

Formal Fallacies

Supplemental module

First, what is a fallacy?

a mistake or failure in an argument that affects its cogency
(sometimes its validity, sometimes its truth)

| V • T • E | | Fallacies (list) | [hide] | |
|--|---|---|--|--|
| Formal | In propositional logic | Affirming a disjunct • Affirming the consequent • Denying the antecedent • Argument from fallacy | | |
| | In quantificational logic | Existential • Illicit conversion • Proof by example • Quantifier shift | | |
| | Syllogistic fallacy | Affirmative conclusion from a negative premise • Exclusive premises • Existential • Necessity • Four terms • Illicit major • Illicit minor • Negative conclusion from affirmative premises • Undistributed middle | | |
| | Masked man • Mathematical fallacy | | | |
| Informal | Equivocation | Equivocation • False equivalence • False attribution • Quoting out of context • Loki's Wager • No true Scotsman • Reification | | |
| | Question-begging fallacies | Circular reasoning / Begging the question • Loaded language (Leading question) • Compound question / Loaded question / Complex question • No true Scotsman | | |
| | Correlative-based fallacies | False dilemma (Perfect solution) • Denying the correlative • Suppressed correlative | | |
| | Illicit transference | Composition • Division • Ecological | | |
| | Secundum quid | Accident • Converse accident | | |
| | Faulty generalization | Anecdotal evidence • Sampling bias (Cherry picking • McNamara) • Base rate / Conjunction • Double counting • False analogy • Slothful induction • Overwhelming exception | | |
| | Vagueness / ambiguity | Accent • False precision • Moving the goalposts • Quoting out of context • Slippery slope • Sorites paradox • Syntactic ambiguity | | |
| | Questionable cause | Animistic (Furtive) • Correlation implies causation (Cum hoc • Post hoc) • Gambler's (Inverse) • Regression • Single cause • Slippery slope • Texas sharpshooter | | |
| | Fallacies of relevance | Appeals to emotion | Fear • Flattery • Novelty • Pity • Ridicule • Think of the children • In-group favoritism • Invented here / Not invented here • Island mentality • Loyalty • Parade of horrors • Spite • Stirring symbols • Wisdom of repugnance | |
| | | Genetic fallacies | Ad hominem | Appeal to motive • Association (Reductio ad Hitlerum (Godwin's law) • Reductio ad Stalinum) • Bulverism • Poisoning the well • Tone • Tu quoque • Whataboutism |
| | | | Authority (Accomplishment • Ipse dixit • Poverty / Wealth) • Etymology • Nature • Tradition / Novelty (Chronological snobbery) | |
| | | Appeals to consequences | Argumentum ad baculum • Wishful thinking | |
| | Ad nauseam (Sealioning) • Argument to moderation • Argumentum ad populum • Appeal to the stone / Proof by assertion • Ignoratio elenchi • Argument from anecdote • Argument from silence • Invincible ignorance • Moralistic / Naturalistic • Motte-and-bailey fallacy • Rationalization • Red herring (Two wrongs make a right) • Special pleading • Straw man • Cliché • I'm entitled to my opinion | | | |
| <div><div><div></div></div><div>Category</div></div> | | | | |

What counts as a fallacy?

What counts as a fallacy?

the types of fallacies include:

- informal (here, I'm including all fallacies of relevance and semantic fallacies; e.g., ad hominem, red herring, appeal to authority, equivocation)
- inductive (e.g., base rate fallacy, hasty generalization, faulty analogy, gambler's fallacy)
- formal (us!)

E.g., Red herring...wait, literally?

Brexit trade deal: What does it mean for fishing?

By Chris Morris & Oliver Barn
BBC Reality Check

**Rotting fish, lost business and piles of red tape.
The reality of Brexit hits Britain**



Analysis by [Luke McGee](#), CNN Business
Published 12:00 AM EST, Sat January 23, 2021

Brexit: UK salmon exports to EU crash 98%



Lucy Harley-McKeown

22 March 2021 · 3-min read



GBPEUR=X -0.0983%

GBP=X +0.54%

EUR=X +0.40%



Fishy business: Why access to UK waters is red herring in Brexit talks

The EU is making a

The issue of fish is a red herring in the Brexit negotiations

It is the level playing field rules that are the real guts of Brexit, on which we must not compromise sovereignty



Henry Carden @henrycarden · Jun 28, 2020

...

