

Irrationality

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Rationality

Identify **True Premises** and from them reach **Sound Conclusions**

- Doing Research and/or Innovation requires a great deal of **Rationality**
 - Observing the world with **objectivity**
 - Finding the **right issues** to address
 - Doing the **right analysis** to take the right course of action
- In fact, Research and Innovation requires a good balance of **Rationality** and **Intuition**
 - Newton's apple
 - Archimedes Eureka
- I will overview some recent findings that show that humans:
 - Are **good** at intuitive **irrational** thinking (guts)
 - Are **bad** at rational **thinking**

Our Timeline

- 4000,000,000 Life
 - 250,000,000 Mammals
 - 6,000,000 Primates
 - 200,000 Homo Sapiens
 - 12,000 Agriculture, language, numbers, money
 - 2,000 Philosophy (what can be known?)
 - 400 Modern Science
 - 200 French Revolution (Human Rights)
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- We have to tame our wild side and promote our educated side
 - In today's lecture I will illustrate weaknesses of our rational side

The Rational Agent Assumption

Rational Agent Assumption

- People are generally rational, and their thinking is normally sound
- Emotions such as fear, affection, and hatred explain most of the occasions on which people depart from rationality (lost of control).
- This assumption has been made during centuries. Most notably in all Social Sciences and Economics

The **Rational Agent Assumption** is now being **revised** by a new discipline called Behavioral Economy (Economists and Psychologists)

- **Founding fathers (70s):** Kahneman (Nobel Prize 2002) and Tversky
- It is a very active research area
- **Applications:**
 - Marketing
 - Political Science
 - Electoral campaigns
 - Welfare State (global happiness)
 - Sports (motivation)
 - ...

- Psychologists and Behavioral Economists have identified many forms of **flawed perception, reasoning and decision making**
- There are many cases of **predictable irrationality** (cognitive bias)
- The errors are due to the design of our cognition machinery rather than the corruption of thought by emotion.
- They happen all the time in our life.
- It is very hard for us to fight against them.
- I think it is interesting to be aware of them.

The Rational Agent Assumption

Rational Agent Assumption in Economics

We always choose to perform the action with the optimal expected outcome for ourselves from among all feasible actions.

Are we really rational agents?

A challenging experiment

Two people X and Y (that do not know each other) have to split \$10 according to the following steps:

- ① X decides how the money is split
 - ② Y accepts the deal or rejects it. In case of rejection they do not get anything
- What the rational agent assumption says? X does a 9-1 split and Y accepts it.
 - What happens in practice?

Are we really rational agents?

Another experiment

An (typically) empty dining room in a corporation building with a coffee maker and a "honesty box"

The Short-term vs Long-term self conflict:

- Being short-term rational means cheating
- Being long-term rational (in many cases) means not cheating

Irrationality due to our Social nature

New scenario

A picture like that in front of the "honesty box"



What does it have to do with my (research) life?

Hint: take advantage of our "social" irrationality

- Write a "social" contract
- Put (maybe virtual) eyes supervising you

Are we in control of our decisions?

- video starting 2'20" (organ donation, heap replacement, Rome with coffe)

What does it have to do with my (research) life?

- We do not like to take complex decisions
 - **Hint:** try to formalize your reasoning (i.e. do not be lazy)
 - write protocols
 - use formal methods (diagrams, scenario probability,...)
- We are terrible at assessing and comparing the effect of not-so-similar items
 - **Hint:** use formal methods (try to quantify on a common measure)

Thinking Fast and Slow (Kahneman 2002)

We have two thinking modes:

- **Fast Thinking:** Intuitive, effortless, automatic, inaccurate
 - Great for survival
 - Driven by fear, group acceptance, laziness, world simplification,...
 - Active most of the time
- **Slow Thinking:** Rational, tiring, self-awareness, more accurate.
 - Probably more recent in our evolution path
 - Takes the control sometimes
 - Sense of agency, selective attention.

video Kahneman 4'10" - 9'25"

Fast Thinking (intuition)

Puzzle

- A **pencil** and a **eraser** cost \$1.10
- The **pencil** costs one dollar more than the **eraser**
- How much does the **eraser** cost?

Slow Thinking (agency)

Attention test video

Slow and Fast thinking: a first lesson from good Research

This is a metaphor

- Good for communication
- Good for discussion
- But always have to remember that it is a metaphor

What does it have to do with my (research) life?

