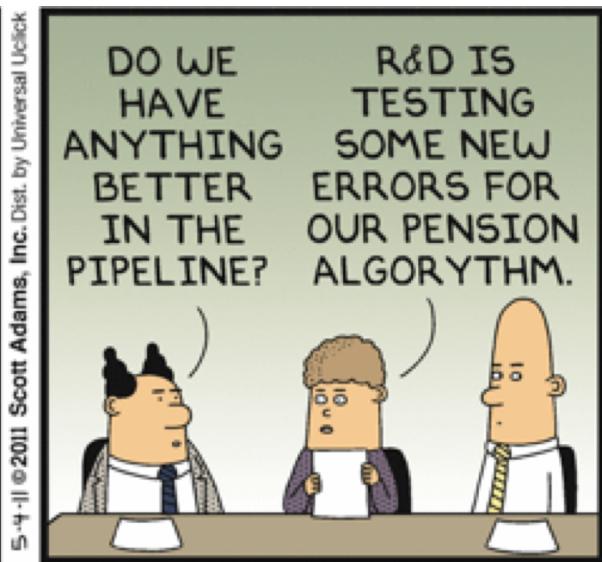
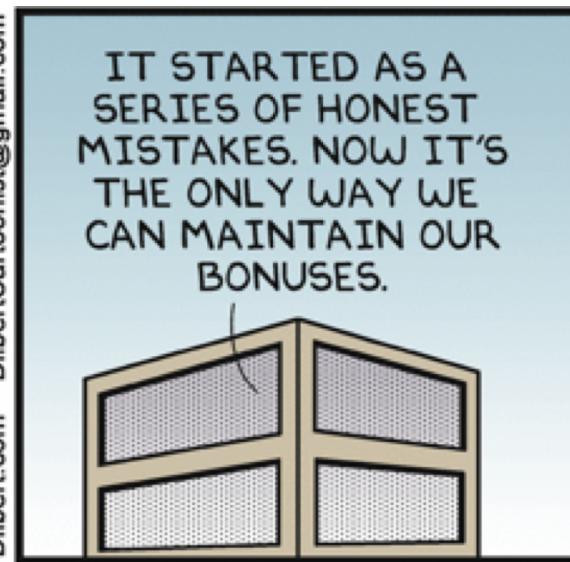
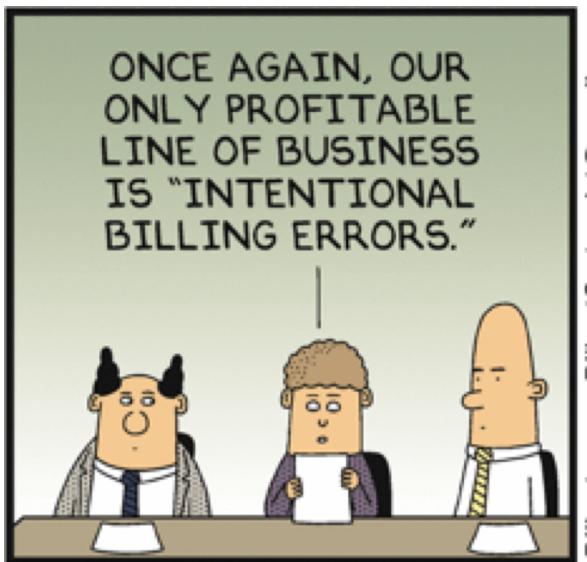


# Lect. #15: Professional Ethics 1



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# Agenda for Today



1. The Seven-step Strategy for Evaluating an Argument



2. “Definition” of Professional Ethics



3. Professional Codes of Ethics



4. Codes of Ethics Related to Professions in Computing and Engineering

# Announcements

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- If you missed class on Tuesday, please be sure you know what you're supposed to do with the GCS case descriptions
- The GCS project prompt and the GCS-PM plan prompt will be available at 3:00 pm today
- Grading rubrics for the GCS initial and final reports and GCS-PM plan will be posted this weekend
- IEEE conference templates for both 5 and 6 authors are available in the Canvas Modules
- If you use Google Docs to work on your reports, note that you're likely to end up with lots of formatting problems

## POLL

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Are you familiar with the seven-step strategy for evaluating an argument?

