



Discussion 1: Research Questions

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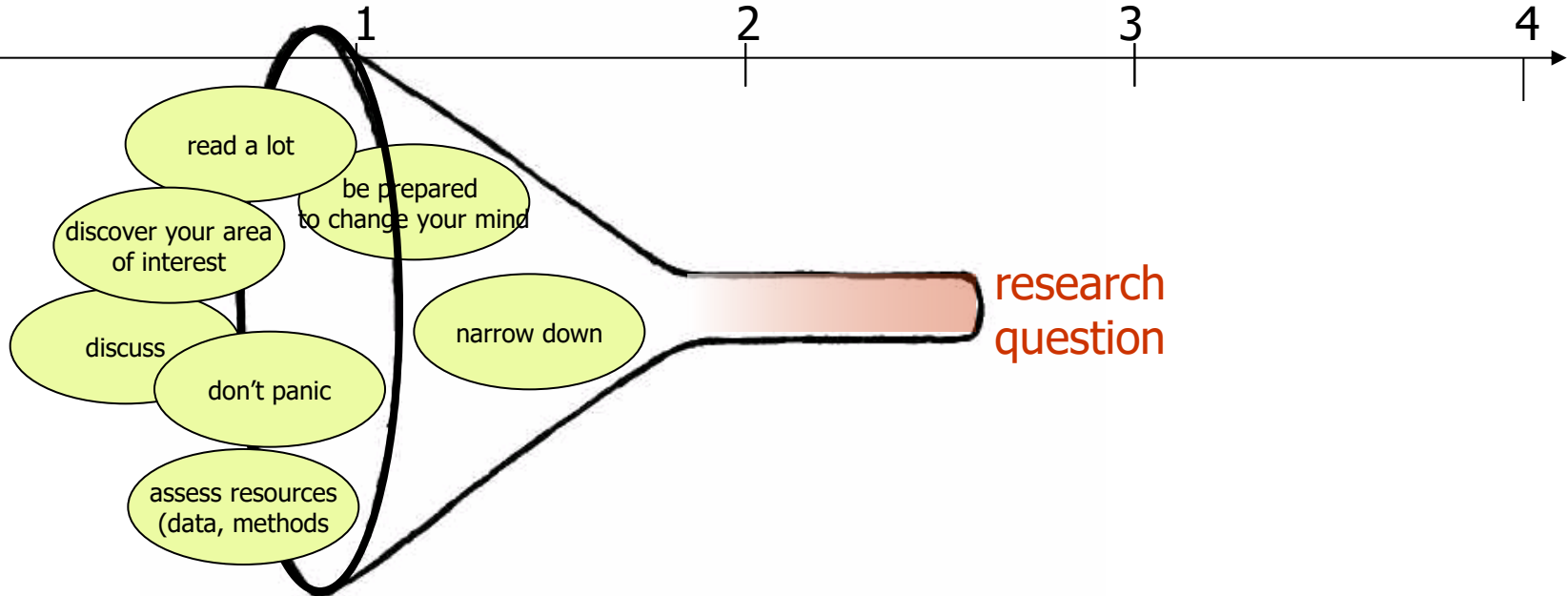
What is Research ?

Research has one end: the ultimate discovery of truth. Its purpose is to learn what has never been known before; to ask a *significant question* for which no conclusive answer has been previously been found; and, by collecting and interpreting relevant data, to find an answer to that question.

Your PhD...

doing project work (writing deliverables and other strange things)		being more and more involved in projects
First talk with supervisor	reading papers	getting acquainted with area of inquiry
very vague idea	doing clerical work for other PhD students	participating in topical research questions
Getting acquainted with research team	learning about research (problems) of other PhD students	first co-authorship in a colleague's paper

years



Good PhD research...

