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Symposium on Argument Strength: A Computational Approach

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Introduction

- Examine the topic of argument strength from a computational perspective.
- Briefly survey computational approaches to argument (with a focus on Dung'ian Abstract Argumentation).
- Briefly examine the Epicurean case-study from an abstract perspective.
- Attempt to identify some conceptions of argument strength associated with this approach.

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Argument & Computers

- Two senses:
  - Using computers to support/assist/stimulate argument analysis
    - Those facets of argumentation that we've already seen (David, Kamila, Marcin, Frank)
  - Using computational tools to go beyond traditional forms of analysis
    - Rooted in very human practises
    - Bound by (current) limitations of computers
    - Unbound by (current) capabilities of computers

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Computational Limitations

- Human analysts can make leaps of intuition & tease out meaning from unexpressed, under-formed, or plain badly-written texts (machines cannot… yet…)
- Even in these days of “AI” & “machine learning”
  - Computers work best with specifics
- The concept of strength is fuzzy in general
  - Computers don’t have a generally accepted base definition of strength from the wider argumentation community to build upon.

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Computational Capabilities

- Repetitive action
  - If we can formally define a concept then we can (generally) build a model (& then argue over its accuracy and applicability)
    - We can then keep applying any algorithms associated with the model as frequently as required.
- In many cases machines can handle a lot more data than humans.

The Result

- Computational approaches to argumentation can appear to deviate from our more mundane expectations
- This is often a function of taking core, well defined argumentative concepts then exploiting them in ways that are aligned with computational strengths
  - i.e. take well defined ideas & apply algorithms to them at scale & at speed

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Abstract Argument Frameworks

- An argument framework is a pair formed from a set of arguments and a set of relationships between those arguments
- An argument is considered to be an atomic unit - take your premises & conclusions, bundle them together, & you have your argument
- Relationships between arguments are restricted to attacks only
- This yields a directed graph of arguments (nodes) which attack (edges) other arguments.

Properties & Subsets of Frameworks

- An argument that is attacked is defended by an attack on it's attacker
- An argument is **acceptable** with respect to a given subset of a framework if that argument is defended by a member of that subset
- A set of arguments is **conflict free** if there is no attack between its arguments
- A set of arguments is **admissible** *iff* it is conflict-free and all its member arguments are acceptable to it

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Semantics

- Inherent conflicts between arguments are handled by selecting subsets of arguments that hold specific properties (where conflict-freeness, acceptability, & admissibility play a central role).
- Admissible, Preferred, Sceptically Preferred, Complete, Grounded, Ideal, etc.
- These are formal methods that govern the argument evaluation process [Baroni & Giacomin(2009)]
- The help us to decide which arguments are justified
- In more complex frameworks the evaluation process can yield multiple evaluations which correspond to different but consistent evaluations of the framework

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Argument Strength: A Computational Perspective

- What does the (computational) literature say about argument strength?
  - In summary: Not an awful lot - Mention of strong arguments, strong attacks, strong defences
  - "A study of how to differentiate the strength of arguments is necessary" — Dung (1995)
    - There is no generally accepted objective measure of argument strength
    - But there are a number of measures which can proxy for a notion of argument strength
    - In the same way that non-computational approaches use *strength* as a proxy for individual evaluations, well-formed-ness, persuasiveness, so too in computational approaches.
- In the rest of these slides I'll briefly examine an argument analysis from an abstract perspective & identify two places where notions of argument strength can be identified

