Task 2.2 Hardware Prototypes: Status and Next Steps

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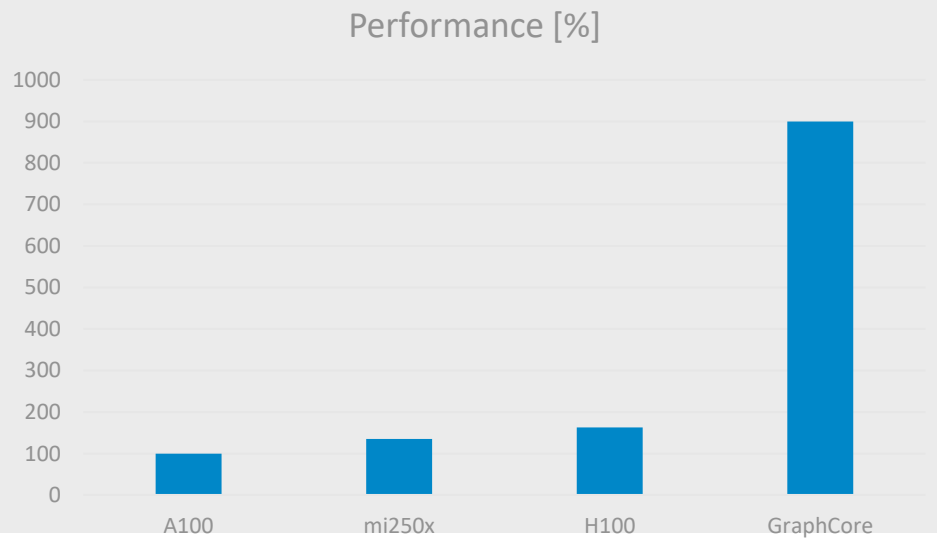
Overview: Prototype Systems in RAISE

Location	System name	CPU	Accelerators
FZJ	DEEP-EST	147 Intel Xeon	75 NVIDIA V100
FZJ	JUAWEI	11 ARM HiSilicon	
BSC	CTE-AMD	33 AMD EPYC	66 AMD MI150
BSC	CTE-ARM	192 ARM A64FX	
BSC	HUAWEI	16 ARM Kunpeng 920	
FZJ	JURECA-EPO	2 AMD + Intel Xeon	4 H100 + 8 MI250 + GraphCore

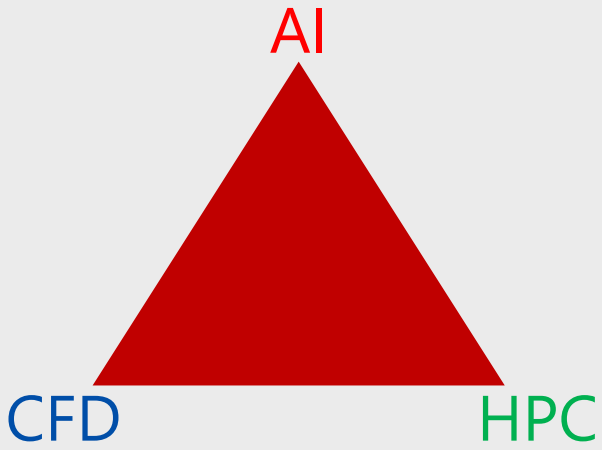
JURECA – Evaluation Platform Overview (EPO)

	NVIDIA A100**	AMD MI250	NVIDIA H100	GraphCore* IPU
System	JURECA-DC	JURECA-EPO	JURECA-EPO	JURECA-EPO
Epoch time [s]	54**	40	33	6
Performance [%]	100**	135	163	900

