2 - Control of a gas turbine-battery hybrid power plant providing an ancillary service
Přemysl Šůcha, Petr Stejskal

The growing penetration of renewable energy increases the need for ancillary services. This paper studies the control of a real-world hybrid power plant consisting of fast aeroderivative gas turbines and a battery energy storage system. We present a feasibility study showing how forecasting of automatic frequency restoration reserve (aFRR) activation can improve plant economics. The control is formulated as an optimization problem, while machine learning supports better unit commitment decisions. We focus on aFRR provision, which is challenging due to strict response times.

3 - Re-optimazion of Battery Energy Storage Systems scheduling in continuous markets
Enrico Brambilla, Renata Mansini, Maria Teresa Vespucci

Following the European Clean Energy Package, Italy's shift to a 15-minute settlement has increased market volatility. This rolling horizon framework optimizes Battery Energy Storage Systems (BESS) within the Single Intraday Coupling (SIDC), using continuous reoptimization to respond to shifting prices. Constraints include power limits, efficiency, and degradation-linked throughput caps. Notably, the model accounts for BESS integration within broader energy systems and pre-existing market positions, enabling both arbitrage and portfolio rebalancing in a volatile environment.

4 - MILP-based optimal scheduling of residential heat pumps with temperature-dependent efficiency and building thermal inertia
Nicolò Zatta, Francesco Ceccanti, Andrea Baccioli, Aldo Bischi

This work presents a mixed-integer linear programming model for the day-ahead scheduling of a residential heat pump. The formulation combines a multi-node building thermal model with a piecewise linear representation of heat pump performance depending on supply temperature and load. Simulations over a 24-hour horizon show that simplified efficiency assumptions can overestimate electricity consumption by up to 35 percent. The model exploits building thermal inertia to shift heating demand and reduce operating costs while maintaining comfort.

■ MC-51

Monday, 10:30-12:00 - Room: HG - Seminar-Raum Geschichte 1 (1st floor, st. 10) (Building: HG)

Optimization for Interpretable and/or Fair AI//ML

Stream: Mathematical Optimization for Transparent and Fair Decision Making
Invited session
Chair: *Craig Larson*

1 - Interpretable Machine Learning for Bicycle Safety Risk Prioritization
Farnaz Farzadnia, Dolores Romero Morales

Cycling is central to sustainable urban mobility, yet safety concerns still deter many potential riders. We propose an interpretable machine-learning framework that estimates segment-level crash probability for bicycle crashes and uses SHapley Additive exPlanations (SHAP) to reveal the key infrastructure and traffic factors driving risk, including how their importance varies across Level of Traffic Stress classes.

2 - Feature Selection through Cooperative Games with Robust Egalitarian Rankings
Marco Piazza, Antonio Consolo, Chiara Mariani, Mauro Passacantando, Enza Messina

Cooperative game-theoretic models for feature selection are attracting growing interest in machine learning. While popular approaches rely on the Shapley value or the Banzhaf index, which quantify marginal feature contributions, we propose new approaches based on minimizing the L1 and L norms of the coalition excess vector, allowing more robust and equitable assessment of feature contributions. Experiments on 20 classification datasets (26-450 features) with logistic regression and random forests show comparable or superior test performance, especially on larger datasets.

3 - Modeling "local" in Local Interpretable Model-agnostic Explanations
Dolores Romero Morales, Emilio Carrizosa, Cristina Molero-Río

Local Interpretable Model-agnostic Explanations (LIME) is a popular technique in XAI that locally approximates a black-box model by an interpretable surrogate. In this talk, we revisit the concept of locality in LIME. The goal of our approach is to choose an interpretable local sample and train a generalized linear model as an interpretable surrogate that effectively performs locally. This problem can be formulated as an MINLO model. The very same methodology allows us to handle tabular data across different prediction tasks, and numerical illustrations of this will be provided.

4 - Conjecturing for Discovery of Patterns in Data
Craig Larson, Paul Brooks

We introduce algorithms for automated discovery of nonlinear and boolean patterns typically hidden by machine learning methods. The first identifies a top-k set of expressions by minimizing an objective function that captures the tradeoff between error and complexity. A second algorithm leverages reinforcement learning to minimize error, complexity, and redundancy to ensure a diverse set of expressions for further investigation. These methods bridge the gap between predictive power and human-readable insights, facilitating the discovery of fundamental relationships within complex datasets.

■ MC-52

Monday, 10:30-12:00 - Room: KOL - PC Raum 1 (Building: KOL)

Power System Planning and Operation

Stream: Energy Markets & Systems
Invited session
Chair: *Ramteen Sioshansi*
Chair: *Enzo Sauma*

1 - Stable and Fair Uniform Price Allocations of Community Aggregation Gains in Retail Electricity Markets
Shmuel Oren, Tomas Valencia Zuluaga

We propose a mechanism to distribute collective savings in a community of residential customers with local energy resources . We exploit the strong duality of Linear Programs to prove that stable imputations in a desired class, the uniform price core, are guaranteed to exist and can be found efficiently, overcoming scalability issues. Looking for fair distributions however, may come at the cost of computational intractability for large problem instances; to overcome this challenge, we propose a sampling methodology that returns imputations in an acceptable relaxation of the uniform price core.