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The 2018 Exposome Short Courses Series

Exposome Practice

Anglet

25-29 June, 2018

Exposome Advanced
London
April

Exposome Basis:
Utrecht
July

Surf64 Summer School:

Statistics and Machine Learning for OMICs profiling and Integration in Exposome Research

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UNIVERSITÉ DE PAU ET DES PAYS DE L'ADOUR

Utrecht University

THE 2018 EXPOSOME SHORT COURSES SERIES

UTRECHT JULY --- LONDON APRIL --- BIARRITZ - ANGLET JUNE

THE EXPOSOME SHORT COURSES SERIES is a multi-institution programme on Statistical models and Bioinformatics tools to analyse Exposome data. It comprises three complementary one-week courses:

- EXPOSOME BASIS (UTRECHT UNIVERSITY, NL): the Molecular Epidemiology and Exposome Course (MEEC) is an introductory course providing a comprehensive introduction to the concept of the exposome and its practical implementation. The course focuses on OMICs data, their features, and the challenges their statistical analysis raises. The MEEC proposes a series of lectures, seminars and practical describing the main statistical methods used in molecular epidemiology. These include univariate models and multiple testing correction strategies (FWER, FDR), dimension reduction techniques, and variable selection approaches.
- EXPOSOME ADVANCED (IMPERIAL COLLEGE, UK): XP ADVANCED is an advanced course presenting further techniques to analyse and integrate OMICs data in an exposome concept. The course build upon a statistical background such as the one taught in the MEEC course to introduce necessary extensions of these methods in order to (i) accommodate complex study designs; (ii) Improve results interpretability; and (iii) handle multiple sets of OMICs data. In addition to regression-based profiling approaches, XP ADVANCED also features the exploration of machine learning techniques, including network inference and their practical application to OMICs data. The course will develop the theoretical background of these methods and their applicability to OMICs data in Exposome Sciences.
- EXPOSOME PRACTICE (IMPERIAL COLLEGE - UNIVERSTIY OF PAU - ANGLET): SURF 64 is a one-week summer school focusing the on the practical application of all methods and principles developed in the MEEC and XP ADVANCED to real data. The summer school will consist in 5-days supervised group work using real data sets and addressing real research questions on OMICs analysis, interpretation and integration. The course also includes a series of lectures, seminars, and tutorials illustrating solutions to OMICs profiling and integration in a real-life setting.

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I3CARE INTERNATIONAL EXPOSOME CENTER

XP- PRACTICE: ANGLET

OVERVIEW

SURF 64 will take place at the UPPA-Anglet Campus in Basque country and will run from the 25th to the 29th June, 2018. The course comprises a 5 full days group-work on real data analysis (including multi omics data) addressing real research question.
These projects will include multi-OMICs data measured in the same individuals and their analysis will call upon multivariate techniques as well as the use of network models and companion bioinformatics tools as taught in the MEEC and XP-Advanced courses. Datasets will be provided by course organisers but participants can also submit a dataset they would like to see analysed during the course. Project based work will be complemented by seminars/lectures related to the methods used in the group-work.

PROJECT WORK

At the beginning of the course a list of research projects will be proposed. Each of these projects will (i) address an original research question, and (ii) include multi-omic data
Attendees will form groups and will chose a project they will work on throughout the course. This project-based work will be supervised by the project leaders on a daily basis, and technical guidance will be provided both by course facilitators and lecturers for specific methodology. The last afternoon of the course will be dedicated to presentations (seminar format) where each group will present their research questions and their main results to their fellow participants and a panel of experts.

LEARNING OUTCOMES

After **SURF 64**, students will have a practical experience in:

- Multi-OMIC profiling using univariate, multivariate approaches and their extensions
- implementing these approaches to analyse real-life data
- integrating different OMICs data and to interpret results using established bioinformatics tools
- inferring network topologies for results interpretation and feature selection
- provide results in a reproducible and sustainable manner using open source tools;

and will have been introduced to machine learning/deep learning.

Target Audience

SURF 64 will be of interest to academics (students, and researchers), and scientists from the industry (pharmaceutical companies, insurance companies, food industries…). Experience in statistics, OMICs data and use of R statistical software is required (e.g. MEC-StatXP courses, Advanced XP course).

Participants should bring their own laptops, and could submit a dataset they would like to analyse during the school.

Up to **30 participants** can register.

