ORGANIZING COMMITEE

Consiglio Nazionale delle Ricerche
IRCrES
ISTITUTO di RICERCA sulla CRESCITA ECONOMICA SOSTENIBILE
RESEARCH INSTITUTE on SUSTAINABLE ECONOMIC GROWTH

ORGANIZING COMMITEE
Dr. Antonio Zinilli (IRCrES-CNR)
Dr. Giovanni Cerulli (IRCrES-CNR)
Dr. Emanuela Reale (IRCrES-CNR)
Dr. Alessia Fava (IRCrES-CNR)

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RISIS2 EU Project

ORGANIZATIONAL DETAILS

The course will take place in Rome (Via dei Taurini 19) from **February 20th, 2023 to February 24th, 2023.**

Maximum number of participants for the course is 20. Participants will be selected on the basis of their interests and CV.

Notification of acceptance and request of confirmation will be sent after the selection process is completed. No fee to be paid for researchers from European Institutions. Travel and accommodation will be covered only in case of researchers, early researchers and PhDs coming from European Institutions. Travel and accommodation will be in charge of the organization.

DEADLINE FOR APPLICATION
30th **November 2022**

Applications and CV must be sent to:

winter.school@ircres.cnr.it

PARTICIPATION REQUIREMENT

Research track-record, with a preference for quantitative studies

Knowledge on basic principles of statistics

Interest in STI studies

RISIS

RESEARCH INFRASTRUCTURE FOR SCIENCE AND INNOVATION POLICY STUDIES

DATA SCIENCE WINTER SCHOOL

Tools and methods for analysing complex Science, Technology, and Innovation (STI) systems: A gentle introduction to Network Science (NS), Machine Learning (ML) and Spatial Models (SM)

From 20th to 24th February 2023

This project is funded by the European Union under Horizon2020 Research and Innovation Programme Grant Agreement n°824091

COURSE OBJECTIVES

Recent years have witnessed an unprecedented availability of information on social, economic, and technological phenomena.

Researchers, practitioners, and policymakers have nowadays access to huge datasets (the so-called "Big Data") on people, companies and institutions, web and mobile devices, satellites, etc., at increasing speed and detail.

Relational (big) data are also in a surge, thus documenting an increasing need to shed light on relationships among research and innovation actors.

NS, ML and SM are relatively new techniques able to enlarge our understanding of complex socio-technological systems, either by digging deeply into the data informative power (ML), or by increasing the understanding of the system relational dimension (NS and SM).

AUDIENCE TARGETED

Target audience for this course are researchers in research policy and innovation studies with a quantitative orientation, who aim to extend their competence on ML, NS, and SA analysis.

The course is addressed to:

- Senior scientists, early career researchers and PhD students at the last phase of their training;
- Officers from the policy making level;
- Research associations.

PROGRAM AND CONTENTS

Day 1 – February 20, 2023

14:15-14:45 Registration
14:45-15:00 Welcome
15:00- 17:30 RStudio Introduction Edmondo di Giuseppe (IBE-CNR)

Day 2 – February 21, 2023

MODULE: NETWORK SCIENCE - Antonio Zinilli (CNR IRCrES)
9:30 - 10:30 Basic concepts of Network Science
10:30-11:00 Coffee break
11:00-12:30 ERGMs Introduction and Estimation
12:30-14:00 Lunch
14:00-15:00 Application scenarios (some illustrative examples of Network Science on specific datasets of Science Technology and Innovation (STI) systems)
15:00-16:00 Organization of the laboratory assignments. Creation of groups and provision of data and teamwork
16:00- 16:30 Coffee break
16:30- 17:30 Young participants' presentation of their assignments (Network models)

Day 3 – February 22, 2023

MODULE: SPATIAL MODELS - Barbara Guardabascio (Università degli studi di Perugia)
09:30-11:00 Spatial models: fundamental concepts
11:00-11:30 Coffee break
11:30-13:00 Estimating spatial models in R
13:00-14:00 Lunch
14:00-15:00 Application scenarios (some illustrative examples of Spatial models on specific datasets of Science Technology and Innovation (STI) systems)
15:00-16:00 Organization of the laboratory assignments. Creation of groups and provision of data and teamwork
16:00-16:30 Coffee break

PROGRAM AND CONTENTS

16:30-17:30 Young participants' presentation of their assignments (Spatial models)

19:30 Social Dinner (Meeting point at Via dei Taurini, 19)

Day 4 – February 23, 2023

MODULE: MACHINE LEARNING – Giovanni Cerulli (CNR IRCrES)
9:30 - 11:00 An introduction to Machine Learning and Data Science for analyzing complex STI systems:

Identification, prediction, trade-offs, and validation approaches
11:00-11:30 Coffee break
11:30- 12:30 Resampling techniques: Bootstrap and Cross-validation
12:30-14:00 Lunch
14:00-15:30 Model selection and regularization: Optimal subset selection; Shrinkage Methods: Lasso, Ridge, and Elastic regression
15:30- 16:00 Coffee break
16:00- 17:00R session with applications to STI datasets

Day 5 – February 24, 2023

MODULE: MACHINE LEARNING – Giovanni Cerulli (CNR IRCrES)
09:30- 11:00 Tree-based models for regression and classification: Bagging, Random Forests and Boosting
11:00- 11:30Coffee break
11:30- 12:30 R session with applications to RISIS datasets
12:30- 13:30 Lunch
13:30- 14:30 Organization of the laboratory assignments
14:30-15:30 Presentation of group work (Machine Learning models)
15:30-15:45 Closing remarks