

Rational Fallacies & Cognitive Biases

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Argument

- What is an Argument?
 - An argument is a collection of propositions – one of which is the Conclusion and the rest are Premises.
- Types of Arguments:
 - Deductive Argument
 - The premises provide strong support for the conclusion such that, if the premises are true then it is impossible for the conclusion to be false
 - Example:
 - It is sunny today
 - If it is sunny then I don't need an umbrella
 - So I don't need an umbrella today
 - Inductive Argument
 - The premises do not guarantee the conclusion. That is if the premises are all true, it is highly likely for the conclusion also to be true
 - Example:
 - The windows are broken
 - There are footprints with mud on the floor
 - Some of the articles are missing
 - Some intruders entered the house and robbed it

Rational Fallacy

- What is a Fallacy?
 - A Fallacy in an argument is an Error in Reasoning such that the premises fail to logically support the conclusion.
- Types of Fallacies:
 - Formal Fallacy
 - Error in the structure of the argument => Invalid Argument
 - Where the conclusion does not necessarily follow from the premises
 - Example:

Valid Argument	Invalid Argument
<ul style="list-style-type: none">• All men are mortal• Socrates is a man• Therefore Socrates is mortal	<ul style="list-style-type: none">• Some men are mortal• Socrates is a man• Therefore Socrates is mortal
 - Informal Fallacy
 - Focus is not on the structure of the argument but on the meaning of the argument (misuse of language, misconceptions due to some assumptions, misstatement of facts)
 - Example:

Syntactic Ambiguity	Semantic Ambiguity
<ul style="list-style-type: none">• Laila calls her mother when she is alone	<ul style="list-style-type: none">• Lots for sale

Formal Rational Fallacies

- Inverse Fallacy
 - Denying the Antecedent
 - $((P \Rightarrow Q) \text{ and } \sim P) \Rightarrow \sim Q$
 - Example:
 - If Elliot follows a regimen he will get better
 - Elliot did not follow a regimen
 - Therefore he will not get better
- Converse Fallacy
 - Affirming the Consequent
 - $((P \Rightarrow Q) \text{ and } Q) \Rightarrow P$
 - Example:
 - If Elliot follows a regimen he will get better
 - Elliot did get better
 - Therefore he followed a regimen

Formal Rational Fallacies

- Compound Fallacy
 - Making the false assumption that when presented with an either/or possibility, if one of the options is true then the other one must be false. What if both are true?
 - $(P \vee Q) \text{ and } P \Rightarrow \sim Q$
 - $(P \vee Q) \text{ and } Q \Rightarrow \sim P$
 - Example:
 - Elliot is a genius hacker or Elliot is an anarchist
 - Elliot is a genius hacker
 - Therefore Elliot is not an anarchist
 - Not a fallacy in case of Exclusive Or

Informal Rational Fallacies

- Ad Hominem
 - Latin for “Attack the Person”
 - Attacking the character of the person proposing the argument in order to undermine the argument
 - Structure:
 - Person P advances an argument A
 - Person P’s character is not satisfactory
 - Therefore A is not a good argument
 - Example:
 - [Interview with Donald Trump – Fox News](#)

Source: <https://www.youtube.com/watch?v=LPzpl7wAoBs>

Informal Rational Fallacies

- Circumstantial Ad Hominem
 - Attacking the circumstances of the person proposing the argument in order to undermine the argument: that the person advancing the argument is doing so because of his/her self-interest or the circumstances that they are in.
 - Structure:
 - Person P advances an argument A
 - Attack on the interests and circumstances of P
 - Therefore A is not a good argument
 - Example:
 - [Sherlock attacking Molly's circumstances – Sherlock](#)

Source: <from my personal collection>

Informal Rational Fallacies

- False Dilemma
 - When only two choices are presented yet a number of possible choices can be available
 - Structure:
 - Either A is true or B is true
 - A is not true
 - Therefore B is true
 - What if both are False and there is a third option available?
 - Not a fallacy when there are only 2 choices present
 - Example:
 - [Bush's Speech – CNN](#)

