Bessa Talks-Unofficial Meeting

January 21, 2022

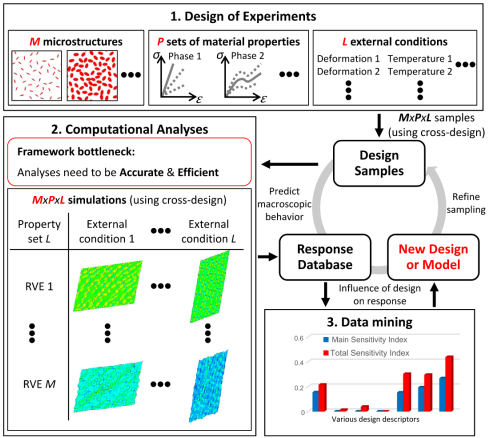
Ozgur Taylan Turan

A Brief History of F3DASM

Who is familiar with F3DASM?

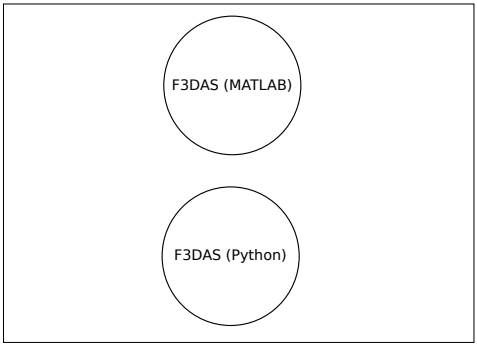
Who is using or intends to use F3DASM?

Data-Driven Design/Modeling



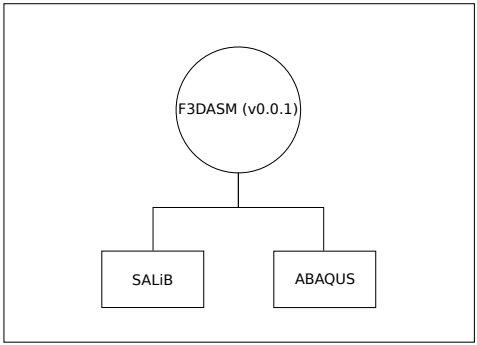
F3DAS

- MATLAB$\rightarrow$ ABAQUS/Python-API for Simulation
- ML: Python



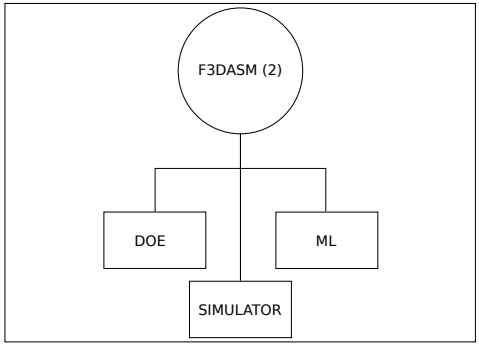
F3DASM-v0.0.1

- Luis→ OOP Abaqus-PythonAPI ToolBox + SALib Interface
- Embedded implementations of Miguel's papers.
- ML: Separate python toolbox



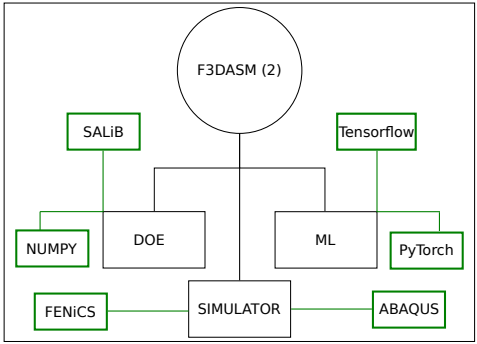
F3DASM2

- Lightweight abstracted work-tree
- No embedded implementation by itself, just thin wrappers to your hardcore projects/toolboxes

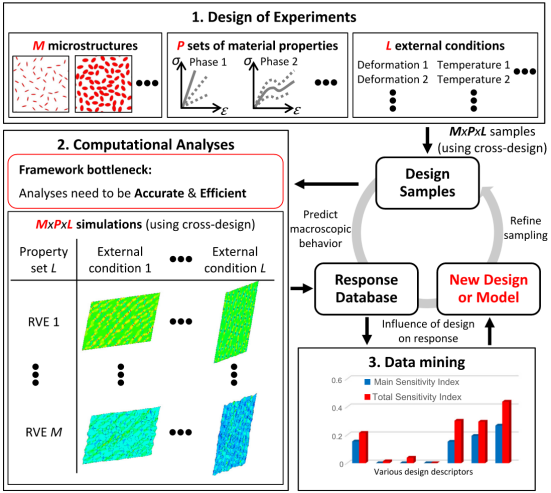


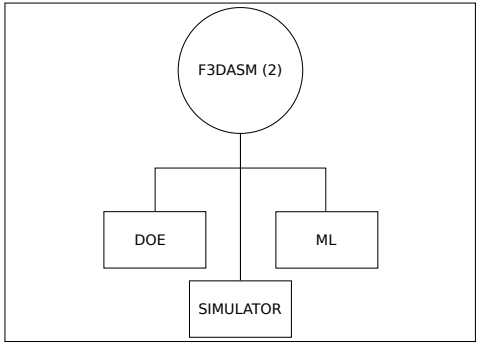
F3DASM2

- Lightweight abstracted work-tree
- No embedded implementation by itself, just thin wrappers to your hardcore projects/toolboxes



