

# Heuristics for the Management of Uncertainty and Complexity; Nudging, Boosting & Behavioral

Lake Como School of Advanced Studies, June 21-24, 2022

Home Program Applications Registration Venue and accommodation Contact Q



## Home

### \*Summer school announcement\*

Heuristics for the Management of Uncertainty and Complexity; Nudging, Boosting & Behavioral Insights June 21 – 24, 2022, Villa del Grumello, Como Lake (CO), Italy.

organized by the University of Milano-Bicocca in collaboration whit the Como Lake School of Advanced Studies and the Fondazione Volta.

Intended Participants:

About 30-40 students (graduate and undergraduate students, Ph.D. students, post-docs, young faculty)

### Lecturers:

- Katsikopoulos (University of Southampton)
- Macchi (University of Milano-Bicocca)
- N. Marewski (HEC Lausanne)
- Martignon (Ludwigsburg University of Education)
- Mousavi (Max Planck Institute for Human Development, Berlin)
- Vagharchakian (French Institute of Health and Medical Research)
- Viale (University of Milano-Bicocca)

Format: The Summer School aims at providing an overview and a toolkit about Risk Literacy, Heuristics for decision making processes and Behavioral insights, and Communication heuristics. On mornings lessons will be held, while the afternoon will be dedicated to teamwork and questions. On the last day, there will be presentations of group works with Prize-giving.

## Course contents:

- Risk and Uncertainty from an Epistemological perspective: introduction to heuristics and risk literacy
- Which heuristics, in which decision-making environments?
- Nudge, Boosting & Behavioral Insights
- · Communication heuristics and decision making

### Laura Macchi & Riccardo Viale

Co-directors, Summer School University of Milano-Bicocca Behavioral Insights Bicocca Research Group www.unimib.it



## Heuristics for the Management of Uncertainty and Complexity; Nudging, Boosting & Behavioral Lake Como School of Advanced Studies, June 21-24, 2022

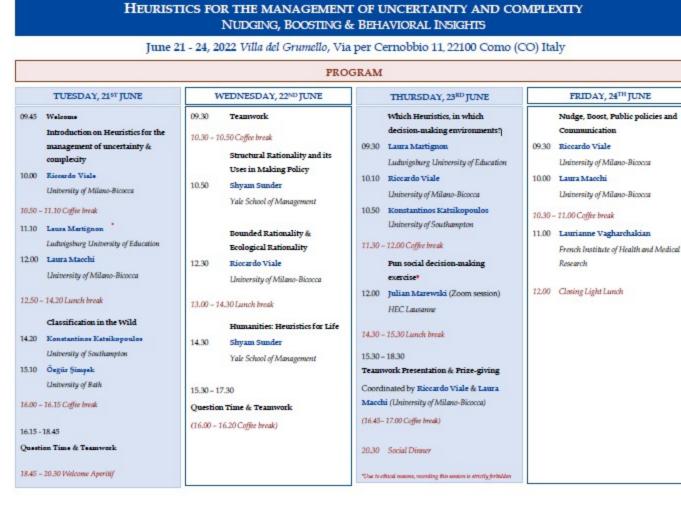
Home Program Applications Registration Venue and accommodation Contact



Summer School 2022

Q

LAKE COMO SCHOOL OF ADVANCED STUDIES



#### riccardo.viale@unimib.it Gallese, V., Mastrogiorgio, A., Petracca, E., & Viale, R. (2021). Embodied Bounded Rationality. In R. Viale (Ed.). Handbook on Bounded Rationality. London: Routledge.

INTRODUCTION ON HEURISTICS FOR THE MANAGEMENT OF UNCERTAINTY & COMPLEXITY From cartesian to 4e's Bounded Rationality

> Viale, R. (2022). Beyond the limits of decision making: from problem solving to problem enacting. In G.



TUESDAY, 21<sup>ST</sup> JUNE 10:00

Summer School HMUC Director

University of Milano-Bicocca

Laura Martignon

Riccardo Viale

Gigerenzer, R. Viale, & S. Mousavi (Eds.). Companion to Herbert Simon. Cheltenham: Edward Elgar Publishing. Various models of Bounded Rationality will be described and justified. There are five models: Optimization under Constraints; Pathology of Rationality; Bounded Rationality As Narratives Of Reasonable Deviations; Procedural Bounded Rationality; Ecological Rationality. One of the central pillar of BR is the theory of cognition that characterizes the interaction with the environment. The mains theories are the Cartesian Mind, The Brain in the Vat, the Narrow Embodied Cognition and the Wide Embodied Cognition

SUGGESTED READINGS

(Ed.). Nudging. The MIT Press.

