University of Maribor

Faculty of Electrical Engineering and Computer Science

DAPHNE

Integrated Data Analysis Pipelines for Large-Scale Data Management, HPC and Machine Learning

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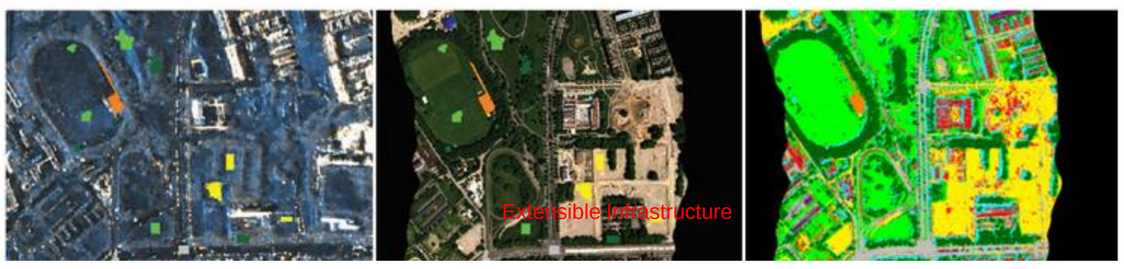
MOTIVATION

The **DAPHNE** project aims to define and build an open and extensible system infrastructure for integrated data analysis pipelines, including data management and processing, high-performance computing (HPC), and machine learning (ML) training and scoring. The acronym DAPHNE relates to the title "integrated **D**ata **A**nalysis **P**ipelines for large-scale data management, **H**igh-performance computing, and machi**NE** learning".

USE CASES

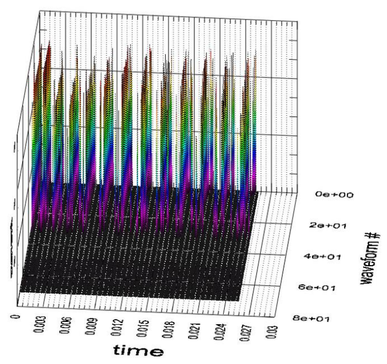


EARTH OBSERVATION

DAPHNE develops a deep learning pipeline for local climate zone classification, based on 4 PB of satellite images.

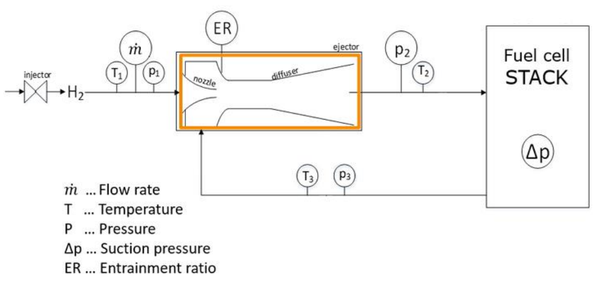
MATERIAL DEGRADATION

This use case focuses on understanding and modeling material degradation during operation of semiconductor devices.



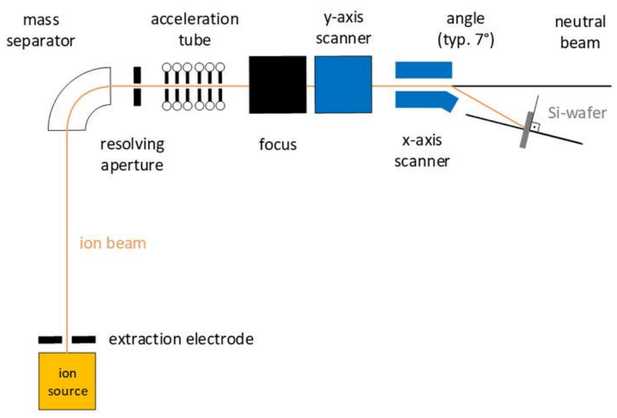
EJECTOR OPTIMIZATION

Out of Daphne Framework a sophisticated optimizer component, trained on the available dataset, is expected with enhanced prediction quality for wider range of application considering a bigger number of design parameters. The desired benefit is a smaller number of numerically expensive CFD Simulations for prediction verification.



AUTOMOTIVE VEHICLE DEVELOPMENT

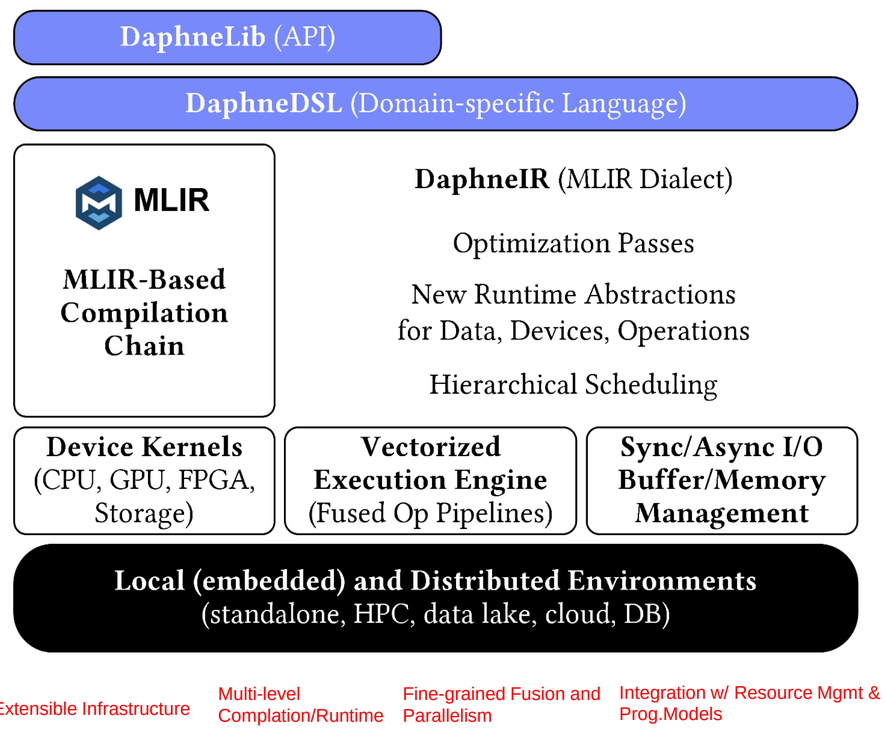
Regarding the automotive development process, we investigate a closed loop high dimensional optimization problem supported by physics-based simulations and behavioral modeling.



SEMICONDUCTOR MANUFACTURING: TUNING SUCCESS RATE

This use case aims to optimize implantation equipment stability and utilization. Ion implanters generate a multitude of sensor readings – perfect for ML algorithms to learn from.

SYSTEM ARCHITECTURE



CONSORTIUM

Join our open source community
https://github.com/daphne-eu

Visit our website
https://daphne-eu.eu/

Join our mailing list
daphne_dev@googlegroups.com

UM CONTRIBUTIONS

UM FERI contributes in project work packages including project management, system architecture, compilation and abstraction of a domain-specific language, runtime and integration, through use cases preparations, benchmarking and analysis, to dissemination and exploitation of project results.

Some highlighted specific contributions from the effort of directly working team of researchers at UM FERI are:

- supercomputer expertise on cloud computing deployment and management, including EuroHPC Vega access models, virtual image packaging, nodelist communication, use case preparation, benchmarking, etc., including committed GitHub code entries,
- design of distributed communications architecture,
- input parameters passing integration in the execution engine,
- participation in discussions on project development, and
- project management and dissemination supporting ongoing efforts.