

Logic and Critical Thinking-2

Recap

- Arguments and Premises
- Sentence vs. proposition
- Truth, validity, and soundness
- Deductive and Inductive inferences
- Logical vs. physical impossibility

Inferences all the time...

- **See them in earphones**
 - Infer they must be listening to music
- **hear them speaking in good Hindi**
 - infer that they must be from the north
- **See the two together**
 - Infer they must be a couple
- **See a bearded guy wearing a kurta and carrying a jhola**
 - Infer he must be from JNU
- **Know she's pursuing her engineering from IIT**
 - Infer she wrote JEE
- **Know he's a billionaire**
 - Infer he's a happy man

Significance of Deductive Inference

- **Deductive inference as**
 - **Non-ampliative**
 - It does not provide us with any new information
 - The truth of the conclusion is hidden within the premises
 - All reptiles lay eggs; no mammals lay eggs; no mammals are reptiles.
- **If the conclusion of a valid deductive argument turns out to be false, then it means one of the premises are false**
 - if you find a sad entrepreneur, then you call into question the truth of one of the premises in the valid argument:
 - all entrepreneurs are billionaires; all billionaires are happy; therefore, all entrepreneurs are happy.
 - or if you find a species that lays eggs as well as suckles its young, then either your premise that no reptiles lay eggs is wrong, or your definition of a ‘mammal’ or a ‘reptile’ is inadequate.

Inductive Inference

- **As ‘*ampliative*’**
 - It provides new information
- **They are non-monotonic**
 - Can always be made weaker or stronger by additional information
- **From a sample to a population**
 - every swan I have ever seen has been white therefore all swans are white
- **From a correlation to a causal generalization**
 - Everyone who is a chain smoker has a disposition to lung cancer. Smoking causes cancer.
 - Compare scientific generalizations with superstitions
 - RCTs

The circularity of Inductive Inference

- **What makes inductive arguments legitimate?**
 - **The Principle of the Uniformity of Nature**
 - Which tells us that the future will always be like the past
 - This underpins every single inductive argument
 - But what makes this principle legitimate?
 - Inductive inference
 - Hence, **circularity**
 - The future has always been like the past in the past
 - therefore the future will be like the past in the future

Truth, Validity, and Soundness: Various combinations

- valid arguments containing only true propositions
- valid arguments containing only false propositions
- invalid arguments containing only true propositions
- invalid arguments containing only true premises and have a false conclusion
- valid arguments having false premises and a true conclusion
- invalid arguments having false premises and a true conclusion
- invalid arguments, of course, containing all false propositions
 - See p. 30 of Copi and Cohen, *Introduction to Logic*

Exercise

- Many children have developed autism shortly after having been given the MMR jab, therefore the MMR jab causes autism.
- Many undergraduates like to get drunk at the weekend, so I should imagine that as it is Saturday, James may be in the pub.
- The IMD predicts thunderstorms over the next few days in Hyderabad. Therefore, there will be rain in the next few days.
- Since the 1950s, the atmospheric CO₂ level and the crime level have increased sharply. Atmospheric CO₂ causes crime.

Fallacies

- what is a fallacy?
 - A fallacy is a type of argument that **may seem to be correct, but that proves on examination not to be so.**
 - A form of argument in which the premises **appear to support** a conclusion but, in fact, do not; the term is often used to refer to familiar types of logical mistakes that may be used to trick or mislead.
 - A fallacy, also called a “courtroom trick” is an identifiable category of argument that does not support its conclusion.

Sophistry vs. Fallacy

- Sophistry is the art of deluding an audience with arguments that **one knows to be illogical or misleading**.
- On the other hand, when an illogical argument is **used innocently, without the speaker's being aware that it is**, in fact, illogical, then logicians call it a fallacy, a term that implies nothing about the speaker's motives.
- **Baseline check**
 - *Thank you for smoking* (2005)

