Fabian Fumagalli (he/him)

Research

SHAP-IQ: Uncovering Interactions for Explainable AI [1-4]

Efficient and Reliable Local Feature Attributions and Feature Interactions [1-4]
- computation of fair and reliable attributions for any model, e.g. vision transformers, language models, scikit-learn [2,4], or tabular data with XGBoost or LightGBM [3]
Trustworthy Explanations in Other Machine Learning Domains
- e.g. data valuation, LLM prompting, hyperparameter optimization

Efficient Explanations for Data Streams and Changing Models [5-7]

Global Feature Importance [5,6] and Feature Effects [7] under Distribution Shifts
- applicable for sensor networks, financial models, and IoT

Selected Publications (First Authors Bold)

[1] **M. Muschalik** et al., shapiq: Shapley Interactions for Machine Learning, **NeurIPS 2024**
[2] **F. Fumagalli** et al., KernelSHAP-IQ: Weighted Least-Square Optimization for Shapley Interactions, **ICML 2024**
[3] **M. Muschalik**, **F. Fumagalli** et al., Beyond TreeSHAP: Efficient Computation of Any-Order Shapley Interactions, **AAAI 2024**
[4] **F. Fumagalli, M. Muschalik** et al., SHAP-IQ: Unified Approximation of Any-Order Shapley Interactions, **NeurIPS 2023**
[5] **F. Fumagalli, M. Muschalik** et al., Incremental Permutation Feature Importance (iPFI): Towards Online Learning on Data Streams, **Machine Learning Journal 2023**
[6] **M. Muschalik, F. Fumagalli** et al., iSAGE: An Incremental Version of SAGE for Online Explanation on Data Streams, **ECML PKDD 2023**
[7] **M. Muschalik, F. Fumagalli** et al., iPDP: On Partial Dependence Plots in Dynamic Modeling Scenarios, **World Conference on Explainable AI (xAI) 2023**

Open Source Projects

shapiq python package [1]
- SHAP interaction quantification
- Shapley Interactions for 11 ML domains

Links
- GitHub
- PyPi
- Docs
- Blog post

Work Experience

PhD Candidate in Explainable AI | 10/2021 - now
Bielefeld University | AG Machine Learning

SAS & Data Science Consultant | 10/2017 - 10/2021
CBTW (former PTC, mayato)
- international project and client responsibility
- high-performance cloud solutions
- optimization and modeling regulatory processes for banking

Data Scientist Intern | 01/2017 - 06/2017
Munich Re
- machine learning for health insurance

Teaching Assistant | 10/2014 - 10/2016
Freie Universität Berlin

Education

Mathematics M.Sc. | 10/2015 - 10/2018
Technische Universität Berlin
- stochastics, financial mathematics, mathematical deep learning

Statistics (ERASMUS+) | 08/2016 - 12/2016
Norwegian University of Science and Technology

Mathematics B.Sc. | 10/2012 - 11/2015
Freie Universität Berlin

Contact me

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Website
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Languages

German (Native)
English (Proficient)
Italian (Elementary)

Academia

Workshop Organizer
DynXAI at ECML PKDD 2023
TempXAI at ECML PKDD 2024
Invited Events
Deep Continual Learning (Dagstuhl)
Reviewer
ICLR'25, NeurIPS'24, ICML'24, AAAI'25, AISTATS'25, MLJ, ESANN'24

Awards & Certificates

Best Paper Award
xAI'23
ECML'23 (MLJ Journal Spotlight)
Top Reviewer
ICML'24, NeurIPS'24
Certificates
SAS Viya Machine Learning Specialist
SAS Visual Business Analyst
SAS Base Programmer

Programming

Python
e.g. torch, scikit-learn, numpy, scipy, pandas, matplotlib...
SQL
SAS Base
JavaScript

Personal

Voluntary Trainer | 11/2011 - 08/2016
TuS Lichterfelde e.V.