- A. Yes
- B. No
- C. Other

# **Seven-Step Strategy for Evaluating Arguments: Steps 1-3**

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**Step 1.** Convert argument into standard form; list premises followed by conclusion

**Step 2.** Test argument for validity

Strategy:

- Assume premises to be true
- If conclusion must be true based on premises, argument is valid
- If one counterexample found, argument is invalid

**Step 3.** Is argument valid?

- If valid, go to Step 4
- If invalid, go to Step 5

# Seven-Step Strategy for Evaluating Arguments:

## Step 4

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### Step 4. Test **valid** argument for soundness

#### Strategy:

- If all premises true in real world, then valid argument is sound
- If one or more premises are false, the valid argument is unsound
- Otherwise, if one or more premises is not provably true or false, then valid argument is inconclusive

Go to Step 7

# Seven-Step Strategy for Evaluating Arguments:

## Step 5

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**Step 5.** Check to see if invalid argument is inductive or fallacious

Strategy:

- If conclusion *likely* to be true if premises are assumed to be true, argument is inductive
- If conclusion *not likely* to be true when premises are assumed to be true, argument is fallacious

Note: Remember that an argument can be fallacious even if the premises and conclusion are all true in the real world

# **Seven-Step Strategy for Evaluating Arguments: Steps 6-7**

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**Step 6.** Determine whether **inductive** argument premises are either true or false in real world

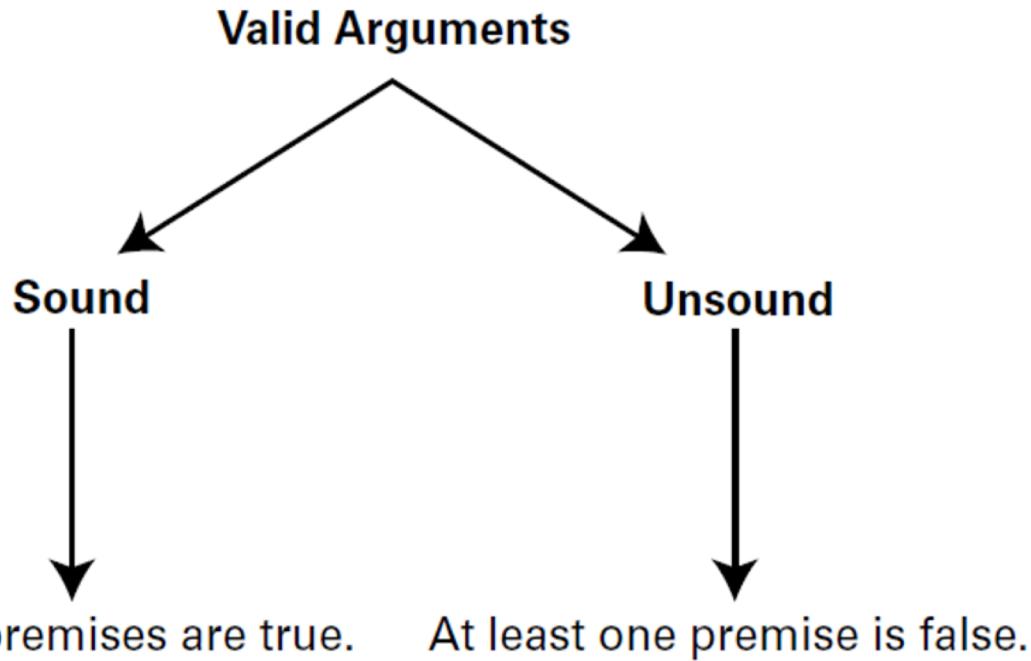
**Step 7.** Make an overall assessment of argument by determining both (a) the argument's strength of reasoning (valid, inductive, or fallacious) and (b) the truth conditions of each of the premises

Argument:

- sound => strong (but likely trivial)
- valid but unsound => weak
- inductive and all or most premises are provably true => strong
- inductive with majority of premises not provably true => not as strong
- fallacious with a mixture of true and false premises => weak
- inconclusive