Classification of Fallacies

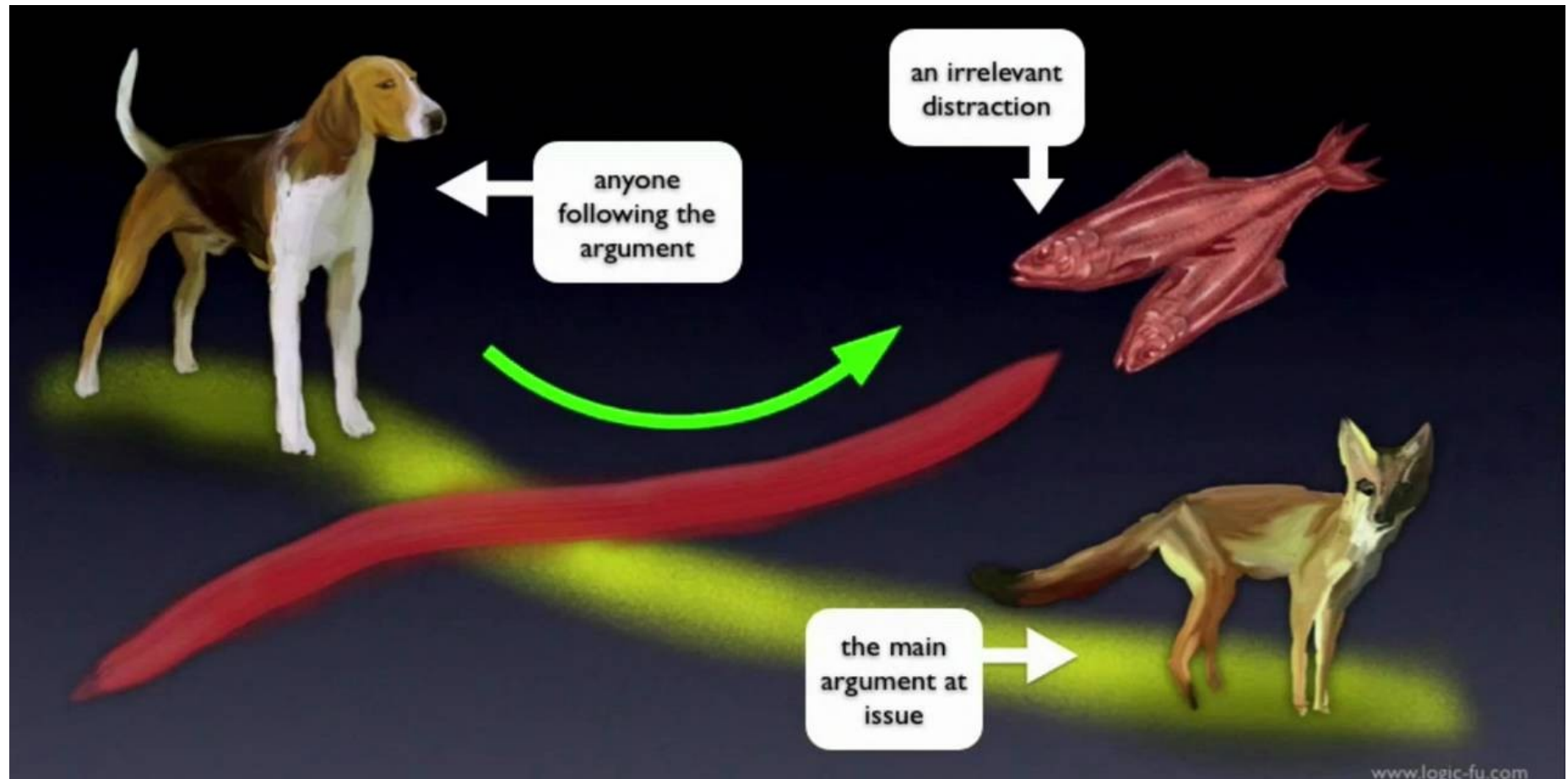
- fallacies of relevance
- fallacies of defective induction
- fallacies of presumption
- fallacies of ambiguity

Fallacies of Relevance

- most numerous and frequent
- the **premises of the argument are simply not relevant to the conclusion.** However, because they are made to appear to be relevant, they may deceive
- they arise when there is **no real connection between the premises and the conclusion of an argument.** Because that connection is missing, **the premises offered cannot possibly establish the truth of the conclusion drawn.**

- **The appeal to the populace**
- **The appeal to emotion**
- **The red herring**
- **The straw man**
- **The attack on the person**
- **The appeal to force**
- **Missing the point (irrelevant conclusion)**
 - ***Caveat...**

A red herring



Fallacies of defective induction

- the mistake arises from the fact that **the premises of the argument, although relevant to the conclusion, are so weak and ineffective** that relying on them is a blunder.
 - **The argument from ignorance**
 - The Malaysian airlines flight MH370 disappeared without a trace over the Indian Ocean. No conclusive evidence has been found to explain its disappearance. There must be some mysterious force at play.
 - Ancient Aliens argument
 - **The appeal to inappropriate authority**
 - Authoritative prefixes: Dr./Prof./Baba/Sri/Sadguru/Sir/Lord/Highness
 - Einstein said that god does not play dice, hence quantum mechanics must be false.
 - **False cause/post hoc ergo propter hoc/slippery slope**
 - Ever since this government came into power, there have been very few protests. It must be doing something good for the people, indeed!
 - **Hasty generalization**
 - My uncle has been a chain smoker his entire life and is in perfect health. It is a hoax that smoking causes cancer.

