Preparatory course in
Mathematics and Statistics
MA Programme in European and Global Studies (EGOS)
September 2022, University of Padova
Syllabus

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Language: English

Purpose of this preparatory course:
- To refresh some mathematical and statistical concepts
- To introduce new notions that will be used later on in the course of the master's program

Pre-requisites: High-school level of mathematics.

Structure: Theory+Exercises. Handouts with concise lecture notes can be found on SESP.
If time allows, in the end of each lecture we will review a political science/international relations paper that draws upon math/stat concepts covered in class.

Venue: Aula B1 (PALAZZO CA' BORIN Via del Santo 22).

Programme

Topics in Mathematics

1. 13 September 9-11 am (2 hours).
Part I: Functions. Domain, co-domain, range. Types of functions. Increasing and decreasing functions. Linear functions and their slopes. Graphical representation of parental functions.
Part II: Exponents and their properties. Logarithms and their properties.

2. 14 September 9-11 (2 hours).
Derivatives. Definition and graphical representation. Rules for computing derivatives. Derivatives of exp and log.

3. 15 September 9-11 (2 hours).
Functions of several variables. Definition. Graphic representation. Partial derivatives. The Chain rule.

4. 16 September 9-12 (3 hours).
Introduction to Matrix Algebra. A vector. A matrix. Operations with matrices: addition, subtraction, multiplication, transposition. Tensors in Machine Learning.

Topics in Statistics

5. 19 September 9-11 (2 hours).
Probability: definitions. Properties of probability. Conditional probability and Bayes Rule.

6. 20 September 9-11 (2 hours).
Random variables. Sample space. Discrete and continuous random variables. Probability mass distribution.

7. 21 September 9-10 (1 hour).
Expected value, variance, standard deviation. Histograms. Correlation vs. covariance vs. causation.
10-11 (1 hour).
The ubiquitous normal distribution. The Law of Large Numbers. The Central Limit Theorem. Properties of a normal distribution, including mean and variance.