MAT120: Lecture 1 Handout

Argumentation

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1 What is an Argument

We often think of an argument as a fight or a conflict. Although this is partly true, the term is a lot more general than that.

1.1 Definition of an Argument

Google provides two definitions:

1. Argument = an exchange of diverging or opposing views, typically a heated or angry one. Example: "I had an argument with my father yesterday"
2. Argument = a reason or set of reasons given in support of an idea, action or theory. Example: "There is a strong argument for submitting a formal appeal"

So, the same word "argument" can mean two different things. Interestingly, in Japanese there are two different words for these two concepts. Definition 1 is roughly translated to "kouron" in Japanese, and Definition 2 translates to something like "giron".

There is a clear similarity between the two concepts: both types of "argument" are some sort of exchange of thoughts or ideas. However, Definition 1 (kouron) is typically emotionally driven, whereas Definition 2 (giron) is typically truth-seeking and logically driven.

We will focus mostly on Definition 2 (giron). These sorts of "arguments" are everywhere, all the time — any time that you want to convince someone of something, you use some sort of argument, either explicitly or implicitly. In general, there are good arguments and there are bad arguments. It is important to recognize the difference between a good argument and a bad argument: if you know what a good argument is supposed to look like, then you know how to better convince people around you, and if you know what a bad argument looks like, then you will know to avoid such things when communicating ideas, and you will be able to better protect yourself from being convinced by bad arguments.

1.2 The Anatomy of an Argument

In the later parts of this handout we will discuss what a good argument should be, and what a bad argument looks like. However, before getting to that topic, we need to first make clear what an argument actually "is". This is a complicated and nuanced philosophical issue, and there are many competing models and theories for what an argument looks like (and should look like). We do not have time to cover all of these theories, so we will instead commit to the most basic possible definition: an argument is a collection of reasons that is used to justify a conclusion. In other words, an argument takes a series of reasons (often called premises), and uses logic to end up at some conclusion (often called a claim). To reiterate:

- **Claim** = the thing you are trying to conclude
- **Premises** = the reasons that you use in the argument

The justification process that connects the premises to the claim is what we call "reasoning".

1.3 Argument vs Explanation

There is a very related concept to argumentation, which one might call "explanation". The core difference between an argument and an explanation is in the ordering of assumptions:

- An argument assumes a series of reasons and uses them to lead to a conclusion.
- An explanation assumes a conclusion and tries to identify reasons why it must be true.

So, an argument starts with reasons and uses logic to find a conclusion. An explanation starts with a conclusion and tries to find reasons why it's true.

2 How to Make a Good Argument

2.1 Three components of a good argument

In the time of the ancient Greeks, common people would hire "lawyers" to argue their legal cases in court. These "lawyers" were not quite lawyers in the sense of today; instead they were simply experts in convincing people of things. So, if you happened to get into trouble, you could hire one of these "lawyers" to argue your case and get you out of trouble. The issue at the time was that these "lawyers" were not dedicated, ethical experts in truth; instead they were merely experts in convincing people. Sometimes, these "lawyers" would knowingly use argumentative tricks and falsehoods to overpower weaker-minded individuals, without ever appealing to the truth. This practice of using dishonest, tricky arguments to convince people of things is called "sophistry", and these "lawyers" were called "Sophists".

Aristotle, a student of the great philosopher Plato, was an ancient Greek philosopher who had a particular love of the truth, and therefore a particularly strong dislike of Sophists. Aristotle did not "invent" logic from nothing, but he systematized formal logic (in the Western tradition), including what are now called "Aristotelian syllogisms". A key point is this: valid reasoning preserves truth — if the premises are true and the reasoning is valid, then the conclusion must be true. We will discuss some of Aristotle's Laws of Logic later in the course. For now, we will talk about something else.

During his study of arguments, Aristotle identified three components to a good argument:

1. **Logos**, which is an appeal to the logical nature of the argument, or to the truth of things.
2. **Pathos**, which is an appeal to the emotions of the listener.
3. **Ethos**, which is an appeal to the audience's sense of character.

In other words: "logos" appeals to the brain, "pathos" appeals to the heart, and "ethos" appeals to the gut.

