis in Time-Series Data Using SHAP

Explainability is critical for the adoption of machine learning models in industrial systems, particularly for failure detection and prediction. This thesis explores the application of SHapley Additive exPlanations (SHAP) to time-series data containing failure events, focusing on attributing model decisions to both relevant features and critical time steps to improve transparency and trust.



Task Description

- Literature research, review state-of-the-art algorithms for time-serial SHAP
- Evaluate & review the performance of different algorithms
- Build a benchmark with public datasets
- Collect the data from the multi-robot system
- Test the algorithms on the robotic data/ other time-serial data
- Documentation and presentation of results

Requirements

- Basic knowledge of Ubuntu / ROS2
- Python / C++
- Git

References

- Lundberg, S. M., & Lee, S. I. (2017). A unified approach to interpreting model predictions. *Advances in neural information processing systems*, 30.
- Aas, K., Jullum, M., & Loland, A. (2021). Explaining individual predictions when features are dependent: More accurate approximations to Shapley values. *Artificial Intelligence*, 298, 103502.
- Bento, J., Saleiro, P., Cruz, A. F., Figueiredo, M. A., & Bizarro, P. (2021). Timeshap: Explaining recurrent models through sequence perturbations. *Proceedings of the 27th ACM SIGKDD conference on knowledge discovery and data mining*, 2565–2573.
- Enhanced SHAP for Sequential and Sparse Data in Predictive Process Monitoring https://niyangbai.github.io/enhanced_shap

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