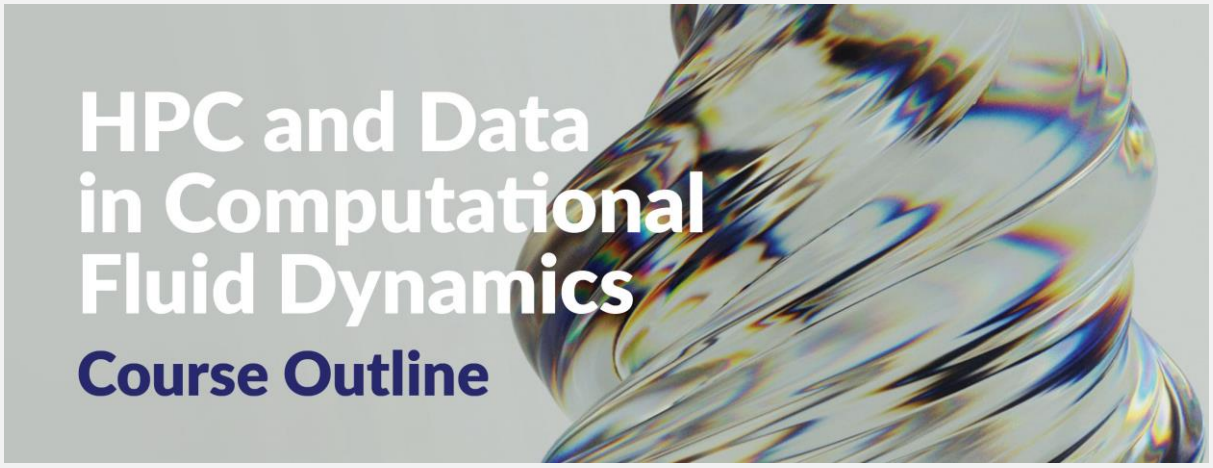


The 3rd collaborative graduate-level course *HPC and Data in Computational Fluid Dynamics* is to be delivered as a live online webinar event by an array of internationally renowned professors and scientists from 29th of August to 23rd of November 2023. The curriculum including introduction to Computational Fluid Dynamics (CFD) and HPC, hands-on HPC tutorials, advanced topics, cutting-edge applications, and industry showcases, aims to support HDR students, ECRs and beyond in Australia who are working on large or complex CFD problems and requiring HPC and data tools to maximize their research impact.

Lecturers

Dr Callum Atkinson (Monash)

Prof Matthew Cleary (USyd)

A/Prof Bishakhdatta Gayen (UniMelb)

Dr Rowan Gollan (UQ)

Dr Andrew Kiss (ANU)

A/Prof Christopher Leonardi (UQ)

A/Prof Fatemeh Salehi (Macquarie)

Prof Richard Sandberg (UniMelb)

Prof Emile Sauret (QUT)

Prof Sean Smith (NCI)

Industry Guest Lecturers

Mr Michael Bergmann (DLR, Germany)

Dr Lewis Clark (LEAP Australia)

Dr Darrin Stephens (Laminar2 Turbulent)

Tutorial Instructors

Dr Zhongzheng Wang (QUT)

HPC Facility Introduction Presenters

Gadi – Dr Matthew Downton (NCI)

Setonix - Dr Alexis Espinosa Gayosso (Pawsey)

Target Audience

HDR students and ECRs who are working on large or complex Computational Fluid Dynamics problems and requiring HPC and data tools to maximize their research impact.

Lectures

This course will be taught live online via Zoom Webinar platform and will be available also for subsequent private viewing on YouTube for registered participants. There will be two 60-minute lectures weekly on Tuesday and Thursday from 1 to 2:10 pm (AEST) for 12 weeks starting Tuesday 29th Aug and ending Thursday 23rd Nov 2023. Note that Lecture 3 and Lecture 8 have different starting times due to the presenters are located in Europe.

Tutorials & Training

Six tutorials in total will be provided covering a number of core topics, involving hands-on applications on NCI's Gadi supercomputing platform and other platforms. If applicable, weekly exercises will be posted online prior to the tutorial sessions. One special HPC training session for beginners (optional) is provided in Week 4 (Wednesday 20th Sep) by NCI Training team. The tutorials and training sessions can go beyond 2:15pm but typically ends by 2:30pm (AEST).

Technology

To participate in this course minimally, all you need is a web browser with Eventbrite and Zoom app.

Prerequisites

Knowledge Base: Undergraduate study in STEM is generally recommended as prior academic training in order to make the most of the lectures.

Computing Skills: To benefit most from the hands-on tutorial training sessions, some familiarity with Linux would be strongly recommended.

Resources for basic research computing skills such as Unix and general guide for getting started with HPC can be found on Intersect website, in addition to other resources. Further resource materials are listed at the bottom of this document.

Literature

Some reading recommendations are listed at the last page below.

Learning Support Group

To facilitate general announcements to the cohort, exchanges of ideas, comments, Q&A and so on, all registrants and lecturers will be invited by the course Coordinator to join a CFD-HPC Slack workspace.

Mid-Term Break

One week break is scheduled between Week 4 and 5.

Organizing Committee

A/Prof Bishakhdatta Gayen (UniMelb)

Dr Rowan Gollan (UQ)

A/Prof Christopher Leonardi (UQ)

Prof Richard Sandberg (UniMelb)

Prof Sean Smith (NCI)

Dr. Meiyun Chang-Smith (Intersect, Coordinator)

Tutorial Support & HPC Training Instructor

Fred Fung (NCI)

Webinar Tech & Video Editing Support

Anurodh Tiwari (Intersect)

Fayette Fung (Intersect)

Resources

Basic to Advanced Programming (For all Python courses offered by Intersect, corresponding courses are available in R programming language)

- Thinking like a Computer: The fundamentals of programming (Intersect webinar - recordings are available)
- Programming with Python (software carpentry course materials)
- Learn to Program: Python (Intersect training)
- Data Manipulation & Visualization in Python (Intersect training)
- Series of Machine Learning Using Python: Linear Regression, Classification, SVM & Unsupervised Learning (Intersect training)

Research Computing

- Linux Command Guide
- Unix Shell and Command Line Basics (Intersect training)
- The Unix Shell (software carpentry course materials)
- From PC to Cloud or High-Performance Computing (Intersect webinar - recordings are available)
- Getting started with HPC using PBS Pro (Intersect training)
- Version Control with Git (software carpentry course materials)

NCI Documentation

- Gadi User Guide
- Gadi Supported Software Application

Pawsey Documentation & Training

- Pawsey Training, including Supercomputer training.

Videos

- Introduction to Gadi (Roger Edberg - NCI)

Reading

H. Lomax, Thomas H. Pulliam, David W. Zingg (2001). Fundamentals of Computational Fluid Dynamics. Springer (ISBN: 9783642074844).

Jens-Dominik Mueller (2015). Essentials of Computational Fluid Dynamics. Apple Academic Press Inc (ISBN 9781482227307).

T. J. Chung (2014). Computational Fluid Dynamics (2 Ed). Cambridge University Press (ISBN: 9781107425255)