Science and Technology Facilities Council

Scientific Computing

CCP-WSI

a Collaborative Computational Project in Wave Structure Interaction

Machine Learning for Wave Structure Interaction Training

Dr Wendi Liu

Introduction to STFC

HM Government

Department for Science, Innovation & Technology

UK Research and Innovation

Science and Technology Facilities Council

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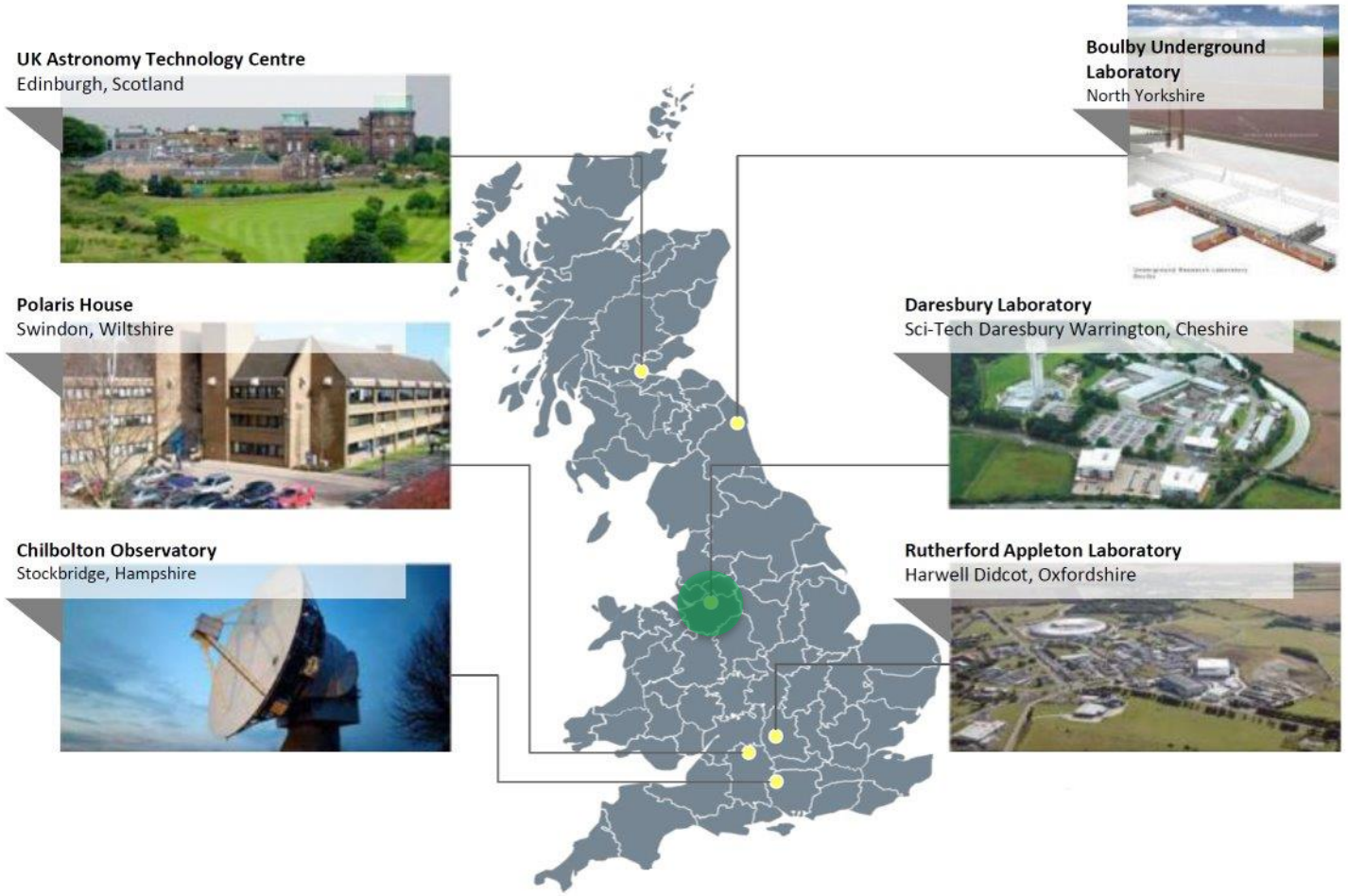
Welcome to Daresbury Laboratory

- One of STFC's 6 UK locations
- One of 2 of the UK's national laboratories
- Home to some of STFC's large facilities and associated activities:
  - Computational Science
  - Supercomputing
  - Particle accelerators
  - Engineering for Science
  - Business Incubation



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Logistics

- You can get access to the materials of this training from the following repository https://github.com/jonycastagna/CCp-WSI-ML-workshop

- There is no fire alarm expected on either day, so if you do hear one then please exit the building immediately

- If you would like to order a taxi then please book it by the number
  - Apec – 01928 57 57 57
  - Abba – 01925 44 44 44
  - Uber – through your smart phone

- Recommendations of where to get an evening meal:
  - Ring O'Bells – Chester Road
  - The Red Lion – Moore
  - Evenwood Farm – Evenwood Close
  - Stockton Heath/Warrington Town Centre has a number of restaurants

If you need to leave the room at any point, please make sure you take an access card with you (and then bring it back!)