Brexiters obsession with fish is an absolute [#redherring](#) It's worth remembering that the UK fishing industry is worth £1.4 billion to the economy each year, compared to the UK music industry (which certainly won't be "better off" by Brexit) being worth around £5.2 billion.

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E.g.,
gambler's
fallacy



E.g., gambler's fallacy

Gambler's fallacy is a belief that the probability of something happening becomes higher or lower as the process is repeated.

It is the belief that random events are somehow interconnected and that each event influences the likelihood of another.

In trading, this bias can cause traders to close profitable trades too early because they believe that the stock is unlikely to continue its trajectory and the chances of more profit become lower as time proceeds.

E.g.,
gambler's
fallacy*

*please invest wisely ☺

Dogecoin DOGE

PRICE

\$0.358221

24 HOUR % CHANGE

▼ **-24.06%**

MARKET CAP

\$46.40B

VOLUME (24H)

\$15.67B

USD ▼

Linear ● Log



EXPORT DATA ↓

02/19/2021 to 05/19/2021

1d 1w 1m 3m 1y all

\$0.7

\$0.6

\$0.5

\$0.4

\$0.3

\$0.2

\$0.1

Whew, we
recovered. Now
I have to sell! It
can't keep
rising!....

I have to sell!
It can't keep
rising!....

coindesk

March

April

May

NOT
gambler's
fallacy*

*please invest wisely ☺

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\$0.1

March

April

May

coindesk

Elon Musk is
about to be
on SNL...I
better sell...

What counts as a fallacy?

- formal (us!)
 - fallacies involving conditionals: affirming the consequent, denying the antecedent
 - others: affirming a disjunct, denying a conjunct
 - fallacies involve QL: fallacy of undistributed middle

Affirming the consequent

Basic idea: You want to argue: $a \rightarrow b, b \therefore a$

How do we know this is bad?

| a | b | $a \rightarrow b,$ | b | | a |
|---|---|--------------------|---|---|---|
| T | T | T | T | ✓ | T |
| T | F | F | F | ✓ | T |
| F | T | T | T | ✗ | F |
| F | F | T | F | ✓ | F |

Affirming the consequent

Basic idea: You want to argue: $a \rightarrow b, b \therefore a$

If you are fully vaccinated, then you do not need to wear a mask.
You are not wearing a mask.
 \therefore You must be fully vaccinated.



Ryan Utter @rye_b · Dec 4, 2020



To use a real-world example:

If COVID-19 was spread by droplets (A) then transmission would happen at close proximity (B)

Transmission happens at close proximity (B)

Therefore COVID-19 is spread by droplets (A)

when arguing something is affirming the consequent, it's often useful to show an alternative way of getting the consequent (besides the antecedent):

If COVID-19 was spread by droplets (A) then transmission would happen at close proximity (B)

If COVID-19 was spread by aerosols (C) then transmission would happen at close proximity (B)

Denying the antecedent

Basic idea: You want to argue: $a \rightarrow b, \neg a \therefore \neg b$

How do we know this is bad?

| a | b | $a \rightarrow b,$ | $\neg a$ | | $\neg b$ |
|---|---|--------------------|----------|---|----------|
| T | T | T | F | ✓ | F |
| T | F | F | F | ✓ | T |
| F | T | T | T | ✗ | F |
| F | F | T | T | ✓ | T |

Denying the antecedent

Basic idea: You want to argue: $a \rightarrow b, \neg a \therefore \neg b$

- 1) Everything that begins to exist has a cause.
- 2) The universe did not begin to exist.
- 3) Therefore, the universe did not have a cause.

Denying the antecedent

Basic idea: You want to argue: $a \rightarrow b, \neg a \therefore \neg b$



Nicholas Grossman @NGrossman81 · May 1, 2019

...

If you say Barr's trustworthy because if he weren't Mueller would object, and then you find out Mueller objected, the reasonable conclusion is Barr's not trustworthy.

translation manual:

m = "Mueller does not object"

b = "Barr is trustworthy"

$m \rightarrow b$

$\neg m$

$\therefore \neg b$

What about...