Viale, R., (2022). Irrational Or Adaptive? In R. Viale

Ludwigsburg University of Education Martignon, L., Laskey, K. Statistical literacy for martignon@ph-ludwigsburg.de classification under risk: an educational perspective. AStA Wirtsch Sozialstat Arch 13, 269-278 (2019). https://doi.org/10.1007/s11943-019-00259-3 TUESDAY, 21<sup>ST</sup> JUNE

INTRODUCTION ON HEURISTICS FOR THE MANAGEMENT OF UNCERTAINTY & COMPLEXITY An introduction to the history of risk & risk literacy



'readiness' - to be sensitive to situations where risk plays a role.

After an introduction to the history of risk, we discuss risk literacy, made up of four components: · Detecting risk and uncertainty: The first component depends on a psychological disposition or

SUGGESTED READINGS

Macchi, L., Bagassi, M. (2021). Bounded rationality and

problem solving. The interpretative function of thought. In

SUGGESTED READINGS

### modelling and representing can be facilitated by tools developed from elementary probability and statistical literacy for estimating key features of risky situations. Dealing with trade-offs (by reflecting on and comparing alternatives): The third component of Risk

Literacy builds on the first two and requires the ability to compare alternatives and deal with risk-Making decisions and acting: The fourth component involves decision making as the result of a

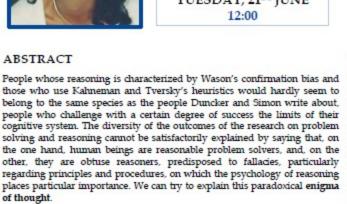
conscious or deliberative process based on features characterizing situations.

 Analysing and representing risk (and modelling risky situations): The second component consists of analyzing, modelling and representing risky situations; this requires basic instruction. Analyzing,

- INTRODUCTION ON HEURISTICS FOR THE MANAGEMENT OF UNCERTAINTY & COMPLEXITY The enigma of thought: problem solving vs. Reasoning and decision making Laura Macchi
- laura.macchi@unimib.it R. Viale (Ed.) Handbook on Bounded Rationality. London: Routledge, 131-154. Bagassi, M., Macchi L. (2016). The Fundamental Interpretative Function and the Emergence of Unconscious Analytic Thought. TUESDAY, 21<sup>ST</sup> JUNE In L. Macchi, M. Bagassi, R. Viale (Eds). Cognitive Unconscious

#### and Human Rationality. MIT Press, Cambridge, pp. 43-76. Problem solving is an original contribution of psychology; it is a completely new field of research and therefore unpolluted by any backdrop of speculation or theories that can affect other consolidated People whose reasoning is characterized by Wason's confirmation bias and

areas of study.



the one hand, human beings are reasonable problem solvers, and, on the other, they are obtuse reasoners, predisposed to fallacies, particularly regarding principles and procedures, on which the psychology of reasoning places particular importance. We can try to explain this paradoxical enigma We consider that the legacies of the extrapsychological disciplines, such as

Summer School HMUC Director

University of Milano-Bicocca

general adaptive heuristic interpretative function, essentially aimed at identifying relationships, to handle non-univocal information from the real world. The search for meaning, in view of an objective, characterizes every activity of the human cognitive system at all levels, from perception to language and to reasoning. Rather than abstracting from contextual elements, this function exploits their potential informativeness. The human capacity of interpreting and creating meaning emerges from experimental evidence as cross-cutting cognitive processes. This perspective is supported by evidence from our research on reasoning.

In the study of insight problem solving in particular, it emerges a

fundamental and general characteristic of human thinking, its

interpretative and communicative nature. Human beings are moved by a

THE SCIENCE AND ART OF TRANSPARENT DECISION MAKING Konstantinos Katsikopoulos University of Southampton K.Katsikopoulos@soton.ac.uk TUESDAY, 21ST JUNE

SUGGESTED READINGS Katsikopoulos, K., Simsek, O., Buckmann, M., Gigerenzer, G. (2021). Classification in the Wild: The Science and Art of Transparent Decision Making. The MIT Press.