These three aspects of a good argument are like ingredients for baking a cake: different proportions of these ingredients are required for different recipes. In some cases, the right argument is purely in terms of Logos (a mathematical proof, a scientific research paper, an engineer justifying the design of a bridge). In other cases, an argument based purely in Logos would not be convincing.

However, in some contexts we do not need to use all three aspects in order to create a good argument. For example, an engineer does not need to use pathos in order to argue that a bridge is safe: they will (hopefully) use Logos instead, i.e. facts and data to support their claim.

2.2 Example of a Good Argument: Doomscrolling

In the introductory lecture I gave an argument for why students should stop doomscrolling. The argument was something like below.

> **Argument:** "You should stop doomscrolling short-form-videos because it will probably make you sadder and dumber in the long term".

We can deconstruct this argument into the premises and a claim:

- **Premise 1:** "doomscrolling short-form-videos probably makes you sad and dumb".
- **Premise 2:** "you should be smart, energetic and happy".
- **Conclusion:** "you should stop doomscrolling short-form-videos".

It should be noted that Premise 2 was not stated explicitly, but was instead assumed implicitly. Of course, it does not make sense to present the skeleton of an argument to the audience. Instead, the right way to convince the audience of an argument like this is to use a mixture of logos, pathos and ethos. I will now explain examples of each of these:

2.2.1 Using Logos

Logos typically involves the presentation of scientific evidence or data to support a premise. One example of Logos to support Premise 1 would be the research paper "Feeds, feelings, and focus", written by Nguyen et. al. and published by the American Psychological Association. In this study, the authors performed a statistical analysis of 71 studies with almost 100,000 participants, and their findings support my claim.

2.2.2 Using Pathos

An appeal to the positive emotions of the audience could be to justify Premise 2 by saying something like "life offers you a fantastic opportunity for exploration and fun. The world is endlessly enjoyable, provided that you choose to participate". By appealing to the potentially magical nature of the human experience, there is a chance that you can invoke a sense of wonder and excitement in the audience, which could be convincing.

Alternatively, pathos can manifest as an appeal to negative emotion by saying something like "you are going to die one day, so don't waste your life meaninglessly scrolling on a phone". This is a powerful message that may invoke feelings of existential dread or fear. It would be considered a form of pathos, even if it is not positive. Emotions are a broad spectrum, and pathos could involve the appeal to either positive or negative emotions.

2.2.3 Using Ethos

Ethos is an appeal to the credibility of the speaker. There are many ways that it can be leveraged as part of an argument. In this case, one such way to use Ethos would be to say something like "As an educator I have a moral responsibility to teach you what you need to know". This openness may give the audience a sense that the speaker is not trying to argue due to hidden motives.

Alternatively, ethos can be given in terms of experiential wisdom, by saying something like "I was once a doom-scroller myself, but I quit and now life is better". This is another way to give the audience a sense that the speaker knows what they are talking about.

As you can see, there is no formula for the "right" argument. Knowing the right thing to say to convince the audience of your argument depends on your sense of what the audience needs to hear — some people may think purely logically, and others may need an emotional basis to an argument to be convinced. Ultimately, delivering the right argument is an art, not a science.