Source: <https://www.youtube.com/watch?v=GgLrMHm32j4>

Informal Rational Fallacies

- Appeal to Belief
 - Structure:
 - A lot of people believe that a claim A is true
 - Therefore claim A is true
 - Very similar to Appeal to Popularity and Bandwagon Effect
 - Example:
 - [Emmet's Belief – The Lego Movie](#)

Source: <from my personal collection>

Informal Rational Fallacies

- Appeal to Authority
 - Structure:
 - Person P claims to be an authority on the subject matter
 - According to person P the claim A is true
 - Therefore A is true
 - Not a fallacy when P is in fact an authority on the subject at hand
- Appeal to Fear and Emotion
 - Emotion is used as Evidence to accept a claim
 - Structure:
 - Assert that some claim A is true and associate an emotional line of reasoning to it
 - Therefore claim A must be true
- Example:
 - [Gothel threatening Rapunzel – Tangled](#)

Informal Rational Fallacies

- Appeal to Tradition
 - Accept a claim to be true because it is the way it has always been done or simply because it is traditional
 - Also known as Appeal to Age or Appeal to Antiquity
 - Structure:
 - Claim A is traditional / has always been done
 - Therefore claim A is true
 - Example:
 - [At the Diogenes Club – Sherlock](#)

Source: <from my personal collection>

Informal Rational Fallacies

- Bandwagon Effect
 - One might accept the truth of a claim so as to not be rejected by the group that proposes the claim
 - Peer Pressure
 - Structure:
 - Claim A is proposed by a Group G with an implicit threat to reject or belittle those who oppose it
 - Therefore person P accepts that claim A is true
 - Example:
 - [Phone Airbag Ad](#)

Source: <https://www.youtube.com/watch?v=YZIO6eg1ZF8>

Informal Rational Fallacies

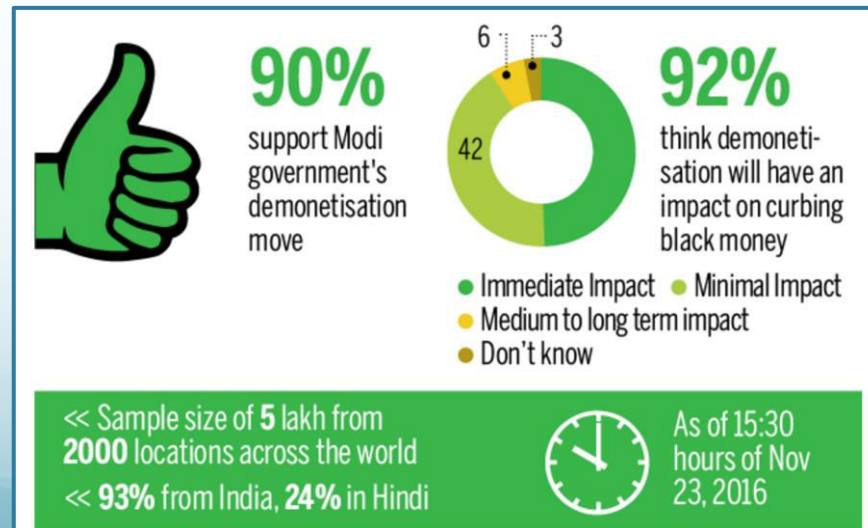
- Begging the Question
 - When the argument's premises assume the truth of the conclusion and these premises are used to prove the conclusion
 - It is true because it says so
 - Structure:
 - Premises assume that claim A is true
 - Therefore claim A is true
 - Example:
 - “Elliot did not create F society in his full senses”
 - “How do you know?”
 - “Because Elliot said that!”
 - “How do you know that the bible is divinely inspired?”
 - “Because it is said in the bible that ‘all scripture is given by the divine inspiration of God’!”
 - Causal Loop – Beethoven – Doctor Who