## simplicity and transparency are not necessarily enemies of accuracy.

THE SCIENCE AND ART OF TRANSPARENT DECISION MAKING Ozgür Şimşek SUGGESTED READINGS University of Southampton O.Simsek@bath.ac.uk Katsikopoulos, K., Simsek, O., Buckmann, M., Gigerenzer, G. (2021). Classification in the Wild: The Science and Art of Transparent Decision Making. The TUESDAY, 21<sup>ST</sup> JUNE ABSTRACT

conceptual and historical connections to cognitive psychology.

Limitations of behaviorally informed policy under social interaction." Journal of Bahavioral Economics for Policy, Vol. 2, No. 1, pp. Sunder, Shyam. "Markets as Artifacts: Aggregate Efficiency from Zero-Intelligence Traders." In Models of a Man: Essays in Memory of Herbert A. Simon edited by M. E. Augier and J. G. March, 501-520. Cambridge, WEDNESDAY, 22ND JUNE MA: MIT Press 2004 Arrow, Kenneth I, and Sunder, Shyam and Forsythe, Robert and Litan. Robert E. and Zitzewitz, Eric W. and Gorham, Michael and Hahn, Robert W. and Hanson, Robin and Kahneman, Daniel and Ledyard, John O. and Levmore, Saul and Milgrom, Paul R. and Nelson, Forrest D. and Neumann, George R. and Ottaviani, Marco and Plott, Charles ABSTRACT R. and Schelling, Thomas C. and Shiller, Robert J. and Smith, Vernon L. In the latter half of the twentieth century, Herbert Simon and his colleagues and Snowberg, Erik C. and Sunstein, Cass R. and Tetlock, Paul C. and Tetlock, Philip E. and Varian, Hal R. and Wolfers, Justin, Statement on Prediction Markets (2007). AEI-Brookings Joint Center Related identified and documented how actual human behavior differs in important ways from the optimizing conception of economic man. In contradistinction to substantive rationality assumed in economics, they labeled it procedural rationality, characterized by successive attempts to reach near the goal through Publication No. 07-11.

STRUCTURAL RATIONALITY AND ITS USES IN MAKING POLICY

Shyam Sunder

Yale School of Management shyam.sunder@yale.edu SUGGESTED READINGS

Reijula, Samuli, Kuorikoski, Jaako, Ehrig, Timo, Katsikopoulos, Konstantinos, and Shyam Sunder. "Nudge, Boost or Design?

The apparent incompatibility between cognitively limited humans on one hand,

and efficient processing of information in markets populated by them on the other, happens to be resolvable. The concept of emergence from complexity

theory points to aggregate level phenomena whose properties are not derivable

from the properties of their own components. The concept of structural rationality recognizes that, beyond substantive and procedural versions rooted in individuals, social structures possess rationality of their own, largely

In the second part of this session we discuss policy implications and potential

independent of the rationality of people who populate them.

uses of emergence and structural rationality:

## focuses on resolving this puzzle-square the circle of social sciences, so to speak-through concepts, models, and data: the concepts are complexity, emergence, and structural rationality; models are heuristics of human behavior markets populated with aleorithmic traders.

simple means-end heuristics. These seminal ideas soon gave rise to behavioral

Beginning with a decade earlier, F. A. Hayek proposed markets as a vast

decentralized mechanism that aggregates and dissemination information dispersed among people as they go about doing their work and living their

lives, unaware of this function of, and their own role in, markets. The so-called efficient market theory is the result of this line of thinking. Behavioral

economics questions if human beings, with their known cognitive limitations

and lack of sophisticated understanding in economics and decision theory, can achieve efficient outcomes. Data from the field and laboratory reveal that such

WEDNESDAY, 22ND JUNE ABSTRACT Ecological rationality characterizes itself as based on a Cartesian Mind model: Evolutionary modules composed of heuristics, their building blocks, and evolved capacities and Algorithmic dimension of heuristics. In reality the core mental capacities of the building blocks of heuristics may be explained according to Wide Embodied Cognition theory. In particular emotion, object tracking and imitation are typical wide

embodied cognition phenomena.

ABSTRACT

BOUNDED RATIONALITY & ECOLOGICAL RATIONALITY Wide embodied cognition and ecological rationality SUGGESTED READINGS Viale, R., (2022). Irrational Or Adaptive? In R. Viale (Ed.). Nudging. The MIT Press. Gallese, V., Mastrogiorgio, A., Petracca, E., & Viale, R. (2021). Embodied Bounded Rationality. In R. Viale (Ed.). Handbook on Bounded Rationality, London: Routledge Viale, R. (2022). Beyond the limits of decision making: from problem solving to problem enacting. In G. Gigerenzer, R. Viale, & S. Mousavi (Eds.). Companion to Herbert Simon. Cheltenham: Edward Elgar Publishing.

