JARA-CSD – Machine Learning & Data Science

PROF. DR. – ING. MORRIS RIEDEL, UNIVERSITY OF ICELAND / JUELICH SUPERCOMPUTING CENTRE (JSC)

20TH APRIL, JARA-CSD WORKSHOP 2021

@ProfDrMorrisRiedel @Morris Riedel @MorrisRiedel @MorrisRiedel https://www.youtube.com/channel/UCWC4VKHmL4NZgFfKoHtANKg

IHPC National Competence Center for HPC & AI in Iceland

EuroHPC Joint Undertaking

EOSC NORDIC

RAISE Center of Excellence

ADMIRE

UNIVERSITY OF ICELAND
SCHOOL OF ENGINEERING AND NATURAL SCIENCES
FACULTY OF INDUSTRIAL ENGINEERING, MECHANICAL ENGINEERING AND COMPUTER SCIENCE

EURO

HELMHOLTZAI | ARTIFICIAL INTELLIGENCE COOPERATION UNIT

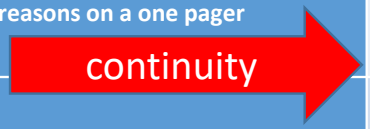
DEEP Projects

JÜLICH Forschungszentrum | JÜLICH SUPERCOMPUTING CENTRE

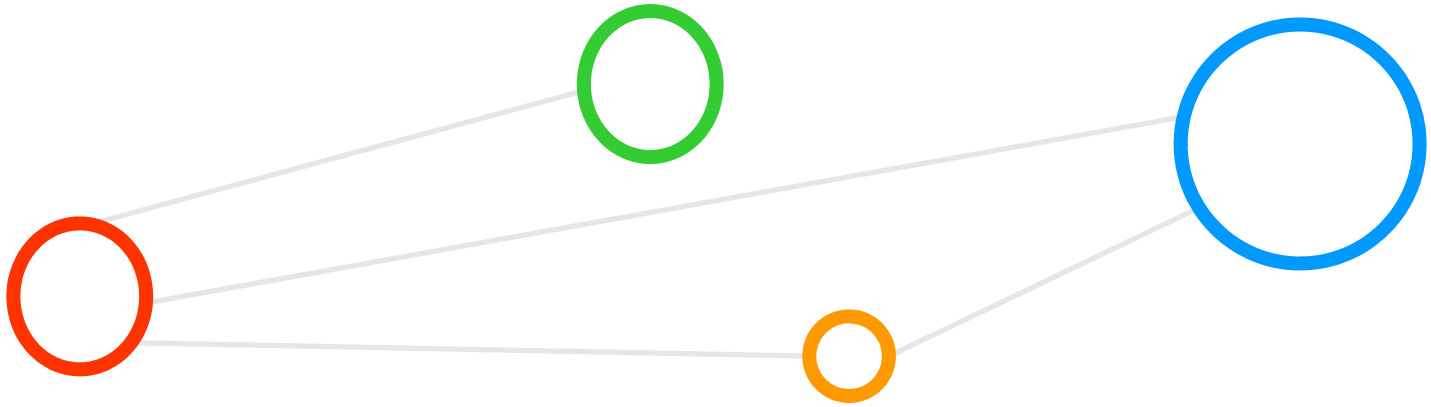
Key Results & Future Goals

Discussion Group: Machine Learning, Data Science
Moderators: W. van der Aalst, M. Riedel

Key results and future goals	Person in charge, contact	Timescale
1. What can CSD do for data sciences? Added value, et. (e.g. no building) → Top 5 reasons on a one pager	moderators (Wil, Morris)	3 month
2. MSC for HPC and for data sciences → others may join, proposal submitted	Morris, Marek	July
3. Proactive Proposals and project setups along the EU timelines of programmes (Horizon/Digital Europe): extend the people involved in proposals, not last minute submissions, roadmapping → Roadmap for Calls relevant for CSD, list of expertise, profile slide setup with expert areas and potential PIs clearly listed (not outdated web pages), curated on 3 month bases?!	Morris, others?	End of 2021
4. Look on the continuous to discrete data science approaches/methods/ (e.g. wind turbines application, both types of data together) → very focused, brainstorm and need a bit of description, what players are where in CSD?	Sebastian, Wil	3 month
5. Bring Theory together with Applications in Data sciences (maybe more content-related presentations would helps too), maybe a workshop, 2-3 minutes lightning talks, etc., not 30 minutes presentations → Data Science Workshop with substance; getting towards an institute culture, journal clubs, coffee rounds, etc. – program developed during the workshop even (example), e.g. one afternoon presentations, maybe one out of data science and ML, e.g. Simulation Sciences; idea: miss out context, rather input, work, output templates, etc.	Ramona, Holger	Next meeting?



