DSSE – Course Offer
(Further Disciplinary and Interdisciplinary courses are offered within Doctoral Programmes)

Transferable skills

Course	Lecturer	ECTS	Objectives/ Outcomes/ description
Good Scientific Practice	Dr Michael MENDE	1 ECTS	Details
Scientific Publication: An Editor's Point of view	Dr Maria JEREZ	1 ECTS	Details
Presentation Skills	Dr Manuel MAIDORN	1 ECTS	Details
Writing Skills	Dr Manuel MAIDORN	1 ECTS	Details
Teaching Skills	Dr Manuel MAIDORN	1 ECTS	Details
Deep Learning: Fundamentals and Applications	Dr Sally EL HAJJAR	1 ECTS	Details

Starting a Research Project	Dr Claire GODET	0.5 ECTS	Details
Data Visualisation for Researchers	Dr Ruediger WESTERMANN	0.5 ECTS	Details
Scientific Data Visualisation	Dr Ruediger WESTERMANN	0.5 ECTS	Details
Data Visualisation for Presentation & Publication	Dr Evan Williams	1 ECTS	Details
Scientific Document Creation using LaTeX	Dr Christian GREVISSE	0.5 ECTS	Details
Open Access	Dr Inma PERAL; Dr Mael GUENNOU; Dr Linda WAMPACH; Dr Helena KOJONEN	0.5 ECTS	Details
Boosting Employability in Industry after PhD Graduation	Dr Patrick CORSI	1 ECTS	Details
Fundamentals of Project Management for Researchers	Dr Sylvie FROMENTIN	1 ECTS	Details
Leadership skills toward a successful PhD	Dr Sabryna JUNKER	1 ECTS	Details
Programming with JULIA	Dr Miroslav KRATOCHVIL, Dr Laurent HEIRENDT		Details
Machine Learning	Dr Jakub LENGEIWICZ	1 to 3 ECTS	Details

UNIVERSITÉ DU LUXEMBOURG

DSSE | DOCTORAL SCHOOL IN SCIENCE AND ENGINEERING

Title of the activity Good Scientific Practice

Speaker Dr Michael MENDE

Course description:

As a researcher, one has the privilege to work freely and creatively, pursuing own interests and adding to the knowledge base of the scientific community - and the community in general. This freedom comes with responsibility: The responsibility for self-control, accuracy, honesty, efficiency and objectivity. The scientific community has introduced rules of research integrity, which aim to preserve the freedom of research and prevent scientific misconduct.
The course informs about the rules of research integrity and Good Scientific Practices and how to Avoid Research Misconduct.

The workshop introduces the standard statutes of research integrity (Singapore Statement, , ALLEA Code of Conduct, DFG Codex) as well as local regulations at place (Code of Conduct ULux, Research Integrity Guidelines Lux FNR). It is also intended to raise awareness for the significance of Good Scientific Practices with respect to different scientific disciplines. The workshop not only focusses on compliance alone but prepares scientists for the complexities and dilemmas of the day-to-day research life by promoting moral and value development: it is structured around the DFG Curriculum „Good Scientific Practice“ for Courses in Science and Medicine | G. Sponholz | 10/2011, as well as the Horizon 2020 supported Virt2ue Ethics concept | Embassy of Good Science 2020, with particular emphasis on the following topics:

Recognizing Scientific Misconduct
Data storage, handling and protection,
Documentation,
Publication process and Authorship,
Plagiarism
Conflict Resolution / Ombudssystem.

Learning outcomes:

All participants will gain a brought background knowledge in general rules and guidelines concerning Good Scientific Practice and learn how to consult these efficiently. Furthermore, they will receive relevant material links to useful resources, a tool-kit with relevant publications, institutional guidelines as well as local contact points, which they can refer to throughout their scientific careers. These skills are also valuable to scientists who transfer to other career paths.

Type of evaluation:

Written homework/paper

Lecturer:

Dr. Michael Mende
mmende@ab.mpg.de

Module:

Transferable Skills

Credits:

1 ECTS

Workload:

The workshop encourages the active involvement of the participants and features case discussions, individual working sessions, plenary discussions, and information input. Small assignments are given in between course days - which require 60' of participants' research for appropriate suggestions related to case studies. Final course evaluation will be a written homework/paper.

