*Advanced Methods and Techniques*

*(GEO4-3902)*

*(AMT)*2022

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GEO4-*3902*

Course Manual

# Details

Code GEO4-3902

Period 1

Timeslot D

Level Master

Credits 5

Department Economic geography (Faculty of GeoSciences)

Coordinator Dr. Sergio Petralia ([s.g.petralia@uu.nl](mailto:s.g.petralia@uu.nl), Vening Meinesz building A)

Prior the beginning of the course you should install & familiarize yourself with R software and RStudio following these instructions/tutorials:

* Install R & R Studio: <https://www.datamentor.io/r-programming/#learn-r-tutorial>
* Familiarize with the interface:

<https://www.youtube.com/watch?v=h_Nruq9-NQw>

<https://scpoecon.github.io/ScPoEconometrics/R-intro.html> (Chapter 1 & 2)

# Schedule

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| --- | --- | --- | --- | --- | --- | --- |
| Date  (Time) | Topic | Instructor  (Place) |  | Date  (Time) | Topic | Instructor  (Place) |
| 21/9  (13:15 – 19:00) | Lecture 1 + Lab 1 & 2  (Introduction to R software ) | **PA**  **(Ruppert 042)** |  | 23/9 |  |  |
| 28/9  (15:15 - 17:00) | Lecture 2 (OLS + Prediction) | **Sergio**  **(Ruppert 042)** |  | 30/9  (15:15 – 18:00) | Lab 2 (OLS + Prediction) | **Sergio**  **(BOL 1.206)** |
| 5/10  (15:15 - 17:00) | Lecture 3 (Networks) | **Sergio**  **(Ruppert 042)** |  | 7/10  (15:15 – 18:00) | Lab 3 (Networks) | **Sergio**  **(KBG Pangea)** |
| 12/10 |  |  |  | 14/10  (10:00 – 12:30) | Lecture 4 (Qualitative Methods) | **Ilse**  **(BOL 1.206)** |
| 19/10 | **(Deadline Assignment 1 at Noon)** |  |  |  |  |  |
| 26/10  (13:15 - 17:00) | Poster Group Meetings  **(Deadline Assignment 2 at Noon)** | **Sergio**  **(MS Teams)** |  | 28/10  (9:00 -13:00) | Lab 4 (Qualitative Methods) | **Ilse**  **(BOL 1.065)** |
| 2/11 |  |  |  | 4/11 | **Poster Deadline** |  |
|  |  |  |  |  |  |  |

# Structure of the Lectures & Tutorials

Lectures & Tutorials are structures such that we introduce topics in the lectures by discussing the intuition behind it and building the theory we need to understand them. These lectures are followed by tutorials/labs a where we apply what we learnt in RStudio or other softwares using a concrete example or a particular dataset.

We have some time slots (Q&A sessions) especially dedicated to discuss any issues you may have for your assignments. It is important that you and your group mates try to solve the assignments in advance such that you can request a Q&A session and ask concrete questions.

# Content

Over the past decades several new methods have emerged to deal with problems that are specific to economics and economic geography. In this course we will cover a set of useful topics and methodologies using RStudio/R Software and Nvivo, very popular statistical softwares.

We will cover a diverse set of topics such as: OLS estimation, prediction, network analysis along with more qualitative methods.

We will also embark in a wider debate on the appropriate use of these methods and how they can be used in other contexts (not only in economics or economic geography).

## Learning Objectives

By the end of the course, students should be capable of:

* understanding the rationale and intuition of all the methods described before;
* understanding for which specific problems they are (not) useful;
* presenting results attractively yet analytically sound on a poster;
* being able to understand and manipulate different data structures;

## Others

### Course Materials

This course is completely based on open source or publicly available documentation. At the end of each lecture you will find the links to all the references. Also, see the references section at the end.

### Language of Instruction

Lectures, assignments, labs/tutorials are all in English.

# Deliverables & Evaluation

The course is graded based on 3 items:

1. 2 assignments (based on randomly selected teams of 2): 25% each
2. A poster (based on teams of 2): 50%

### Pass/non-pass

* If the final grade before rounding off is at least 5.50, and besides the poster you have at most one grade below 5.50, you have passed the course.
* If the final grade before rounding off is higher than or equal to 4.00 but lower than 5.50 **and** you have satisfied all the effort requirements (see below), you have the opportunity to improve your grade by means of retaking either the exam or doing an additional assignment to compensate the grade of the first or the second assignment – whichever of these three had the lowest grade. If you pass this additional opportunity, the final grade of the course will be a 6, no matter what your actual weighted average is.
* If the weighted average of all the grades before rounding off is lower than 4.00, or it is lower than 5.50 but you failed the effort requirements, you have failed the course. In this case, you cannot participate in the re-sit of the exam or make an additional assignment to compensate.

### Effort requirements

The required efforts consist of the following elements:

* Mandatory participation in the poster presentations.
* Handing in all assignments on time.

