Critical Thinking and Research

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Criteria for Evaluating Reasoning

- ❑ Purpose
- ❑ Question/Formulation
- ❑ Concepts
- ❑ Assumptions
- ❑ Information/Inferences
- ❑ Point of View
- ❑ Implications

Purpose

- What is the purpose of my research?
  - A new theoretical framework?
  - A new problem?
  - A new formulation of a problem?
  - A new solution of an existing problem?
  - A new discovery using existing methods?
  - More …
- Is it justifiable?
  - Is the purpose important and attractive?
  - Is there any new contribution?
  - Is it meaningful?

Question / Problem Formulation

- What is the research question?
  - Is it clearly stated/formulated?
  - Is it clear and unbiased?
  - Does the expression of the question do justice to the complexity of the matter at issue?
  - Are the question and purpose directly relevant to each other?
- Is this the most important problem to consider?
- Why is the question non-trivial/difficult?
- What are some of the complexities of this question?
- What are some of the difficulties we need to deal with?

Concepts/Ideas

- Are the key concepts clear?
  - Do the concepts make sense in the problem formulation and solutions?
- Are they creative and interesting?

Assumptions

- What are the assumptions?
  - Explicit or inexplicit
  - Are they justified?
  - Are the assumptions the same as or different from other researchers?
    - Are there any additional assumptions used?

Information/Evidence/Inferences

- Is there any evidence?
  - Cited references
  - Theoretical derivations
  - Logical reasoning
  - Simulations
  - Experiments
- Is the evidence relevant to the question and purpose?
  - e.g. My face expression recognition method works?
- Is it accurate?
- Is the complexity of the issue addressed?
  - Various aspects …

Point of View (Opposition)

- What's wrong with existing methods?
  - Alternative methods
  - Compare with others
- What if anything goes wrong?
  - Assumptions
    - Validation of the concepts
    - Theoretical limitations
    - Robustness
  - Experimental limitations
  - Practical considerations
- Fairness
  - Is it a fair comparison with other methods?

Implications/Generalizations

- What are the implications/consequences if it works?
  - What else can be done with this solution?
  - Can the solution be generalized?

Clarity, Accuracy, Precision and Relevance

- Clarity
  - What can be done for face expression recognition?
  - How can we better recognize face expression using a sequence of images?
- Accuracy
  - Free from error
  - Is it true? How to check?
  - e.g. Our method is effective/ineffective in most cases – is this accurate?
- Precision
  - Our method performs better than existing methods in reducing false alarms
- Relevance/Logical reasoning
  - Q: The results show that the PCA method does not perform well in this video analysis application, can you please let me know why?
    - A: Other people have used it in image analysis and it works fine – is this relevant?

About Research Taste

Research Taste

- Is this a meaningful research?
  - Inside view and outside view

- Inside view
  - Do you think it's meaningful?
  - Do you love the work and are you excited about possible outcomes?
  - What's your motivation?
  - Can you convince yourself that it will make a difference?
  - Is there a vision? Will it lead to something greater and greater?
  - Is there a framework that's bigger than one piece of work?

Research Taste

- Is this a meaningful research?
- Outside view
  - Any outside evidence to support your judgment?
  - Could you convince a few researchers you respect?
  - Will it lead to something important?
- Are you doing it for
  - Easy to publish -- popularity
  - The only area you know of – you have done this for a long time
    - Sunk cost fallacy
  - …

More discussions ……