CETPartnership Joint Call 2025

Multilinear multi-objective multi-vector decision support system (M3DSS)

Project Idea

Multilinear multi-objective multi-vector decision support system (M3DSS)

Concept:

Develop a decision support framework based on a multi-objective model-based predictive control setup for multi-vector systems, modeled as multilinear systems using tensors, and subject to regulatory, market, and societal constraints.

Key Strengths:

- Model-based approaches using multilinear systems can capture complex multi-vector nonlinear dynamics, including all Boolean dynamics like switching natively (existing results for heating and power systems)
- Using tensors for multilinear systems enable not only their efficient representation but a whole toolkit of highly efficient and scalable tensor methods for decomposition, identification, and analysis (mature toolset with applications on many disciplines)
- A multi-objective framework allows the simultaneous assessment of multiple criteria that are otherwise challenging to compare directly (e.g., environmental or societal aspects), enabling a decision support system tailored to the end-user priorities.

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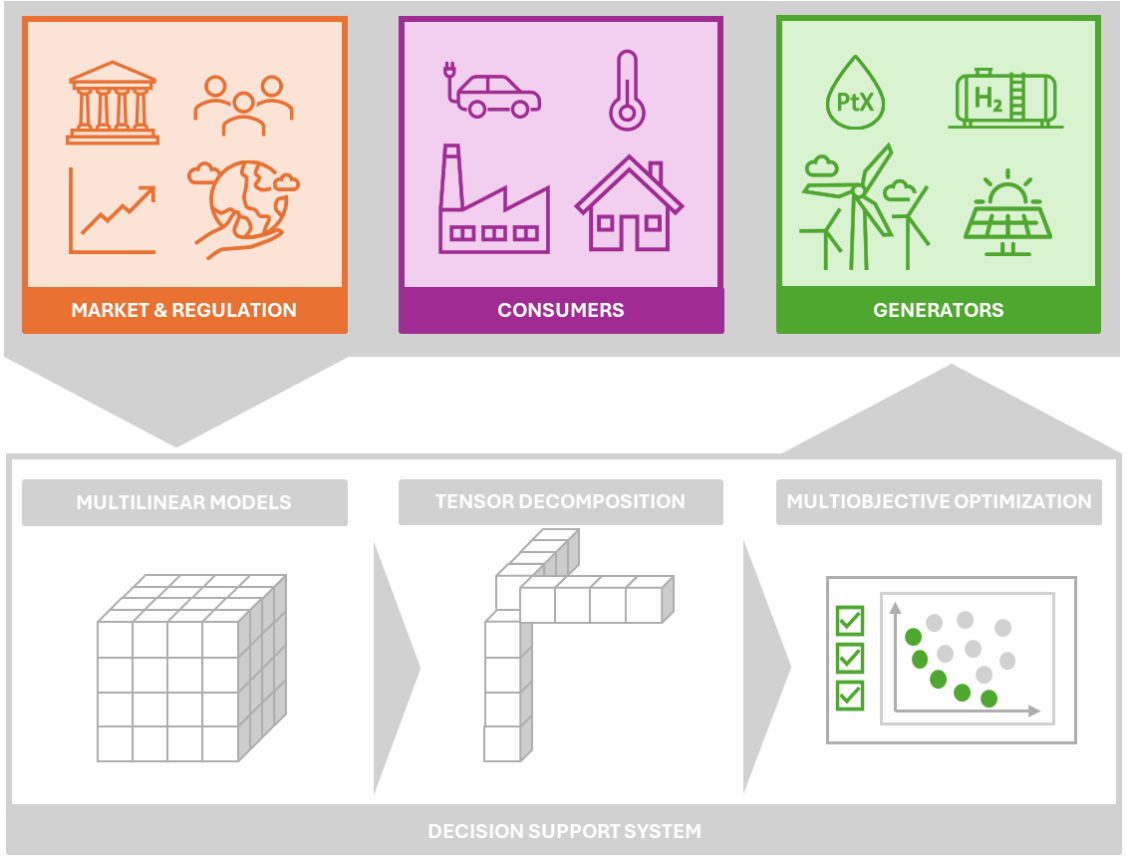
Multilinear multi-objective multi-vector decision support system (M3DSS)

Activities & Research Topics:

- Develop a multilinear modelling library tailored towards multi-vector systems stored as tensors that capture their unique nature and complex interfaces.
- Redefine tools for identifying, analyzing, and decomposing multilinear models by tailoring them to multi-vector systems, leveraging their structure and properties.
- Develop a decision support system based on a multi-objective optimization approach that can capture all stakeholder needs and is tailored to the end user profile.



Fraunhofer IWES

Project Idea

Ongoing consortia

Fraunhofer IWES (Germany)

Model-based control, EMS, Co-simulation (FMUs), Digital Twin, Power Systems Analysis

TU Delft (Netherlands)

Tensor decomposition, system identification, and analysis tools

HAW Hamburg (Germany)

Multilinear systems modelling and control, Heating systems, Multi-energy systems

UPV (Spain)

Multi-objective optimization toolset with specialized differential evolution solvers

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Thank you for your time!

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