## WEDNESDAY, 22ND JUNE 14:30

Much discussion, research and analysis of heuristics concerns the work and professional aspects of our actions. But most of what we think and do in our lives is often unstructured. Humanities - classics as well as current literature, art, music, theater, language, and philosophy are rich sources of templates that help shape the rules-of-thumb for our living. In this session we shall discuss examples in the context of the lives and thoughts of many people.

HUMANITIES:

This talk is devoted to the tool box for coping with risky situations. More precisely, we will discuss tools for

The tools, which stem from basic probability theory, will be introduced by means of dynamic, interactive webpages produced by CODAP. Codap is a free educational software production, with excellent visualizations. It offers web-based tools in a platform for developers. We will mainly work with ARBOR. For the modelling of risky situations, we will investigate the reliability of features in order to construct adequate schemes. In order to deal with decision-making based on the analysis of the risky situations and

WHICH HEURISTICS, IN WHICH DECISION-MAKING ENVIRONMENTS? Tool box for coping with risky situations

the corresponding evaluations, we will discuss simple and transparent decision trees. WHICH HEURISTICS, IN WHICH DECISION-MAKING ENVIRONMENTS? Wide embodied cognition: from decision making to problem-enacting Summer School HMUC Director

ABSTRACT

ABSTRACT

and finally.

modelling risky situations,

for decision-making.

THURSDAY, 23RD JUNE 10:10

University of Milano-Bicocca

riccardo.viale@unimib.it

The cognitive psychology of decision precisely reflects the conceptual structure of formal subjective expected utility (SEU). Its theory relies on the Cartesian Mind: symbol maniputation, information processing and

Riccardo Viale

Gallese, V., Mastrogiorgio, A., Petracca, E., & Viale, R. (2021). Embodied Bounded Rationality. In R. Viale (Ed.). Handbook on Bounded Rationality. London: Routledge. Viale, R. (2022). Beyond the limits of decision making: from problem solving to problem enacting. In G. Gigerenzer, R. Viale, & S. Mousavi (Eds.). Companion to Herbert Simon. Cheltenham: Edward Elgar Publishing.

Viale, R., (2022). Irrational Or Adaptive? In R. Viale (Ed.).

SUGGESTED READINGS

SUGGESTED READINGS

Katsikopoulos, K., Simsek, O., Buckmann, M., Gigerenzer, G. (2021). Classification in the Wild: The Science and Art of Transparent Decision Making. The

Nudging. The MIT Press.

# THURSDAY, 23RD JUNE

ABSTRACT

Riccardo Viale Summer School HMUC Director University of Milano-Bicocca riccardo.viale@unimib.it FRIDAY, 24TH JUNE

nudges, the good and the bad ones: NUDGOOD AND NUDGEVIL.

Viale, R., (2022). Irrational Or Adaptive? In R. Viale (Ed.). Nudging. The MIT Press. Gallese, V., Mastrogiorgio, A., Petracca, E., & Viale, R. (2021). Embodied Bounded Rationality. In R. Viale (Ed.). Handbook on Bounded Rationality. London: Routledge Viale, R. (2022). Beyond the limits of decision making: from problem solving to problem enacting. In G. Gigerenzer, R. Viale, & S. Mousavi (Eds.). Companion to Herbert Simon. Cheltenham: Edward Elgar Publishing.

Already for the Greeks the most political action is realised in speech [...], finding the right words at the right time means to act. (Hanna Arendt)

## (BRAN) that make available to citizens simple and frugal ways to choose that are useful in specific uncertain environments and that in this way strengthen their autonomous capacity for decision making and success?

Cognitive Misers.

ABSTRACT

Laura Macchi SUGGESTED READINGS Summer School HMUC Director Macchi, L., Zulato, E. (2021). Numbers do not add up! The University of Milano-Bicocca pragmatic approach in the framing of medical laura.macchi@unimib.it treatments. Judgment and Decision Making. vol.16(3), 586-Macchi, L. (2021). La comunicazione pubblica. In R. Viale, & L. Macchi (Eds). Analisi Comportamentale delle Politiche FRIDAY, 24TH JUNE Pubbliche. Bologna: Il Mulino. 10:00 Bagassi, M., & Macchi, L. (2006). Pragmatic Approach to Decision Making under Uncertainty: the Case of the Disjunction Effect. Thinking & Reasoning, 12(3), 329-350.

