[simula . research laboratory]

Argumentation Analysis

Learning goals: Improved ability to identify essential argumentation elements and to use this to evaluate the quality of argumentations.

Supporting texts:

• Alec Fisher, The logic of real arguments, Chapter 2: A general method of argument analysis. Cambridge University Press. 2004. p 15-28.

• Karyn Charles Rybacki and Donald Jay Rybacki, Advocacy and opposition, Chapter 8: What should I avoid? Pearson. 2004. p 142-163.

• www.unc.edu/depts/wcweb/handouts/evidence_use.html

• Appendix 1 & 2 of: M. Jørgensen, B. Kitchenham and T. Dybå. **Teaching Evidence-Based Software Engineering to University Students** , In 11th IEEE International Software Metrics Symposium, Como, Italy, September 19-22. , 2005.

(Recommended buy: Alec Fisher, Critical Thinking: An introduction, Cambridge University Press, 2007)

Argumentation: Definitions

From “Advocacy and opposition”, by Rybacki og Rybacki:

- *“**Argumentation** is a form of instrumental communication relying on reasoning and proof to influence belief or behavior through the use of spoken or written messages.”*
- *“**Persuasion** is an attempt to move an audience to accept or identify with a particular point of view.”*

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Warm-Up Exercise 1

- Erasmus Montanus:
  - *MONTANUS:* *... Morlille, jeg vil gjøre Jer til en sten.*
  - *NILLE:* *Ja snak, det er end mere konstigt.*
  - *MONTANUS:* *Nu skal I få det at høre. En sten kan ikke flyve.*
  - *NILLE:* *Nei, det er visst nok, undtagen når man kaster den.*
  - *MONTANUS:* *I kan ikke flyve.*
  - *NILLE:* *Det er og sant.*
  - *MONTANUS:* *Ergo, er Morlille en sten.*

  (Nille græder)
- Translated and simplified:
  - A stone cannot fly.
  - NILLE (his mother) cannot fly.
  - This means that you are a stone.

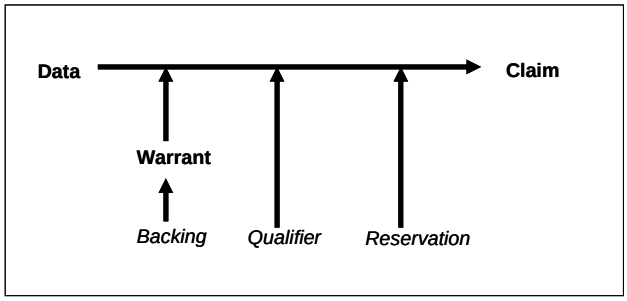
Warm-Up Exercise 2

- Pascal's Wager:
  - Either there is a Christian God or there isn't. If you believe in Him and live a Christian life, then if He exists you will enjoy eternal bliss and if He doesn't exist you will lose very little [in comparison].
  - On the other hand, if you don't believe in Him and don't live a Christian life, then if He doesn't exist you will lose nothing [and not win much in comparison to eternal bliss], but if He does exist you will suffer eternal damnation!
  - So it is rational to believe in God's existence and live Christian life. [even if the likelihood of a God is very small].
- Intuitively most disagree with the argument, but what is wrong, if anything?

Warm-Up Exercise 3

- Aristotle claimed that bodies of different weights in the same medium, travel (in so far as their motion depends on gravity) with speeds that are proportional to their weights.
- Galileo tried to refute this claim by the following reasoning:
  - If we then take two bodies whose natural speeds are different, it is clear that uniting the two, the more rapid one will be partly retarded by the slower, and the slower one will be somewhat hastened by the swifter .....
  - But if this is true, and if a large stone moves with a speed of, say, eight while a smaller moves with a speed of four, then when they are united, the system will move with a speed less than eight,
  - but the two stones when tied together make a stone larger than that with before moved with a speed of eight. Hence the heavier body moves with less speed than the lighter; and effect which is contrary to your supposition.
  - Thus, you see how from your assumption that the heavier body moves more rapidly than the lighter one, I infer that the heavier moves more slowly.
- We know that Galileo was right (at least in vacuum), but is his reasoning valid? And, more importantly, how do we analyze a complex reasoning?

Toulmin's Model of Argumentation



- The primary elements of an argument, according to Toulmin's model, are in **bold** letters, and the secondary elements in *italic*. Toulmin's model of argumentation can be viewed as a layout of argument.
- More details in Appendix 1 of: M. Jørgensen, B. Kitchenham and T. Dybå. **Teaching Evidence-Based Software Engineering to University Students** , In 11th IEEE International Software Metrics Symposium, Como, Italy, September 19-22. , 2005.