Informal Rational Fallacies

- Burden of Proof
 - When a person P proposes a claim A, it is P who has the obligation to provide proof that supports his/her claim
 - Instead if the burden of proof is shifted to the party opposing the claim – then it becomes a fallacy
 - The opposition's inability to invalidate the claim is not the same thing as proving it true
 - Example:
 - In legal settings, a defendant is presumed innocent until proven otherwise. So the prosecution has the burden of proof.
 - Analogies used in the debate on Theism vs. Atheism
 - Russell's Teapot
 - Carl Sagan's Dragon in the Garage
 - Invisible Pink Unicorn
 - Prosecution's Burden of Proof – The Night Of

Informal Rational Fallacies

- Biased Sample
 - When a conclusion about a population is drawn based on a biased sample – which is not representative of the entire population
 - Examples:
 - Opinion Polls that predict election results
 - PM's survey on demonetization
 - Survey available only as a mobile app (not even on website). Population of India - 1.336 billion. No. of Mobile Internet users - 371 million—roughly 28%
 - Available only in 6 languages
 - Available on registration only – Registration Form is in English

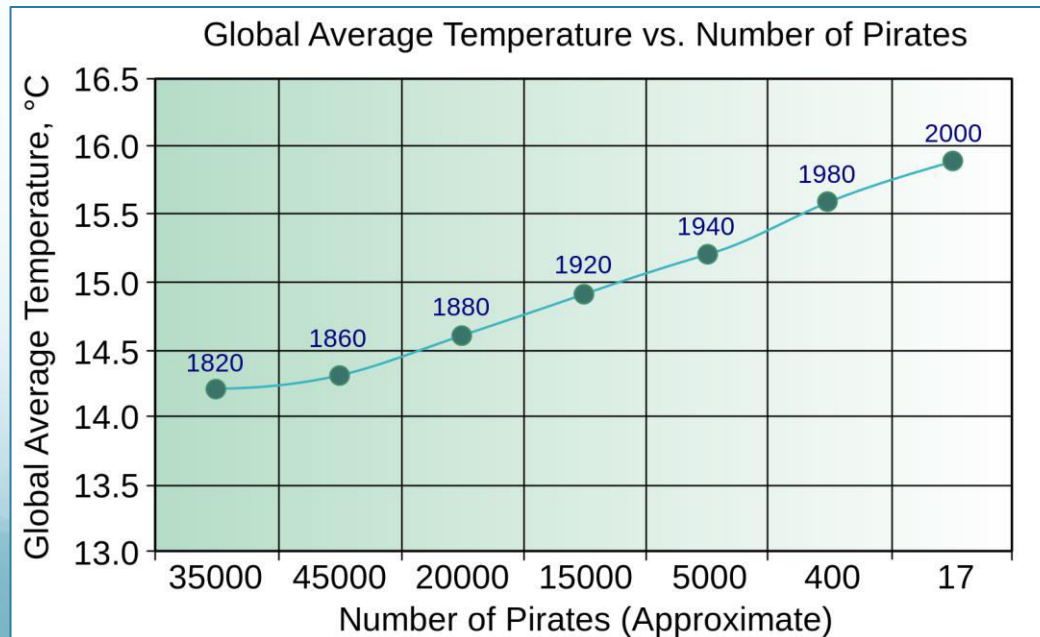


Source:

<http://timesofindia.indiatimes.com/india/Over-93-percent-support-for-demonetisation-in-survey-on-PM-Narendra-Modis-app/articleshow/55584567.cms>

Informal Rational Fallacies

- Causality and Correlation
 - Correlation is the relationship between two sets of variables – can either be positive or negative
 - Correlation is a Symmetric relation whereas Causation is an Asymmetric relation
 - Causation implies Correlation
 - Correlation does not imply Causation
 - Example: Pirates cause Global Warming



Source:

<https://en.wikipedia.org/wiki/File:3aPiratesVsTemp%28en%29.svg>

Informal Rational Fallacies

- Straw Man Argument
 - Person P proposes a claim A
 - Instead of attacking the veracity of claim A, the opponent takes a distorted, misrepresented or oversimplified version of claim A, say A' and attacks A'
 - Structure:
 - Person P proposes claim A
 - Person Q presents a distorted version of A as A'
 - Person Q proves that A' is false
 - Therefore A is false
 - Example:
 - Evolution – Phoebe vs. Ross – Friends