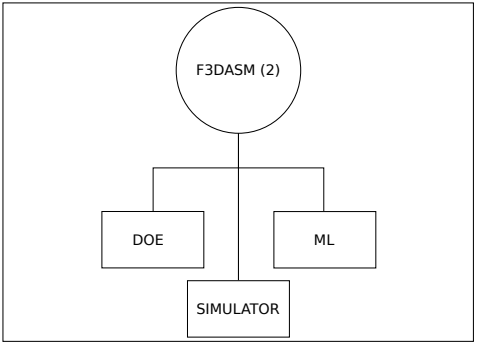
F3DASM2


1. Design of Experiments
M microstructures
P sets of material properties
Phase 1
Phase 2
L external conditions
Deformation 1
Temperature 1
Deformation 2
Temperature 2
MxPxL samples
(using cross-design)
2. Computational Analyses
Framework bottleneck:
Analyses need to be Accurate & Efficient
Design Samples
Predict macroscopic behavior
Refine sampling
MxPxL simulations (using cross-design)
Property set L
External condition 1
External condition L
RVE 1
RVE M
Response Database
New Design or Model
Influence of design on response
3. Data mining
Main Sensitivity Index
Total Sensitivity Index
Various design descriptors


F3DASM (2)
DOE
ML
SIMULATOR

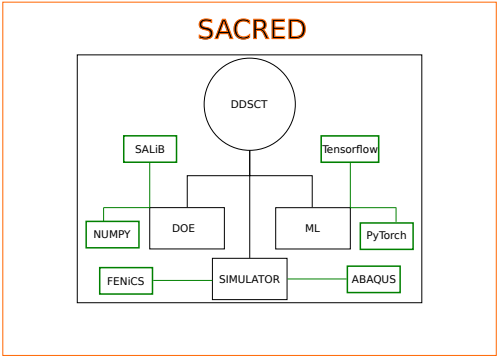
F3DASM-LatestDevelopmentBranch

- Shushu (FENiCS) and Gawel (ABAQUS)
- Follows the basic ideology of F3DASM2
- Embedded models in F3DASM repo (gmshModel?)
- Separate Machine Learning



DDSCT-v0.0.1

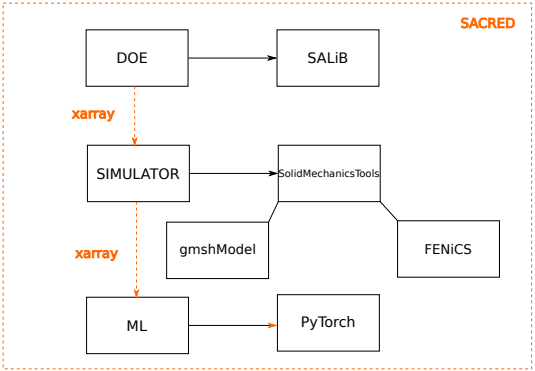
- Another skeleton implementation of F3DASM
- Miguel's commentary
- Utilization by MSc. students in the future
- Ready for deploy models



DDSCT-v0.0.1

Sacred

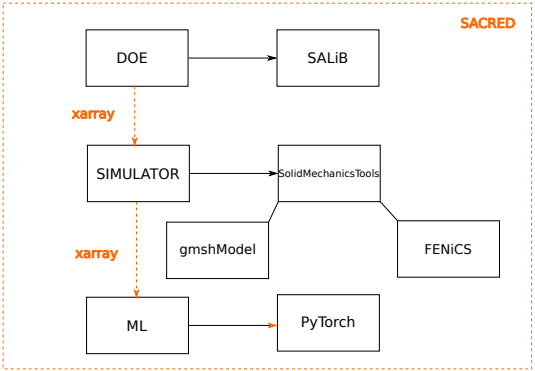
- Directory handling
- Configure/log/reproduce
- JIT compiler benefits



DDSCT-v0.0.1

xarray

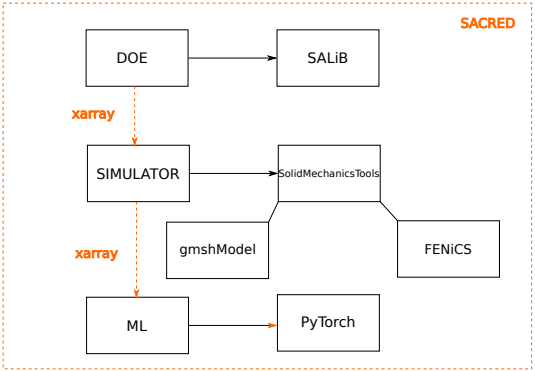
- Numpy like array handler
- Fast and structured



DDSCT-v0.0.1

multiprocessing

- Pool of workers
- Not everything is parallelizable.



Final Words

- Shared my ideas/vision with Miguel
- Direction towards my ideal, but still specific applications are desired
- Please contact Gawel, Shushu or Miguel for information regarding F3DASM
- AIM: lightweight starting point for MSc students

What are the tools that you think: "Thank god, this exists!!!"?