UNIVERSITÉ DU LUXEMBOURG

DSSE | DOCTORAL SCHOOL IN SCIENCE AND ENGINEERING

Title of the activity Scientific Publication: An Editor's Point of view

Speaker Dr Maria JEREZ

Course description:

The purpose of the course is to understand the process of scientific publishing, analyse the structure of scientific articles, and learn what the key aspects of each part of the article are, in order to know how to write them properly and increase their impact.

Learning outcomes:

- scientific publication and peer-review
- Considerations to choose a journal?
- Bibliometric factors
- Elements of scientific articles
- Where to start when writing an article
- The review article
- The submission process
- The editorial process
- Ethics and fraud in publication

Lecturer:

Dr Maria Jerez
maria.jerez@ext.uni.lu

Credits:

1 ECTS

Workload:

2x8 hours of presence
The workshop encourages the active involvement of the participants in exercises and discussions.
Preparatory work: 2 hours.
Final assignment (7 hours): written homework/paper with individual feedback.

UNIVERSITÉ DU LUXEMBOURG

DSSE | DOCTORAL SCHOOL IN SCIENCE AND ENGINEERING

Title of the activity Presentation Skills

Speaker Dr Manuel MAIDORN

Course description:

The purpose of the course is to train doctoral candidates in science communication and presentation, including both an interdisciplinary exchange between topics and preparation for public outreach activities. During the course, participants will acquire a skillset to design a target-group oriented presentation which is tailored to effectively convey their message. Along those lines, also exercises to improve the personal presentation style, overcome anxiety and explore new presentation formats will be introduced. After the course, students shall be able to confidently present their topic in an exciting way, even in stressful situations.

Learning outcomes:

Covered topics:

- Pre-course survey: self-assessment of deficits, expectations, experience of candidates. Which are the most crucial factors to improve according to the participants? What do they see as the major challenges in presenting their work?
- Knowing your audience: the appropriate choice of wording and language
- Storytelling: how to gain the attention and enthusiasm of the audience while being scientifically accurate?
- Seeing is believing: how to design appealing slides and figures supporting your content without overloading the presentation?
- Time is key: learn to focus on the most important aspects of the story giving the spectator enough time to understand
- More than words: what does body language tell you during presentations?
- Vocal and phonetic training: how to get your message across clearly?
- Improvisation: how to deal with unforeseen situation and anxiety?
- Hands-on exercises: creation of mini-presentations with individual feedback
- Alternative ways of science communication: more than just Power Point!
- Intercultural awareness: how communication changes across the world
- The second part: How to deal with (unexpected) questions and moderate your own discussion
- Science in a nutshell – how to present your topic in a very condensed way during networking events
- Moderation and leadership – just another way of presenting?
- Final evaluation & feedback: Considering the initial concerns & self-assessment: What might be different in future presentations?

Type of evaluation:

Written homework/paper

Lecturer:

Dr Manuel Maidorn
manuel.maidorn@ds.mpg.de

Module:

Transferable Skills

Credits:

1 ECTS

Workload:

1) 3x7 (=21) presence hours (28 TU)
2) preparatory work: Self-assessment: 2 hours
3) homework: Create small presentation for the next days: 2 hours

UNIVERSITÉ DU LUXEMBOURG

DSSE | DOCTORAL SCHOOL IN SCIENCE AND ENGINEERING

Title of the activity Writing Skills

Speaker Dr Manuel MAIDORN

Course description:

The purpose of the course is to sharpen the scientific writing skills of doctoral candidates as an essential aspect of science communication. We will analyze the structure of scientific papers inferring key skills for own writing. The course aims to help how to structure research results into written form in a refined and professional manner. In this context, hands-on exercises will help to develop and refine a professional style of writing, regardless if participants are just about to draft their first manuscript or already authored several publications.