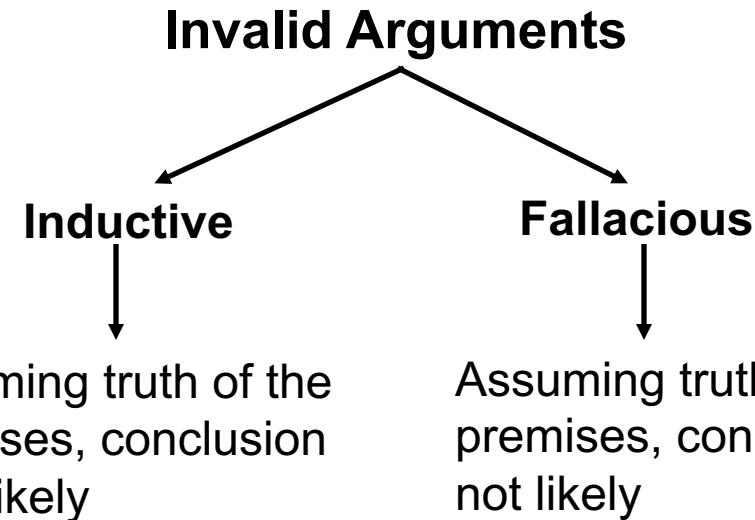
# Arguments: Sound vs Unsound Arguments

Tavani, Fig. 3.2



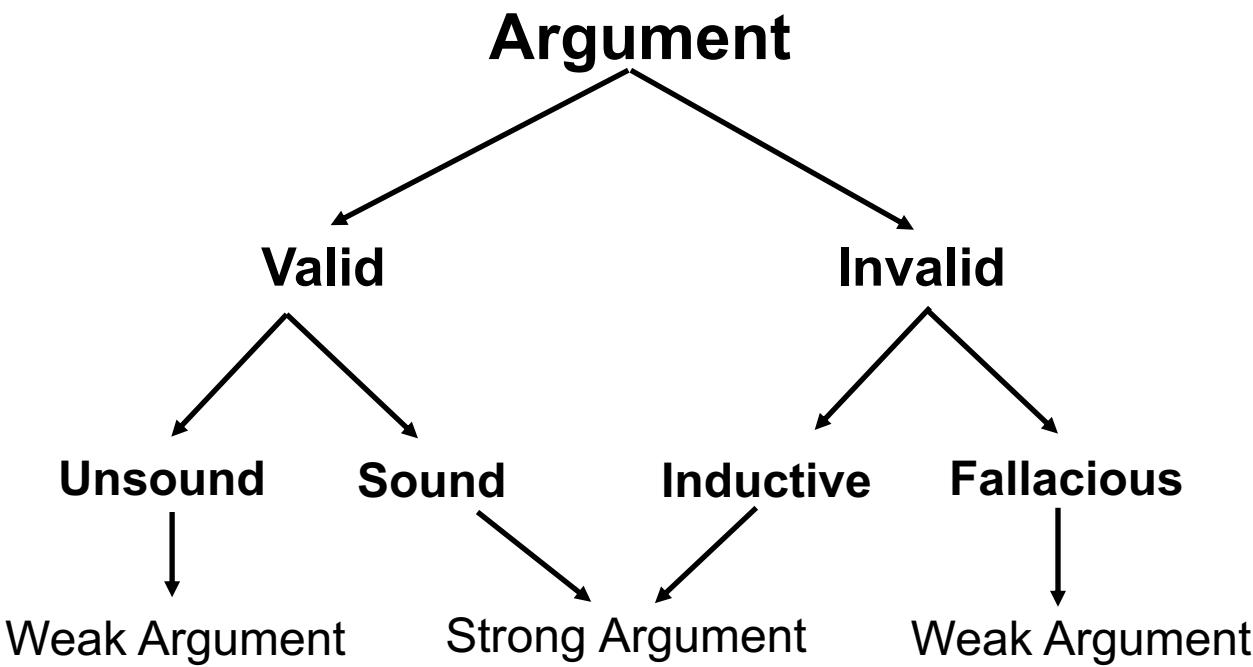
- A *valid argument* is *sound* when **all** premises are true
- An argument can be valid but not sound
- However, an argument can't be sound if it isn't valid

# Arguments: Inductive vs Fallacious Arguments



- An invalid argument is fallacious if the conclusion isn't likely
- An argument can be fallacious even if its premises and conclusion are all true
- Ironically, an argument can be valid even if one or more of its premises is false and its conclusion is also false

# Overview of Different Argument Forms



## Notes:

- Valid argument: Sound if premises true
- Inductive argument: Strong if most premises true; weaker if some false or unprovable
- Fallacious argument: All premises and conclusion can be true, but argument still fallacious; fallacious if conclusion not likely to be true when premises assumed to be true

# Case Study: Therac-25

## Application of Seven-Step Strategy

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AECL should have told the victim of the Therac-25 accident in December 1985 that it knew of previous Therac-25 incidents. In July 1985, AECL knew of two individuals, one in Marietta, Georgia, and the other in Ontario, Canada, who had received massive overdoses of radiation while undergoing treatment with the Therac-25. According to Virtue Ethics, a moral company possesses the virtue of *honesty*. By Virtue Ethics, moral companies should always be honest about what they know.