Fallacies of Presumption

- **too much is assumed in the premises.** The inference to the conclusion depends mistakenly on these unwarranted assumptions.
 - **Accident**
 - All those who study arts and humanities are weak in math.
 - **Complex question**
 - Have you stopped plagiarizing on your assignments?
 - **Begging the question/circular argument**
 - Fried foods are bad for you because they are not part of a healthy diet.
 - Induction is a reasonable form of inference, since experience shows it to be the case that there is uniformity in nature.

Fallacies of Ambiguity

- The incorrect reasoning in fallacies of ambiguity arises from the **equivocal use of words or phrases**. Some word or phrase in one part of the argument has a meaning different from that of the same word or phrase in another part of the argument
 - **Equivocation**
 - technology = progress
 - reservation = discrimination
 - Anti-ruling party = Anti-national
 - IQ = intelligence
 - welfare = freebies
 - **Amphiboly**
 - No smoking allowed
 - **Accent**
 - Mutual fund investments are subject to market risks, please read the offer document carefully.
 - Terms and conditions apply.

Some common fallacies

- **Ad hominem:** A fallacy that depends on an attack against the person making a claim instead of the claim that is being made.
- **Straw man:** exaggerating or misrepresenting the claims of the opposition in order to more easily appear to refute those claims.
- **Circular argument:** when the premise and the conclusion are different sentences expressing the same proposition
- **Equivocation:** The fallacy of equivocation occurs when we change the meaning of a word in the middle of an argument
- **Distinction w/o a difference:** a fallacy that occurs when we try to draw a distinction between two things that are not, in fact, distinct.

Kinds of Ad Hominem

- **Abusive**

- “Television entertainer Bill Maher argues that religion is just a lot of foolish nonsense. But Maher is an arrogant, shameless, self-righteous pig. Obviously his arguments are not worth listening to.”

- **Circumstantial**

- Poisoning the well
 - Attacking motivations
- Tu quoque
 - You did it too!

Examples

- A majority of the population thinks we coddle criminals. It's time we got tough on crime.
- UFOs must be real because a significant portion of the population takes UFO sightings seriously.
- “Which phone should I go for?” “You must buy a Redmi phone, because it is the largest selling phone in India.”

More examples...

- Every morning, he steps out onto the porch and exclaims, “Let this house be safe from tigers!” Then he goes back inside. His wife asks him, “What’s that all about? There isn’t a tiger within a thousand miles of here.” The man says, “See? It works!”
- “I was jogging out to centerfield when I picked up a scrap of paper. I got some good hits that night, and I guess I decided that the paper had something to do with it. The next night I picked up a gum wrapper and had another good night. I’ve been picking up paper every night since.”

- The Republicans say we should shrink the deficit and cut down on government spending. But these are the same people who cranked up the deficit by getting us into two wars simultaneously. These are the same people who cranked up the deficit by passing tax breaks for the rich. These are the people who gave us the Bush years of spending more massive than any preceding administration of either party.
- Mr. Goldberg has argued against prayer in the public schools. Obviously Mr. Goldberg advocates atheism. But atheism is what they used to have in Russia. Atheism leads to the suppression of all religions and the replacement of God by an omnipotent state. Is that what we want for this country? I hardly think so. Clearly Mr. Goldberg's argument is nonsense.

- The United States says that North Korea is stockpiling nuclear weapons and is, therefore, a danger to world peace. But surely both Israel and the United States have their own stockpiles of nuclear weapons!
- “Kejriwal talks about the economy because it will benefit him politically.”
- “You either marry Julie and have a wonderful life and family, or you live the rest of your life as a lonely bachelor. Go ahead. Make your choice.”
- Either you’re with us, or you’re with the terrorists.
- Brexit: Vote ‘Yes’ or ‘No’

- The first person I met in Delhi was cold and rude. The second person I met in Delhi was cold and rude. I guess everybody in Delhi must be cold and rude
- “Many ships and planes have utterly disappeared in the regions of the Bermuda Triangle, without explanation and often without a physical trace. Some mysterious force must be at work beneath the waves.”
- “In order to build something like Puma Punku you need writing and planning. All the mainstream archaeologists agree upon one thing, that the Imara didnt have any writing. So how is it possible that they built all of this without plans?”
- Jamie Bartlett: “i think it’s an important job for journalists to try to ask about the negative possibilities of this stuff (wrt automation and disruption)”.

Sam Altman: “I think if you continue this thrust of, shouldn’t we stop progress, no one’s going to take you seriously, because people want this stuff”.

- Why do you rob banks? because that's where all the money is.
- It's wrong to kill animals because animals feel pain.
- Why are you called John? Because that's what my parents named me.
- It's not that I don't care about you; I'm just not concerned with your life choices.
-

- My GPS says that we should take route 70 to route 97. You think we should take route 85 to Buckminster Road after looking at a map. I'm thinking that the GPS directions are better because the GPS is equipped with the latest route-finding algorithm.
- Look at the line for that new movie! It is out of the theater door, down the street, and around the corner. That film must be great.
- I was reading the expert reviews for this product on its website. All of them were outstanding. I think that this could be the product we've been waiting for.

