

Graduate Seminar: Advanced Quantitative Methods
(990402)

Spring Semester 2021

Instructor:

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Virtual Office Hours: Mondays, 2:00-4:00pm

Course Times and Location:

March 19th – June 18th, 2021
Fridays, 12:00-3:00pm
Teams and Research 4, Conference Room

Official Course Description:

This course aims to provide an overview and understanding of some of the more commonly applied statistical techniques. It will cover methods for both continuous data as well as categorical data. The standard setting will be the supervised learning situation in which there is one target variable, the behavior of which is to be predicted by some other variables. We will briefly revise the essentials of confirmatory statistics, including hypothesis testing, significance and power, as well as the ideas behind data reduction, prediction and explanation. The course is 'advanced' in terms of concepts and methods, rather than statistical theory or algebra. The focus will be on real-world applications, discussing the assumptions, limitations and interpretations of a wide range of statistical techniques.

Intended Learning Outcomes:

By the end of this seminar, students should gain:

- familiarity with common multivariate statistical procedures;
- an ability to link theoretical concepts and empirical operationalization;
- an ability to conduct state-of-the-art statistical analyses using R;
- experience in replicating, understanding, and critically commenting on empirical studies in the field of international relations; and
- an ability to assess appropriateness of quantitative techniques for empirical studies in international relations.

Course Organization:

The course is organized into online lectures, tutorials, and occasional lab sessions. The **online lectures** will be **asynchronous**, consisting of pre-recorded videos, quizzes, and tasks that you should watch and complete independently – meaning that *we do not meet as a group for online lectures, but these should be watched and completed on your own*. The online lectures will be made available every Friday afternoon under the respective session on Teams. These online lectures cover the content relevant to the aims of the course, and provide you with opportunities to test and practice your new knowledge. It is intended that you use the time of our scheduled session to do so (**Fridays from 1:30-2:45pm**), but in principle, you can work on the online lecture and tasks at your own convenience throughout the week until the respective tutorial. Please note that the quizzes and tasks that are part of the online lectures are not graded. You are encouraged to post your open questions regarding the lecture or the tasks in the respective channel on Teams until the Thursday (12:00pm) prior to the respective tutorial.

The **synchronous tutorials** typically take place on **Fridays from 12:00-1:15pm** on Teams and in Research 4, Conference Room at Jacobs University.¹ These tutorials will be used to discuss the online materials from the previous week's lecture together with any open questions.

Occasionally, the online lectures and tutorials will be replaced with **lab sessions** (see session plan below). These are intended to offer you dedicated class time to work solely on your research project, while also having the opportunity to consult with me if needed. For these lab sessions, you can choose to work wherever is most convenient – it does not necessarily need to be in the classroom or on Teams. However, I will be available in the classroom and on Teams for consultation if needed.

Please see the session plan below for more details:

¹ This is subject to change according to COVID-19 regulations. Please double check the Session Plan on Teams for the most up-to-date status.

| Week/ Session | Date and Time | Type | Location | Topic and Literature |
|---|--|----------------------------------|---------------------------------------|--|
| W1/S1 | Friday, Mar 19 th 12:00-1:15pm | Tutorial (Synchronous) | Teams | Introduction to the course and each other |
| W1/S2 | Friday, Mar 19 th 1:30-2:45pm | Online Lecture (Asynchronous) | Teams | Introduction to quantitative methods <i>Suggested Reading:</i> Field et al. Ch. 1 |
| W2/S3 | Friday, Mar 26 th 12:00-1:15pm | Tutorial (Synchronous) | Teams and Research 4, Conference Room | Follow-up on Session 2 |
| W2/S4 | Friday, Mar 26 th 1:30-2:45pm | Online Lecture (Asynchronous) | Teams | Introduction to R <i>Suggested Reading:</i> Field et al. Ch. 3 |
| No session on April 2nd due to Good Friday holiday | | | | |
| W3/S5 | Friday, April 9 th 12:00-1:15pm | Tutorial (Synchronous) | Teams and Research 4, Conference Room | Follow-up on Session 4 |
| W3/S6 | Friday, April 9 th 1:30-2:45pm | Online Lecture (Asynchronous) | Teams | Exploring assumptions & exploring data graphically <i>Suggested Readings:</i> Field et al. Ch. 2, 4, and 5 |
| W4/S7 | Friday, April 16 th 12:00-1:15pm | Tutorial (Synchronous) | Teams and Research 4, Conference Room | Follow-up on Session 6 |
| W4/S8 | Friday, April 16 th 1:30-2:45pm | Online Lecture (Asynchronous) | Teams | Comparing two means <i>Suggested Reading:</i> Field et al. Ch. 9 |
| W5/S9 | Friday, April 23 rd 12:00-1:15pm | Tutorial (Synchronous) | Teams and Research 4, Conference Room | Follow-up on Session 8 |
| W5/S10 | Friday, April 23 rd 1:30-2:45pm | Online Lecture (Asynchronous) | Teams | Comparing several means <i>Suggested Reading:</i> Field et al. Ch. 10 |