Intuition vs Rationality

Research needs of both intuition and rationality. Due to evolution, our brain is a little unbalanced.

- Exercise your rationality: Critical Thinking
- Be aware of in which mode you are running

Irrationality assessing likelihood of events

Assign probabilities to events

- 1 Flooding in the US in the next 10 years killing at least 1000 people
- 2 Earthquake in California in the next 10 years causing a flooding that kills at least 1000 people

Assign probabilities to events

How much would you be willing to pay for an insurance that pays you \$100,000 in case of:

- 1 Dead
- 2 Dead caused by a terrorist incident

Insurance companies exploit that

video "Expensive wine is for suckers"

Grading Pleasure

Take two wines made out of the same type of grape. One is cheap (\$14, simple production) and the other is expensive (\$130 complex production).

- 1 Grade them without knowing the price (small difference)
- 2 Grade them knowing the price (larger difference)
- 3 Monitor enjoyment (brain sensors) without knowing price (small difference)
- 4 Monitor enjoyment (brain sensors) knowing price (larger difference)

Luxury car brands make profit out of that

Hot hand and regression to the mean

You are the coach of a Basketball team. During a game, one second before the end, there is a tie. Your team has two free shots. Who should you assign the shooting?

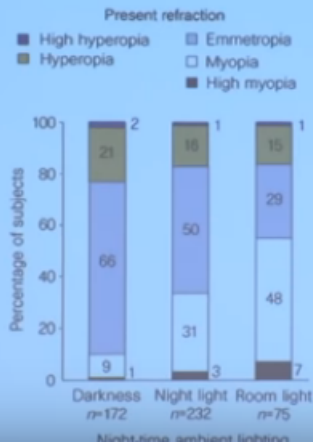
- 1 A player that has scored 10 free shots during the game without missing any.
- 2 The player with the best free shots average last month
- 3 The player with the best free shots average along the season.

Casinos exploit that

What does it have to do with my (research) life?

- Use your intuition to identify patterns, relations,...., but
 - Back them up with a **quantitative analysis**
 - Back them up with a good **explanation**
 - Check on how well it **predicts** (fits in new data)

What does it have to do with my (research) life?

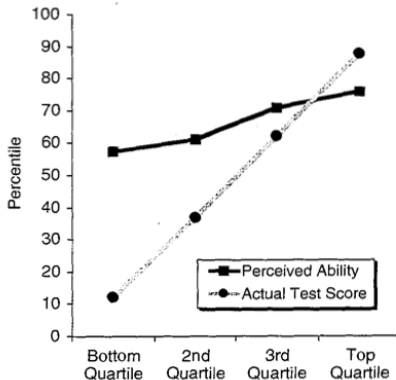


"the strength of the association . . . does suggest that the absence of a daily period of darkness during childhood is a potential precipitating factor in the development of myopia"

Irrationality due to our self-confidence

The Dunning-Kruger Effect

People of low ability tend to overestimate their abilities.



Irrationality due to our self-confidence

S. Sloman (Cog. Scientist, Brown Univ)

Our president (D. Trump) is really example number one of this. But we have to think about the community that made this administration possible. As much as I hate hearing Trump lie, I get even crazier when I see that 44 percent of the American population put more faith in his words than in the mainstream media.

Irrationality Revising our Beliefs

How politics makes us stupid, Kahan

Researchers are experimenting with a new cream for skin rash. Consider the results of this experiment

	Improve	No Improve
Cream	223	75
No Cream	107	21

Please indicate whether the experiment shows that using the new cream is likely to make the skin condition better or worse.

Results support the *Science Comprehension Thesis*: the better subjects were at math, the more likely they were to stop, work through the evidence, and find the right answer.

How politics makes us stupid, Kahan 2013

Politicians are studying the effect of banning guns on crime rate. Consider the following data

	Improve Crime rates	No Improve Crime
Banned	223	75
Not Banned	107	21

Please indicate whether the data indicates that banning guns is likely to increase or decrease crime rates.

Results show that ideology drove the ability to find the right answer.

S. Sloman (Cognitive Scientist, Brown Univ)

Most people don't like to think at all, or like to think as little as possible[...]. Even the rest seem to devote a lot of their resources to justifying beliefs that they want to hold, as opposed to forming credible beliefs based only on fact