Logical Arguments

September 3, 2012
Logical Arguments

- Logic
- Parts
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- Example 2
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- Validity Test
- Sound
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- SoundEx2
- SoundEx3
- SoundnessCheck
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- FalsePremises2
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- Silly
- Ethical
- AcceptReject
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Case Studies
An argument is a chain of reasoning designed to prove something.
Logical Arguments

An argument is a chain of reasoning designed to prove something.

An argument is a set of statements, some of which serve as premises, one of which serves as a conclusion, where the premises are intended to provide evidence for the conclusion.
Parts of an Argument

An argument consists of:
Parts of an Argument

An argument consists of:

- One or more premises
Parts of an Argument

An argument consists of:

- One or more premises
- A conclusion
An argument consists of:

- One or more premises
- A conclusion

What is missing?
Parts of an Argument

An argument consists of:

- One or more premises
- A conclusion
- A claim that the conclusion follows from the premises
Example Argument

- A cat will not live forever.
Example Argument

- A cat will not live forever.
- Princess is a cat.
Example Argument

- A cat will not live forever.
- Princess is a cat.
- Princess will not live forever.
Example Argument

- A cat will not live forever.
- Princess is a cat.
- Princess will not live forever.
- Princess will die.
Another Example

- It is morally acceptable to strike an animal if it feels no pain.
Another Example

- It is morally acceptable to strike an animal if it feels no pain.
- Headless cats feel no pain.
Another Example

- It is morally acceptable to strike an animal if it feels no pain.
- Headless cats feel no pain.
- It is morally acceptable to kick a headless cat.
Valid Arguments

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Case Studies
Valid Arguments

A valid argument is defined as one where if the premises are true, then the conclusion is true.
Valid Arguments

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Case Studies
Valid Arguments

The conclusion follows from the premises if and only if
Valid Arguments

The conclusion follows from the premises if and only if

- it is impossible for the premises to be true
Valid Arguments

The conclusion follows from the premises if and only if

- it is impossible for the premises to be true
- and the conclusion false at the same time.
Sound Arguments

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Case Studies
Sound Arguments

Only a valid argument with true premises must have a true conclusion.
Sound Arguments

Only a valid argument with true premises must have a true conclusion.

Sometimes we say a sound argument is a valid argument with true premises.
Soundness Example 1
Soundness Example 1

- All mammals nurse their young.
Soundness Example 1

- All mammals nurse their young.
- Pigs are mammals.
Soundness Example 1

- All mammals nurse their young.
- Pigs are mammals.
- Therefore, pigs nurse their young.
Soundness Example 1

- All mammals nurse their young.
- Pigs are mammals.
- Therefore, pigs nurse their young.
- If premises true, conclusion true.
Soundness Example 2

Logical Arguments

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Case Studies

Logical Arguments – 10
### Soundness Example 2

- All pigs are mammals.
Soundness Example 2

- All pigs are mammals.
- The animal in that pen is a mammal.
Soundness Example 2

- All pigs are mammals.
- The animal in that pen is a mammal.
- Therefore the animal in that pen is a pig.
Soundness Example 2

- All pigs are mammals.
- The animal in that pen is a mammal.
- Therefore the animal in that pen is a pig.

- If premises true, conclusion true?
Soundness Example 3

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Case Studies
Soundness Example 3

- All pigs can fly.
Soundness Example 3

- All pigs can fly.
- My cat is a pig.
Soundness Example 3

- All pigs can fly.
- My cat is a pig.
- Therefore, my cat can fly.
Soundness Example 3

- All pigs can fly.
- My cat is a pig.
- Therefore, my cat can fly.

If premises true, conclusion true!
Checking for Soundness

When analyzing arguments, it is vital to separate two issues:
When analyzing arguments, it is vital to separate two issues:

- Whether the premises are true.
Checking for Soundness

When analyzing arguments, it is vital to separate two issues:

- Whether the premises are true.
- Whether the premises logically support the conclusion (validity).
False Premises and Validity

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Case Studies
False Premises and Validity

An argument can have false premises and still be valid.
False Premises and Validity

An argument can have false premises and still be valid.

- All Democratic Presidents since 1900 have had extra-marital affairs.
False Premises and Validity

An argument can have false premises and still be valid.

- All Democratic Presidents since 1900 have had extra-marital affairs.
- Bill Clinton was a Democratic president.
False Premises and Validity

An argument can have false premises and still be valid.