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|---------|--|----------------------------------|---|--|
| W6/S11 | Friday, April 30 th 12:00-1:15pm | Tutorial (Synchronous) | Teams and Research 4, Conference Room | Follow-up on Session 10 Exam 1 |
| W6/S12 | Friday, April 30 th 1:30-2:45pm | Online Lecture (Asynchronous) | Teams | Correlation <u>Suggested Reading:</u> Field et al. Ch. 6 |
| W7/S13 | Friday, May 7 th 12:00-1:15pm | Tutorial (Synchronous) | Teams or Research 4, Conference Room | Follow-up on Session 12 |
| W7/S14 | Friday, May 7 th 1:30-2:45pm | Online Lecture (Asynchronous) | Teams | Regression I <u>Suggested Reading:</u> Field et al. Ch. 7 |
| W8/S15 | Friday, May 14 th 12:00-1:15pm | Tutorial (Synchronous) | Teams and Research 4, Conference Room | Follow-up on Session 14 |
| W8/S16 | Friday, May 14 th 1:30-2:45pm | Online Lecture (Asynchronous) | Teams | Regression II <u>Suggested Reading:</u> Field et al. Ch. 7 |
| W9/S17 | Friday, May 21 st 12:00-1:15pm | Tutorial (Synchronous) | Teams and Research 4, Conference Room | Follow-up on Session 16 |
| W9/S18 | Friday, May 21 st 1:30-2:45pm | Online Lecture (Asynchronous) | Teams | Logistic regression <u>Suggested Reading:</u> Field et al. Ch. 8 |
| W10/S19 | Friday, May 28 th 12:00-1:15pm | Tutorial (Synchronous) | Teams and Research 4, Conference Room | Follow-up on Session 18 |
| W10/S20 | Friday, May 28 th 1:30-2:45pm | Online Lecture (Asynchronous) | Teams | Categorical data <u>Suggested Reading:</u> Field et al. Ch. 18 |
| W11/S21 | Friday, June 4 th 12:00-1:15pm | Tutorial (Synchronous) | Teams and Research 4, Conference Room | Follow-up on Session 20 Exam 2 |
| W11/S22 | Friday, June 4 th 1:30-2:45pm | Lab (Synchronous) | Teams and Research 4, Conference Room | Group Work/Consultations |

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| W12/S23 | Friday, June 11 th 12:00-1:15pm | Lab (Synchronous) | Teams and Research 4, Conference Room | Group Work/Consultations |
| W12/S24 | Friday, June 11 th 1:30-2:45pm | Lab (Synchronous) | Teams and Research 4, Conference Room | Group Work/Consultations |
| W13/S25 | Friday, June 18 th 12:00-1:15pm | Lab (Synchronous) | Teams | Research Project Presentations |
| W13/S26 | Friday, June 18 th 1:30-2:45pm | Lab (Synchronous) | Teams | Research Project Presentations |
| <p align="center">Research Project Presentation slides due by Friday, June 18th at 3:00pm</p> <p align="center">Research Project Written Report due by Tuesday, August 31st at 12:00pm (noon)</p> | | | | |

Assessment for the 9 CP Version:

The assessment in this version of the course consists of three components: (1) Two short exams; (2) a Research Project Presentation; and (3) a Research Project Written Report.

Two short in-class exams (25%)

- Format: The exams will be open-book and multiple choice. You can make use of any of the materials from the course (e.g., slides, notes, readings) in order to complete the exams.
- Aims: The exams will assess the content of weeks 1 to 5 (Exam 1) and the content of weeks 6 to 10 (Exam 2)
- Submit: Exam 1 will take place during Session 11 in Week 6 (**Friday, April 30th**). Exam 2 will take place during Session 21 in Week 11 (**Friday, June 4th**). Both will be conducted online using MS Forms.

Research project presentation (25%)

- Format: Students will work in groups of three of your own selection.
- Aims: Work on one dataset per group using R. Design a research question, search for relevant information in the dataset. Operationalize one dependent variable, operationalize independent variables, provide descriptive statistics, and provide graphics concerning the descriptive statistics. Report and discuss findings.
- Present: Prepare a 12-minute presentation using PowerPoint or a similar presentation software that demonstrates your skills related to: (1) managing data, (2) analyzing data, and (3) interpreting and reporting results. Be prepared to answer questions from the instructor and classmates about your research project. Presentations will take place in class during the final two session of the course on June 18th.

