

GRAD-E1354: Data Science and Decision Making

Concentration: Policy Analysis

Will Lowe/Slava Jankin

1. General information

Class time	Tue, 14-16h
Course Format	This course is taught online only via the platform Clickmeeting/Teams. Clickmeeting/Teams allows for interactive, participatory, seminar style teaching.
Instructor	Will Lowe Slava Jankin
Instructor's office	3.14 3.15
Instructor's e-mail	lowe@hertie-school.org jankin@hertie-school.org
Instructor's phone number	XXX 167
Assistant	Name: Alex Karras Email: karras@hertie-school.org Phone: +49 30 259 219 156 Room: 3.45
Instructor's Office Hours	On request

Link to Module Handbook [MIA](#) and [MPP](#)

Link to [Study, Examination and Admission Rules](#)

Instructor Information:

Will Lowe is Senior Research Scientist at the Hertie School. His research and teaching focuses on statistical text analysis and causal inference. He joins the Hertie School from Princeton after a variety of research, infrastructure, and teaching positions at Mannheim, Maastricht, Nottingham and Harvard, and was Technical Architect at an enterprise software company in the United Kingdom. Will holds a PhD in Cognitive Science from the University of Edinburgh.

Slava Jankin is Professor of Data Science and Public Policy at the Hertie School. He is the Director of the Hertie School Data Science Lab. His research and teaching is primarily in the field of natural language processing and machine learning. Before joining the Hertie School faculty, he was a Professor of Public Policy and Data Science at University of Essex, holding a joint appointment in the

Institute for Analytics and Data Science and Department of Government. At Essex, Slava served as a Chief Scientific Adviser to Essex County Council, focusing on artificial intelligence and data science in public services. He previously worked at University College London and London School of Economics. Slava holds a PhD in Political Science from Trinity College Dublin.

2. Course Contents and Learning Objectives

Course contents:

This course offers students the opportunity to reflect on the extensive methods and techniques they have acquired and learn how to make optimal decisions based on the evidence at hand. It also provides relevant insights into the day-to-day operations of data and policy practitioners in the field and how their choices affect the work of their organisations at large. The course begins with a formal introduction to decision theory and how to reason under a multitude of choices, information and data sources, especially when the decision taken will have real-world consequences. Following this, the second part of the course will feature practitioners from government, industry and non-profit organizations to explain in detail how these principles and theories are applied in reality. Depending on availability, the course seeks to include a range of speakers to generate a lively discussion on how data-driven decision-making is implemented in different scenarios and professional settings.

Main learning objectives:

By the end of the course, students should have understood the connection between data science theory and practice and how public policy can employ them for better decision-making, have networked and engaged with professionals from different sectors and obtained a better vantage point on their career paths.

Target group:

Anyone interested in data-driven decision making and public policy.

Teaching style:

Seminars discussing core concepts interspersed with real-world experiences from invited speakers.

Prerequisites:

None.

Diversity Statement:

As you may know, the Hertie School is committed to implementing a new Diversity and Inclusion Strategy. We strive to have an inclusive classroom but ask your informal feedback on inclusivity throughout the course. Through a series of invited speakers the course aims to bring diverse perspectives.

3. Grading and Assignments

Composition of Final Grade:

Assignment 1: Session summary	Deadline: tba	Submit via Moodle	30%
Assignment 2: Policy brief	Deadline: tba	Submit via Moodle	45%

Assignment 3: Discussant	Deadline: tba	Submit via Moodle	25%
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Assignment Details

Assignment 1: Session summary

A 2000 words session summary including a synopsis and critical (personal) reflection of the session reading material and the content and discussions throughout the session, and accompanying practitioner talk. The summary should also outline what you regard as the main takeaways/lessons from the session.

Assignment 2: Policy brief

Groups of 2-3 students will each submit a "[six-page narrative](#)" (Amazon style) to a senior leadership team (company, government department, NGO, etc) proposing a policy. You may choose any policy in any domain as long as it's realistic and data-driven. Your policy proposal should clearly reflect one or more of the key theoretical concepts of the course.

Assignment 3

As pre-work before the first lecture of the course, students will be asked (through an online poll disseminated over moodle) to choose a lecture topic for which they will be a discussant. For each lecture, up to three students will be assigned to give a brief report (pre-recorded video of about 3 slides / max 5 minutes) and then lead discussion about an aspect of the lecture's substance. Initial preparation should be based on the readings, but questions may be adjusted in response to the lecture. The presenters should coordinate to maximise the learning experience for other students by spreading attention among readings and/or perspectives. Bringing in additional material from other courses or your own research is good practice. Marks though will be individual.

A note on group work: Doing **too much** work (monopolising or controlling agendas) or **too little** (shirking) is not acceptable. Unless notified otherwise, we will assume that all group members worked approximately equally, in accordance with their skills, and all will get equal marks. If a group is suffering one of these two modes of failure, students should first try to address this between themselves, and then second, with the help of the professors. In these cases, there can be individual differences made in marks.

Late submission of assignments: For each day the assignment is turned in late, the grade will be reduced by 10% (e.g. submission two days after the deadline would result in 20% grade deduction).

Attendance: Students are expected to be present and prepared for every class session. Active participation during lectures and seminar discussions is essential. If unavoidable circumstances arise which prevent attendance or preparation, the instructor should be advised by email with as much advance notice as possible. Please note that students cannot miss more than two out of 12 course sessions. For further information please consult the [Examination Rules](#) §10.