Toulmin's Model of Argumentation

- Start with the identification of the **claims** or conclusions made by the authors. These are normally found in the conclusion section of the papers or in the abstract, but may be found other places as well. Poor papers may, in fact, have no explicit claims at all. Evaluate the claim, e.g., whether the claim is circular or vague.
- Identify the **qualifiers**, i.e., statements about the strength of the claim, and the **reservations**, i.e., statements about the limitations of the claim. These are important when later evaluating the relevance of the evidence and the connection between evidence and claim. For example, a claim that is qualified with "this weakly indicates a cause-effect relationship" should be evaluated differently from the claim "there is a cause-effect relationship."
- Look for the **data**, i.e., the evidence supporting the claim. In particular, we ask them to evaluate the relevance of the evidence. We frequently find that the students are surprised by how little relevant evidence a lengthy software engineering paper contains.

Toulmin's Model of Argumentation

- Finally, we ask the students to look for the **warrant**, i.e., the supporting connection between the data and the claim. This is frequently the most difficult part of the evaluation of the argumentation, where the critical appraisal ability and analytical skill of the students is most important.
- Evaluate the degree to which the relevant data supports the claim. The warrants may have a **backing**, i.e., an argument that supports a connection of confirmation or deduction between the data and the claim. When it is not obvious that the connection between data and claim is valid (or invalid), search for elements that the authors use to support it (the backing). This may, for example, consist of analytical argumentation or evidence supporting the specific interpretation of data conducted by the authors.

Argumentation types

From “Advocacy and opposition”, by Rybacki og Rybacki:

- Argumentation from cause.
  - Suggests a temporal connection between phenomena.
  - When we can document effect, we may reason as to its cause; when we can document cause, we may reason as to its effect.
  - A necessary cause is a factor that must be present to bring about an effect, but will not in and of itself produce the effect.
  - A sufficient cause includes all factors needed to produce a particular effect.
  - Control questions:
    - Is the cause capable of producing the effect?
    - Is the effect produced by the cause or does the effect occur coincidentally to the cause?
    - Are there other potential causes?
    - Has this effect consistently followed from this cause?
  - Example: Smoking increases the likelihood of lung cancer.

Argumentation types

- Argumentation from sign (indicators):
  - Connect phenomena with conditions that merely exist (correlation, prediction).
  - Tells what is the case (description), while a cause explains why it is the case.
  - Signs are observable symptoms, conditions, or marks used to prove that a certain state of affairs exist.
  - Sign reasoning is assessed on the basis of the presence of a sufficient number of signs or the certainty of an individual sign’s strength.
  - Example: People who smoke and buy “Se og Hør” are less likely to have higher education.

Argumentation types

- Argumentation from generalization:
  - A form of inductive reasoning in which one looks at the details of examples, specific cases, situations, and occurrences and draws inferences about the entire class they represent.
  - Should be based on a sufficiently large sample of cases.
  - Instances cited in making the generalization should be representative of all members of the group.
  - Negative (non-confirming) instances should sometimes be explained or accounted for.
  - Example: My random sample of projects in of Norwegian sw development companies shows that the average effort overrun (of all Norwegian sw companies) is about 40%.

Argumentation types

- Argument from parallel case:
  - Reason on the basis of two or more similar events or cases; because case A is known to be similar to case B in certain ways, we can appropriately draw inferences from what is know to what is unknown.
  - For the argument from parallel cases to be valid, the cases must not only similar but their similarities must also pertain to important rather than trivial factors.
  - Example: If you liked the book X, you will probably also like the book Y. They are written by the same author and have the same “style”.

Argumentation types

- Argument from analogy:
  - Similar to “parallel case”, but related to dissimilar cases with some fundamental sameness between characteristics.
  - Considered to be the weakest type of argumentation.
  - Frequently only used rhetorically.
  - Example: Students need more structure. Students are very much like children. We all know that children need other people to structure their lives.

Argumentation types

- Argument from authority:
  - Relies on the credibility and expertise of the source.
  - Only credible within their fields of expertise.
  - Look for biases.
  - If the authority express an opinion at odds with the majority of experts in the field, the arguer should establish the credibility of that view.
  - The opinions should have a basis in facts.
  - Example: My experience [and I’m an expert in the field] is that the main problem with software projects is the lack of customer involvement.