- Submit: Please submit the slides from your presentation in PDF form. These are due using the Assignments feature of Teams by the close of the final class session. There are not a suggested number of slides, but they should be appropriate for a 12-minute presentation. Please note that the submission of slides without a presentation will not be considered.
- Evaluation: This is a group achievement, with all group members receiving the same grade.
- Due: **Friday, June 18th at 3:00pm** via Assignments on Teams.

Research Project Written Report (50%)

- Format: Students will work with the same groups of three as above, or can instead choose to work individually. You can decide whether you will work as a group or as an individual until the final submission date.
- Aims: Decide on an appropriate statistical analysis (e.g., ANOVA, OLS, logistic regression) for the data and research question prepared for the project presentation described above. Prepare the data and variables for the statistical analysis and run the analysis in R. Provide outputs and graphics concerning the statistical analysis. Report and discuss findings.
- Submit: For a group report, please submit a report of approximately 1,500 words per person. For an individual report, please submit approximately 2,500 total. These are due as a Word or pdf document form via Turnitin.
- Evaluation: For those choosing to work in groups, it is a group achievement, with all group members receiving the same grade. Those working individually will receive an individual grade.
- Due: **Tuesday, August 31st at 12:00pm (noon)** via Turnitin.

Assessment for the 6 CP Version:

The assessment in this version of the course consists of two components: (1) Two short exams; and (2) a Research Project Presentation.

Two short in-class exams (50%)

- Format: The exams will be open-book and multiple choice. You can make use of any of the materials from the course (e.g., slides, notes, readings) in order to complete the exams.
- Aims: The exams will assess the content of weeks 1 to 5 (Exam 1) and the content of weeks 6 to 10 (Exam 2)
- Submit: Exam 1 will take place during Session 11 in Week 6. Exam 2 will take place during Session 21 in Week 11. Both will be conducted using MS Forms.

Research project presentation (50%)

- Format: Students will work in groups of three of your own selection.
- Aims: Work on one dataset per group using R. Design a research question, search for relevant information in the dataset. Operationalize one dependent variable, operationalize independent

variables, provide descriptive statistics, and provide graphics concerning the descriptive statistics. Report and discuss findings.

- Present: Prepare a 12-minute presentation using PowerPoint or a similar presentation software that demonstrates your skills related to: (1) managing data, (2) analyzing data, and (3) interpreting and reporting results. Be prepared to answer questions from the instructor and classmates about your research project. Presentations will take place in class during the final two sessions of the course on June 18th.
- Submit: Please submit the slides from your presentation in PDF form. These are due using the Assignments feature of Teams by the close of the final class session. There are not a suggested number of slides, but they should be appropriate for a 12-minute presentation. Please note that the submission of slides without a presentation will not be considered.
- Evaluation: This is a group achievement, with all group members receiving the same grade.
- Due: Friday, June 18th at 3:00pm via Assignments on Teams.

How to Do Well in the Course:

This course covers a lot of information in a relatively short time, with the goal of allowing you to gain practical skills related to advanced quantitative methods. A variety of materials, resources, and learning formats will be offered to help you make the most of the course. It is expected that you take an active role in your learning by preparing the materials in advance, thinking critically about the tasks to be done, and participating in class discussions.

In order to practice these skills related to the course, you have the opportunity to work in groups of three on conducting out a small research project together. Group work can sometimes be a challenge, but being able to collaborate, bounce ideas off each other, and share the workload will be to your advantage. A private group channel will be created for each group to help you structure your work so that it is fair and productive, and to ease communication both with each other and with me.

Course Materials:

The course is organized primarily using MS Teams. You will find all materials, including the syllabus, lecture videos, quizzes, suggested readings and tasks organized according to session channels. All relevant announcements and information will be shared via Teams.

This course does not have required readings, but there are suggested readings for lecture sessions which are recommended for your benefit and understanding. Please refer to the session plan for exact information. The suggested readings will be posted to their respective sessions on Teams. The readings come from the following book, which is also on reserve at the Jacobs University library:

Field, A., Miles, J., & Field, Z. (2012). *Discovering statistics using R*. Thousand Oaks, CA: Sage.

Course Equipment and Software:

Please make sure you have a computer (ideally with a functional camera), a stable internet connection, and MS Teams installed. You will be working with R software throughout the course, but we will discuss how to install this in Week 2 of the course.

For those submitting a Research Project Written Report, it must be submitted via Turnitin, a software that checks for possible plagiarism. At least one person in your group is responsible for registering for the Turnitin classroom and ensuring that Turnitin is set-up and functioning properly. In order to avoid last minute technical problems, make sure to submit the Research Project Written Report well in advance of the deadlines.

Course Communication:

You are always welcome to send me an email or a chat message via Teams if you have any questions, and I will do my best to answer in a timely manner (Monday through Friday, during normal working hours). But please consider the following questions before doing so:

- Have you included your name and which course you have a question about?
- Have you been specific about the question you are asking?
- Have you double-checked to make sure that the answer to your question is not on the syllabus or Teams?