Some more critical thinking...

- It's wrong to kill animals because animals feel pain.
- It's not that I don't care about you; I'm just not concerned with your life choices.
- Reservation is a form of discrimination; therefore reservation is wrong!

- Look at the line for that new movie! It is out of the theater door, down the street, and around the corner. That film must be great.
- our brains are not meant to hold so many passwords. That's science. Manage your passwords with Lockwise when you join Firefox
- You say caste-based reservation is way to correct the historical wrongdoings of our caste society. Then what about the economically poor who are from upper castes? Should we just ignore them?
- Many ships and planes have utterly disappeared in the regions of the Bermuda Triangle, without explanation and often without a physical trace. Some mysterious force must be at work beneath the waves
 - Ignorance as evidence

This good-old chestnut

- **A:** *“You really need to clean those dishes in the sink. You make yourself a snack and just clutter the kitchen and leave it for me. That is not respectful or fair to me.”* **B:** *“Well, if you want to talk about messes and respect, what about the fact that you never put out the garbage? You just let it get to a point where I have to always put it out myself.”*

Whataboutism?

- A form of red herring
- <https://www.outlookindia.com/website/story/understanding-whataboutery/295794>

How to discover a fallacy

- Identify the conclusion of the argument
- Identify the premises stated in support of the argument
- Do the premises lend independent support to the conclusion?
- No?? Then, it's a fallacy!
 - To identify the fallacy, ask *how* the premises is being used to support the conclusion.
 - Is it restating the conclusion in other words?
 - Is it setting up a false dichotomy?
 - Is it attacking the person/character/morality?
 - Is it playing with words?
 - Is it setting up a strawman version of the conclusion?
 - Is it distracting from the issue at hand?

- “Like any rational entity, the algorithm learns how to modify the state of its environment—in this case, the users mind—in order to maximize its own reward. The consequences include the resurgence of fascism, the dissolution of the social contract that underpins democracies around the world, and potentially the end of the European Union and NATO. Not bad for a few lines of code, even if it had a helping hand from some humans. Now imagine what a really intelligent algorithm would be able to do.”
 - Stuart Russell, *Human Compatible: Artificial Intelligence and the Problem of Control*

- “Here are a few examples of jobs that humans used to do but that technology automated long ago, at least in developed countries: clothes washer; rickshaw driver; elevator operator; punkawallah (a servant in India whose sole job was to work a manual fan for cooling the room, before the days of electric fans); computer (a human, usually female, who performed tedious calculations by hand, particularly during World War II). Most people will agree that in those instances replacing humans with machines in such jobs made life better all around. One could argue that today’s AI is simply extending that same arc of progress: improving life for humans by increasingly automating the necessary jobs that no one wants to do.”
 - Melanie Mitchell, Artificial Intelligence: A guide for thinking humans

Note about Refutation

- **Just because someone makes a bad argument for a conclusion does not give us rational justification for thinking that the conclusion is not the case.**
 - An argument provides us good reason to believe in the likely truth of the conclusion. **If an argument fails, then it means that those specific premises do not give us reason to believe that conclusion.**
- But it doesn't mean that there can be no other set of premises that does. **There could be a good argument for that conclusion, and this one just isn't it.** Every true proposition can be made the conclusion of a terrible argument.
 - All men are mortal. Thursday follows Wednesday; therefore New Delhi is the capital of India

Explore

- Peter Burke, *The Polymath: A cultural history from Leonardo da Vinci to Susan Sontag*
- David Epstein, *Range: Why generalists triumph in a specialized world*
- Waqas Ahmed, *The Polymath: Unlocking the power of human versatility*
- Tom Nichols, *The Death of Expertise: The Campaign against Established Knowledge and Why It Matters*

Practice

- E.g., *Wag the Dog* (1997)
- *Thank You for Smoking* (2005)
 - <https://www.youtube.com/watch?v=xuaHRN7UhRo>
 - Catch the fallacies?

Resources

- Copi and Cohen, *Introduction to Logic*
- Patrick Hurley, *A Concise Introduction to Logic*
- Edward T. Damer, *Attacking Faulty Reasoning: A Practical Guide to Fallacy-Free Arguments*
- Fallacyfiles.org
- <https://yourlogicalfallacyis.com/>
- <https://www.ancientaliensdebunked.com/>
- Podcasts
 - The Fallacy-a-Day Podcast
 - Fallacious Trump
- Watch
 - Wag the Dog (1997)
 - Brexit: The Uncivil War (2019)
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