- All Democratic Presidents since 1900 have had extra-marital affairs.
- Bill Clinton was a Democratic president.
- Bill Clinton had extra-marital affairs.
False Premises and Validity

An argument can have false premises and still be valid.

- All Democratic Presidents since 1900 have had extra-marital affairs.
- Bill Clinton was a Democratic president.
- Bill Clinton had extra-marital affairs.

Note that the conclusion is true even with false premises.
False Premises and Validity

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Case Studies
False Premises and Validity

An argument can have false premises and still be valid.
False Premises and Validity

An argument can have false premises and still be valid.

- All Iowa State faculty members have attended at least four universities.
False Premises and Validity

An argument can have false premises and still be valid.

- All Iowa State faculty members have attended at least four universities.
- Paul Lasley is an Iowa State faculty member.
False Premises and Validity

An argument can have false premises and still be valid.

- All Iowa State faculty members have attended at least four universities.
- Paul Lasley is an Iowa State faculty member.
- Paul Lasley has attended at least four universities.
An argument can have false premises and still be valid.

- All Iowa State faculty members have attended at least four universities.
- Paul Lasley is an Iowa State faculty member.
- Paul Lasley has attended at least four universities.

Note that the conclusion is false even though the argument is valid.
False Premises and Validity

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Case Studies
False Premises and Validity

- An valid argument may lead to false conclusions if the premises are not true.
False Premises and Validity

- An valid argument may lead to false conclusions if the premises are not true.
- False premises may not lead to a false conclusion.
Soundness Example 4

Logical Arguments
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Case Studies
Soundness Example 4

- The Earth is cube-shaped.
Soundness Example 4

- The Earth is cube-shaped.
- All cube-shaped things have plants & animals living on them.
Soundness Example 4

- The Earth is cube-shaped.
- All cube-shaped things have plants & animals living on them.
- Therefore the Earth has plants and animals living on it.
Soundness Example 4

- The Earth is cube-shaped.
- All cube-shaped things have plants & animals living on them.
- Therefore the Earth has plants and animals living on it.

Two false premises but conclusion is true.
Soundness Example 5

Logical Arguments
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- **SoundEx5**
- Silly
- Ethical
- AcceptReject
- Reject
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Case Studies
Soundness Example 5

- Some snakebites cause red marks and shortness of breath.
Soundness Example 5

- Some snakebites cause red marks and shortness of breath.
- Bill has a red mark on his leg and shortness of breath.
Soundness Example 5

- Some snakebites cause red marks and shortness of breath.
- Bill has a red mark on his leg and shortness of breath.
- Therefore, Bill has been bitten by a snake.
Soundness Example 5

- Some snakebites cause red marks and shortness of breath.
- Bill has a red mark on his leg and shortness of breath.
- Therefore, Bill has been bitten by a snake.

How can you show that this is not a valid argument.
Soundness Example 6

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Case Studies
Some arguments are just silly.
Soundness Example 6

Some arguments are just silly.

- Iowa State’s colors are cardinal and gold.
Soundness Example 6

Some arguments are just silly.

- Iowa State’s colors are cardinal and gold.
- Terry Branstad is the current governor of Iowa.
Some arguments are just silly.

- Iowa State’s colors are cardinal and gold.
- Terry Branstad is the current governor of Iowa.
- Therefore Lance Armstrong won the Tour de France in 2005.
Some arguments are just silly.

- Iowa State’s colors are cardinal and gold.
- Terry Branstad is the current governor of Iowa.
- Therefore Lance Armstrong won the Tour de France in 2005.

Note that the conclusion is true even though the argument is silly.
Soundness Example 6

Some arguments are just silly.

- Iowa State’s colors are cardinal and gold.
- Terry Branstad is the current governor of Iowa.
- Therefore Lance Armstrong won the Tour de France in 2005.

Note that the conclusion is true even though the argument is silly.

Maybe not.
Ethical Arguments

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Case Studies
Ethical Arguments

Moral (ethical) arguments have two kinds of premises.
Ethical Arguments

Moral (ethical) arguments have two kinds of premises.

1. Moral principles
Ethical Arguments

Moral (ethical) arguments have two kinds of premises.