## **Breakout Discussion (5 min)**

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Apply the seven-step strategy to the argument presented in the previous slide using Virtue Ethics. Use the Ethics Summary sheet in Canvas.

Choose someone to present your results:

- Is the argument valid or invalid?
- If valid, is it sound or unsound?
- If invalid, is it inductive or fallacious?
- How strong is the argument?

# **Seven-Step Strategy**

## **Step 1: Convert to standard form**

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**PREMISE 1:** By July 1985, AECL knew of two individuals who had received massive overdoses of radiation while undergoing treatment with the Therac-25.

**PREMISE 2:** According to Virtue Ethics, a moral company possesses the virtue of *honesty*.

**PREMISE 3:** By Virtue Ethics, a moral company should be honest about what it knows

**CONCLUSION:** AECL should have been honest and told the victim of the December 1985 Therac-25 accident that it was aware of previous overdose incidents with the Therac-25.

# **Seven Step Strategy**

## **Step 2: Test validity of argument**

**PREMISE 1:** By July 1985, AECL knew of two individuals who had received massive overdoses of radiation while undergoing treatment with the Therac-25.

**PREMISE 2:** According to Virtue Ethics, a moral company possesses the virtue of *honesty*.

**PREMISE 3:** By Virtue Ethics, a moral company should be honest about what it knows

**CONCLUSION:** AECL should have been honest and told the victim of the December 1985 Therac-25 accident that it was aware of previous overdose incidents with the Therac-25.

- Must conclusion follow from premises?
  - No
- **Step 3:** Argument invalid => Go to **Step 5**

## Seven Step Strategy

### Step 5: Check to see if argument inductive or fallacious

**PREMISE 1:** By July 1985, AECL knew of two individuals who had received massive overdoses of radiation while undergoing treatment with the Therac-25.

**PREMISE 2:** According to Virtue Ethics, a moral company possesses the virtue of *honesty*.

**PREMISE 3:** By Virtue Ethics, a moral company should always be honest about what it knows

**CONCLUSION:** AECL should have been honest and told the victim of the December 1985 Therac-25 accident that it was aware of previous overdose incidents with the Therac-25.

- Assuming premises are true:
  - Conclusion likely to be true => Inductive
  - Conclusion not likely to be true => Fallacious

## Seven Step Strategy

### Step 6: Determine whether premises are true or false

**PREMISE 1:** By July, 1985, AECL knew of two individuals who had received massive overdoses of radiation while undergoing treatment with the Therac-25.

**PREMISE 2:** According to Virtue Ethics, a moral company possesses the virtue of *honesty*.

**PREMISE 3:** By Virtue Ethics, a moral company should be honest about what it knows

**CONCLUSION:** AECL should have been honest and told the victim of the December, 1985, Therac-25 accident that it was aware of previous overdose incidents with the Therac-25.

- P1: True
- P2: Normative => Can't verify empirically, but strong premise
- P3: Normative => Can't verify empirically, but strong premise

# Seven Step Strategy

## Step 7: Make overall assessment

**PREMISE 1:** By July 1985, AECL knew of two individuals who had received massive overdoses of radiation while undergoing treatment with the Therac-25.

**PREMISE 2:** According to Virtue Ethics, a moral company possesses the virtue of *honesty*.

**PREMISE 3:** By Virtue Ethics, a moral company should be honest about what it knows

**CONCLUSION:** AECL should have been honest and told the victim of the December 1985 Therac-25 accident that it was aware of previous overdose incidents with the Therac-25.

- Argument invalid and inductive
- One premise true, two premises strong
  - => Strong inductive argument, but could be stronger

# **Professional Ethics: What?**

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“Professional ethics is a field of applied ethics concerned with moral issues that affect” computing and engineering professionals. –Tavani

# Professional Ethics: Why?

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“Professionals are experts in a field, which provides them an advantage over the lay person in that the professional’s work has the potential to impact—either positively or negatively—the general public at large”

– Elizabeth Buchanan (2004)

Computing and engineering professionals can “adversely affect an ‘increasingly large and diverse clientele by failing to act responsibly, fairly, timely, and appropriately’”

– Tavani quoting Buchanan 2004

# Professional Ethics: Areas of Impact

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- Air traffic and control systems
- Mass transportation, including aircraft
- Power systems
- Weapon systems (e.g., UAVs)
- Medical diagnosis and treatment
- Electric vehicles
- Space exploration
- Online retail and other online businesses
- Telecommunications
- And many more