Learning outcomes:

- Things to consider before starting to write
- Knowing scientific journals
- Creating a plan of action and what to keep in mind
- Creating and structuring a story – where and how to start?
- Style-exercises: appropriate use of wording and language
- Usage of graphs and figures to support your message
- Final proofs: what to consider before submission?
- Peer-review: how to make the publication a success?
- Scientific vs. Journalistic writing – similarities & differences

Type of evaluation:

Written homework/paper

Lecturer:

Dr Manuel Maidorn
manuel.maidorn@ds.mpg.de

Module:

Transferable Skills

Credits:

1 ECTS

Workload:

1) 8 presence hours (11 TU)
2) preparatory work: Self-assessment: 8 hours
3) final assignment: writing exercise with individual feedback

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DSSE | DOCTORAL SCHOOL IN SCIENCE AND ENGINEERING

Title of the activity Teaching Skills

Speaker Dr Manuel MAIDORN

Course description:

The purpose of the course is to prepare the participants for current or future teaching activities in their field. The goal is to develop a toolkit of different methods which can be applied and adapted to different teaching situations to create a productive learning environment. The participants will learn methods to adapt their presentation format towards a student- and learning-oriented teaching. The workshop aims to help the participants structuring their teaching and implement new & innovative approaches for knowledge transfer.

Learning outcomes:

- Planning and preparation: what to consider before starting to teach
- Knowing your audience: the appropriate choice of wording and language
- Storytelling: how to keep the attention of students?
- More than facts: how body language and interactive exercises can support you
- Vocal and phonetic training: how to get your message across clearly?
- How to deal with unforeseen situations, questions, and anxiety?
- Innovative ways of teaching: more than just Power Point!
- Establish a feedback-culture

Type of evaluation:

Written homework/paper

Lecturer:

Dr Manuel Maidorn
manuel.maidorn@ds.mpg.de

Module:

Transferable Skills

Credits:

1 ECTS

Workload:

- 21 hours participation
- Pre-course self-assessment

UNIVERSITÉ DU LUXEMBOURG

DSSE | DOCTORAL SCHOOL IN SCIENCE AND ENGINEERING

Title of the activity Deep Learning: Fundamentals and Applications

Speaker Dr Sally EL HAJJAR

Course description:

This course provides a deep dive into the field of deep learning, covering its fundamentals, architectures, and practical applications.

1. Students will gain an understanding of deep learning architectures.
2. Students will explore different deep learning architectures such as convolutional neural networks (CNNs), recurrent neural networks (RNNs), etc.
3. Students will also delve into advanced topics in deep learning, including transfer learning, attention mechanisms, and reinforcement learning.
4. Students will learn how to pre-process and augment data for deep learning tasks, effectively train deep models using large-scale datasets, and fine-tune pre- trained models for specific applications.
5. Students will learn how to evaluate deep learning models.
6. Students will explore practical applications of deep learning. They will learn how to apply deep learning techniques for image classification, object detection, etc.

Admission criteria:

Background in Mathematics, any scientific field, data science, computer science, Physics, or engineering.

Lecturer:

Dr Sally El Hajjar
Sally.ElHajjar@liser.lu

Module:

TS

Credits:

1 ECTS

Workload:

In-person workload: 10 hours
Preparation workload: 8hours
Homeworkworkload:7hours

UNIVERSITÉ DU LUXEMBOURG

DSSE | DOCTORAL SCHOOL IN SCIENCE AND ENGINEERING

Title of the activity Starting a Research Project

Speaker Dr Claire GODET

Course description:

This module is designed to help students in the early stages of their research. It is divided in 4 parts to assist students with the basics of conducting a research project and writing research papers.

1) What is research? How to find a good topic of research?

This interactive activity is designed to help students think about their topic of research and give them an understanding of how to produce reliable research outputs

2) Writing with integrity

This section addresses questions about plagiarism, referencing and finding reliable sources.

3) Writing an academic article or a literature review

Students will learn what it entails to write an academic article. The main objective in this session is to guide students in all the steps that are necessary to finish a thesis chapter or academic article

4) Surviving your PhD

The main goal of these activities and discussions is to answer any question or worry the students might have. How to manage a 4-year project? How to beat procrastination? What are all the documents/requirements I need to finish my PhD?

Through exercises and discussions, this module will give students the tools to start their research with confidence.