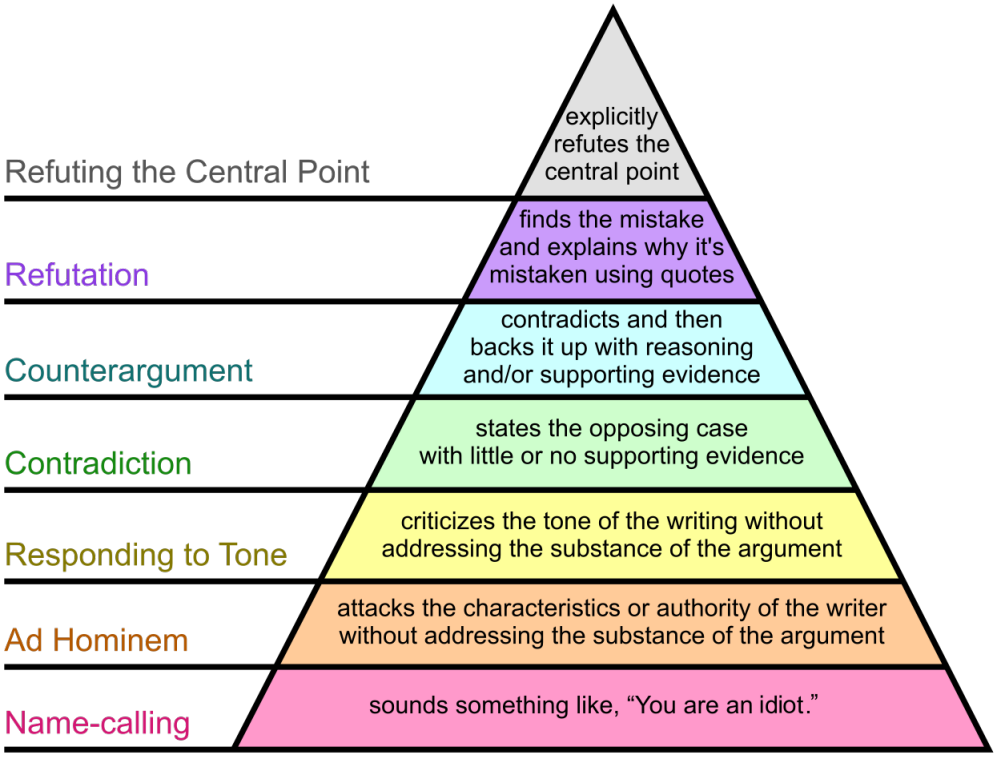
2.3 Counterarguments and Refutation

A counterargument is an argument against someone else's argument. This is also commonly called a refutation, and it is a form of dismissal (or disagreement). There are various ways to provide counterarguments — some are good and some are bad. We can imagine that a bad type of disagreement would be to simply dismiss somebody's argument without actually addressing why you think that it is wrong.

In contrast, we could imagine that a good counterargument would be one in which you intelligently identify the key components of the argument, and pick apart the validity of it. Ideally, we would like to deliver a strong counterargument to somebody's claim. That way, if they perform the same back to you, a "debate" emerges: an intelligent back-and-forth exchange of reasonable arguments until a mutual conclusion is reached.

2.4 Graham's Hierarchy of Refutation

Since this is just an overview of argumentation theory, we will keep things simple and only present one theory of refutation, which comes from Paul Graham's famous essay "How to Disagree". In his theory of refutation, Graham provides a "pyramid" of possible disagreement tactics. The bottom of the pyramid are the weakest methods of refutation, and the top of the pyramid are the strongest methods.



There are 7 layers of the pyramid, which I will label R1, R2, ..., R7, starting from the bottom. Another explanation of the seven tiers of the hierarchy is below.

- **R1: name-calling.** The weakest way to dismiss somebody is to simply call them a name.
- **R2: ad hominem.** Instead of criticising the argument, you criticize the person making the argument.
- **R3: responding to tone.** Instead of criticising the person making the argument, you criticize the way in which it is written or presented.
- **R4: contradiction.** You dismiss the argument by simply stating the opposite, providing little or no explanation.
- **R5: counterargument.** You refute an argument by contradicting it and then providing some supporting evidence for the opposite view.
- **R6: refutation.** You refute an argument by finding the key mistakes in their argument and explaining why it's wrong.
- **R7: refuting the central point.** You refute an argument by generously identifying the key point of the argument, and then you argue against that by providing a collection of reasons. This is the ultimate form of refutation.

Ideally, in practice we would like our counterarguments to fit into level R7. Resorting to name-calling or an ad hominem attack is a form of logical weakness.

2.5 Example Refutation: Flat Earth

A local man thinks that the Earth is flat. He argues as follows.

> **Argument:** "I fink that the Erff is flat. If you look around you, you can see that it is flat. Also, I read online that Antarctica is a giant ice wall and Erff is shaped like a dinner plate."