Basic idea: You want to argue: $a \rightarrow b, \neg b \therefore \neg a$

not bad! this is the contraposition of the original conditional and is a valid argument.

| a | b | $a \rightarrow b, \neg b$ | | | $\neg a$ |
|-----|-----|---------------------------|---|---|----------|
| T | T | T | F | ✓ | F |
| T | F | F | T | ✓ | F |
| F | T | T | F | ✓ | T |
| F | F | T | T | ✓ | T |

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Affirming a disjunct

Basic idea: You want to argue: $a \vee b, a \therefore \neg b$

equivalently: You want to argue: $a \vee b, b \therefore \neg a$

Affirming a disjunct

Translation manual:

s: "is an issue with soda"

c: "is an issue with calories"

$$s \vee c, c \therefore \neg s$$



Colin Champ, M.D.
@ColinChampMD

It's hard to take any research seriously when scumbags like [#CocaCola](#) fund a bunch of scientists at the sham European Hydration Institute to write articles playing down issues with [#soda](#) and instead pointing to [#calories](#) like this



Impact of beverage intake on metabolic and cardiovascula...
Abstract. This review is based on a presentation that was made at a meeting concerning hydration. It summarizes th...
[academic.oup.com](#)

7:22 AM · Apr 21, 2018 · Twitter Web Client

49 Retweets 4 Quote Tweets 105 Likes



SwiftMo - Bike hire and training. @SwiftMomentum · Apr 21, 2018

Replying to [@ColinChampMD](#) and [@ProfTimNoakes](#)

Can you elaborate your point a bit further, specifically regarding "issues with [#soda](#)"? You seem to be affirming a disjunct re said issues and calories.



Is it affirming a disjunct really?

Translation manual:

s: "is an issue with soda"

c: "is an issue with calories"

$$s \vee c, c \therefore \neg s$$

But researching issues with calories is a red herring when soda is the issue!



Colin Champ, M.D.
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Affirming a disjunct



What Is It Like to Be a Philosopher? @CliffordSosis · Mar 27, 2019

Which country is in worse shape right now, overall? [#brexit](#) [#trump](#)

UK

54.2%

US

45.8%

166 votes · Final results



5



1



2



Thom Burrus @ThomBurrus · Mar 27, 2019

Classic case of **affirming a disjunct**?



1



Translation manual:

s: "the US is worse off"

k: "the UK is worse off"