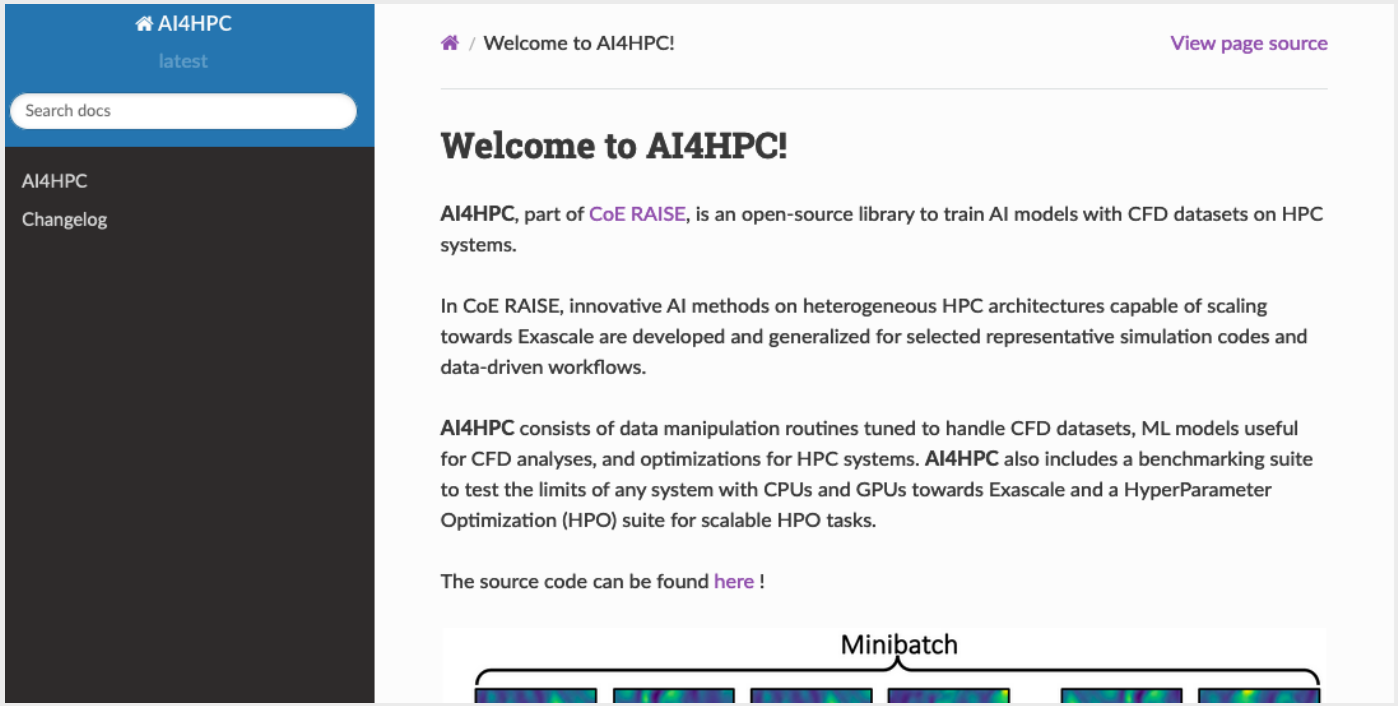


*https://www.graphcore.ai
**Base case

AI4HPC part of UAIF (T2.4)



Is an open-source library to train AI models with CFD datasets on HPC systems



ai4hpc.readthedocs.io

What AI4HPC offers

- Pre-processing routines
- ML models for CFD
- HPC optimizations
- Post-processing routines
- Benchmarking suite
- HPO suite

README | GNU General Public License v2.0 or later | CHANGELOG

Set up CI/CD | Add Wiki | Configure Integrations

Name	Last commit
Batch	Update 5 files
Bench	update to v0.1
Cases	added HPO
HPO	Update 5 files
Scripts	added HPO
docs	Update 5 files
CHANGELOG.md	added HPO
LICENSE	Add LICENSE
README.md	Update README.md
setup.py	added HPO

