UGRC 150: CRITICAL THINKING AND PRACTICAL REASONING

LECTURE 5: Deduction *versus* Induction

(Unit 6)

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Jan- April 2023

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Outline

- ***CONTRASTING DEDUCTIVE AND INDUCTIVE ARGUMENTS***
  - Particular and general statements
    - Reference class and attribute class
  - Types of generalizations
  - Universal generalizations as disguised conditionals

DEDUCTIVE ARGUMENT AND **INDUCTIVE** ARGUMENT

Outline Cont'd

- *FOUR **VALID** SYLLOGISTIC PATTERNS*
  - *Understanding syllogisms*
  - *Understanding negation*
  - Modus Ponens (affirming the *antecedent*)
  - Modus Tollens (negating the *consequent*)
  - Disjunctive Syllogism
  - Hypothetical Syllogism
- *FORMAL **FALLACIES***
  - Fallacy of affirming the *consequent*
  - Fallacy of negating the *antecedent*
  - False hypothetical syllogism
- *VALID ARGUMENT AND SOUND ARGUMENT*

Deduction vs. Induction

These terms describe two types of **arguments**. (two ways of reasoning; two ways of supporting a claim with evidence(s))

Deductive argument: In a valid deduction if the premises are true, then the conclusion is also **necessarily** true *already*.

Inductive argument: The conclusion may not necessarily follow(may not be true) even if the premises are true.

Recall premises and conclusion!

Recall Argument

Argument: a passage that contains a single **conclusion** that is presented as a logical consequence of **reasons** (premises/evidence) offered.

- Thus, hence, therefore, so, indicate *conclusion*
- *S*ince, if, given that, provided, indicate premises (reasons/evidence).
- **Refer to the text for examples!! Discuss during interactions**

COMPARE
TWO TYPES OF ARGUMENTS

Deductive

1. All students write exams

   Ama is a student

   So, she writes exams

Inductive

2. Most Ghanaians are hospitable

   My mother is a Ghanaian

   Therefore, she is hospitable

Discuss types of argument cont'd

– Inductive argument

3. Since the security man was the last person who left the building yesterday, he stole the project leader's laptop.

– Deductive argument

4. All mangoes are fruits

My pen is not a fruit

So, it is not a mango

CORRECT DISTINCTION:
DEDUCTIVE AND INDUCTIVE ARGUMENTS

- **Deductive argument**: an argument is deductive when the truth of the premises **guarantee(proves)** the truth of the conclusion.
- In a good (valid) deductive argument, if the premises are assumed to be true, then the conclusion must be **necessarily** true.
- In a *valid deductive* argument, it is **impossible** for the premises to be true, and the conclusion to be false at the same time.
- If not, you create a contradiction!!!

CONTRASTING
DEDUCTION AND INDUCTION

- It is **wrong** to say deductive arguments move from general premises to particular conclusions while inductive move from particular to general. That is ambiguous!!!
- **Note** that deduction is **topic-neutral** but induction depends on subject matter!
- Deduction is about form/pattern/structure but induction is about content.
- See text for more examples!

TYPES OF VALID DEDUCTIVE ARGUMENTS

Your textbook lists 4 types of VALID deductive ***syllogistic arguments***, but there are more:

1. Modus Ponens (affirming the antecedent)
2. Modus Tollens (denying or negating the consequent)
3. Disjunctive Syllogism
4. Hypothetical Syllogism

See examples from text!

Note: A syllogism is a form of deductive argument with ***two premises and one conclusion***

Understanding particular vs general statements

Every statement (proposition) has two parts : the reference class and the attribute class.

e.g. That man is a bully.

- 'That man' is the reference class

(since 'that man' is specific, countable and finite, we describe this statement as a **particular statement**)

e.g. Men are bullies.

- 'Men' is the reference class

(since 'men' is not specific, not countable and is infinite, we describe this statement as a **generalization**)

Types of generalizations universal and statistical

Universal/lawlike generalization: The attribute applies to all members of that infinite reference class. (No one is exempted!) *E.g. Men are bullies*.

Statistical generalization: The attribute applies only to a subset of the infinite reference class. (some are exempted but the class is still infinite, therefore a generalization). *E.g. Some men are bullies.*

NOTE: **The reference class tells you whether a statement is general or particular; as well as the type of generalization**

Practice! particular vs. general statements: See pg. 191

1. **The disease** is contagious . verifiable
2. **Few Ghanaians** are allergic to pineapples. confirmable
3. **The liquid** in that ball is poisonous. verifiable
4. **Green tables** are scarce these days. confirmable
5. **Kofi** is the new SRC president. verifiable
6. **All voters** prefer a recount of ballots. confirmable
7. **All *the* voters** interviewed said they will prefer a recount of the ballot. verifiable
8. **No student** registers unless forced. confirmable
9. None of ***the* students** in that class registered for the course. verifiable
10. **80% of all retailed** stones are not real diamonds. confirmable

NOTE:
Universals are either affirmative or negative

Universal Affirmative

- Ghanaians are hospitable.
- Christians worship on Sundays.
- Alcoholics are womanizers.
- Ghanaians approve of same-sex marriage.