Here are some possible ways to refute his argument based on Graham's hierarchy:

- **R1: name-calling.** "You are an idiot"
- **R2: ad hominem.** "Your argument is wrong because you don't know what you are talking about"
- **R3: responding to tone.** "You spelt Earth wrong, twice."
- **R4: contradiction.** "You are wrong, everyone knows that the Earth is round"
- **R5: counterargument.** "You are wrong, the Earth is round. Here is a picture of the Earth taken yesterday from the International Space Station."
- **R6: refutation.** "If your claim is that the Earth is globally flat, how can you conclude this from local data? Also, just because you read something online, that doesn't make it true."

R7: refuting the central point. This would be an absolute destruction of the argument. Saying something like: "Your conclusion is wrong for these reasons:" and listing a bunch of reasons:

1. Every other planet is round and you need to provide a good reason for why Earth is so special.
2. There are literally millions of resources from around the world regarding the curvature of Earth. If the Earth were flat then all of this data would have been somehow made up as part of a large conspiracy. Even countries currently at war with each other simultaneously agree that the Earth is round. Why would they do this?
3. Many real-world navigation facts (for example: great-circle flight planning, long-distance travel routes, and global satellite tracking) are consistent with a spherical Earth, and would require major distortions or ad hoc explanations on a flat-Earth map.
4. During a lunar eclipse, the Earth's shadow on the Moon is circular. Why would that consistently happen if the Earth were not (approximately) spherical?
5. If the Earth is flat then you cannot explain why night exists. Where does the Sun go at night?
6. If the Earth is flat then you cannot explain why boats disappear as they sail away. Where do they go?
7. Just because the Earth appears to be flat as you walk around it, that does not mean that the Earth is totally flat on average. There are many objects that appear flat if you zoom in far enough (a sphere, for example).

As you can see, level (R7) is the most robust and logical response to his original argument. At level (R7) we separate the argument from the speaker, and then address the points that we generously think the speaker is trying to make.

2.6 Example Refutation: Liberal Arts

Let's now consider another example of a refutation. A local student says the following.

> **Argument:** "I think that liberal arts colleges like LUJ are a total waste of time. It's a much better idea to go and take a specialist degree somewhere else."

Here are some sample ways to refute their argument based on Graham's hierarchy:

- **R1: name-calling.** "You suck"
- **R2: ad hominem.** "Your argument is wrong because you don't know what you are talking about"
- **R3: responding to tone.** "You are using really emotional language, so I don't believe you."
- **R4: contradiction.** "You are wrong, Liberal Arts has its place in society."
- **R5: counterargument.** "You are wrong, Liberal Arts is a rich tradition that has lasted centuries. If it was a waste of time then it would've died out by now."
- **R6: refutation.** "You claim it's a better idea, but you don't explain why: there are many reasons that people go into higher education, and becoming a specialist is only one such reason."

R7: refuting the central point. This would be an absolute destruction of the argument. Saying something like: "Your conclusion is wrong for these reasons:" and listing a bunch of reasons:

1. Liberal Arts colleges have an emphasis on small class sizes and high teaching quality. If you go to a conventional university then you will be one student amongst hundreds in the lecture hall and the professor won't even know your name.
2. Lots of students don't actually end up using their trained specialty in their later career. Instead, many newly-graduated employees simply learn on the job. With this in mind, perhaps it makes sense to have a broader undergraduate education that exposes you to more-general, societally-relevant knowledge, instead of wasting time learning a specialty that you will probably not end up using.
3. In some cases yes, you will need to specialize in order to perform certain jobs (Lawyer, Doctor, Engineer etc). However, that does not mean that it is a "much better idea" to pursue these particular career options. Different students have different motivations, and not everybody wants to be a Lawyer, for example.
4. It seems that you are implying that the most useful way to spend your time is to dedicate it to a single specialty. But, not everybody knows what they want to do, so perhaps it's not the best idea to commit to whole-heartedly to a specialty that you are not so sure about.

2.7 Steel-manning

"Steel-manning" involves taking an argument, generously making it as strong as possible, and then refuting it anyway. It is the ultimate way to refute an argument, and is an important part of (R7), the top of Graham's hierarchy. The term is a bit of an unusual one: it comes about as an adaptation of the fallacy of the strawman (which we will talk about in Section 3).

