Vall d'Hebron
Institut de Recerca

Course Presentation

Introduction to Bioinformatics for Biomedical Research

UEB – VHIR

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Vall d'Hebron Hospital · Generalitat de Catalunya Departament de Salut · Institut Català de la Salut · UAB Universitat Autònoma de Barcelona · Generalitat de Catalunya Departament d'Economia i Coneixement · Institució CERCA Centres de Recerca de Catalunya · Instituto de Salud Carlos III

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OUTLINE

1. UEB Presentation

- Who we are?
- What do we do?

2. Course presentation

- Why this course?
- Main Goals
- Methodology
- Contents

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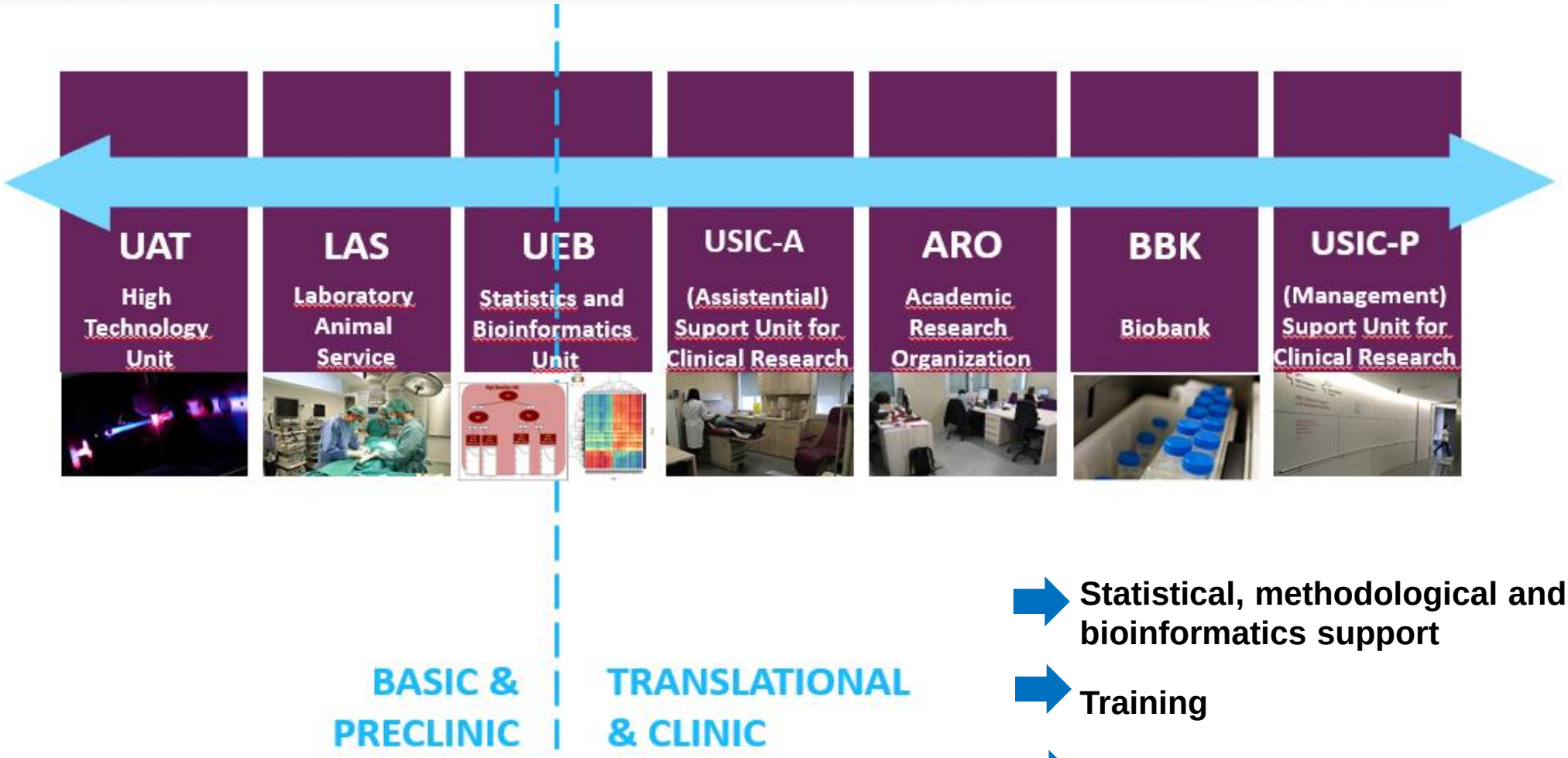
1. UEB Presentation