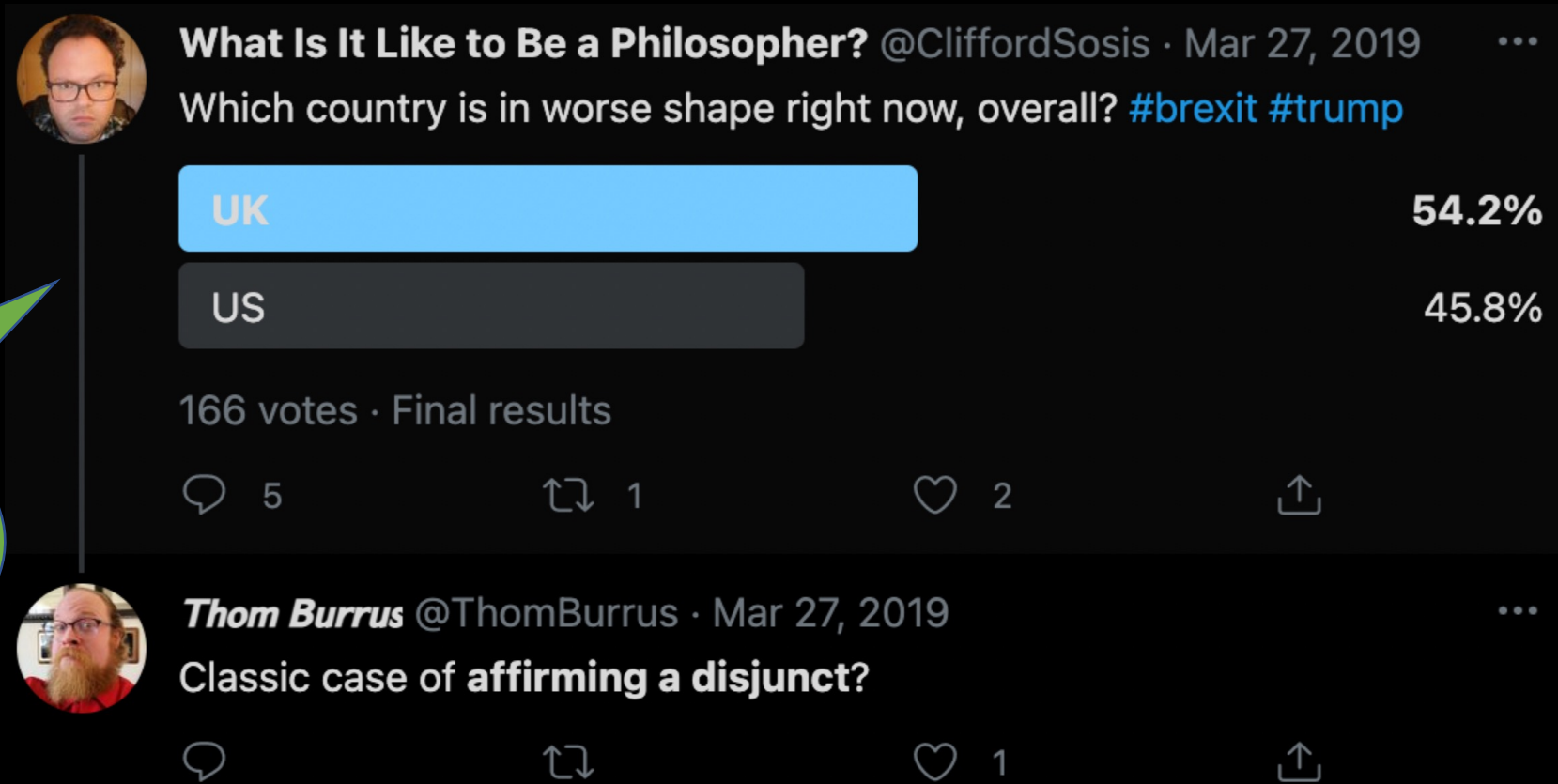
$$s \vee k, k \therefore \neg s$$

Is it affirming a disjunct really?

"Worse off"
translates to an
exclusive or!

Translation manual:
s: "the US is worse off"
k: "the UK is worse off"

$$s \vee k, k \therefore \neg s$$



Translation manual:
s: "the US is worse off"
k: "the UK is worse off"

$$s \vee k, \neg(s \wedge k), k \therefore \neg s$$

Denying a conjunct

Basic idea: You want to argue: $\neg(a \wedge b), \neg b \therefore a$

equivalently: You want to argue: $\neg(a \wedge b), \neg a \therefore b$



Using DeMorgan's, we have: $(\neg a \vee \neg b), \neg b \therefore a$

if you switch all a to $\neg a$, and all b to $\neg b$ and use double negation elimination, you recover affirming a disjunct:

Affirming a disjunct: $a \vee b, b \therefore \neg a$

What counts as a fallacy?

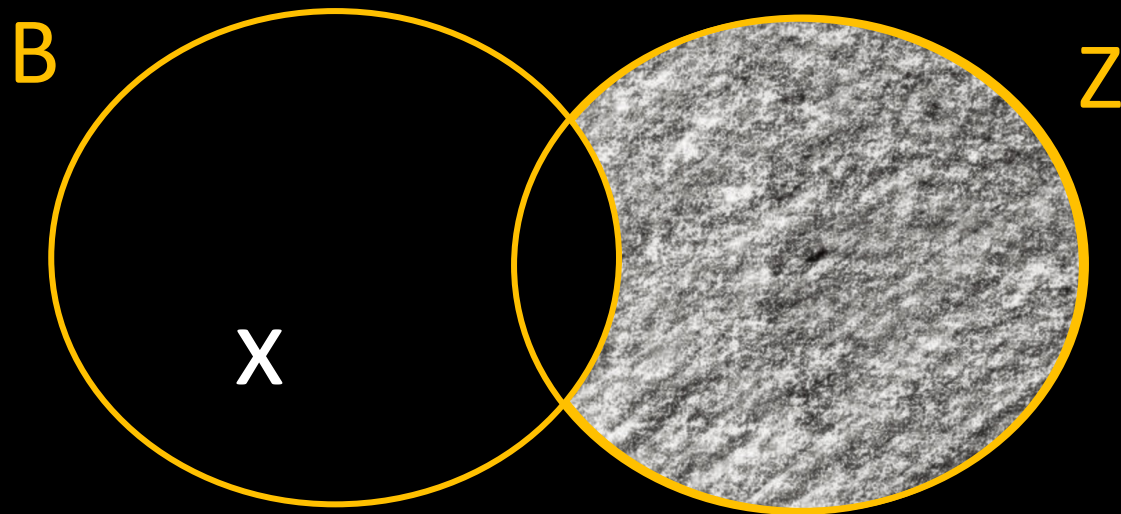
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Fallacy of undistributed middle

