MIT 7116 RESEARCH METHODOLOGY

Philosophy and Approaches

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- Will I get what I want?

Philosphy

- Must be well thought out
- Truth in one aspect does not mean truth in another
- Previous related research should guide, not dictate. Your job is to critique and possibly cite; not recite
- You must be convinced to convince others
- The domain of study is key. In ICT, public opinion is rarely imperical knowledge. Social science believe otherwise

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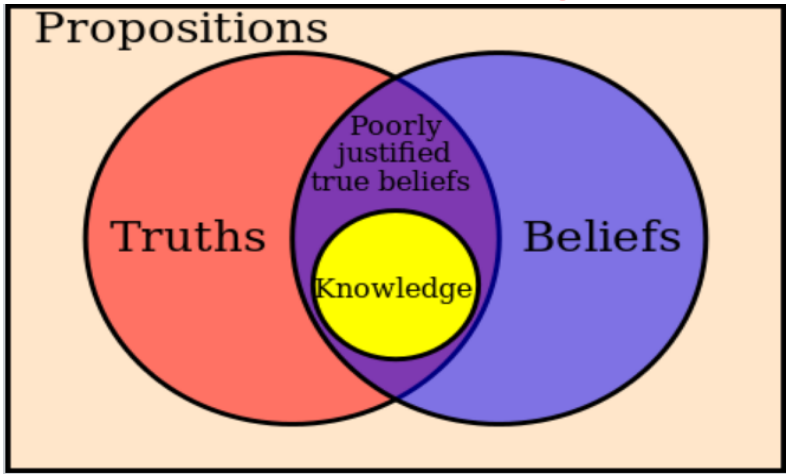
Philosophical study of value. Broken into two: Ethics - what is right/good and Aesthetics - the concept of "beauty" and "harmony" The research has to be axiologically sound. Producing right (proven) results and presernted harmoniously with the existing related knowledge

The Pholosophical Pillars

Epistimology

The study of knowledge, justification of belief and rationality. Address issues like "What makes justified beliefs justified?", "What does it mean to say that we know something?", and "How do we know that we know?" Research knowledge generated must be visble, related to existing knowledge and provable



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$a = 2a$

Since its for any value of a, set $a = 1$

$1 = 2$ $\square$

Some Common Fallacies

1. Appeal to probability / Appeal to authority
2. Argument from fallacy (fallacy fallacy)
3. Appeal to ignorance Fallacy
4. Conjunction fallacy
5. Base rate fallacy
6. Masked-man fallacy
7. Affirming a disjunct
8. Affirming the consequent / Denying the antecedent
9. Affirmative conclusion from a negative premise
10. Fallacy of exclusive premises
11. Negative conclusion from affirmative premises
12. Fallacy of the undistributed middle

Approaches

- General ways research is done
- Largely determined by
  - The purpose of research
  - The nature of the parameters
  - Mode of proof
  - Level of Accuracy
  - Precedence
- Using a different approach from the usual may invalidate the research
- But can be another research topic its self
- An approach summarises the philosophy - value, knowledge, truth, etc

Engaged Scholarship

- Application of academic scholarly work and professional expertise
- intended public purpose
- mutual benefit
- demonstrates engagement with external (and non-academic) constituencies.

Design Science

- Develop and describe knowledge parameters
- Knowledge its self is somewhat out of reach
- But can be deduced
- Focus on development of the knowledge representation

Impirical Research

- Focus on empirical evidence.
- Use direct and indirect observation
- Sometimes experience.
- Logical correctness is key
- General steps Observation: Induction (hypothesis generation), Deduction, Testing and Evaluation

Methods

- Detailed step by step of how the research is going to be carried out
- its a description of what to do not doing
- Indicates decisions made and possibly why
- Has to be in line with a certain research philosophy
  - For Masters the philosophy may not be described esp if obvious

Formal

- Represent the problem numerically
  - Equation
  - System of equations/Innequalities
  - Defferential/difference equations
  - Logical expressions
- Solve and make mathematical conclusions
- Deduce in real life

Simulation

- Develop the system you are studying as a computer systems
- possibly on a customisable platform
- Run and rerun the system as different issues are studed
- Represent results

Experimentation

- Chose the parameters needed
- Design an experiment to represent and show the parameters
- Run experiment and investigate how the parameters of interest varry
- Represent the results

Qualitative/Quantitative

- Collect data from sampled observations
- Qualitatively or quantitatively analyse it
- Deduce the results

Do this to validate not prove. Public opinion is not imperical knowledge in most aspects of CS/SE/NW

Mixed

- Hybridise the different approaches
- You must justify the hybridisation