VHIR's CoreFacilities



- Statistical, methodological and bioinformatics support
- Training
- Innovation and development

1. UEB Presentation

http://en.vhir.org/portal1/article_menu_serveis.asp?s=serveis&contenttypeid=43&contentid=1250&t=presentation

Statistics and Bioinformatics Unit (UEB)

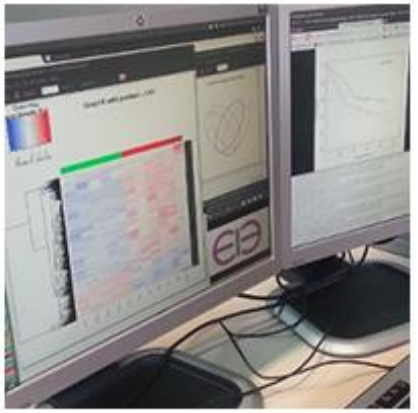
Presentation | Team | Services | Teaching | Publications | Rates | Service Request

The Statistics and Bioinformatics Unit (UEB) was created in 2008 in order to **promote the use and development of modern statistical and bioinformatics resources on research** performed in its environment.

Nowadays, the Statistics and Bioinformatics Unit includes the former Support Unit in Methodology for Biomedical Research (USMIB) and, as part of the Scientific and Technical Support Area of the Vall d'Hebron Research Institute, has the mission to provide expert advice, services and training for clinical and biomedical research.

The main objectives of the UEB are:

- To provide statistical, methodological and bioinformatics support for clinical and biomedical research, mainly in our center but also to the rest of the community.
- To contribute to training in statistics and bioinformatics for clinical and biomedical research, by conducting its own courses and participating in formal training in the VHIR's area.
- To carry out innovation and development activities in the field of statistics and bioinformatics, particularly in anything that could revert in an improvement of the procedures and services provided by the Unit.



- Presentation
- Academic Research Organization (ARO)
- Biobank
- Laboratory Animal Service
- High Technology Unit (UAT)
- Statistics and Bioinformatics Unit (UEB)
  - Presentation
  - Team
  - Services
  - Teaching
  - Publications
  - Rates
  - Service Request
- Support Unit for Clinical Research (USIC)
- BioCores BCN

1. UEB Presentation

- Incorporation of new methods & pipelines
- Standarization of workflows and pipelines
- Development of new tools
- Adhesion to quality standards (**ISO9001:2015**)

2008 →

Former members:
-Ricardo Gonzalo
-Ferran Briansó
-Xavier de Pedro
-Israel Ortega
-Josep Lluís Mosquera

1. UEB Presentation

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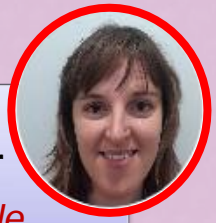
Bioinformatics Platform



Mireia Ferrer
Responsible Bioinformatics

Esther Camacho
Bioinformatics Technician

Head of Unit
Santi Pérez-Hoyos

Statistics Platform

Santi Pérez-Hoyos
Responsible Bioestatistics

Miriam Mota
Biostatistics Technician

Augusto Sao-Avilés
Biostatistics Technician

Projects in Data Science

Alex Sánchez
Responsible Projects in Data Science

Angel Blanco
EOSC-LIFE Project Manager

Guillem Fernández
Clinical data specialist

Berta Miró
VEIS Project Manager

Anna Sanjuan
EU-Pearl Project Manager

1. UEB Presentation

We provide support in …

Clinical Data Analysis

- Biostatistical Analysis
- Clinical Trials
- CRF development (REDCap)
- Epidemiological studies
- Data Management for Clinical Research