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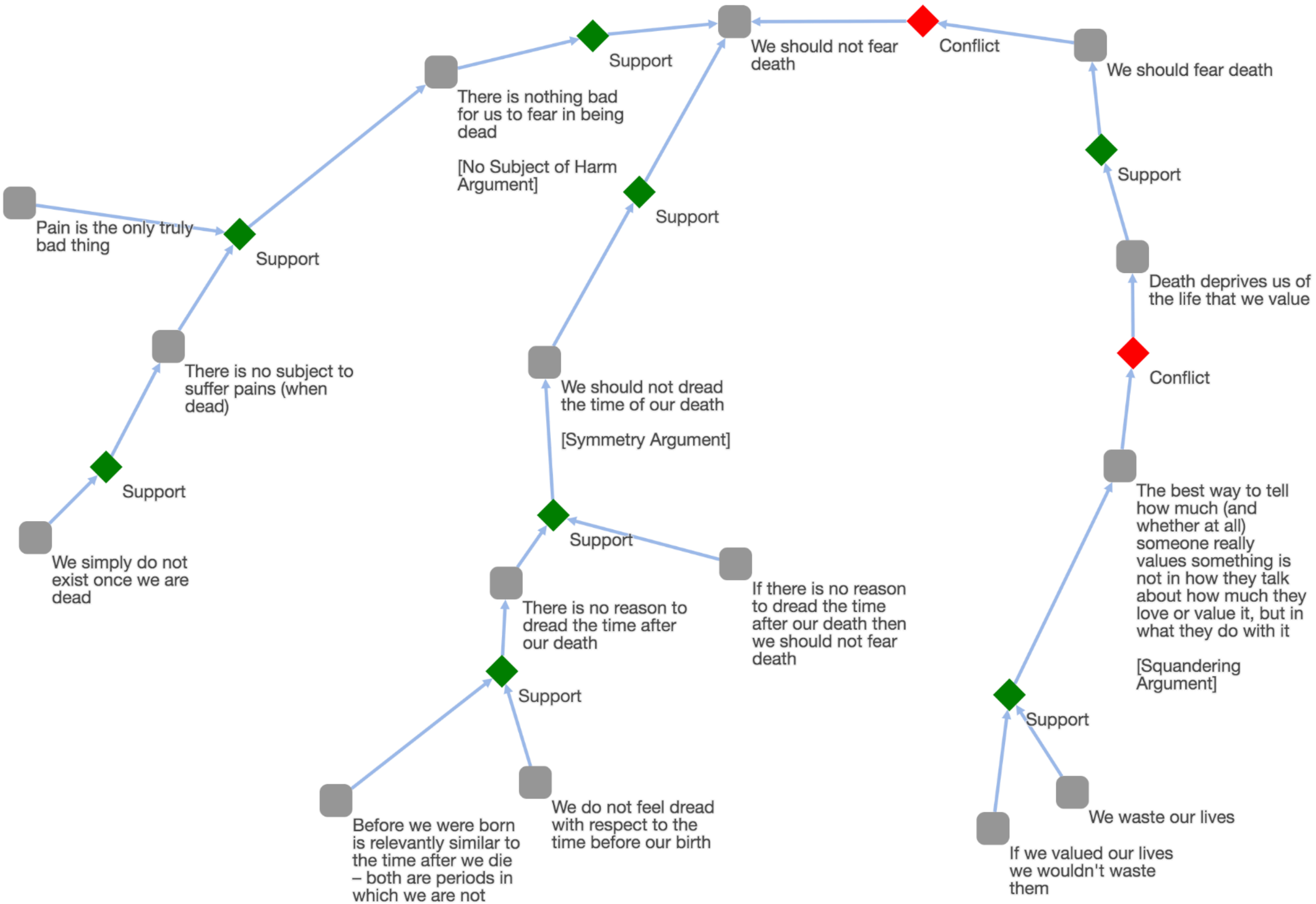