CCP-WSI+

www.ccp-wsi.ac.uk

CCP-WSI
a Collaborative Computational Project in Wave Structure Interaction

- **C**ollaborative **C**omputational **P**roject on **W**ave **S**tructure **I**nteraction
- Chaired by Plymouth University
- Founded in 2016 and funded by EPSRC until September 2025
- Community building around computational methods and related software to solve problems related to WSI
- Directly supported by the STFC CoSeC programme to:
  - Deliver training
  - Implement, release and support software
  - Develop new computational modelling and simulation methods

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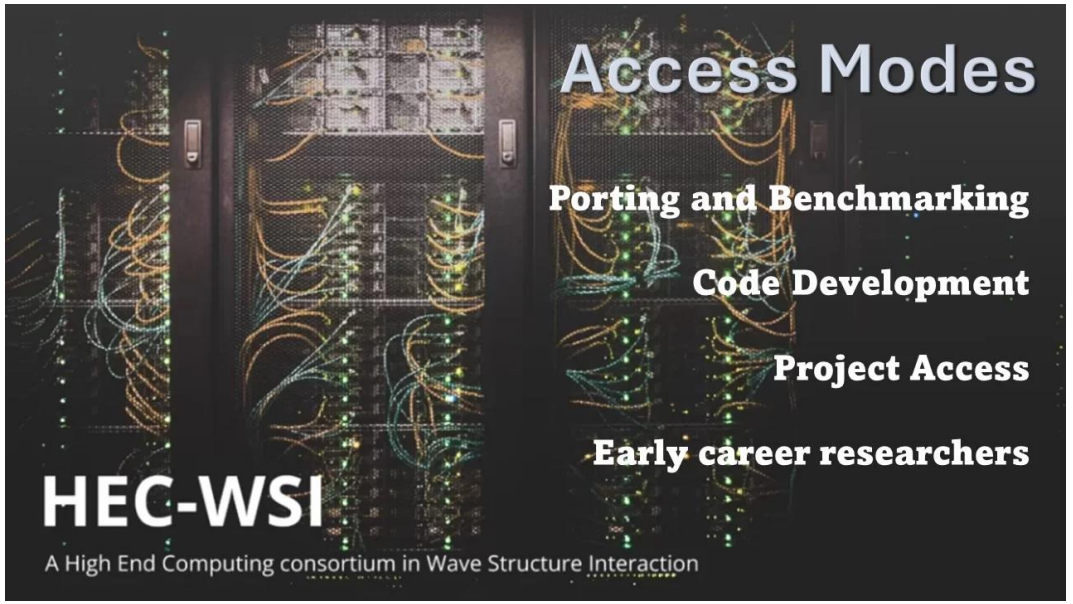
University of Plymouth
Newcastle University
City University of London EST 1894
University of Bath
UKRI Science and Technology Facilities Council
UKRI Engineering and Physical Sciences Research Council
Manchester 1824 The University of Manchester
CoSeC Computational Science Centre for Research Communities
Manchester Metropolitan University
University of Exeter

HEC-WSI

www.hec-wsi.ac.uk

HEC-WSI
a High End Computing Consortium for Wave Structure Interaction

- **H**igh **E**nd **C**onsortia on **W**ave **S**tructure **I**nteraction
- New EPSRC funded community running until December 2026
- Chaired by Plymouth University with the same working group as CCP-WSI
- Provides a simple and single point of entry for UK national supercomputing resources for UKRI funded work related to WSI
- Supported by CoSeC around application performance engineering and training
- Visit the HEC website to apply for access to the ARCHER2 service