Learning outcomes:

After this seminar students will be able to:

- Understand the difference between research and other writing assignments
- Identify the main steps of research
- Identify the main databases for their research
- Look efficiently for literature and resources for their research
- Prepare their research and manage their time efficiently
- Organise their data and resources

Admission criteria:

English B2 min

Lecturer:

Dr Claire Godet

Module:

TS- Inter/Disc.

Credits:

0,5 ECTS

Workload:

In-person attendance: 13 hours
Preparatory and homework: 5h

UNIVERSITÉ DU LUXEMBOURG

DSSE | DOCTORAL SCHOOL IN SCIENCE AND ENGINEERING

Title of the activity Data Visualisation for Researchers

Speaker Dr Ruediger WESTERMANN

Course description:

Visual Design and Graphical Representations
• Introduction
• History of visualisation, application domains
• Importance of data visualisation: how making data visual can reveal interesting information
• Basic design and gestalt principles
• Attribute encodings: how to turn data into visual attributes, color and shape
• Categories of graphical representations: comparison, distribution, correlation, hierarchy, evolution, spatial
• Chart types: bar chart, line graph, scatter plots, pie charts, parallel coordinate plots
• Chart pitfalls: intentional or unintentional
• Maps: when do they work, and when don't they?
• Table design: tables as an alternative to using charts, sparklines and heatmaps, decluttering tables, adding visual cues
3D graphics for visualisation:
• Polygonal models and link to surfaces in SciVis
• Basics of shading and lighting in CG
• A note on GPUs and ray-tracing for visualisation
• Discussion of tools for rendering meshes
ð We will introduce MeshView and discuss the internal model representation used
ð Students should write a file in which simple models like spheres and tori are represented, map textures to them and render them using MeshView (about 2hr of homework)

Learning objectives:

Know what type of visual mappings and encodings exist, and for what type of data they can be used.
Know the strength and weaknesses of different mappings and encodings
Know how to visualize own data using learned encodings with available languages (R for visualization) and tools (tableau).

Lecturer:

Rüdiger Westermann
westermann@tum.de

Module:

Transferable Skills

Credits:

1 ECTS

Workload:

9 contact hours
3.5 hours homework

UNIVERSITÉ DU LUXEMBOURG

DSSE | DOCTORAL SCHOOL IN SCIENCE AND ENGINEERING

Title of the activity Scientific Document Creation using LaTeX

Speaker Dr Christian GREVISSE

Course description:

LaTeX is a typesetting system well-known in the fields of mathematics and computer science. Nevertheless, its advantages compared to more common word processing applications are applicable in any imaginable domain.

Learning outcomes:

- The goal of this course is to give doctoral students a head start into the use of LaTeX for their scientific productions. The content of this course includes:
  - basic typesetting
  - graphics & multimedia
  - mathematics, code (depending on the attendees' domains)
  - publisher templates & bibliography
  - special packages (presentations, exams, CV, thesis)
- After completing this course, doctoral students will be able to:
  - autonomously create scientific productions in LaTeX based on existing templates
  - apply best practices related to document creation
  - search for and use additional packages specific to their domain

Type of evaluation:

Written homework/paper

Lecturer:

Dr. Christian Grévisse
christian.grevisse@uni.lu

Module:

Transferable Skills

Credits:

0.5 ECTS

Workload:

In-person workload: 6 hours
Homework: ca. 6 hours

UNIVERSITÉ DU LUXEMBOURG

DSSE | DOCTORAL SCHOOL IN SCIENCE AND ENGINEERING

Title of the activity Open Access

Speaker Dr Linda Wampach, Ass. Prof. Dr Maël Guennou, Dr Inma Peral Alonso

Course description:

- 9h30 – 9h35 : Welcome by Inma Peral
- 9h35 – 10h00 : Types of Open Access (green and gold); How to find open Access journals; Preprint repositories and post-print repositories
- 10h00 – 10h30 : Linda Wampach (FNR): Why to publish open access?; What do they accept or don't accept?
- 10h30 – 10h45 : Break
- 10h45 – 12h45: Mael Guennou: Open Data; Best practice how to share data (before and after analysis); Data publication and GDPR;
- 12h45 – 14h00: Break
- 14h – 15h30 : Inma Peral : practical aspects (where to register, reimbursement, …) and practical "exercices"
- 15h30 – 15h45: Break
- 15h45 – 17h15 : Inma Peral: practical aspects (where to register, reimbursement, …) and practical "exercices"

Learning outcomes:

Open access publishing and open science are becoming more and more important to remove barriers to scientific results and to make results available to the scientific community.
In this course you will learn more, what we mean be open access and open data, why and how they help the scientific community and the public.
And you will learn how to practically make your papers and publications open access.