Argumentation types

- Argument from dilemma:
  - Built with two or more arguments from cause that embody undesirable consequences.
  - Example: We need higher taxes to improve the health system. The extra burden we put on tax paying people is less negative than the suffering by those in need of better health services.

How to build a good argumentation

Preparation phase:

- Collect relevant and valid information from many perspectives
- Have a critical distance to the validity of the information
- Try not do make up your mind before all information is collected and analyzed
- Try to avoid irrelevant and misleading information
- Understand your own biases and prejudices.

Argumentation building phase

- Clarify the frames and context of your argumentation (define concepts, perspectives, assumptions, motivation, level of competence, goal of argumentation, …)
- Include all relevant arguments, not only those in favor of your conclusion. The strength of the conclusion should be based on a balanced evaluation of all relevant arguments, and, known missing information.
- Focus the argumentation on the most relevant and valid evidence.
- Emphasize the logical connection between evidence and conclusion.

Improvement phase

- Critically evaluate your argumentation and improve (play the devil's advocate)

Argumentation – What should be avoided?

- Hasty generalization
  - Example: The other day I met a group of Danish people. None of them understood what I said. I don't think Danish people are able to understand Norwegian.
- Transfer
  - Example: Bill Clinton lied about Monica Lewinsky. We can never trust what he says. Irrelevant arguments
- Circular reasoning (repeating the claim, so that it looks like an argument)
  - Example: If people exercised enough we would have no obesity. The fact that obesity is a health problem, shows that people do not exercise enough.
- Avoiding the issue
  - Example: We cannot listen to X's arguments related to speed limits. As an adult he was penalized for speeding several times.
- Forcing a dichotomy
  - Example: Should we force the children to go to bed at a time solely decided by their parents, or should we treat them as individual beings with own rights?

How to evaluate argumentations

- Be a skeptic!
- Remember that it is the argument that you are supposed to evaluate, not how much you agree with the claims.
- Start with the identification of the main claims. The claim is frequently part of an "abstract" or present in the conclusion.
- Assess the relevance of the claims for your purpose.
- Stop for a while and reflect on what evidence would convince you that the claim was true.
- Before you read the paper, assess whether it is likely that the authors have vested interests in the claims. If yes, how might this affect the results? What is the background and scope of the previous experience of the author? Is it likely that this biases the search for evidence and the conclusion?
- Read the paper with the purpose of identifying evidence that supports the claims. Skip the less relevant parts the first time you read the paper.

How to evaluate argumentations

- Evaluate the relevance and validity of the evidence. Assess whether it is opinion-based, example-based, based on a systematic review of scientific studies, etc. Is the evidence credible?
- Evaluate the connection between the evidence and the claim. Is the claim a possible, likely, or, necessary consequence?
- Check the use of measures and statistical methods. In particular, assess randomness in selection of subjects and allocation of treatment when statistical hypothesis testing is used. If not random, assess the effect of the non-randomness. [You will learn more about how to do this, later.]
- Search for manipulating elements, e.g., text that is not relevant for the argument, or loaded use of terminology used to create sympathy or antipathy. If large parts of the text are not relevant, evaluate the intended function of that part. Be aware of rhetorical elements.

How to evaluate argumentations

- Assess the degree to which the “what to avoid” is present.
- Assess whether the inclusion of evidence is one-sided or gives a wrong picture.
- Assess whether weaknesses of the study are properly discussed. If not discussed at all, why not?
- Try to identify missing evidence or missing counter-arguments. Be aware of your tendency to evaluate only what is present and forget what is not included.
- Be particularly careful with the evaluation of the argumentation if you are sympathetic to the conclusion. Our defense against "theory-loaded evaluation" and "wishful thinking" is poor and must be trained. Put in extra effort to find errors if you feel disposed to accept the conclusion in situations with weak or contradictory evidence.
- Do not dismiss an argument as having no value, if it has shortcomings. There are very few bullet-proof arguments and we frequently have to select between weak and even weaker arguments in software engineering contexts. A weak argument is frequently better than no argument at all.

Exercises

- **Exercise 1**: *Robert C. Martin: Professionalism and Test-driven development, IEEE Software, 32-36, May/June 2007.*
- **Exercise 2***: M. Jørgensen and K. J. Moløkken-Østvold.* ***Eliminating Over-Confidence in Software Development Effort Estimates****, In Conference on Product Focused Software Process Improvement. Lecture Notes in Computer Science. Springer-Verlag, Japan, 174–184, 2004.*
- Be critical! Especially towards my study ☺