Academic Integrity: The Hertie School is committed to the standards of good academic and ethical conduct. Any violation of these standards shall be subject to disciplinary action. Plagiarism, deceitful actions as well as free-riding in group work are not tolerated. See [Examination Rules](#) §16.

Compensation for Disadvantages: If a student furnishes evidence that he or she is not able to take an examination as required in whole or in part due to disability or permanent illness, the Examination Committee may upon written request approve learning accommodation(s). In this respect, the submission of adequate certificates may be required. See [Examination Rules §14](#).

Extenuating circumstances: An extension can be granted due to extenuating circumstances (i.e., for reasons like illness, personal loss or hardship, or caring duties). In such cases, please contact the course instructors and the Examination Office *in advance* of the deadline.

4. General Readings

At the moment there is no single textbook we can use for this course. We will draw from a large number of sources across multiple disciplines.

5. Session Overview

Session	Session Date	Session Title
1	09.02.2021	Introducing decision theory
2	16.02.2021	Formal models of inference under uncertainty
3	02.03.2021	Practitioner talk 1
4	09.03.2021	Formal models of decision making
5	16.03.2021	Practitioner talk 2
Mid-term Exam Week: 22 – 26.03.2021 – no class		
6	30.03.2021	Machine learning and other automated inference & decision tools
7	06.04.2021	Practitioner talk 3
8	13.04.2021	Human learning and decision-making
9	20.04.2021	Practitioner talk 4
10	27.04.2021	Group decision making
11	04.05.2021	Practitioner talk 5
12	11.05.2021	Putting it all together
Final Exam Week: 17 – 21.05.2021 – no class		

6. Course Sessions and Readings

Generally readings will be accessible on the Moodle course site before semester starts. In the case that there is a change in required readings, students will be notified by email. Topical optional readings may be added on short notice due to the rapidly moving nature of the field.

Required readings are to be read and analysed thoroughly. Optional readings are intended to broaden your knowledge in the respective area and it is highly recommended to at least skim them. Discussants should generally fully analyse the optional readings between themselves.

Session 1: Introducing decision theory	
Learning Objective	We discuss theorising information, estimation, decisions, and consequences
Required Readings	https://people.kth.se/~soh/decisiontheory.pdf
Optional Readings	Gintis, H. (2009) The Bounds of Reason. Princeton University Press ch.1 or McCarty and Meirowitz (2007) Political Game Theory. Cambridge University Press ch.2-3

Session 2: Formal models of inference	
Learning Objective	We cover Bayesian inference and its alternatives
Required Readings	Bishop, C. M. (2006) Pattern recognition and machine learning. Springer. ch. 1
Optional Readings	

Session 3: Practitioner talk 1	
Learning Objective	The first speaker (TBD) will cover the real world application of topics covered in Session 2 for decision making.
Required Readings	TBD
Optional Readings	

Session 4: Formal models of decision making	
Learning Objective	We introduce elements of decision theory and social choice
Required Readings	Weatherson, B. (2015) Lecture notes on decision theory. https://brian.weatherson.org/DTBook-15.pdf McCarty and Meirowitz ch.4
Optional Readings	

Session 5: Practitioner talk 2

Learning Objective	The second speaker (TBD) will cover the real world application of topics covered in Session 4 for decision making.
Required Readings	TBD
Optional Readings	

Session 6: Machine learning and other automated inference and decision tools

Learning Objective	We cover data-driven biases, forecasting performance, and generalisation performance.
Required Readings	Tetlock (2005) Expert political judgment.
Optional Readings	

Mid-term Exam Week: 22 – 26.03.2021 – no class

Session 7: Practitioner talk 3

Learning Objective	The third speaker (TBD) will cover the real world application of topics covered in Session 6 for decision making.
Required Readings	TBD
Optional Readings	

Session 8: Human learning and decision-making

Learning Objective	We discuss cognitive biases, forecasting and explanation
Required Readings	Gigerenzer (2002) Reckoning with risk, Penguin
Optional Readings	Glimcher (2004) Decisions, uncertainty, and the brain. MIT Press

Session 9: Practitioner talk 4

Learning Objective	The fourth speaker (TBD) will cover the real world application of topics covered in Session 8 for decision making.
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Required Readings	TBD
Optional Readings	

Session 10: Group decision making

Learning Objective	We discuss “wisdom of crowds”, preference aggregation, deliberation, and “group think”
Required Readings	Chouldechova and Roth (2020) A snapshot of the frontiers of fairness in Machine Learning. Communications of the ACM, May 2020, Vol. 63 No. 5, Pages 82-89
Optional Readings	List, C (2017) Democratic deliberation and social choice: a review. Oxford Handbook of deliberative democracy. Oxford University Press Stevenson, M. (2018) Assessing risk assessment. Minnesota Law Review.

Session 11: Practitioner talk 5

Learning Objective	The fifth speaker (TBD) will cover the real world application of topics covered in Session 10 for decision making.
Required Readings	TBD
Optional Readings	

Session 12: Putting it all together

Learning Objective	Making decisions with a mix of human and automated information sources in a group context. We are going back and assessing how different theoretical concepts of decision making relate to real world practice of decision making, and draw out key lessons.
Required Readings	There are no specific readings for this week. We will revisit previously assigned readings to highlight the unifying themes.
Optional Readings	

Final Exam Week: 17 – 21.05.2021 – no class