Universal negative

- No man is perfect.
- No cat is a dog
- No goats require vaccinations

Universal generalizations as disguised conditionals

Note: any ***universal generalization*** is actually a disguised conditional which has an antecedent and a consequent.

- *All men are bullies* is the same as *if x is a man then x is a bully.*
- *Every student cheats* is the same as *if x is a student then x cheats*

Universal generalizations as disguised conditionals cont'd

- We can clearly determine the antecedent and the consequent of our statement when written as a conditional (if…then statement).
- Antecedent: the 'if clause'
- Consequent: the 'then clause'

E.g. If x is a man then x is a bully. (antecedent is x is a man; consequent is x is a bully)

E.g. If x is a student then x cheats. (antecedent is x is a student; consequent is x cheats)

Universal negations as conditionals

- For the expression **"No man is perfect",** the conditional form reads thus: "if x is a man, then x is not perfect'.
- For the expression, **"No cats are dogs",** the conditional form reads thus: "if x is a cat, then x is not a dog"
- For the expression, **"No humans have feathers"**, the conditional form reads thus: "if x is a human then x has no feathers "

A note on syllogism

- A syllogism simply refers to a deductive argument with ***two premises and a conclusion.***

- ***All the valid forms we will study are syllogisms.***

A note on interpreting negation

- Note: if the original statement is a negation, then its negation will be positive, and vice versa.
- E.g. the negation of the statement “Kofi is not a student” is “Kofi is a student”, while the negation of the statement “Kofi is a student” is “Kofi is not a student”.
- This note is useful for affirming and denying antecedent and consequent.

Types of valid deductive forms (valid syllogistic forms)

- **Modus Ponens** (affirming the antecedent)

All mangoes are fruits

This thing is a mango

So it is a fruit

- **Modus Tollens** (negating the consequent)

All mangoes are fruits

This thing is not a fruit

So, this thing is not a mango

valid deductive forms cont'd

- **Hypothetical Syllogism**

All mangoes are fruits

All fruits are edible

So, all mangoes are edible

- **Disjunctive Syllogism**

You either save at Barclays or Stanchart

You do **not** save at Barclays

Therefore, you save at Stanchart

Formal/Syllogistic FALLACIES

- Formal fallacies simply refer to an error in the form of deduction (i.e. you do not deduce according to the correct form or pattern)

1. The fallacy of affirming the consequent. When you affirm the consequent instead of the antecedent.

   All Xs are Ys

   ➢ This thing is a Y

   So, this thing is an X

Formal fallacies cont'd

2. The fallacy of denying or negating the antecedent. When you negate the antecedent instead of the consequent.

All Xs are Ys

- This thing is NOT an X

So, this thing is NOT a Y

Formal fallacies cont'd

3. False hypothetical syllogism:

If two different antecedents share a common consequent, it does not mean the two antecedents are the same or identical. "E.g. Every table is a furniture. Every chair is a furniture. So, every table is a chair." That is a fallacy!!!

All Xs are Ys

All Zs are Ys

So, all Xs must be Zs

Compare!

• VALID FORM	ITS INCORRECT FORM (FALLACY)
MODUS PONENS (affirming the antecedent)	**Affirming the consequent**
Heavy smokers have lung issues	Heavy smokers have lung issues
Kofi is a heavy smoker	Kofi has lung issues
So, he has lung issues	So, he is a heavy smoker
MODUS TOLLENS(denying the consequent)	**Denying the antecedent**
Heavy smokers have lung issues	Heavy smokers have lung issues
Kofi does NOT have lung issues	Kofi is NOT a heavy smoker
So, he is NOT a heavy smoker	So, he does NOT have lung issues
HYPOTHETICAL SYLLOGISM	**False Hypothetical Syllogism**
All mangoes are fruits.	All mangoes are fruits
All fruits are edible	All bananas are also fruits
So, all mangoes are edible	So, all mangoes are bananas

Recall! Validity vs. Soundness of a deductive argument

- Valid and true premises = sound

  1. All men are mortal.

  Socrates is a man.

  Therefore, Socrates is mortal.

- Valid but false premises = not sound

  2. All human beings have feathers.

  This table is a human being

  So, this table has feathers

SOUND ARGUMENT

- A sound argument must ***first be valid and then its premises must be true***.

END OF LECTURE 5 (UNIT 6)

BLESSED, SAFE WEEK!!

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