Source code: gitlab.jsc.fz-juelich.de/CoE-RAISE/FZJ/ai4hpc

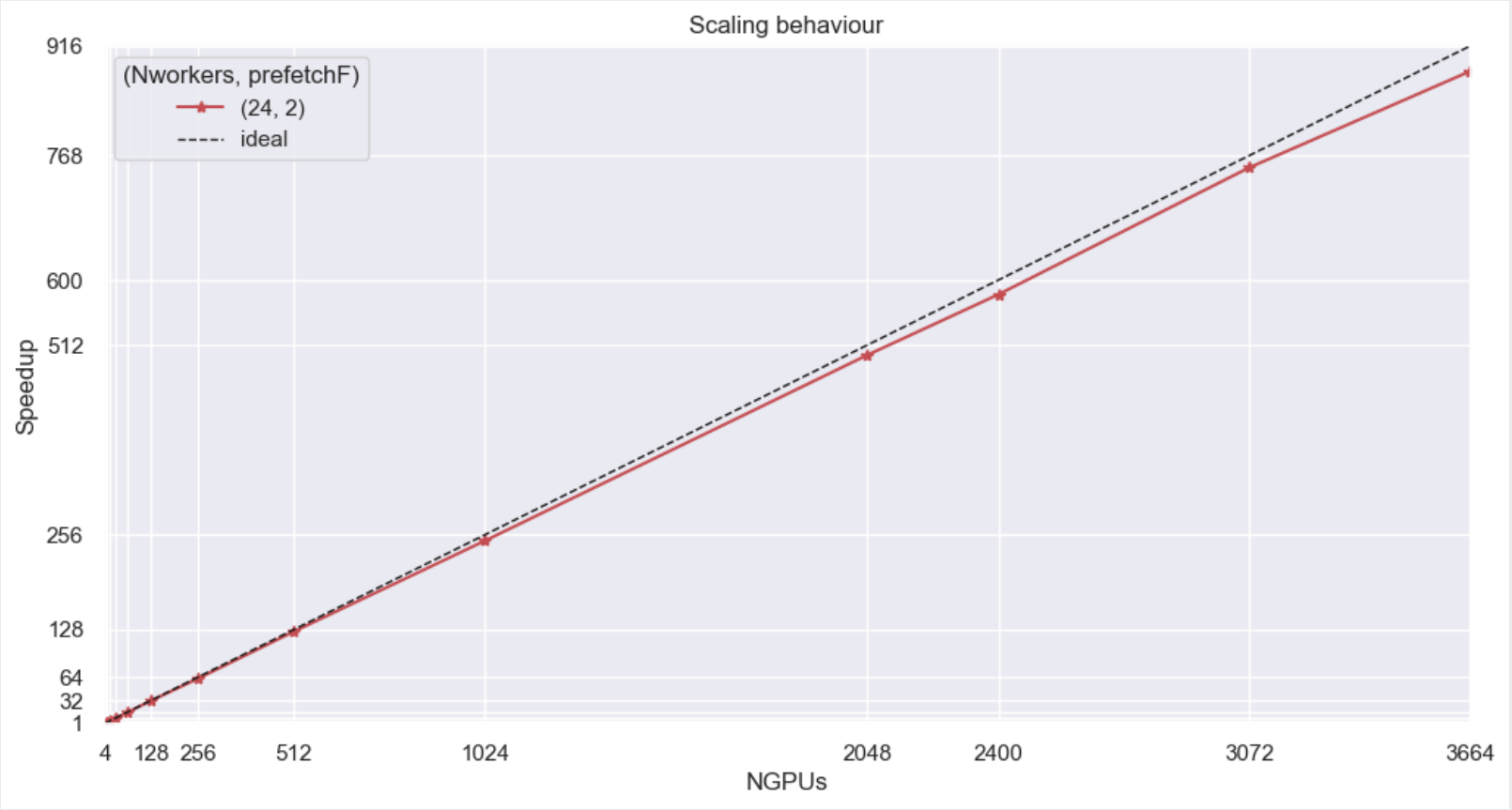
Performance

Super scaling

- Test on JUWELS-BOOSTER
- Up to 3,664 GPUs
- E>0.93

Details:

