Applied Statistics

JESUS PLANAGUMA AND NICOLAS MATEOS

October 30, 2026 to November 27, 2026

Mir-Puig Seminar Room

This workshop is designed for PhD students, postdocs, staff researchers, and master's students in bio-related fields at ICFO. No prior knowledge of biostatistics is required. Participants will learn to design robust studies, analyze complex biological data, and interpret statistical results with confidence. Through hands-on exercises, case studies, and discussions, they will develop a strong foundation in statistical methods used in biomedical research. The workshop will also enhance their ability to critically evaluate scientific literature and effectively apply statistical tools in their own projects.

Dates: October 30 th November 6 th, 13 th, 20 th, 27 th

Target audience: PhD students, staff researchers, postdoctoral fellows, and students in bio-groups and experimental groups.

Training content:

General introduction to statistics: o Fundamental statistical concepts

o Types of variables, statistical units, null hypothesis, statistical significance, p-value
o Descriptive statistics (mean, median, variance, etc.) with visual examples
o Data visualization: histograms, boxplots, violin plots, scatter plots, etc.
o Exploratory data analysis: univariate, bivariate, multivariate
o Software overview: SPSS, Prism, OriginPro, Python, MATLAB, R Studio, JASP
o Example and exercise

Distributions o Gaussian/normal distributions and non-normal distribution examples

o Exercises

Normality tests o Importance of normality testing

o Explanation of different normality tests with examples
o Graphical and numerical tests
o Application to real datasets
o Data transformation: converting non-normal data to normally distributed data
o Exercises

Parametric and non-parametric tests (Statistical tests) o Parametric tests: t-test, ANOVA, etc., with examples

o Non-parametric tests: Wilcoxon test, Kruskal-Wallis, Mann-Whitney, etc., with examples

Power analysis o Example related to animal ethics: mandatory power analysis to minimize th impact on animal experiments

o Exercise: calculating power analysis for a given experiment

Interpretation of data results. o Comprehensive exercise covering all concepts

o Graphical representation of data

Training methods

This course is highly practical and tailored to the needs of researchers actively engaged in experimental work. It focuses on statistical tools most relevant to real-world biomedical and experimental research, ensuring that participants can directly apply what they learn to their projects.

The course follows an interactive format, combining theoretical lectures with hands-on exercises to reinforce key concepts and promote critical thinking. Active participation and discussions are encouraged throughout, allowing students to deeply engage with the material and clarify doubts in real time.

Participants will gain experience using JASP, a free and user-friendly statistical software, which will be used in practical sessions for data analysis. This approach facilitates intuitive learning and enables students to focus on statistical reasoning without the barrier of complex coding.

By the end of the course, students will not only understand core biostatistical principles but will also be confident in applying them using modern, accessible tools to analyze and interpret their own experimental data.

Trainers

Dr. Jesus Planaguma holds a degree in Biochemistry from the University of Barcelona and a PhD in Biochemistry from the Autonomous University of Barcelona. He has completed two postdoctoral stays in the Departments of Biomedicine at the University of Helsinki (Finland) and the University of Bergen (Norway). Currently, he is a senior researcher at the Clinic Foundation for Biomedical Research and a visiting researcher at the Institute of Photonic Sciences (ICFO). His professional career is focused on biomedicine, particularly in the field of neuroscience, where he has specialized in advanced optical microscopy, including laser confocal and super-resolution microscopy. Additionally, he has extensive expertise in image processing and analysis, as well as molecular and cellular biology techniques, including the

establishment of primary and neuronal cell lines. He also has significant experience in handling experimental animals.

Dr. Nicolas Mateos holds a degree in Physics Engineering and a PhD in Photonics from the Universitat Politecnica de Catalunya (UPC), as well as a master's in biomedical engineering from the University of Twente (Netherlands). His doctoral research focused on advanced single-molecule fluorescence tools to reveal spatiotemporal multi-molecular interactions in living cells, bridging the fields of photonics and cellular biophysics to uncover the dynamic complexity of molecular processes in real time. Currently, Dr. Mateos is a staff researcher at the Super-Resolution Light Microscopy and Nanoscopy (SLN) facility, where he specializes in bioimage

data analysis. He develops innovative computational tools to interpret microscopy data and leads data management initiatives to ensure that all facility-generated data adhere to FAIR principles-Findable, Accessible, Interoperable, and Reusable. Through his interdisciplinary expertise, Dr. Mateos is advancing the frontiers of quantitative imaging, helping facility users conduct their research with cutting-edge tools.

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