

ORGANIZING COMMITTEE



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Dr Antonio Zinilli (CNR IRCrES)
Dr Emanuela Reale (CNR IRCrES)
Dr Serena Fabrizio (CNR IRCrES)
Dr Giovanni Cerulli (CNR IRCrES)
Dr Marco De Biase (CNR IRCrES)
Dr Thomas Scherngell (AIT)

Contact person: Marco De Biase (CNR IRCrES)
E-mail: marco.debiase@ircres.cnr.it

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 RISIS2 EU Project

ORGANIZATIONAL DETAILS

The course will take place on **ONLINE PLATFORM** from **February 15th, 2021** to **February 26th, 2021**.

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 fees to be paid by European participants

For Extra European participants: EUR 50,00
Details on Payment will be provided after the selection.

DEADLINE FOR APPLICATION
18th November 2020

Applications and CV must be sent to:
Marco De Biase (CNR IRCrES)
marco.debiase@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

WINTER SCHOOL

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

From 15th to 26th February 2021



This project is funded by the European Union
under Horizon2020 Research and Innovation
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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.

Network Science (NS), Spatial Models (SM) and Machine Learning (ML) 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

*Remote workgroup

Students will have 1 day to work remotely between each assignment (17, 22, 25 February). During this days, each group will have 1 hour dedicated session of tutoring with modules instructors.

Day 1 – February 15, 2021

14:45-15:00 Welcome (Emanuela Reale – CNR IRCrES)

15:00-17:30 RStudio Introduction (Edmondo Di Giuseppe – CNR IBE)

Day 2 – February 16, 2021

MODULE: NETWORK SCIENCE - Antonio Zinilli (CNR IRCrES)

9:30 - 10:30 Basic concepts of Network Science

10:30-11:00 Break

11:00-12:30 ERGMs Introduction and Estimation (Markov Chain Monte Carlo estimation for exponential random graphs)

12:30-14:00 Break

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

REMOTE WORKGROUP February 17, 2021

Day 3 – February 18, 2021

MODULE: NETWORK SCIENCE - Antonio Zinilli (CNR IRCrES)

10.00-12.00 Young participants' presentation of their assignments (Network models)

Day 4 – February 19, 2021

MODULE: SPATIAL MODELS - Thomas Scherngell and Martina Neuländtner (AIT)

9:30 - 11:00 Spatial models: Basic concepts and classes

11:00-11:30 Break

11:30-13:00 Estimating spatial models in R

13:00-14:00 Break

14:00-15:00 Organization of the laboratory assignments.
Creation of groups and provision of data and teamwork

PROGRAM AND CONTENTS

REMOTE WORKGROUP February 22, 2021

Day 5 – February 23, 2021

MODULE: SPATIAL MODELS - Thomas Scherngell and Martina Neuländtner (AIT)

10:00-12:00 Presentation of group work (Spatial models)

MODULE: MACHINE LEARNING - Giovanni Cerulli (CNR IRCrES)

14:30-16:00 An introduction to Machine Learning and Data Science for analyzing complex STI systems: Identification, prediction, trade-offs, and validation approaches

16:00-16:30 Break

16:30- 17:30 Resampling techniques: Bootstrap and Cross-validation

Day 6 – February 24, 2021

MODULE: MACHINE LEARNING - Giovanni Cerulli (CNR IRCrES)

09:30-11:00 Model selection and regularization: Optimal subset selection; Shrinkage Methods: Lasso, Ridge, and Elastic regression

11:00 – 11:30 Break

11:30 – 13:00 Tree-based models for regression and classification: Bagging, Random Forests and Boosting

13:00 – 14:30 Break

14:30 – 15:30 R session with applications to STI datasets

15:30 – 16:00 Organization of the laboratory assignments

REMOTE WORKGROUP February 25, 2021

Day 7 – February 26, 2021

MODULE: MACHINE LEARNING - Giovanni Cerulli (CNR IRCrES)

09:30-11:30 Presentation of group work (Machine Learning models)

11:30-11:45 Closing remarks