2.8 Russell's Teapot and the Burden of Proof

Bertrand Russell once made the claim (1952) that there is a teapot floating in outer space. The obvious counterargument is: I don't believe you, because you have no proof of such a teapot. But, Russell may reply: you should believe me, because you have not proved that there is not such a teapot!

In this situation we appear to be stuck. Both the arguer and the counter-arguer are saying that the other person ought to provide proof for their claim, and in both situations it is effectively impossible to provide proof. In the case of Russell, he cannot prove that there is a teapot floating behind the moon because there is not one. In the case of the counter-arguer, they cannot prove that there is not such a teapot because it would be impossible to check (it's 1952, and also it's simply not possible to check all of outer space for a teapot).

This example illustrates an important principle in argumentation known as the "burden of proof". The term "burden of proof" refers to which speaker has the duty to prove their claim. In the case of Russell's teapot, it is Bertrand Russell who has the burden of proof, since he is the one making the more unbelievable claim.

Generally: the person who is making the more unbelievable claim is the one who must provide more evidence to justify it. There is a nice rubric, due to Carl Sagan: extraordinary claims require extraordinary evidence.

2.9 Example of the Burden of Proof

Suppose that two friends, Timmy and Jimmy, are arguing about the existence of aliens.

- **Jimmy's claim:** Aliens exist and they occupy positions of power on Earth
- **Timmy's claim:** No they don't.

Who has the burden of proof here? The answer is Jimmy.

2.10 Persuasion

The term "persuasion" roughly means "getting somebody to do something for you". It is closely linked to argumentation, but slightly different. One theory of persuasion comes from Anatol Rapoport (1960), and it is fundamentally based on human psychology. He identified three main ways to change people's behaviour:

(P1) A *Pavlovian* strategy: manually encode new habits in the other person
(P2) A *Freudian* strategy: explain away the beliefs of the other
(P3) A *Rogerian* strategy: ethical debate

We will briefly explain these in order.

2.10.1 Pavlovian Strategy

"Pavlovian" refers to Ivan Pavlov, a behavioural psychologist from the ∼1900s. His most popular discovery is Pavlovian conditioning, in which behaviour is changed by controlling habits through a

series of rewards/punishments. Extending this idea from dogs into humans, a Pavlovian strategy of persuasion would involve the control of a person's behaviour by encoding new habits by leveraging rewards/punishments. This sort of "persuasion" is common with very young children, since they lack the capacity of reason or meaningful dialogue.

Examples: training a dog, raising a child, brainwashing, ...

Limitation: the strategy assumes complete authority over the other's resources.

2.10.2 Freudian Strategy

"Freudian" refers to Sigmund Freud, the most famous psychologist ever. One of his (many) theories is that our true beliefs and motivations are buried within some unconscious part of our mind that we are not aware of. A Freudian strategy of persuasion involves outwardly rejecting the claims of others by bringing their unconscious beliefs to the surface.

Example: "you're only saying that because you actually believe deep down that..." (some psychotherapists still do this).

Limitation: it assumes the other has complete trust in you as an authority. Otherwise they won't believe you, and will probably get mad at what you are saying.

2.10.3 Rogerian Strategy

"Rogerian" refers to Carl Rogers, a psychologist from the 1950s. A Rogerian strategy of persuasion involves three principles:

1. **Non-judgementally listening and making the other feel understood.** Ideally, you would want to understand the other's opinions so well that you can rephrase them for yourself, and they would respond with something like "oh wow, that's exactly right. I didn't think to put it in that way".
2. **Finding some merit in the other's position.** The assumption here is that humans like to include moral consistency as part of their self-image, i.e. nobody thinks that they are the villain of their own lives. Instead, disagreements often come about due to misunderstandings, miscommunications, or bad luck. So, understanding the other in this light will help you to see them as an equal.
3. **Increasing perceived similarity.** If you are able to find some reasons why somebody thinks the things they do (even if you disagree with those opinions on a surface-level), then you can begin to find common ground. It is especially helpful to somehow communicate to the other that you are actually working on the same page, and that your apparent separation from them is not strictly necessary. This can help the other person to see you as an equal, perhaps more of an ally than an adversary.