1. Moral principles
2. Claims about the way the world is, nonmoral claims, or facts
Accepting and Rejecting Arguments

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Case Studies
Accepting and Rejecting Arguments

When presented with an argument, one may either accept or reject it.
Accepting and Rejecting Arguments

When presented with an argument, one may either

1. Accept the premises and the conclusion.
Accepting and Rejecting Arguments

When presented with an argument, one may either

1. Accept the premises and the conclusion.

2. Reject the premises.
Accepting and Rejecting Arguments

When presented with an argument, one may either

1. Accept the premises and the conclusion.

2. Reject the premises.

3. Argue (or show) that the conclusion does not follow from the premises.
Rejecting an Argument

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Case Studies
1. To reject a nonmoral claim, one argues that the facts are not proven.
Rejecting an Argument

1. To reject a nonmoral claim, one argues that the facts are not proven.

2. To reject a moral claim, one argues that the principle is not general or not reasonable.
Rejecting an Argument

1. To reject a nonmoral claim, one argues that the facts are not proven.

2. To reject a moral claim, one argues that the principle is not general or not reasonable.

3. To show that the reasoning is not valid, one argues that the conclusion does not follow from the premises.
Moral Example 1
Moral Example 1

- In some societies infanticide is acceptable.
Moral Example 1

- In some societies infanticide is acceptable.
- In other societies such as the current U.S. society, infanticide is not considered acceptable.
Moral Example 1

- In some societies infanticide is acceptable.
- In other societies such as the current U.S. society, infanticide is not considered acceptable.
- Therefore, infanticide is neither objectively right nor objectively wrong, it is merely a matter of opinion that varies from culture to culture.
Moral Example 1

- In some societies infanticide is acceptable.
- In other societies such as the current U.S. society, infanticide is not considered acceptable.
- Therefore, infanticide is neither objectively right nor objectively wrong, it is merely a matter of opinion that varies from culture to culture.

So have we proven that infanticide is a relative moral principle?
“Moral” Example 2

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- MoralEx3

Case Studies
“Moral” Example 2

- In some societies the earth is thought to be flat.
“Moral” Example 2

- In some societies the earth is thought to be flat.
- In other societies the earth is thought to be round.
“Moral” Example 2

- In some societies the earth is thought to be flat.
- In other societies the earth is thought to be round.
- Therefore, the earth is neither objectively flat nor objectively round, it is merely a matter of opinion that varies from culture to culture.
“Moral” Example 2

- In some societies the earth is thought to be flat.
- In other societies the earth is thought to be round.
- Therefore, the earth is neither objectively flat nor objectively round, it is merely a matter of opinion that varies from culture to culture.

So have we proven that the flatness of the world is a relative principle?
Moral Example 3

Logical Arguments

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Case Studies
### Moral Example 3

- If there were any such thing as objective truth in ethics, we should be able to prove that some moral opinions are true and others false.
Moral Example 3

- If there were any such thing as objective truth in ethics, we should be able to prove that some moral opinions are true and others false.

- But in fact, we cannot prove which moral opinions are true and which are false.
Moral Example 3

- If there were any such thing as objective truth in ethics, we should be able to prove that some moral opinions are true and others false.
- But in fact, we cannot prove which moral opinions are true and which are false.
- Therefore there is no such thing as objective truth in ethics.
# Emergency Room Case

## Logical Arguments

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<td>Surgeon2</td>
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Emergency Room Case

You are an emergency room physician, and you only have five doses of a certain drug left. Alas, you have six patients who need it. Bloggs has a very severe version of the condition for which the drug is a treatment, and it will take all five doses of the drug to cure him. Your other five patients have mild versions of the condition, and each of them will be cured by a single dose. Any one of the six who doesn’t get the full dosage they need will die.
Emergency Room Case

You are an emergency room physician, and you only have five doses of a certain drug left. Alas, you have six patients who need it. Bloggs has a very severe version of the condition for which the drug is a treatment, and it will take all five doses of the drug to cure him. Your other five patients have mild versions of the condition, and each of them will be cured by a single dose. Any one of the six who doesn’t get the full dosage they need will die.

What would you do?
Trolley Case

Logical Arguments

Case Studies

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- Surgeon
- Surgeon2
Trolley Case

A trolley is running out of control down a track. In its path are 5 people who have been tied to the track by a mad philosopher. Fortunately, you can flip a switch which will lead the trolley down a different track. Unfortunately, there is a single person named Bloggs tied to that track.
A trolley is running out of control down a track. In its path are 5 people who have been tied to the track by a mad philosopher. Fortunately, you can flip a switch which will lead the trolley down a different track. Unfortunately, there is a single person named Bloggs tied to that track.