#### communication and their consideration influences not only the degree of effectiveness of a discourse, but also of a behavioural intervention. It is therefore important that in the development of a public policy not only an analysis of the cognitive mechanisms involved is carried out, but also, and I stress the inescapability of this, the consideration of the communicative factors intrinsically connected to them. Considering nudge as a communicative act, it is possible to avoid conceiving it as an intervention tout court, reflecting the conception of biases as general mechanisms independent of contextual factors [Stanovich and West 2008]. Examples from researches will be discussed. In particular, the framing of medical treatments will be considered. Our results showed that, while the framing effect is present when employing a

cumulative frequency format (misleading formulation of the data), it disappears when using a linear progression one.

NUDGE, BOOST, PUBLIC POLICIES AND COMMUNICATION Psychology of public policies

Nudge interventions or behavioural policies in general, much of what behavioural units around the world do, involve



FRIDAY, 24TH JUNE 11:00

Laurianne Vagharchakian

French Institute of Health and

vagharchakian@gmail.com

Medical Research

In the second part, two examples of behavioral insight applied to public policy developed in France will be detailed. The first example targets wood-induced air pollution, a major concern of health and environmental authorities in Europe. The second example deals with eco-friendly purchases in order reduce short-lived products. Both issues have been investigated through behavioural experiments tested under real-life conditions via a randomised controlled trial. The results will be discussed in light of the two currents (Nudge versus Boost).

#### logic, the theory of probability, and so on have conditioned the psychology of reasoning and decision making and have had a negative impact in terms decision making and in particular on insight problem solving, which we consider a privileged route to understanding what kind of special of originality and adequacy on psychological research. The psychology of reasoning, by adopting an ideological approach, superimposed on the psychological reality, burdened itself with a great limitation: the assumption unconscious thought produces the solution (Bagassi & Macchi, 2016; Macchi & Bagassi, 2021). We speculate that the creative act of of a pre-established norm, borrowed from long-standing tradition. restructuring implies a form of high-level unconscious thought, the The development of problem solving followed a completely different path, unconscious analytic thought. This perspective allows us to reconsider the phenomenological in nature, where the research was not affected by these dual processing approach and the question of bounded rationality.

### ABSTRACT In the wild refers to situations where, unlike in a typical experiment or decision model, uncertainty cannot be reduced to probability. Jimmie Savage, father of decision theory, argued that even planning a picnic lies outside it. Can decision making in the wild be based on science? Yes. We introduce formal models. Classification in the Wild provides transparent tools easy to understand and execute, unlike neural networks and random forests used in financing or in courts where it is a mystery to loan applicants or defendants why they were denied the loan or bail. The tools allow practitioners to make fast and accurate classifications when no fancy algorithm is at hand as at the site of an accident or suicide attack. Classification in the Wild introduces heuristics that are both descriptive and prescriptive, describing the art of how experienced practitioners decide while

also suggesting how to improve it. These heuristics are models of bounded rationality, a term coined by Herb Simon, founder of artificial intelligence and pioneer of the cognitive revolution. They are useful additions to existing models in psychology and AI, allowing for fast, transparent and accurate decisions. In the wild,

CLASSIFICATION IN THE WILD:

CLASSIFICATION IN THE WILD:

## This talk will focus on classification "in the wild". In the wild, unlike in typical psychological experiments that take place in the lab, the future is not knowable and uncertainty cannot be meaningfully reduced to probability. Connecting the science of heuristics with machine learning, we will discuss how to create formal models of classification that are simple, fast, and transparent and that can be as accurate as mathematically sophisticated algorithms developed for machine learning. We will discuss real-world examples, such as predicting flu incidence, how to induce the models statistically, compare the performance of such models to machine learning algorithms when applied to problems such as predicting bank failure, and discuss

#### achievements are often (but not always) observed. First part of this session Design of social processes and institutions (such as arguments given for nudging) cannot assume that they share the attributes of humans who populate them. Water douses fire, but oxygen that constitutes 89% of the mass of water (H2O), spreads it. and rational expectations equilibrium; and data are taken from market 2. Information aggregation properties of markets can be used to systematically experiments in laboratory with human traders and computer simulations of gather dispersed information from members of a population and put to good use, provided that the use is beneficial