Once these three points are established, only then can you begin to respond and debate, eventually yielding an eventual change. In a sense, this is the best method for resolving interpersonal conflict (or, it certainly feels that way, compared to the other two methods of persuasion). A key idea of Roger's psychology is that mostly we humans have a desire to be understood by others, as a way of acknowledging each others suffering and genuinely empathizing with each other. When this happens, true change can follow it.

Limitation: it assumes that the other is willing to listen and speak as equals, and it won't work when there are severe power imbalances.

3 How to Make a Bad Argument

We saw that a good argument is typically a mixture of Logos, Pathos, and Ethos. But what makes a bad argument? Typically: incorrect steps in logic, misuse of words, misunderstanding of each other, and so on. Such unreasonable "mistakes" in argumentation are known as fallacies. We will now run through some examples.

3.1 The Strawman

Definition: Misrepresenting someone's position (making it weaker or more extreme) and then attacking that distorted version instead of the real claim.

Example: "You think we should reduce homework? So you want students to learn nothing."

Response: "That's not what I'm saying. My claim is X. If you disagree, address X directly."

3.2 Equivocation

Definition: Using a key word in two different senses within the same argument, so the conclusion doesn't follow.

Example: "Gravity is just a 'theory,' so it's just a guess," (switching 'theory' from scientific sense to casual sense).

Repair / response: "Define the term precisely. Are we using the word in the same meaning throughout?"

3.3 Ad hominem

Definition: Attacking the person (character, motives, background) rather than evaluating their reasons.

Example: "You only say that because you're not a real expert."

Repair / response: "Even if you're right about the person, the argument still needs to be assessed: what is wrong with the reason?"

3.4 Red Herring

Definition: Introducing an irrelevant issue to distract from the original claim or shift the topic.

Example: "Why worry about climate policy when there are homeless people?"

Response: "That may be important, but it's a different question. Let's finish the original claim first."

3.5 Overgeneralisation/Hasty Generalisation

Definition: Drawing a broad conclusion from too little evidence or from an unrepresentative sample.

Example: "I met two rude tourists from America — Americans are rude."

Response: "That's not enough evidence. What's the sample size, and is it representative?"

3.6 Appeal to Population

Definition: Treating widespread belief as if it guarantees truth.

Example: "Everyone knows this is true, so it must be true."

Response: Popularity is not evidence. What are the reasons or data that make it true?

3.7 Cherry Picking

Definition: Selecting only the evidence that supports your conclusion while ignoring relevant counter-evidence.

Example: "This supplement works—look at these two success stories".

Response: We need the full dataset. What evidence goes against your conclusion, and how do you address it?

3.8 The Naturalistic Fallacy

Definition: Inferring an "ought" (what is good/right/justified) directly from an "is" (what is natural/common), without an explicit moral principle connecting them.

Example: "Competition is natural, so it's right that society should be competitive."

Response: Even if something is natural, why does that make it good or obligatory? For example, bears are natural but I don't want one as a pet.

3.9 Appeal to Authority

Definition: Treating an authority's opinion as decisive evidence, especially when the authority is not qualified in the relevant domain or when the authority's claim substitutes for reasons.

Example: "Ariana Grande says that this diet cures poverty, so it must be true."

Repair / response: "What is the evidence? Is the authority relevantly qualified, and do credible independent sources agree?"

3.10 Post hoc Fallacy

Definition: Assuming a causal link between events just because they happened in quick succession.

Example: "I wore my lucky socks and we won the big game — so the socks caused the win."

Response: Timing isn't causation. What is the causal mechanism, and what are the alternative explanations?

3.11 Honourable Mention: Ungeneralising

Definition: Stating a single counterexample in opposition to a general claim about averages.

Example: "People with a university degree tend to earn more money later in life."
"That's not true, Bill Gates dropped out of college and he is super rich."

Response: General claims about average results are in a different category than claims about individual data points. Providing a single counterexample does not disprove a general rule.

3.12 A final note

There are literally hundreds of these fallacies. It is your responsibility to yourself to figure out the ways in which people incorrectly argue for things. This will help protect your mind against incorrect theories: conspiracy theories, political theories, marketing rhetoric, etc.