Should (would) you flip the switch?
Trolley Case 2
Trolley Case 2

A trolley is hurtling down a track towards five people. You are on a bridge under which it will pass, and you can stop it by dropping a heavy weight in front of it. As it happens, there is a very fat man (named Bloggs) next to you — your only way to stop the trolley is to push him over the bridge and onto the track, killing him to save five.
A trolley is hurtling down a track towards five people. You are on a bridge under which it will pass, and you can stop it by dropping a heavy weight in front of it. As it happens, there is a very fat man (named Bloggs) next to you — your only way to stop the trolley is to push him over the bridge and onto the track, killing him to save five.

Would (should) you proceed?
Trolley Case 3

As before, a trolley is hurtling down a track towards five people. As in the first case, you can divert it onto a separate track. On this track is a single fat man named Bloggs. However, beyond the fat man, this track loops back onto the main line towards the five, and if it wasn’t for the presence of the fat man, flipping the switch would not save the five.
Trolley Case 3

As before, a trolley is hurtling down a track towards five people. As in the first case, you can divert it onto a separate track. On this track is a single fat man named Bloggs. However, beyond the fat man, this track loops back onto the main line towards the five, and if it wasn’t for the presence of the fat man, flipping the switch would not save the five.

Should you flip the switch?
Trolley Case 4

Logical Arguments

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- ER1
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- Trolley2
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- Trolley4
- Surgeon
- Surgeon2
As before, a trolley is hurtling down a track towards five people. You can divert its path by colliding another trolley into it, but if you do, both will be derailed and go down a hill, across a road, and into a man’s yard. The owner (Bloggs), sleeping in his hammock, will be killed. The riders in the trolleys will only suffer minor injuries.
As before, a trolley is hurtling down a track towards five people. You can divert its path by colliding another trolley into it, but if you do, both will be derailed and go down a hill, across a road, and into a man’s yard. The owner (Bloggs), sleeping in his hammock, will be killed. The riders in the trolleys will only suffer minor injuries.

Should you proceed?
Surgeon Case

Suppose that you are a famous transplant surgeon, and that your transplants always work. You have five patients, each of whom needs a transplant. One needs a heart, one a brain, two need one lung apiece, and one needs a liver. One of your patients, Bloggs, has come in today to find out the results from some lab work. You know from the results of the lab work that Bloggs would be a perfect donor for each of your five other patients, and you know that there are no other available donors. So you ask Bloggs if he would be willing to be cut up and have his organs distributed. He declines your kind offer, but you realize that you could easily overpower Bloggs and cut him up without his consent.
Suppose that you are a famous transplant surgeon, and that your transplants always work. You have five patients, each of whom needs a transplant. One needs a heart, one a brain, two need one lung apiece, and one needs a liver. One of your patients, Bloggs, has come in today to find out the results from some lab work. You know from the results of the lab work that Bloggs would be a perfect donor for each of your five other patients, and you know that there are no other available donors. So you ask Bloggs if he would be willing to be cut up and have his organs distributed. He declines your kind offer, but you realize that you could easily overpower Bloggs and cut him up without his consent.

Should you cut him up?
You are the finest doctor in all the land, doing charitable work in the wilderness. While you are doing a routine checkup on a man, five people are brought to you who were critically injured. Coincidentally, all five victims, and the man in for a checkup, share the same blood type. Each of the victims is injured in a different vital organ, and will die without a transplant. You are such a great doctor, that it is virtually guaranteed that all the transplants would be successful, and each person would make a complete recovery. You only have a moment to decide: do you kill the healthy individual and harvest his organs, so that the five men will survive; or do nothing, and allow the victims to die?
You are the finest doctor in all the land, doing charitable work in the wilderness. While you are doing a routine checkup on a man, five people are brought to you who were critically injured. Coincidentally, all five victims, and the man in for a checkup, share the same blood type. Each of the victims is injured in a different vital organ, and will die without a transplant. You are such a great doctor, that it is virtually guaranteed that all the transplants would be successful, and each person would make a complete recovery. You only have a moment to decide: do you kill the healthy individual and harvest his organs, so that the five men will survive; or do nothing, and allow the victims to die?

Should you kill the man who came in for a checkup?