Type of evaluation:

Written homework/paper

Lecturer:

Dr Linda Wampach (FNR)
Ass. Prof. Dr Maël Guennou
Dr Inma Peral Alonso
linda.wampach@fnr.lu
mael.guennou@uni.lu
inma.peral@uni.lu

Module:

Transferable Skills

Credits:

0.5 ECTS

Workload:

5 hrs of pre-/post course work
Entire workload including the classes: 12 hrs

UNIVERSITÉ DU LUXEMBOURG

DSSE | DOCTORAL SCHOOL IN SCIENCE AND ENGINEERING

Title of the activity Boosting Employability in Industry after PhD Graduation

Speaker Dr Patrick CORSI

Course description:

The entry into professional life within the industrial or, more generally, the socio-economic sphere, breaks fundamentally with academic objectives and frameworks. Entering this critical stage of life can often be perceived as relatively intimidating or unfamiliar territory by many doctoral students. However, it is possible to develop a more confident and robust entry pathway that will mitigate the risks of adjustment for both them and their employers, which will more quickly translate into mutual benefits.

The course offers multifaceted exposure to a range of critical determinants, situations, and environments similar to professional experience in current contexts. It will allow for a better perception of an individual's skills set and competencies, both by the new employee and by the employing organization.

The course method alternates key thematic inputs, targeted role-playing and real-life anonymous stories drawn from the coach's experience in industrial contexts - from start-ups to large multinationals, institutional and otherwise, over 35 years internationally. The approach is very dynamic, involving students in increasingly complex situations, while provoking reactions and debates.

Reading references, methods and appropriate toolkits are offered to participants, with the aim of supporting their career development.

Learning outcomes:

Students benefit in several ways. They- learn to value their strengths, neutralize their weaknesses and improve their self-confidence in various contextualized situations- understand how to position themselves on the job market according to their own abilities- understand the cultural and managerial ways of operating in companies- know how to better manage one's time and skills to best adapt to the job.

Type of evaluation:

Exam, written

Lecturer:

Dr Patrick Corsi
patrick.corsi@icloud.com

Module:

Transferable Skills

Credits:

1 ECTS

Workload:

25 hours of course

UNIVERSITÉ DU LUXEMBOURG

DSSE | DOCTORAL SCHOOL IN SCIENCE AND ENGINEERING

Title of the activity Fundamentals of Project Management for Researchers

Speaker Dr Sylvie FROMENTIN

Course description:

The purpose of the course is to provide team members of projects with advanced techniques and practical skills for initiating, planning, tracking, controlling, and evaluating any kind or size of project.
This course covers the fundamental skills, concepts, and techniques of project management through the project lifecycle, start to finish.
At the end of the course, the participants will be able to gain a good understanding of project management, the methods and tools used to manage projects and how to ensure the success of a project.

o Quality Assurance
o Communication Management
Phase 4: Monitoring and Controlling
o Integrated Change Control
o Risk and Issue Management
o Escalation process
Phase 5: Closing
o Lessons learned
o Lessons learned repository
• What does it take to be a good project Manager?
• Project Management skills
• How to develop Project Management skills

Type of evaluation:

Written homework/paper

Learning outcomes:

Covered topics:
• What is Project Management? /• Definition of a Project
• Difference between project, Program and Partnership
• Project Management Framework /• Project tri-constraints
• Project Management Phases/ • RASIC
• Portfolio and Project Management / • Project Infrastructure
Phase 1: Initiating
o Project Charter
o Work Package
o Statement of Work
o Scope Management
Phase 2: Planning
o Develop Project Plan
o Time Management
o Planning Process
o Resource Plan
o Gantt Chart
o Quality Management
Phase 3: Executing
o Project reporting plan
o Deliverable and acceptance processMeasure progress
o Quality Assurance
o Communication Management
Phase 4: Monitoring and Controlling
o Integrated Change Control
o Risk and Issue Management
o Escalation process
Phase 5: Closing
o Lessons learned
o Lessons learned repository
• What does it take to be a good project Manager?
• Project Management skills
• How to develop Project Management skills