Potentially Interesting EU Calls



Example: RAISE Center of Excellence (CoE) EU Project – HPC Intertwined with AI

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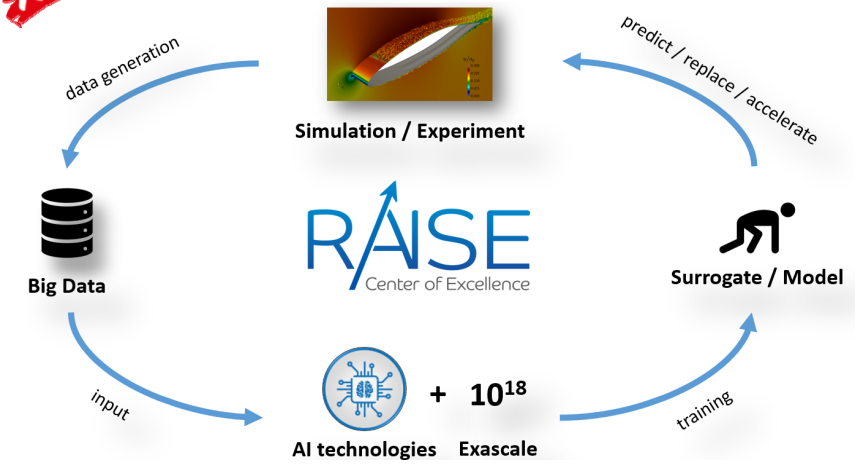
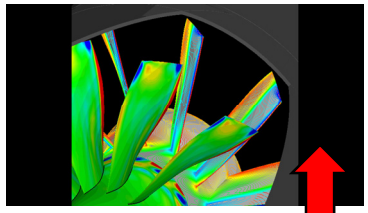
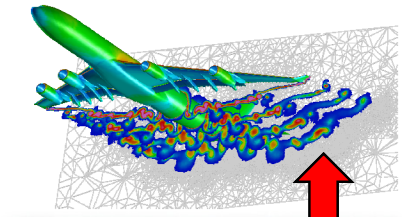


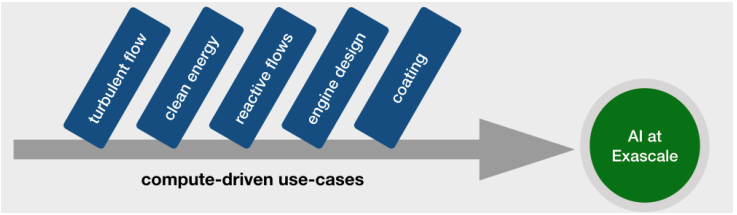




[4] CoE RAISE Web Page

[3] Simulation Figure

RAISE funds three use cases for the University of Iceland in the area of AI-enabled remote sensing, sound engineering, and links with our computational fluid dynamics activities



Challenge finding good people: PhD Position in EU Project RAISE @ Iceland

Information

The PhD position is funded by the EU project Center of Excellence "Research on AI- and Simulation-Based Engineering at Exascale" (CoE RAISE). This project will be the excellent enabler for the advancement of European multi-physics and/or multi-scale applications on industrial and academic level and a driver for novel intertwined AI and HPC technologies.

Supervisor: Prof. Morris Riedel (University of Iceland)
Co-Supervisors: Dr. Gabriele Cavallaro (Jülich Supercomputing Centre) and Prof. Magnús Örn Úlfarsson (University of Iceland)

Starting date: January 2021
(Due to the current corona pandemic, the first work period can be conducted remotely)

Location: Reykjavík (Iceland). You will be employed at the University of Iceland. A research stay at the Jülich Supercomputing Centre (Forschungszentrum Jülich, Germany) is envisaged for a minimum period of time of 6 months. To obtain your PhD degree at the University of Iceland you will have to acquire 30 ECTS from courses and seminars. Your working hours will be not monitored and working from home will be largely permitted.

Goal: pioneer the research of advanced deep transfer learning methods in the context of complex learning scenarios in applications from remote sensing. The priority will be put on the investigation of the transferability capacity of Deep Learning (DL) models with meta-learning and Neural Architecture Search methods.