Source: <https://www.youtube.com/watch?v=cXr2kF0zEgI>

Informal Rational Fallacies

- Guilt by Association
 - Structure:
 - Person P or Group G accepts some claim A
 - Therefore claim A must be wrong (because I don't like person P or group G)
 - People in general do not like to be associated with a person/group they dislike
 - Examples:
 - The Hitler Card:
 - "I love my job"
 - "So did Hitler!"
 - McCarthyism: Anti-Communist purges in USA
 - Communists support Modern Art
 - Therefore Modern Art is wrong

Informal Rational Fallacies

- Hasty Generalization
 - When the sample size is very small – Fallacy of Insufficient Sample
 - First Order Logic: Existential Generalization
 - Structure:
 - Some small sample S have the property Z
 - Therefore the entire population P must have the property Z
 - Example:
 - Never trust a Woman – Batman: The Movie

Source: <https://www.youtube.com/watch?v=KqeqTWD2Ymg&index=5>

Cognitive Biases

- What is Cognitive Bias
 - Flawed pattern of thinking that affects our perceptions and decisions
 - Because of our preconceived notions we might project a distorted version of reality and believe that to be true
- How is it different from a Fallacy
 - A Fallacy involves flawed reasoning while validating an Argument whereas a Cognitive Bias involves flawed pattern of thought

Cognitive Biases

- Confirmation Bias
 - When we tend to accept new evidence/information absolutely when it reinforces our existing beliefs or ideas
 - Thereby be extremely critical of evidence/information that contradicts our preconceived notions
 - Example:
 - Paid News items: the newspaper/reporter may only interview experts that are in favor of the issue at hand
 - [Sword in the Field – The Messenger: The story of Joan of Arc](#)

Source: <https://www.youtube.com/watch?v=9oSJdSL8YOE>

Cognitive Biases

- Denomination Bias
 - We are likely to spend more when we have lower denomination notes/coins with us than when we have higher denomination notes
 - When we spend the lower denomination notes – makes us feel as if we are spending less
- Default Bias
 - When we tend to accept the default choice provided
 - To avoid spending effort on analyzing other choices, accepting the recommended default values, or when deviating from the default might be expensive
 - By setting defaults we can influence the behavior of the subjects

Cognitive Biases

- Anchoring Bias
 - Based on the very first idea (called the anchor) our subsequent decisions are taken – clearly biased
 - Once we fix the anchor as the reference point, all further decisions are made adjusting around the anchor point
 - Example: Sales & Marketing
 - Initial Price Setting – the initial price of the item sets the standard for the rest of the negotiation
 - Multiple Unit Pricing – 5 packets of biscuit for Rs.25 vs. 1 packet of biscuit for Rs.5
- Relativist Bias
 - That the truth of some claim A is relative – that it is true for some but not for others
 - Relative to: an individual or place or culture
 - It is a cognitive bias when we are dealing with an objective truth

Cognitive Biases

- Hawthorne Effect
 - People change their behavior (alter their performance) when they know that they are being observed
 - People who are part of some research feel important for being included in the experiment
 - As a result they will sometimes alter their behavior to help confirm the experimenter's hypothesis
 - Can be counteracted
 - By observing the test subjects without their knowledge
 - By making the participants' responses anonymous

Cognitive Biases

- Clustering Illusion
 - The tendency to see meaningful patterns or clusters in a random sequence of events
 - Associated with a neurological disorder called Apophenia defined as an “unmotivated seeing of connections”
 - Example:
 - [Unearth the Soviet plot – A Beautiful Mind](#)

Source: <from my personal collection>

References

- <http://www.nizkor.org/features/fallacies/>
- <http://rationalwiki.org/>
- <https://explorable.com/hawthorne-effect>