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## Horizon Europe MSCA 2021 – Doctoral Network CohesiNet

### *Training Course*

### *“Think Statistics and Probability Theory”*

*Webinars held on 17-19-21 May 2025*

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#### **Objective**

This course provides an introduction to applied statistics which is indispensable for any scientific investigation. We will focus on the intuition behind the methodology rather than on a mathematically rigorous presentation. Although the calculation examples are written in the R statistical programming language, we concentrate on general statistics knowledge, rather than on "how to run a given test in R".

After completing the course, the participants shall be able to select and carry out hypothesis tests appropriate to the scientific question being investigated. Furthermore, they shall be able to interpret statistical results correctly.

#### **Description**

The course consists of the following major parts:

- Sampling theory: obtaining information about a population via sampling. Sample characteristics (location, dispersion, skewness).
- Central Limit Theorem and the Normal distribution.
- The distribution of the sample mean. Confidence interval (C.I.).
- Basic principles of hypothesis testing. Student's t-test derived from C.I.-s.
- Type I and Type II errors. P-value distributions. Power calculations.
- "Cookbook of tests": distribution tests, parametric and non-parametric tests, counting statistics, contingency tables, correlation tests.

#### **Methodology**

Instructor-led lectures (in English) with numerous small hands-on exercises written in R, using a Web-based (Jupyter) programming environment. The lectures are complemented by simple "homework" assignments that the participants can work on at their own pace.

#### **Prerequisites**

- Basic familiarity with the R programming language is required for the "homework" assignments.
- Working knowledge of high-school calculus (differential quotients, integrals).
- Familiarity with the basics of probability theory.

#### **About the instructor**

Dr András Aszódi (VBCF GmbH, Vienna) is an experienced computational biologist who has been teaching programming and statistics at various universities for over 15 years.