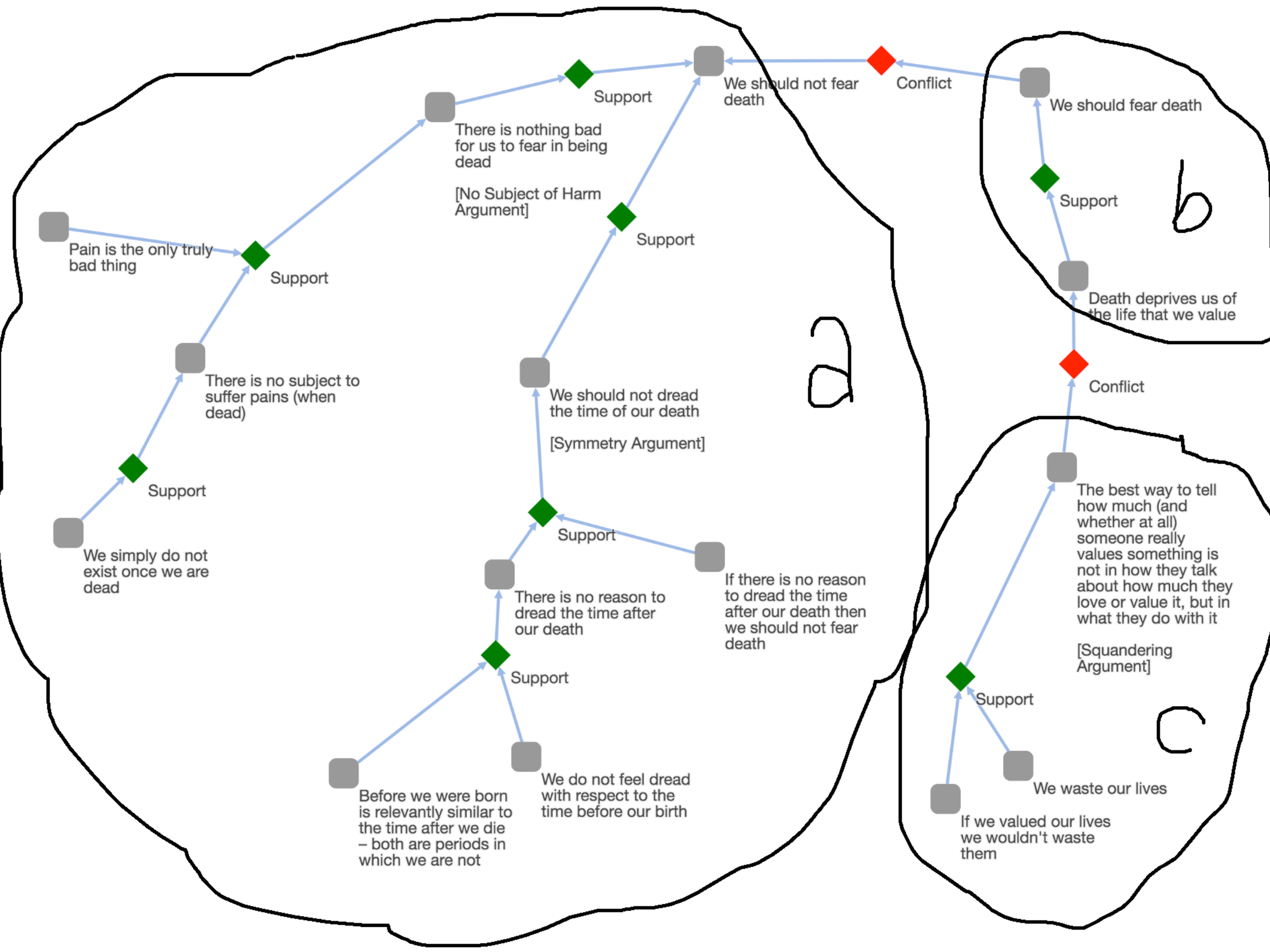
Source Text