Bioinformatics Analysis

- Analysis of omics data (Microarrays, RNA-seq, proteomics and other NGS)
- RTqPCR, HT-qPCR
- Variant Analysis
- Biological significance analyses (pathways, networks,…)
- Integrative analyses and biomarker discovery
- High performance computing, development of applications

Consulting and Research Projects

- Sample size
- Experimental design
- GRANT review
- Statistical writing and response to reviewers
- Support for research projects request

Training

- Courses
- Short Workshops
- Statistical Pills
- Official training (MSc)
- Students in practice

Short consultations (< 3hrs) are free

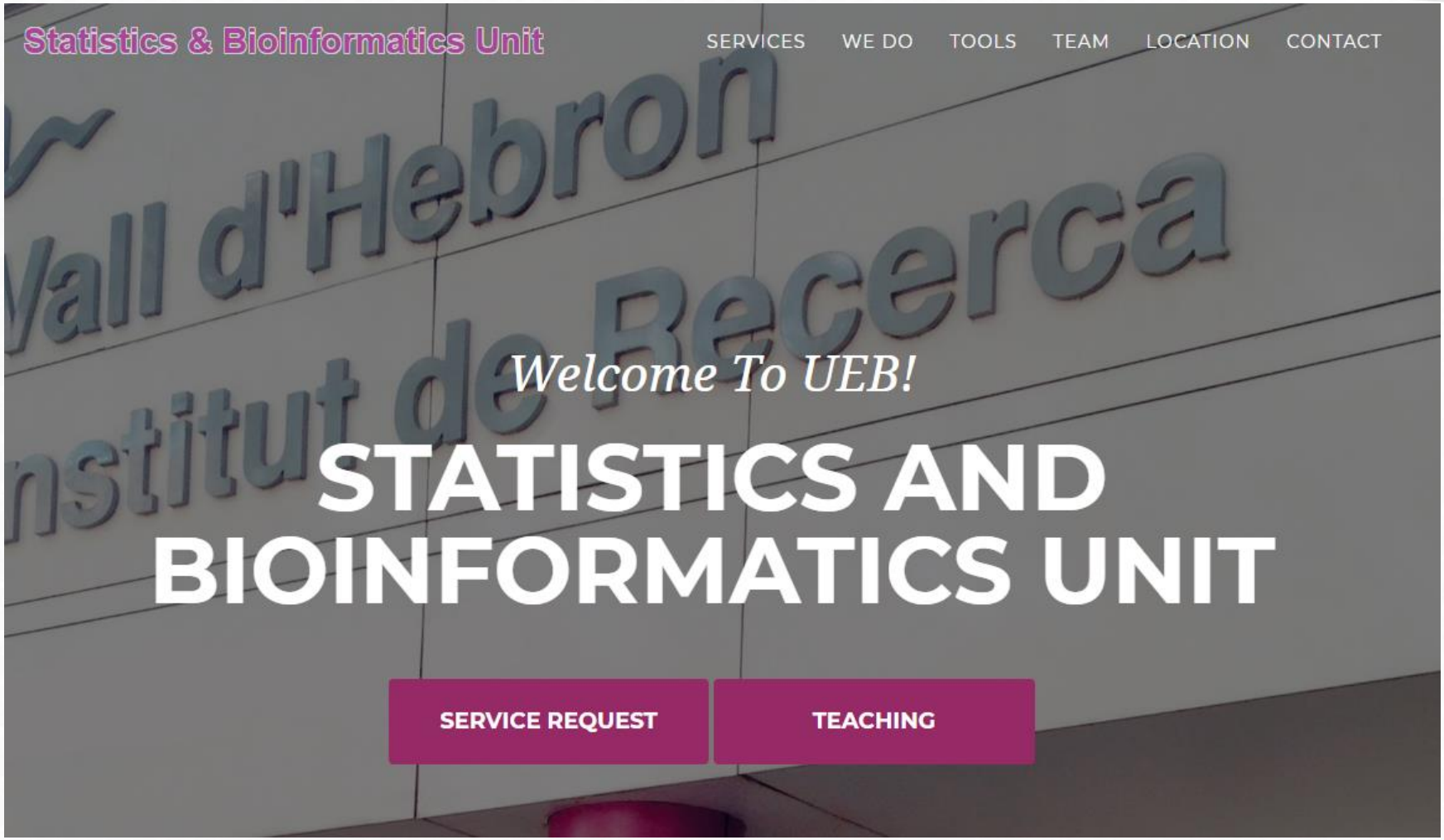
Other services budgeted according our rates:
http://ueb.vhir.org/Services