Research Group: be part of our joint research group "High Productivity Data Processing" at University of Iceland and Jülich Supercomputing Centre. The group is highly active in developing parallel and scalable machine (deep) learning algorithms for remote sensing data processing and many other types of applications (i.e., medical research and retail sectors).

Working Environment: Direct access to high performance multi-GPU systems equipped with the state-of-the-art of DL frameworks (TensorFlow, pyTorch, Chainer, Horovod, DeepSpeed). There is also the possibility to access innovative quantum computing systems.

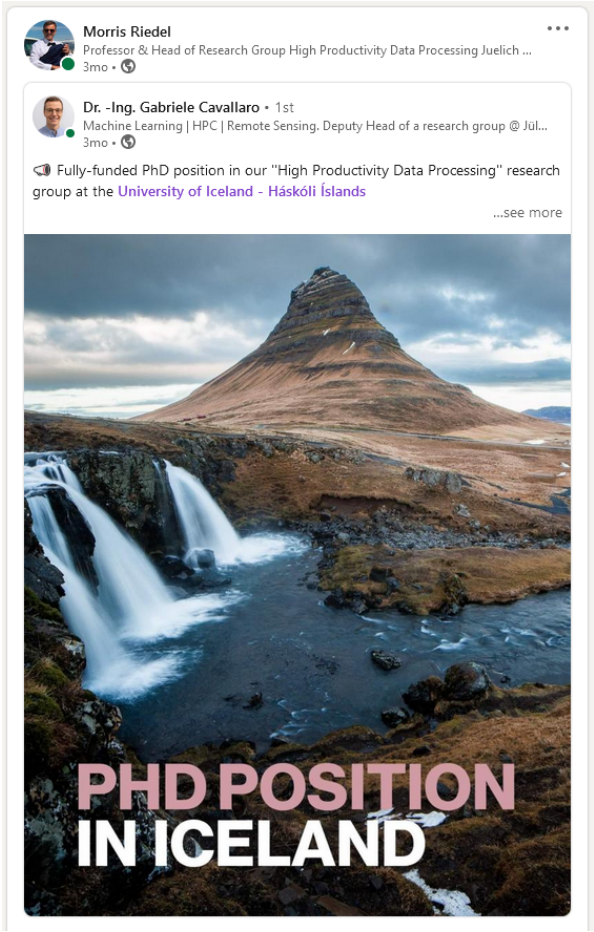
Other information: You will have the possibility to participate in international top conferences in the field of machine learning, HPC and remote sensing. You will be put in contact with several international partners for initiating research collaborations that match the topic of the PhD.

Background education: MSc degree in computer science or computer engineering. Level of English >= B2.

Required knowledge and experience: deep learning (Convolutional Neural Networks and/or Transformers) and Python programming (TensorFlow and/or pyTorch). Experience with parallel programming (OpenMP and MPI), High Performance Computing (HPC) and remote sensing data processing are a substantial plus.

Apply: Send your CV, a cover letter and the transcripts of records of your bachelor and master to Gabriele Cavallaro: g.cavallaro@fz-juelich.de.

Apply now



[10] Open PhD Position, RAISE EC Project @ Iceland

Strategic: Potential Calls of Interest – Early Drafts

European Commission

Exploratory Actions EuroHPC JU 2021-27

Horizon Europe Programme Funding

INDICATIVE

PILLAR	ACTION	Total EU (21 - 27)
3- Tech	R&D efforts on European high-end exascale and post exascale technologies: low power GPP processor and accelerator (open Risc-V) including application-specific IP.	€250M
3- Tech	Developing European software stack: software and algorithms, programming models and tools, first level integration in novel architectures, for exascale performances.	€200M
3- Tech	Emerging Computing Architectures (Neuromorphic, etc)	€100M
3- Tech	Co-design R&I and system integration in prototypes/pilots for post Exascale (including software and tools environments and co-design with applications)	€75M
3- Tech	International Cooperation (Japan, SouthMed, Latan)	€25M

Tactical: Potential Calls of Interest – Early Drafts

European Commission

Pillar 3: Investment Plan for 2021-22

Horizon Europe Programme Funding

INDICATIVE

PILLAR	ACTION	TOTAL (EU)
Technology	R&D efforts on European high-end exascale technologies: low power GPP processor and accelerator (open Risc-V) including application-specific IP.	€85M
Technology	Developing European software stack: Software and algorithms, programming models and tools, first level integration in novel architectures, developing the European software for exascale and post exascale performances.	€50M
Technology	Emerging Computing Architectures	€15M
Technology	International Cooperation (Japan, SouthMed, Latinamerica)	€5M