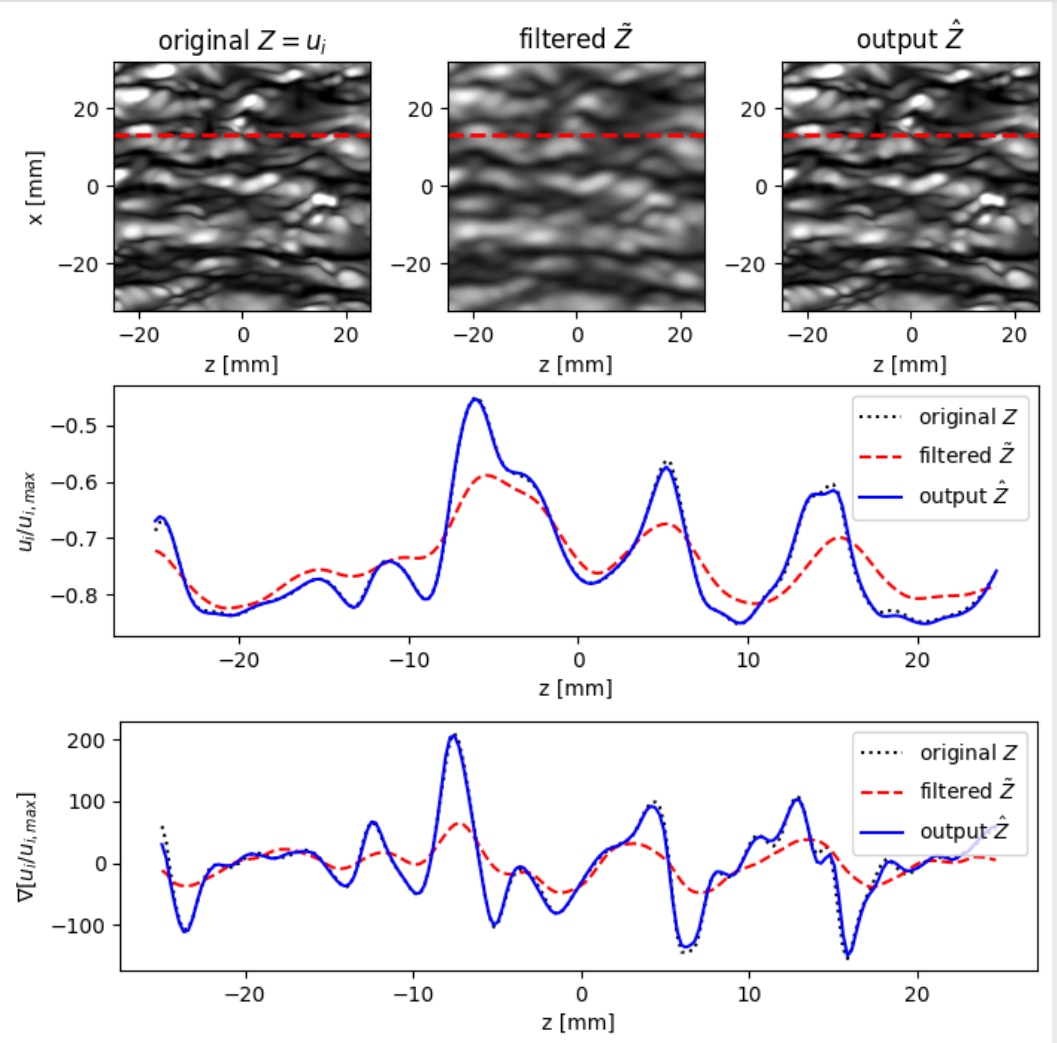
- Data-distributed training
  - PyTorch[2] w/ Horovod[3]
- I/O disabled – synthetic data



AI4HPC benchmarking suite tested on JUWELS-BOOSTER*
*https://www.fz-juelich.de/en/ias/jsc/systems/supercomputers/juwels

Results of T3.1 using AI4HPC

- Motivation: Super-resolution
- Aim: recover 5 times coarse grid
- Model: Convolutional Defiltering (CDM)
- System: 32 GPUs on JURECA-DC
- Shown: Streamvice velocity results
  - Black line -> fine grid
  - Red line -> 5x coarse grid
  - Blue line -> super-resolution



Remarks

- AI4HPC is part of UAIF (T2.4)
- Continuous support to WP2-4

Thank you for your attention

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