# Artificial Intelligence & Natural Language Processing for Decision Making

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***COURSE AIMS AND INTENDED LEARNING OUTCOMES***

The availability of information, together with the ability to handle it efficiently, are the key to carry out any kind of business activity. For this reason, the course aims to explore the key concepts and methodologies to understand to what extend and how technology can support decision-making processes, with a focus on the AI and NLP. In particular, the course will analyze these systems from the point of view of their structure and possible applications, as well as their business models, in order to identify the best conditions in which they can be used. The theoretical analysis will be supported by the concrete application of the concepts and the methodologies explained in class in a specific project case study.

At the end of the course, students will be able to:

1. identify the principles and theories behind decision-making processes and the impact of competitive advantage for companies;

2. understand and compare the features, the criteria for adoption, the strengths and the weaknesses of different kinds of decision-support systems;

3. recognize the effects of technological innovation on the configuration of business models and decision-making processes;

4. evaluate the impact of AI and NLP in designing new decision processes;

5. present a project idea using an appropriate terminology based on a real-case;

6. develop their independent judgement skills, and choose the best option - from a strategic, technological, economic, and ethical perspective - for the creation of business information systems.

***COURSE CONTENT***

1. Introduction to Artificial Intelligence & Foundations of Natural Language Processing (NLP) in decision-making

2. Decision-making processes and information systems in organizations.

3. The different types of decision support systems

4. The life cycle of decision support systems

5. IT Architectures, Data, and IoT for supporting decisions

6. Computational theory of mind and thoughts experiments (the Chinese Room)

7. Make or buy: how to perform a software selection.

8. The business case of technologies

9. The impact of blockchain on decision-making and security of NLP

10. IT security, adversarial attack, model drifts.

11. Ethics and Ethical Codes

12. Compliance with standards and regulations

13. How to assess ethical risks

14. Extension of Kahneman’s decision-making theory

15. Relevance of Explainable AI in the decision-making process

16. AI applications in decision-making

17. NLP applications in decision-making

18. Business Foresight of NLP

19. Ethical Foresight Analysis of NLP

20. Translational issues

21. Auditing Certification

***READING LIST***

[All the readings reported below are not mandatory for the exam]

Agrawal, A., Gans, J., & Goldfarb, A. (2018). *Prediction Machines: The Simple Economics of Artificial Intelligence*. Harvard Business Review Press.

Ariely, D. (2008). *Predictably irrational: The hidden forces that shape our decisions*. HarperCollins Publishers.

Floridi, L., & Chiriatti, M. (2020). GPT-3: Its Nature, Scope, Limits, and Consequences. In *Minds and Machines* (Vol. 30, Issue 4, pp. 681–694). https://doi.org/10.1007/s11023-020-09548-1

Johnson, R. L., Pistilli, G., Menédez-González, N., Denisse, L., Duran, D., Panai, E., Kalpokiene, J., & Bertulfo, D. J. (2022). The Ghost in the Machine has an American accent: value conflict in GPT-3. *Arxiv*. https://arxiv.org/abs/2203.07785v1

Kahneman, D. (2011). *Thinking, Fast and Slow*. Penguin Press.

Pearl, J., Mackenzie, D. *The Book of Why. The new science of cause and effect*, Penguin Books, Londra 2018.

Schwartz, Barry, 1946-. *The Paradox of Choice: Why More Is Less*. New York : Ecco, 2004.

Thaler, R. H., & Sunstein, C. R. (2008). *Nudge: Improving decisions about health, wealth, and happiness*. Yale University Press.

Zalta, E.N. (ed.), “The Chinese Room Argument”, The Stanford Encyclopedia of Philosophy, Stanford University.

***TEACHING METHOD***

Lectures (in English) with exercises.

Insights by external guests are expected.

***ASSESSMENT METHOD AND CRITERIA***

Written exam to verify the degree of acquisition of the course contents.

In particular, questions are about two main kinds of contents:

(a) theoretical aspects of the decision-making process and how it could be impacted by a data-driven inference: describing informational deformations, financial impact, and ethical risks.

(b) practical comparative study: analyzing the difference between a company that used NLP to improve its customer service with a case study of a government agency that used NLP to analyze public opinion on a specific issue.

In terms of assessment criteria, there is no difference between the questions about the theoretical contents of the course and those on the practical aspects.

***NOTES AND PREREQUISITES***

Given the introductory nature of the course, no prior specific expertise in computer science is required, apart from basic competence (e.g. using a web browser).

*Place and time of consultation hours*

On appointment, before or after the lesson.

Place: CIRCSE Research Center, Franciscanum building,