Strategic: Potential Calls of Interest – Early Drafts

INDICATIVE

Pillar 4: Exploratory Plan for 2021-27

Horizon Europe/ Digital Europe Programme Funding

PILLAR	ACTION	Total EU (21 - 27)
Applications	Supporting the HPC Centres of Excellence (CoEs) on HPC applications (e.g. health, engineering, energy, etc) that promote and prepare the use of exascale and extreme performance computing capabilities	€150M
Applications	Large scale test-beds HPC with BigData/AI/Cloud	€100M
Applications	Deployment of industrial/sectorial HPC tools, codes & software environments	€150M
Applications	Digital Twins	€100M

Tactical: Potential Calls of Interest – Early Drafts

INDICATIVE

Pillar 4: Exploratory Plan for 2021-22

Horizon Europe/Digital Europe Programme Funding

PILLAR	ACTION	Total EU (21 - 22)
Applications	Supporting the HPC Centres of Excellence (CoEs) on HPC applications (e.g. health, engineering, energy, etc) that promote and prepare the use of exascale and extreme performance computing capabilities	€50M
Applications	Large scale test-beds HPC with Big Data/AI/Cloud	€40M
Applications	Deployment & adaptation of industrial/sectorial HPC tools, codes & software environments	€50M

Strategic: Potential Calls of Interest – Early Drafts

INDICATIVE

Pillar 5: Investment Plan for 2021-27
Digital Europe Programme Funding

PILLAR	ACTION	Total EU (21 - 27)
Usage & Skills	Supporting Networking National Centres of Competence (CoC) on HPC (Actions to strengthen the wide application of HPC and increasing the innovation potential of SMEs using advanced HPC services)	€100M
Usage & Skills	Education (Curricula development) - Short Term trainings/Traineeships	€30M
Usage & Skills	M.Sc. HPC	€20M

NEW

Tactical: Potential Calls of Interest – Early Drafts

INDICATIVE

Pillar 5: Investment Plan for 2021-22
Digital Europe Programme Funding

PILLAR	ACTION	Total EU (21 - 22)
Usage & Skills	Supporting Networking National Centres of Competence (CoC) on HPC (Actions to strengthen the wide application of HPC and increasing the innovation potential of SMEs using advanced HPC services)	€50M
Usage & Skills	Education (Curricula development) - Short Term trainings/Traineeships	€10M
Usage & Skills	M.Sc. HPC	€5M

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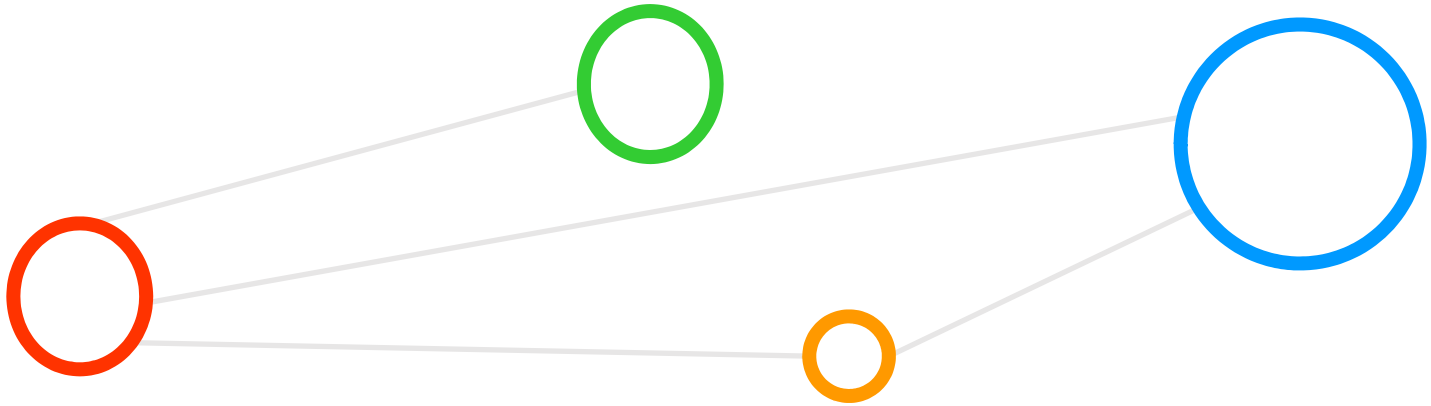
Appendix – Major Icelandic HPC Activities