Registration/Fees

REGISTRATION can be done online:

http://www.imperial.ac.uk/school-public-health/study/short-courses/XP-series/

For any question please send an email to:

m.chadeau@imperial.ac.uk or benoit.liquet@univ-pau.fr

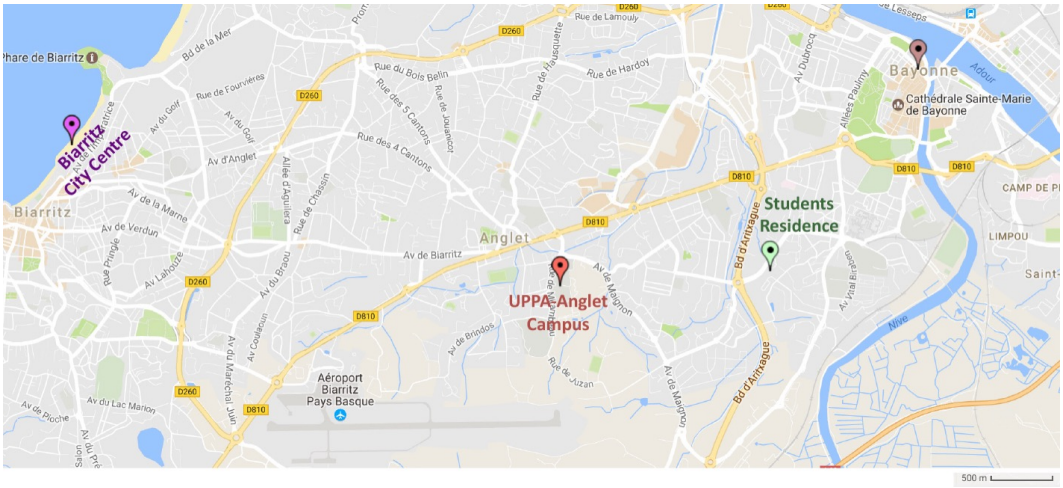
Course fees:

- **Early bird registration (until April 30th 2018)**
  Academic: £1,000 - Non-academic: £1,200
- **Standard registration**
  Academic: £1,100 - Non-academic: £1,400

Location

VENUE: UPPA ANGLET CAMPUS – PARC MONTAURY

Teaching will take place at the Biarritz-Anglet Campus of UPPA.



Accommodation

ACCOMMODATION: STUDENTS RESIDENCE EUGÈNE GOYHENECHE

Accommodation is not included in the course fees, but negotiated rental fares are available for flats in Bayonne Student Residence: £200 for the rental of a studio flat (limited availability).

Flats feature one small kitchenette and a shower room, and are located at a walking distance from Bayonne city centre and less than 1.5km from the campus.

Interested attendees should contact the organisers to check availability and books their flat.

CONTRIBUTORS

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MONDAY 25, JUNE

REFRESHER ON METHODS AND PROJECTS DEFINITION:

9.15-09:30 WELCOME AND REGISTRATION
9.30-10:30 LECTURE 1: *Refresher on OMICs Profiling and Integration*
Speaker: M Chadeau-Hyam
10:30-11:00 *Datasets overview – projects allocation*
Speaker: G Campanella
11:30-13:00 TUTORIAL: *Reproducible results using RStudio-RMarkdown and GitHub*
Speaker: B Liquet
14:00-17:30 GROUP WORK: *Data exploration – Repository set up – Analytical Plan*
17:30-18:00 GROUP PRESENTATION: *Projects overview and plan*

TUESDAY 26, JUNE

EXPLORATORY ANALYSES - VISUALISATION

09:30-11:00 TUTORIAL: *Big Data Visualisation and Exploration*
Speaker: G Miller (TBC)
11:30-13:00 GROUP WORK: *Exploratory analyses – Association Studies*
14:00 -14:45 SEMINAR: *Resampling techniques: Calibration/Validation/Stability*
Speaker: L Portengen
15:00-17:30 GROUP WORK: *Visualise and interpret profiling results*
17:30-18:00 GROUP PRESENTATION: *Preliminary results – planned refined analyses*

WEDNESDAY 27, JUNE

SENSITIVITY/STABILITY ANALYSES – RESULTS INTERPRETATION

09:30-11:00 TUTORIAL: *Pathway Exploration – Bioinformatics tools*
Speaker: G Miller (TBC)
11:15-13:15 GROUP WORK: *Implementation of stability analyses*
14:00-17:00 GROUP WORK: *Results generation and interpretation*
17:00-17:30 GROUP PRESENTATION: *Finalised results & plans for OMICs integration*

THURSDAY 28, JUNE

OMICS INTEGRATION:

9.30-10:45 LECTURE: *Network models, machine learning & deep learning: overview*
Speaker: G Campanella
11:00-13:00 GROUP WORK: *Targeted OMICs Integration*
13:30-14:15 LUNCH SEMINAR: *Introduction to Bayesian Networks*
Speaker: B Liquet
14:15-17:30 GROUP WORK: *Implementing network models for (multi)-OMIC data*
17:30-18:00 GROUP PRESENTATION: *Multi-OMICs results and plans for final analyses*

FRIDAY 29, JUNE

NETWORK MODELS IN PRACTICE

09:30-12:30 GROUP WORK: *finalising analyses – presentation*
13:00 -13:45 LUNCH SEMINAR: *Mechanistic investigation and causality*
Speaker: M Chadeau-Hyam
14:00-15:30 GROUP WORK: *Presentations Finalisation*
15:30-17:30 FINAL GROUP PRESENTATION
17:30-18:00 PERSPECTIVES: *Future of Quantitative Exposome Research*
Speaker: R Vermeulen