Lecturer:

Dr Sylvie Fromentin
sylvie.fromentin@uni.lu

Module:

Transferable Skills

Credits:

1 ECTS

Workload:

1) 16 hours (22 TU)
2) 3h30 preparatory work
3) 3h30 homework

UNIVERSITÉ DU LUXEMBOURG

DSSE | DOCTORAL SCHOOL IN SCIENCE AND ENGINEERING

Title of the activity Manage your PhD – How to cope with chances and challenges

Speaker Dr Sabryna JUNKER

Course description:

This workshop will train young scientists to successfully meet the challenges of a PhD project in competitive scientific environments. Often PhD students face high pressure due to time constraints, a (mental) commitment towards this important step in their career or unexpected challenges connected to pioneering science. This workshop therefore concentrates on both project management (how to manage the PhD project in terms of time, efficiency, and mental health) as well as upward leadership (how to maintain a productive relationship with scientific supervisors).

Admission criteria:

- Motivation – How can I stay motivated over the (long) years of my PhD?
- Project management – How do I transform the title of my PhD into a feasible workplan?
- Psychology of upward leadership – How can I understand my boss?
- Communication in upward leadership – How can I talk to my boss?
- Conflict management – What can I do if something goes wrong?

Lecturers:

Sabryna Barbara Junker
Sabryna.junker@imp.ac.at

Module:

TS

Credits:

0.5 ECTS

Workload:

- 14 hours participation
- Pre-course self-assessment
- Homework (15 min per day)

UNIVERSITÉ DU LUXEMBOURG

DSSE | DOCTORAL SCHOOL IN SCIENCE AND ENGINEERING

Title of the activity Programming with JULIA

Speaker Dr Miroslav KRATOCHVIL, Dr Laurent HEIRENDT

Course description:

Introductory course into Julia programming. Attendees will learn basic skills to process their data using Julia language, the basic practices of program efficiency required for accelerating and scaling up their analyses. The course will give an overview of the main scientific programming libraries in the Julia ecosystem, giving the attendees the ability to quickly utilize the available software for solving their problems, with additional focus on parallelism and HPC utilization.

Learning outcomes:

Ability to use Julia for a wide range of computation-heavy scientific and software engineering tasks, including utilization of cluster computing technologies.

Type of evaluation:

Exam, practical

Lecturer:

Miroslav Kratochvil
Laurent Heirendt
miroslav.kratochvil@uni.lu
laurent.heirendt@uni.lu

Module:

Transferable Skills

Credits:

1 ECTS

Workload:

2 sessions per week for 3 weeks, each session:
1) 2h,
2) 30m,
3) 2h
giving total 27 hours

UNIVERSITÉ DU LUXEMBOURG

DSSE | DOCTORAL SCHOOL IN SCIENCE AND ENGINEERING

Title of the activity Machine Learning

Speaker Dr Jakub LENGEIWICZ

Course description:

The Machine Learning Seminar series aims to facilitate presentations of fundamental and methodological advances in data science and machine learning, as well as to discuss application areas presented by domain specialists. The uniqueness of the seminar series lies in its attempt to extract common denominators between domain areas and to challenge existing methodologies. The focus is on both theory and applications in a wide range of domains, including Computational Physics and Engineering, Computational Biology and Life Sciences, and Computational Behavioural and Social Sciences.

Each session will consist of a 30-minute presentation by an expert guest speaker, followed by a 30-minute discussion where attendees will have the opportunity to ask questions and engage with the speaker.

Learning outcomes:

For those who wish to obtain ECTS credits, you need to actively attend at least 10 seminar sessions throughout 2023 as well as you are required to prepare a presentation on a topic of your choice related to machine learning. The presentation can be done individually or as a team project with up to 2 other students and will follow the same format as other seminar meetings (i.e., 30-minute presentation plus 30-minute discussion). The presentation can be a review of existing research, a presentation of your own research, or a demonstration of a practical application of Machine Learning.