1. UEB Presentation

UEB teaching activities:

- Annual scheduled courses:
  - ✓ Basic Statistics for biomedical research
  - ✓ Advanced Statistics for biomedical research
  - ✓ **Bioinformatics for biomedical research**
- Participation in VHIR Annual Master (Translational Biomedical Research)
- 'On demand' Courses
- Statistics Pills **(back in January 2022!)**

1. UEB Presentation



http://ueb.vhir.org/

1. UEB Presentation

Where we are?

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Why this course?

- Current biomedical research often has to do (either as “Input” or “output”) with massive quantities of biological information
- Some of this requires sophisticated tools of methods
- Other can be managed with basic knowledge of simple tools
- Researchers and/or technicians must know
  - How to deal with basic problems
  - How to recognize complex situations
  - How to communicate with specialists and understand their questions, proposals and work.

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Goals and Expected Output

- The main objective is to provide a (biased) overview of some of the most commonly used bioinformatics methods and tools in biomedical research.
- At the end of the course you should ...
  - Have an overview of the main areas of bioinfomatics.
  - Recognize some problems whose solution requires a bioinformatics approach.
  - Recognize a variety of bioinformatics problems
  - Know how to solve some of them using online bioinformatics tools or adapting R scripts provided in the course (or found in the web).
  - Know when to ask for a bioinformatician's help and understand the solution proposed.

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Methodology

- This is an applied bioinformatics course.
- Most work based on examples & real data
- Intended for non-programmers:
  - Most tools presented will have a GUI
  - We will do an introduction to R because doing Bioinformatics also means some scripting.

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Practical infos

- Classroom course: Aula d'Informàtica Pavelló Docent UAB Campus Vall d'Hebron – Mòdul Sud
- Please keep your mask on!
- 5 Sessions from 9:30-13:50 h

  2h (theoretical session) + 20min break + 2h (practical session)
- In each session: Main professor + Support professor
- Certificate of Assistance after the course
  - Sheet of signatures at the end of each class
- Satisfaction Survey will be sent to you after the course
- Any doubts/questions/comments: ueb@vhir.org

2. Course Presentation

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Contents

Sessions: 2h + 2h (20 min break)

Session 1 – Wednesday 17th november

- Introduction to Bioinformatics and Databases for Molecular Biology
- Introduction to R/Rmarkdown and Bioconductor. Hands On

Session 2 – Monday 22nd november

- Introduction and applications of Next Generation Sequencing
- Managing NGS data with Galaxy. Hands On

Session 3 – Wednesday 24th november

- Introduction to Variant Analysis
- Running a variant analysis workflow on Galaxy. Hands On

Session 4 – Monday 29th november

- Introduction to RNA-seq Analysis
- Running a Differential Expression Analysis on R. Hands On

Session 5 – Wednesday 1st december

- Introduction to Biological Significance Analyses (Pathway Analysis)
- From Gene lists to Pathways. Hands On

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Course materials

- Slides posted on UEB's website before each session
- Software
  - Online tools
  - Galaxy webserver
  - R & Bioconductor already installed in class computers
- Links and resources from the web
  - List of journals and books

2. Course Presentation

Course materials

https://uebvhir.github.io/Course_Bioinformatics_2021.html