Basic idea: You want to argue: $\forall x(Zx \rightarrow Bx), Ba \vdash Za$

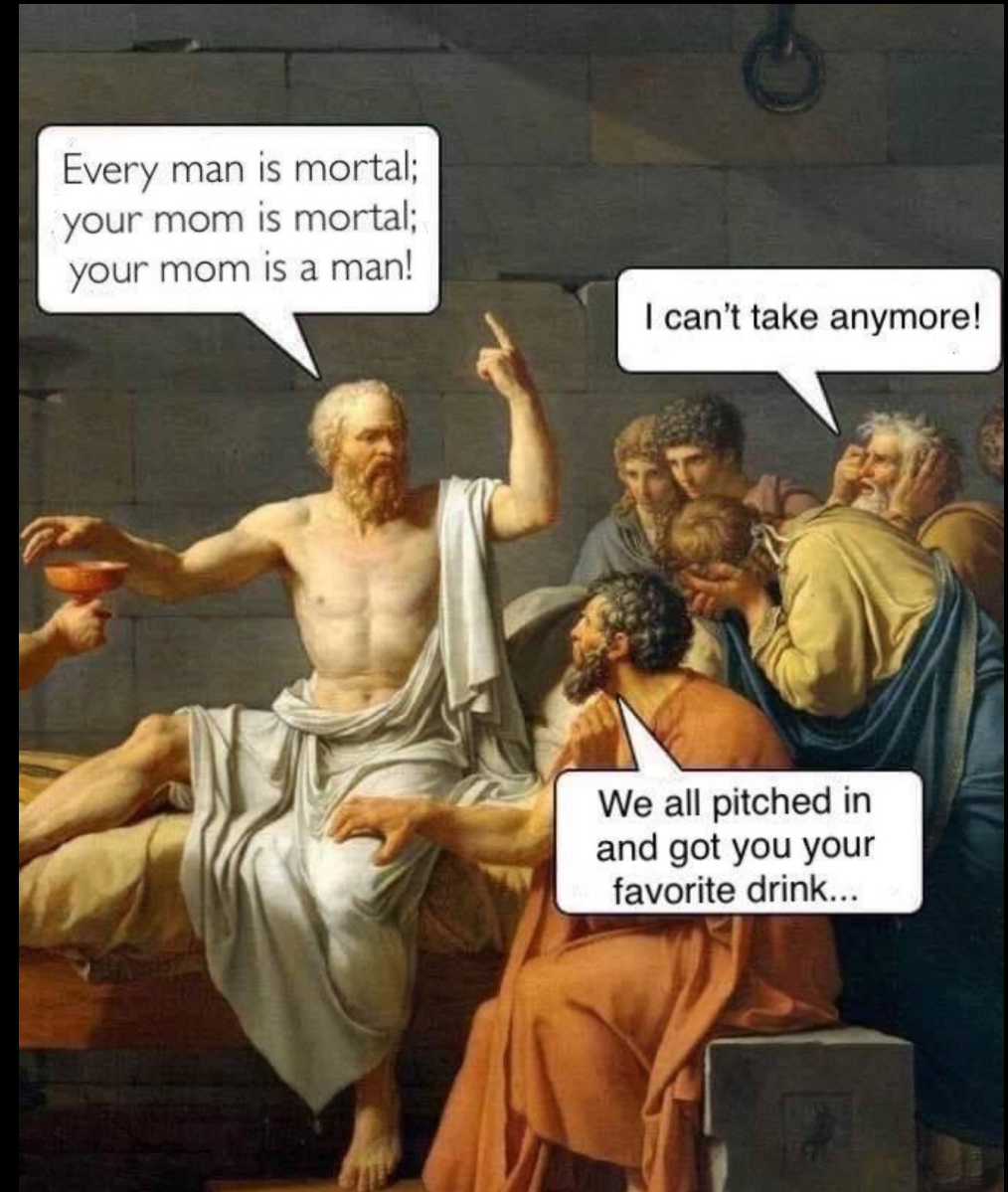
How do we know this is bad?

Check via Venn Diagrams:



Fallacy of undistributed middle

Basic idea: You want to argue:
 $\forall x(Zx \rightarrow Bx), Ba \vdash Za$



Fallacy of undistributed middle

Basic idea: You want to argue:
 $\forall x(Zx \rightarrow Bx), Ba \vdash Za$



Helen

@Hellsbellsmith

...

[#AskDanielRadcliffe](#) Hi Dan, if transwomen are women, and I am a woman, am I a transwoman? 🤔 Thanks in advance for answering.

5:36 AM · Jun 15, 2020 · Twitter for iPhone

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