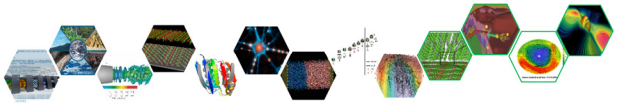
Executive Summary – Major Icelandic HPC Activities

Icelandic National Infrastructure for HPC

- ❖ **HPC hardware funds** by RANNIS; now via **roadmap IReiP**
- ❖ Proposals yearly required to obtain funds still
- ❖ Joint proposal from IHPC community

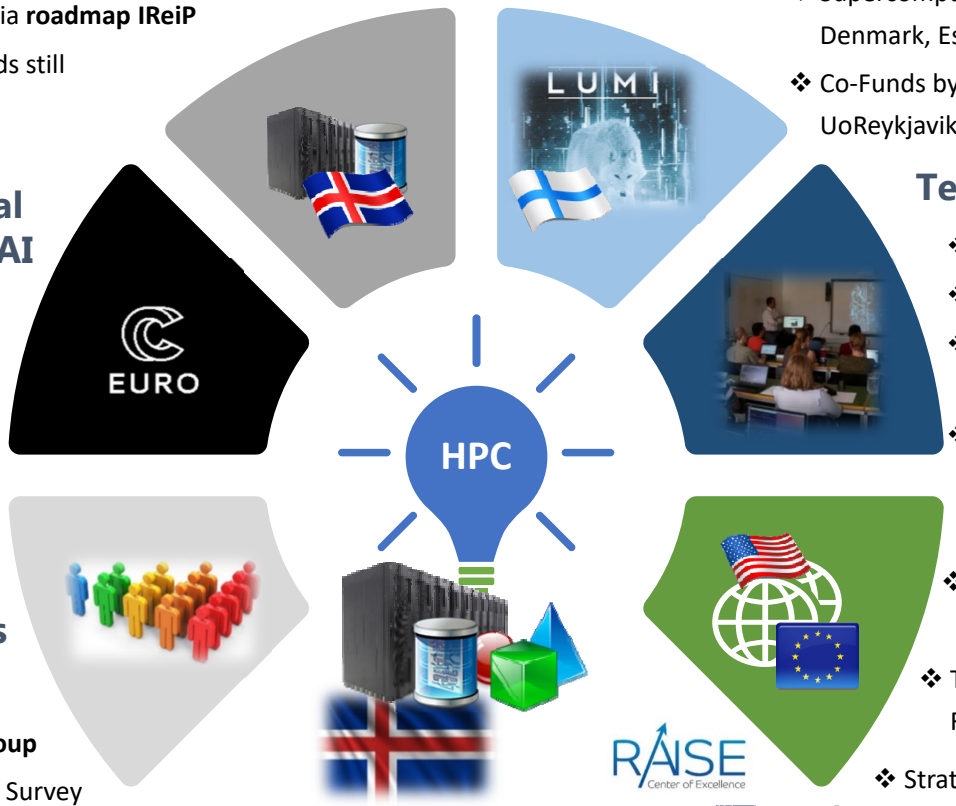
EuroHPC EuroCC National Competence Center for HPC & AI

- ❖ EU Project (09/2019-08/2021), 2 years
- ❖ Building **Simulation and Data Labs (SDLs)** of the IHPC Community of Users
- ❖ Supports industry engagement in HPC



IHPC Community of Users

- ❖ Organized around RANNIS proposals
- ❖ **~53 scientific experts & research group**
- ❖ UoIceland/UoReykjavik, Iceland Geo Survey ÍSOR, Met Office & industry: Matis, etc.



EuroHPC LUMI Supercomputer in Finland

- ❖ Supercomputer funded by Finland, Belgium, Czech Republic, Denmark, Estonia, Iceland, Norway, Poland, Sweden, Switzerland
- ❖ Co-Funds by EC and Iceland participation funds from: UoIceland, UoReykjavik, and Hannes Jonsson & Egill Skulason

Teaching & Education in HPC & AI

- ❖ University of Reykjavik
- ❖ University of Iceland
- ❖ Arctic Webinar Series (with US partners)
- ❖ Digital/Horizon Europe MSc in HPC

International Cooperations

- ❖ Tactical: ~4 Joint PhDs with Juelich Supercomputing Centre in Germany (#1 HPC System in Europe)
- ❖ Tactical**: EC Projects** like DEEP-EST, EOSC-Nordic, RAISE Center of Excellence (CoE)
- ❖ Strategic: Building an **Icelandic National Lab** with international cooperation together with Industry (e.g. Kaiser Global, other investors)