ISCD Summer School 2017

Scientific Trends at the Interfaces
Bioinformatics – Visual Data Analysis

Organisers: Alessandra Carbone, Pascal Frey, Elodie Laine

July 17th – August 11th, 2017, Roscoff - France

Science at the interfaces

A multidisciplinary way of learning

Improve your curriculum

Discover the challenges of tomorrow

Welcome to ISCD Summer School

Experience a multidisciplinary way of learning, explore areas outside your major and enjoy international campus life at the UPMC Marine Station in Roscoff.

Ideally located on the Northern Brittany coast, the renowned research and training centre is jointly operated by the French National Centre for Scientific Research (CNRS) and the Pierre & Marie Curie University (UPMC).

Read more on our Summer Schools Programme at:

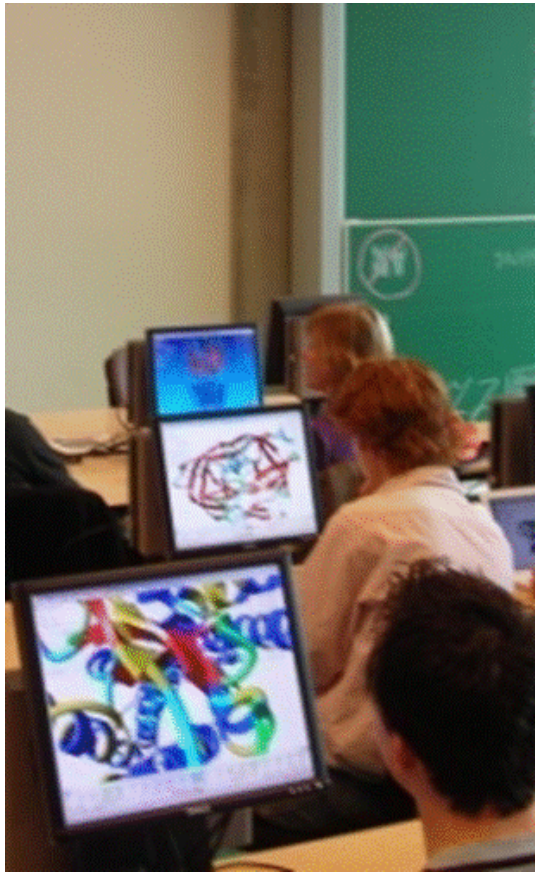
iscd.upmc.fr/training/summer-school

ISCD Commitment to Teaching

For talented undergraduate and graduate students who wish to broaden their experience, our unique four weeks summer program offers challenging opportunities.

We are committed to provide the best level of teaching and academic environment in view of creating a community beyond the classroom and build life lasting friendships.

Full sponsorship may be provided thanks to French state funds awarded to CALSIMLAB under the *Investissements d'Avenir* programme, reference ANR-11-IDEX-0004-02



Students working on an educational task with YASARA software (Wikimedia Commons)

"Interdisciplinary programmes are a unique opportunity to achieve scientific breakthroughs in numerical simulations"

Pascal Frey,
Programme Director, ISCD Summer School

A stimulating experience

ISCD invites motivated undergraduate and graduate students to apply.

We select students with excellent academic results and who wish to experience a different style of learning with world-class faculty.

The Summer School Programme allows students to enlarge their curriculum and explore areas at the interfaces between disciplines that are making extensive use of scientific computing and simulation.

Morning classes, afternoon tutorials/projects and seminars by worldwide speakers are scheduled.

Eligibility

The Summer School is for advanced Bachelor's and Master's degree (L3 to M2 levels). To apply, students should have completed at least three years of university studies.

Scholarships

A limited number of full/partial scholarships is available. A full scholarship covers tuition fees, accommodation in Roscoff.

Language requirements

Students from all over the world are encouraged to apply.

All courses are taught in English, depending on the audience. Applicants are expected to be fluent in either language in order to follow the lectures and participate to classrooms discussions.

Accommodation

All Summer School students have the opportunity to live on campus hotel. Breakfast, lunch and evening meals (except on Saturdays and Sundays) are included.