# **Professional Ethics: Examples of How We Can Adversely Affect Society**

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- Design software with biases toward certain groups
- Create technology that take jobs away from people
- Create technology that if not regulated can cause harm, chaos, destruction
- Write insecure software causing data breaches
- Create software that doesn't inform the user that it's manipulating them
- Develop technology that uses resources wastefully
- Develop batteries that cause fires

# Professional Ethics: Why Professional Codes of Ethics?

## Bynum & Rogerson, 2004

Five primary functions:

- **Inspiration**—identify “values and ideals” to which to aspire
- **Education**—inform members of values and standards
- **Guidance**—specify “standards of good practice”
- **Accountability**—emphasize accountability to society and need to adhere to codes
- **Enforcement**—remind us that those who violate code may be disciplined

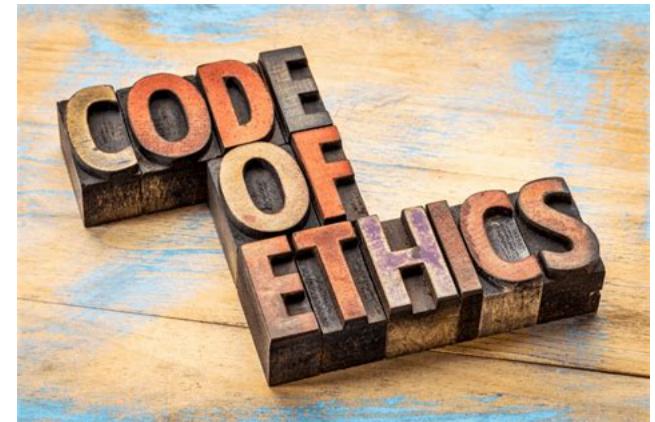


[codecondu.com/?p=4674](http://codecondu.com/?p=4674)

# Professional Ethics: Criticisms of Codes of Ethics

## Ethics Codes Don't Make People Ethical

- Davis (1995): Codes are too vague
- Fairweather (2004): Codes are incomplete, often limited only to privacy, accuracy, property, and accessibility
- Ladd (1995): Ethics can't be codified; codes are more like legal requirements than ethical rules



[www.appleseeds.org/Ethics-Codes\\_Josephson.htm](http://www.appleseeds.org/Ethics-Codes_Josephson.htm)  
[medical-alert-systems.bestreviews.net/code-ethics-medical-alert-industry/](http://medical-alert-systems.bestreviews.net/code-ethics-medical-alert-industry/)

## Poll

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Do you think professional codes of ethics are necessary?

- A. Yes
- B. No
- C. Other

# Professional Ethics: IEEE Code of Ethics



We, the members of the IEEE, ... agree:

- I. To uphold the highest standards of integrity, responsible behavior, and ethical conduct in professional activities.
- II. To treat all persons fairly and with respect, to not engage in harassment or discrimination, and to avoid injuring others.
- III. To strive to ensure this code is upheld by colleagues and co-workers.

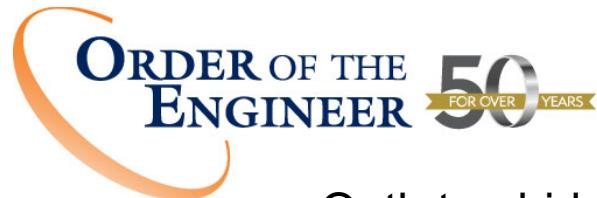
# Professional Ethics: ACM Code of Ethics

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1. **General ethical principles**, e.g., contribute to society and to human well-being, avoid harm, be honest and trustworthy, respect privacy
2. **Professional responsibilities**, e.g., strive to achieve high quality... of professional work, maintain high standards
3. **Professional leadership principles**, e.g., ensure that the public good is the central concern
4. **Compliance with the Code**, e.g., uphold, promote and respect the principles of the Code



# Professional Ethics: Order of the Engineer



Oath to abide by code of ethics taken before joining:

I am an Engineer. In my profession, I take deep pride. To it, I owe solemn obligations.

As an engineer, I pledge to practice integrity and fair dealing, tolerance and respect, and to uphold devotion to the standards and dignity of my profession. I will always be conscious that my skill carries with it the obligation to serve humanity by making the best use of the Earth's precious wealth.

As an engineer, I shall participate in none but honest enterprises. When needed, my skill and knowledge shall be given, without reservation, for the public good. In the performance of duty, and in fidelity to my profession, I shall give my utmost.

— *"Obligation of an Engineer"*

## Poll

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Did you know of the existence of the IEEE or ACM codes of ethics prior to this class?

- A. Yes
- B. No
- C. Other