- The Epicureans Text
- Argumentative analysis
- Concerned with relationships of support and conflict
- Schemes, presumptions, burden-of-proof, evidence don't concern us right now (very important but don't play a role in this approach)


Pain is the only truly bad thing
Support
There is no subject to suffer pains (when dead)
Support
We simply do not exist once we are dead
There is nothing bad for us to fear in being dead
[No Subject of Harm Argument]
Support
We should not fear death
Conflict
We should fear death
Support
Death deprives us of the life that we value
Conflict
The best way to tell how much (and whether at all) someone really values something is not in how they talk about how much they love or value it, but in what they do with it
[Squandering Argument]
Support
We waste our lives
If we valued our lives we wouldn't waste them
Support
We should not dread the time of our death
[Symmetry Argument]
Support
There is no reason to dread the time after our death
If there is no reason to dread the time after our death then we should not fear death
Support
Before we were born is relevantly similar to the time after we die – both are periods in which we are not
We do not feel dread with respect to the time before our birth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[Squandering Argument]
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If we valued our lives we wouldn't waste them
a
b
c

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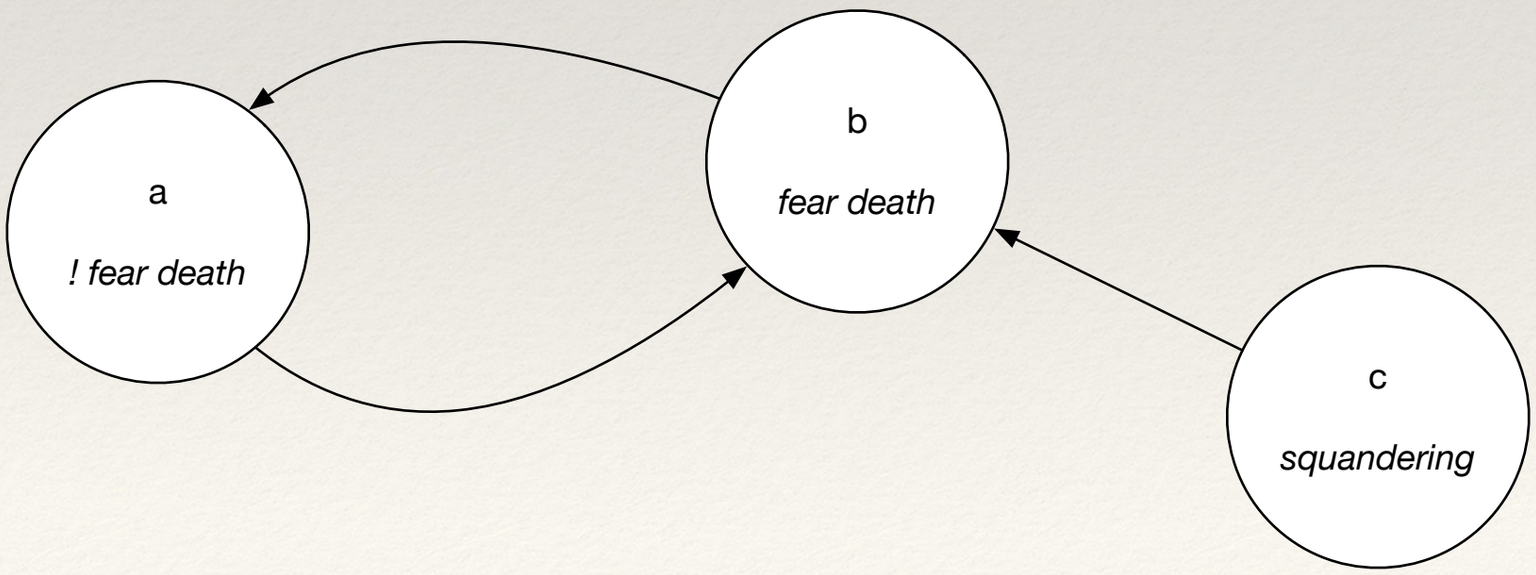
A Sense of Strength

- Which arguments within a DAF are strongest?
- Dung & subsequent authors have little to say on this specific question
  - Some aspects are concerned with types of attack - different attacks can have different strengths
- A natural position is to assume the *gunfighter* analogy:
  - Those arguments (gunfighters) that are acceptable (survive) at the end of the process (gunfight) can be deemed strong on the basis that they survived.
    - i.e. for a given DAF and a specified semantics, an argument that is acceptable is strong
    - NB This doesn't tell us much about which is the *strongest* argument
    - but does enable us to partition our set of argument into either (un)acceptable sets or (assuming labellings) in | out | undecided.
- This is an inherently defeasible position - with the addition of new attacking arguments the sets of surviving arguments may alter



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A Second Sense of Strength

- People are convinced for many reasons, by poor arguments, by good arguments, by things that we might even debate regarding their status "as arguments".
- People are also pernickety - An argument that persuades one might not persuade another (& may even do your case harm) - human psychology is *problematic*.
- Given two or more arguments that we might "objectively" define as strong - they survive evaluation where other arguments are defeated - doesn't mean that all, or any, of them would be persuasive (strong) to whom they are targeted.
- Suggests a second sense of argument strength: the "unique butterfly" sense in which each person has their own response to a given set of arguments.
- How does this manifest within computational argument? —- Preferences

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Conclusions

- From the perspective of abstract argumentation we can identify two core senses of argument strength:
  - The “Gunfighter” sense - objective, algorithmic, & generally applicable - but granular.
  - The “Unique Butterfly” sense - subjective, effort intensive to determine & apply - but very specific to a particular target of an argument.
- There are other approaches to computational argument, e.g. Assumption Based Argumentation, ASPIC+, bi-polar, &c. that haven’t been explored here.

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References

- Baroni, P. & Giacomin, M. (2009) “Semantics of Abstract Argument Systems”
- Cerutti, F. *et al*. (2017) “Foundations of Implementations for Formal Argumentation”
- Dung, P. M. (1995) “On the acceptability of arguments and its fundamental role in nonmonotonic reasoning, logic programming and *n*-person games”