Application and registration

To secure your participation, we advise you to apply as soon as possible.
Application form can be found on the ISCD web site:
iscd.upmc.fr/training/summer-school/applications/
and must be returned by email at:
training_iscd@upmc.fr

2017 Summer School Programme

The purpose of these 4 weeks of training is to introduce the basics of scientific visualization and data sciences.

Term I - 17-28 July: **Bioinformatics**

Term II – 31 July -11 Aug.: **Visual Data Analysis**

Summer School Terms I and II are interdisciplinary courses and can be taken independently: students may enroll for either or both, however they are encouraged to take both. The courses consist of morning plenary sessions, afternoon numerical simulation hands-on activities and evening lectures.

During this training programme, students will discover several aspects of state of the art and current research in bioinformatics, scientific visualization and data analysis and will get a thorough introduction to the underlying mathematical and computational methods applied to these challenging topics.

Term I: **Bioinformatics is the application of computer science and information technology to the field of biology and medicine**.
Bioinformatics primarily focuses on developing computationally intensive techniques to increase the understanding of biological processes. This involves dealing with algorithms and computation theory, artificial intelligence, image and signal processing, discrete mathematics, control and system theory, databases and information systems, and statistics.

Term II: **Scientific visualization is a booming area that helps to advance knowledge at the interfaces of disciplines**.
With nowadays complex numerical simulations, scientists are in need for abstract, general-purpose methods of analysis to improve their understanding of the phenomena that have been simulated. Real-time interactive visualization can serve as interpretation, help building hypothesis and reasoning. Active research areas in this topic involve information theory, computer graphics, mathematics, physics, and cognitive science.

This advance training is open to young and brilliant scientist students (undergraduate and graduate) and does not specifically require prior knowledge other than a solid 3-years scientific university background.

The number of participants is limited to 40.

To benefit from this formation, students need to have a strong desire to learn and understand new elements. There will be ample time for filling some gaps in understanding. Instructors will be happy to explain, either in face-to-face discussions or during the tutorial sessions.

The main areas that will be covered include:

- Protein structures and protein-protein interactions
- High-throughput sequence analysis, gene regulatory networks
- Evolutionary processes, phylogeny and co-evolution
- Basic information theory and computation
- Mathematical methods for topological analysis
- Computer graphics and advanced rendering techniques

Keynote Speakers and Supervisors

Adel Ait-Hamlat, *PhD, IBPS, Paris*
Marc Baaden, CNRS *Director of Research, IBPC, Paris*
Juliana Bernades, *Professor, LQCB, UPMC, Paris*
Alessandra Carbone, *Professor, LQCB, UPMC, Paris*
Ryan Chikhi, *CNRS researcher, Université Lille 1*
Jean Daniel Fekete, *Senior Research Scientist, Inria Saclay*
Pascal Frey, *Professor, LJLL-ISCD, UPMC, Paris*
Elodie Laine, *Professor, LQCB, UPMC, Paris*
Anne Lopes, *Professor, Université Paris Sud*
Loïc Norgeot, *Research engineer, ISCD, UPMC, Paris*
Raffaella Rizzi, *Professor, University of Milan-Bicocca*
Dirk Straatman, *Professor, IMPC, UPMC, Paris*
Riccardo Vicedomini, *Research engineer, LQCB, UPMC, Paris*

Plenary lectures

Plenary lectures are held every morning on weekday and will propose talks on a wide range of topics of importance for Scientific visualization and Data science: from basic information theory, numerical methods for topological analysis, basic statistical analysis, deep learning methods, etc.

Full details about the lecturers and speakers will appear in the daily timetable you receive upon registration.

Hands-on simulations

These afternoon sessions are meant to be interactive, educational and, possibly fun.

They will provide various insights and concrete experiences with educational software packages.

Students will be encouraged to develop their intuition and skills by interacting with experienced users in a user-friendly environment. Under the guidance of experts, participants will play and learn by doing.

Students are encouraged to assist and participate actively.

Evening lectures

During the sessions, a few topic-related lectures will take place on evenings, given by invited speakers and faculty members.

These sessions are aimed to enhance your understanding and enjoyment of the programme. Speakers are experts in their field: senior figures from within and beyond the University, Course Directors, and Guest Lecturers from industrial research centres.

Institute for Computing and Data Sciences

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