Type of evaluation:

Written homework/paper

Lecturer:

Dr Jakub Lengiewicz
Jakub.lengiewicz@uni.lu

Module:

Transferable Skills

Credits:

1 to 3 ECTS

Workload:

1) 10 to 30 hours participation to seminars
2) 15 hours per presentation

UNIVERSITÉ DU LUXEMBOURG

DSSE | DOCTORAL SCHOOL IN SCIENCE AND ENGINEERING

Title of the activity Scientific Data Visualisation

Speaker Dr Rüdiger Westermann

Course description:

Scattered Data Visualisation and Grids

- Problem statement and applications
- Grid types and cell-wise interpolation
- Scattered data interpolation
- Mapping field values to colour via transfer functions
- Space vs. time

ð Students are given tools to apply interpolation and understand differences in quality and speed (about 1hr of homework)

Scalar Field visualisation

- 2D contouring and applications (weather maps)
- Volumes in medical imaging and CFD
- Surfaces in 3D data sets
- Direct volume visualisation

ð Students are given datasets and tools (ParaView, Vis3D) for 3D visualisation, and understand differences in quality and speed (about 1.5hr of homework)

Vector Field Visualisation

- Flow fields and their applications
- Trajectories in flow fields
- Topology-based visualisation of flow fields

ð Students are given datasets and tools (ParaView) for 3D visualisation, and understand differences in quality and speed (about 1.5hr of homework)

Learning outcomes:

Know what type of visualisation methods for scalar and vector fields exist, and for what type of information they can reveal.

Know the strength and weaknesses of different visualisation techniques.

Know how to visualize own data using learned techniques with available tools.

Type of evaluation:

Written homework/paper

Lecturer:

Dr Rüdiger Westermann
Jakub.lengiewicz@uni.lu

westermann@tum.de

Module:

Transferable Skills

Credits:

1 ECTS

Workload:

9 contact hours
3.5 hours homework

UNIVERSITÉ DU LUXEMBOURG

DSSE | DOCTORAL SCHOOL IN SCIENCE AND ENGINEERING

Title of the activity Data Visualisation for Presentation & Publication

Speaker Dr Evan Williams

Course description:

Vector graphics can be modified, assembled, resized, and standardized to permit data visualizations to be appropriate prepared for a variety of different purposes, particularly for papers, for presentations, and for posters. The different visual needs of these three common mediums for communicating scientific results means that there is no "one-size-fits-all" best format for a single graphic: scientists must know how to adapt their visualizations for the appropriate format. Knowing how to edit data visualizations in vector drawing software is an essential skill for scientists. Note that this class is for EDITING, ASSEMBLING, and REFINING data visualizations – it is not about HOW to plot data on graphs (we will create graphs during class exercises, but the class will not focus on that skill).

Learning outcomes:

Understand vector and raster graphics, and why the difference is critically important
Know differences between exploration vs. explanation of data, and how this affects graphs
How to save and export data visualizations (focus on R, but MATLAB & other graphing tools are OK)
How to edit graphs (focus on vector graphic editing with Adobe Illustrator and Inkscape)
How to assemble graphs into a multi-panel figure
Know how to read & use common visualizations, and how to avoid common errors
How to convert graphs for proper display between figures, presentations, and posters
How to write figure legends and use figure calls in text with appropriate length & level of detail
Know the relationship between the target audience with data visualizations & level of detail
Identify and recognize changing graph standards over time – know how to keep current

Type of evaluation:

Written homework/paper

Lecturer:

Dr Evan Williams
Evan.williams@uni.lu

Module:

Transferable Skills

Credits:

1 ECTS

Workload:

1) 22 contact hours
2) 6 hours of homework
3) Presentation

Admission criteria:

Students should know very basic concepts of programming and command line interfaces (e.g. what it means to 'comment' code, how to navigate to a directory in command line). Preference for students in the 2nd-3rd-4th year of their PhD. It is not required to have already generated vector graphic images. The example data in the class will be biological, but a biological understanding is not required.