HEURISTICS FOR LIFE Shyam Sunder SUGGESTED FILM Yale School of Management shyam.sunder@yale.edu hiips://www.imdb.com/title/tt1057500/

SUGGESTED READINGS

Martignon, L., Laskey, K. Statistical literacy for

classification under risk: an educational perspective. AStA Wirtsch Sozialstat Arch 13, 269-278 (2019). https://doi.org/10.1007/s11943-019-00259-3

## THURSDAY, 23RD JUNE 09:30

Laura Martignon

Ludwigsburg University of Education

for evaluating loss and benefits coping with trade-offs,

martignon@ph-ludwigsburg.de

## amodal mental represenation. SEU driven psychology deals solely with analytic judgements and choices, It is not interested in how to frame problems, set goals and develop a suitable course of action. On the contrary, cognitive success in most human activities is based precisely on the successful completion of those problemsolving phases. Problem solving is not computation of a decision based on an analytical data based prediction activity, but also on a pragmatic recursive process made up of many attempts and related positive or negative feedback from the environment. In reality problem solving and action are part of the same phenomenon that I dub "problem-enacting": it is a dynamic process based on pragmatic recursive attempts and related positive or negative feedback from the environment as its explained by wide embodied cognition theory. WHICH HEURISTICS, IN WHICH

DECISION-MAKING ENVIRONMENTS?

The theory of ecological rationality states conditions that delineate when a simple heuristic will be more accurate than another heuristic, or a more complex model. It has been developing over decades across disciplines, such as psychology, judgment and decision making, cognitive science, operational research, statistics, and machine learning. Ecological rationality employs mostly a precise, analytical language, but it can

Konstantinos Katsikopoulos

University of Southampton K.Katsikopoulos@soton.ac.uk

also use more qualitative, synthetic statements. It can thus be both technical and wise.

## NUDGE, BOOST, PUBLIC POLICIES AND COMMUNICATION Nudgoods and bran-bounded rational adaptive nudge SUGGESTED READINGS

A public policy intervention is classified as a nudge when it is not a coercive measure, retains freedom of choice, is based on automatic and reflex responses, does not involve methods of direct persuasion, does not significantly alter economic incentives, and does revise the context of choice according to the discoveries of behavioural economics. In order to characterize nudging's positive and negative aspects, especially from the point of view of safeguarding the autonomy and choice of the citizen, we could develop two categories of

Nudgoods are different from boosts according to the following oppositions: Educational Paternalism (Empowerment) Vs. Cognitive Paternalism (Subsidiarity); Autonomy Vs. Public Help To Improve Bounded Rationality (Attention Gaps, Miopia, Poor Feedbacks, Complexity, Uncertainty); Cognitive Givers Vs.

Is it possible to incorporate smart and frugal heuristics tools in nudges that help citizens make adaptive choices in uncertain and complex situations? Is it possible to outline Bounded Rational Adaptive Nudges



communication [Dianoux 2019; Singler 2015]. Since many of these interventions and messages are intended to prevent risky behaviour, as well as remind us of our duties, it is important that those who design and formulate them make them effective, easy to understand and not subject to misunderstanding. Halpern [2017] points out that most of what a behavioural centre is called upon to do is 'inform, encourage and persuade'. Nudge itself can be considered a communicative act, at least in a broad sense. Tacit knowledge, implicit assumptions and implications are indeed the necessary background of any kind of

From marketing to public policy, behavioral approaches are almost unavoidable these days: what are the challenges, the potentials and the limits of these approaches? In the first part of the presentation, a quick historical highlight of the behavioral approaches will be offered from

the perspective of decision-making in an uncertain context. The work of Herbert Simon (Nobel Prize in 1978) was a turning point in the way of analyzing the actual behavior of individuals. On the basis of his work, two currents of thought can be identified. On the one hand, the "nudge" based on human automatisms, put forward by Richard Thaler (Nobel Prize 2017) and by Daniel Kahneman (Nobel Prize in 2002). On the other side, the "boost", put

forward by Gerd Gigerenzer, which seeks to empower and clarify the decision-making of individuals.

SUGGESTED READINGS

Machines, 26: 149-183

Psychological science.

Grüne-Yanoff, T. and Hertwig, R. (2016), 'Nudge versus

boost: How coherent are policy and theory?', Minds and

Schultz, P. Wesley, et al., (2017) 'The Constructive, Destructive, and Reconstructive Power of Social Norms',

## Heuristics for the Management of Uncertainty and Complexity; Nudging, Boosting & Behavioral.