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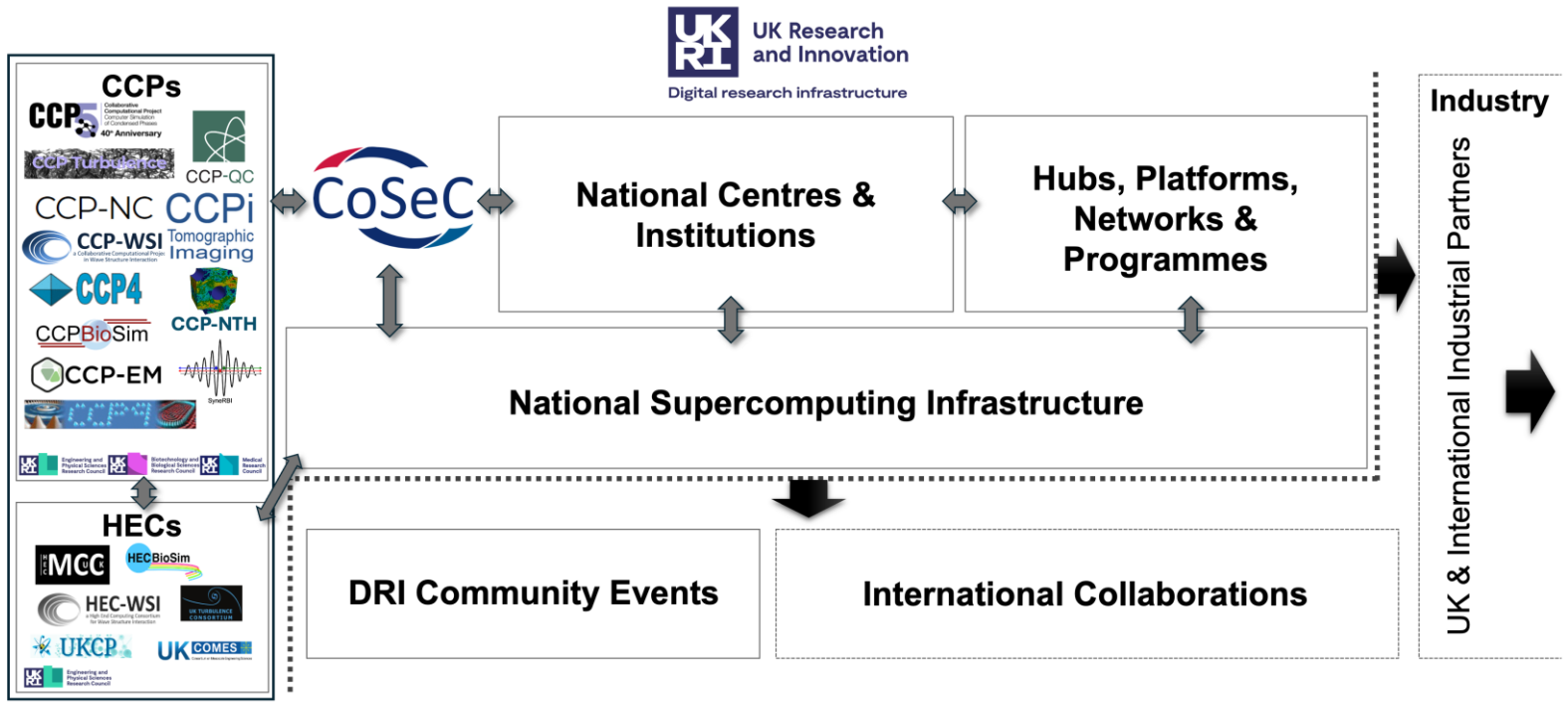
CoSeC

www.cosec.stfc.ac.uk

Computational Science Centre for Research Communities

- The **C**omputati**o**nal **S**cience C**e**ntre for Research **C**ommunities
- CoSeC is a national Centre
- Across UKRI it provides an interface and point of co-ordination for CCP activity and a bridge for HECs and related DRI components
- A large, stable and diverse team of Research Technical Professionals



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Machine Learning for WSI

- The aim of this course is to give an introduction to machine learning (deep learning) and an overview of how different techniques can be applied to CFD problems.

- Through hands-on exercises in computer vision and natural language processing, you'll train deep learning models from scratch, learning tools and tricks to achieve highly accurate results. You'll also see how to leverage freely available, state-of-the-art pre-trained models to save time and get your deep learning application up and running quickly.

Agenda

Day 1

12:00 – 12:50	Lunch
12:50 – 13:00	Welcome & Introduction
13:00 – 14:00	Introduction to Deep Learning (NVidia Deep Learning Institute)
14:00 – 15:00	How a Neural Network Trains
15:00 – 15:30	Coffee break
15:30 – 16:30	Convolutional Neural Networks
16:30 – 17:30	Data Augmentation and Deployment

Day 2

09:00 – 09:45	Pre-trained Model
09:45 – 10:30	Advanced Architectures
10:30 – 11:00	Coffee Break
11:00 – 12:30	Some Literature overview on Deep Learning for Turbulence
12:30 – 13:30	Lunch break
13:30 – 15:00	Test case: StyleGAN as deconvolution operator for LES in BOUT++

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Questions?