### Assignments

The assignments are undertaken in groups of 2. You are randomly enrolled in one group in each assignment; make sure you contact your group mates early enough to finish the assignment on time.

### Poster

One of the deliverables of this course is a poster that you have to do in a group of 2. You will have, in this case, freedom to choose your class mates to do the Poster with. You will have to choose a topic, devise a research question, and carry out an empirical analysis using any of the method(s) we use in class or any other that you consider appropriate. You can carry out this project gathering data from Eurostat, Statistics Netherlands, or any other source that you may find appropriate. Your poster should include ONE main question or research idea to be tested empirically/presented. You have total freedom to choose the topic and the statistical tool you will use to discuss your idea/research question. Note, however, that you will be evaluated based on the following criteria:

1. Does the abstract set up the problem/idea in a clear and impactful way?
2. Is the methodology you chose appropriate to solve the research question/idea?
3. Does the poster have a clear structure (abstract, introduction, methodology, results, and conclusion)?
4. Does the poster include an impactful visual representation of the results?
5. Does the poster contain enough information for the reader to clearly understand the problem?
6. Is the format of the poster appropriate? It should be made in a reasonable font size such that it can be properly read by somebody standing in front of it.
7. The group presentation on MS Teams

### Poster Presentation

You and your team mates will present the idea for your poster using a presentation of not more than 5 slides and no longer than 5 minutes. You can record the presentation if you want. At that instance you will receive comments to improve your poster, which will be delivered the week after.

### Deadlines

* 19/10 Assignment 1
* 26/10 Assignment 2
* 4/11 Group Poster

# Literature

All literature is compulsory reading; it is necessary for the assignments and will be evaluated. You can find all the links to the references at the end of each lecture.

**Lecture 1:**

References:

- [The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies](https://www.amazon.com/Second-Machine-Age-Prosperity-Technologies/dp/0393350649) by Erik Brynjolfsson & Andrew McAfee  
- [Prediction Machines: The Simple Economics of Artificial Intelligence](https://www.amazon.com/Prediction-Machines-Economics-Artificial-Intelligence/dp/1633695670) by Ajay Agrawal, Joshua Gans & Avi Goldfarb  
- [AI Superpowers: China, Silicon Valley, And The New World Order](https://www.amazon.com/AI-Superpowers-China-Silicon-Valley/dp/132854639X) by Kai-Fu Lee

- <http://www.statmethods.net>  
- <https://pballand.wixsite.com/balland/install-r>

- [The Observatory of Economic Complexity (OEC) website](http://atlas.media.mit.edu/)  
- LeCun, Yann, Yoshua Bengio, and Geoffrey Hinton (2015) [Deep learning](https://www.nature.com/articles/nature14539), *Nature* (you don’t have to understand it all, just skim through it)  
- Pierre-Alexandre Balland, Cristian Jara-Figueroa, Sergio G. Petralia, Mathieu P. A. Steijn, David L. Rigby & César A. Hidalgo (2020) [Complex economic activities concentrate in large cities](https://www.nature.com/articles/s41562-019-0803-3" \l ":~:text=Complex%20economic%20activities%2C%20such%20as,as%20apparel%20or%20paper%20manufacturing.), *Nature Human Behavior*  
- Amazon’s description of their [collaborative filtering AI system](https://www.amazon.science/the-history-of-amazons-recommendation-algorithm)  
- [Why data is the most valuable resource](https://www.economist.com/leaders/2017/05/06/the-worlds-most-valuable-resource-is-no-longer-oil-but-data) according to *The Economist*

**Lecture 2:**

Some notes on linear regression:

* <http://www.mit.edu/~6.s085/notes/lecture3.pdf>

Linear regression in R with examples:

* <https://scpoecon.github.io/ScPoEconometrics/linreg.html>

Linear regression in R with examples:

* <https://www.econometrics-with-r.org/4-lrwor.html>

**Lecture 3:**

Article on the Product Space:

* <https://macro.media.mit.edu/papers/HidalgoKlingerBarabasiHausmannScience2007.pdf>

Article on the principle of relatedness:

* <https://dspace.library.uu.nl/bitstream/handle/1874/367925/Hidalgo2018_Chapter_ThePrincipleOfRelatedness.pdf?sequence=1>

R package to create useful network-related measures:

* <http://econ.geo.uu.nl/peeg/peeg1709.pdf>

A very detail tutorial on network visualization:

* <https://kateto.net/sunbelt2019>

**Lecture 4:**

References :

- Flyvbjerg, B. (2006). Five misunderstandings about case-study research. Qualitative inquiry, 12(2), 219-245.

- Hennink, M., Hutter, I. and A. Bailey (2011) , Qualitative Research Methods, chapter 2 The nature of qualitative research. pp. 8-28. Sage

- Corbin, J. & A. Strauss (2008) Basics of qualitative research, chapter 4 Strategies for qualitative data analysis, pp. 65-85. London: SAGE.

- Crang, M. & I. Cook (2007) Doing ethnographies, chapter 8 Analysing field materials, pp. 131-149. London: SAGE