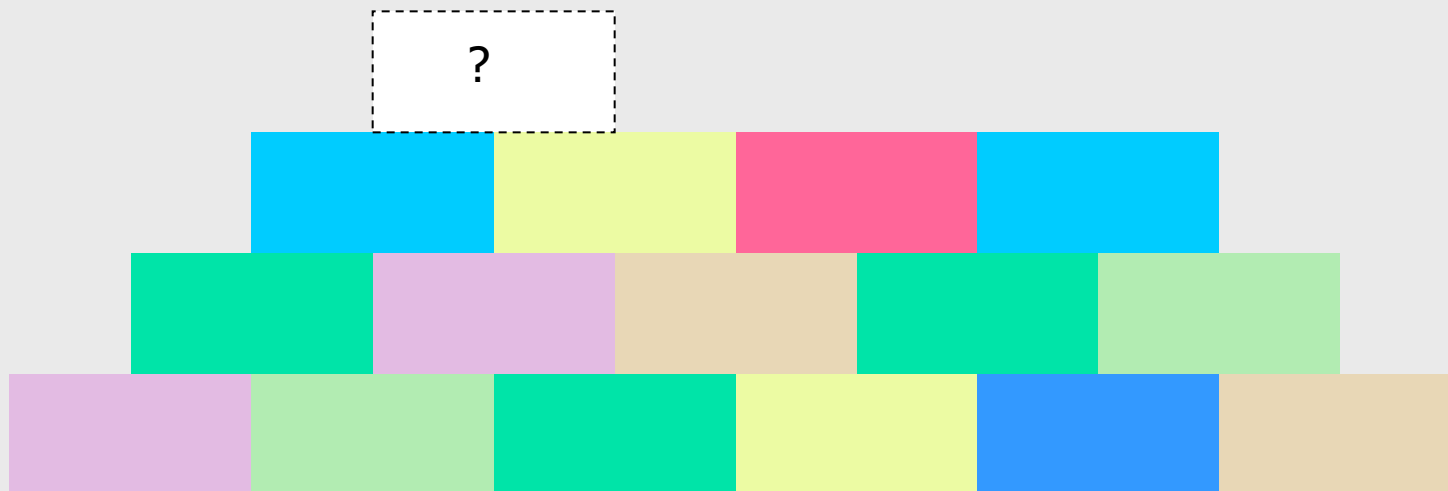
...requires a good
research question

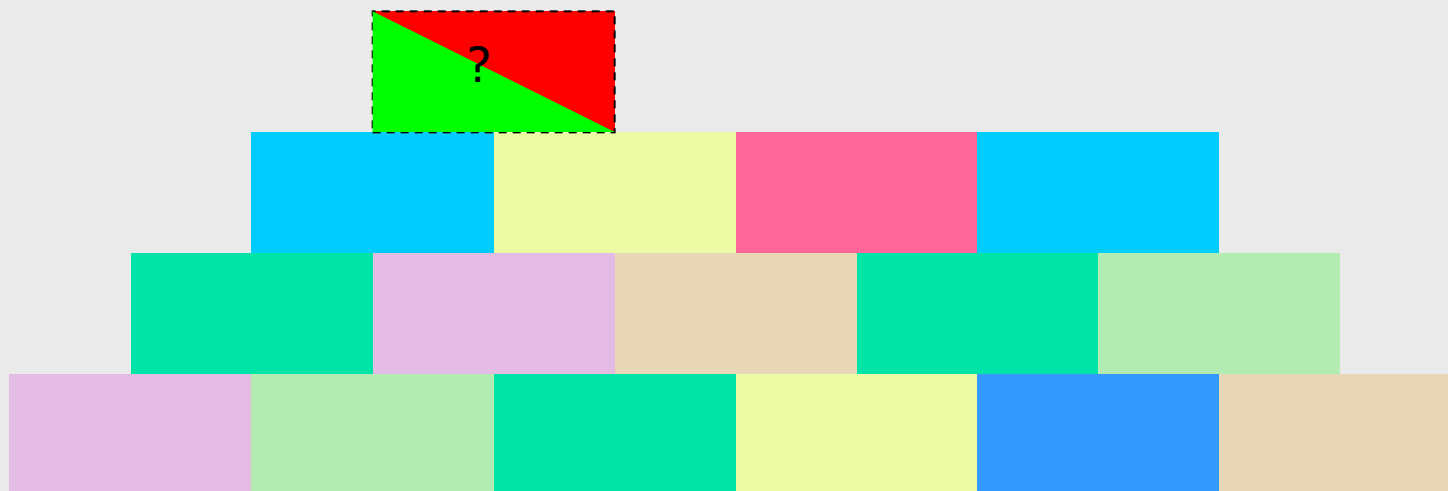


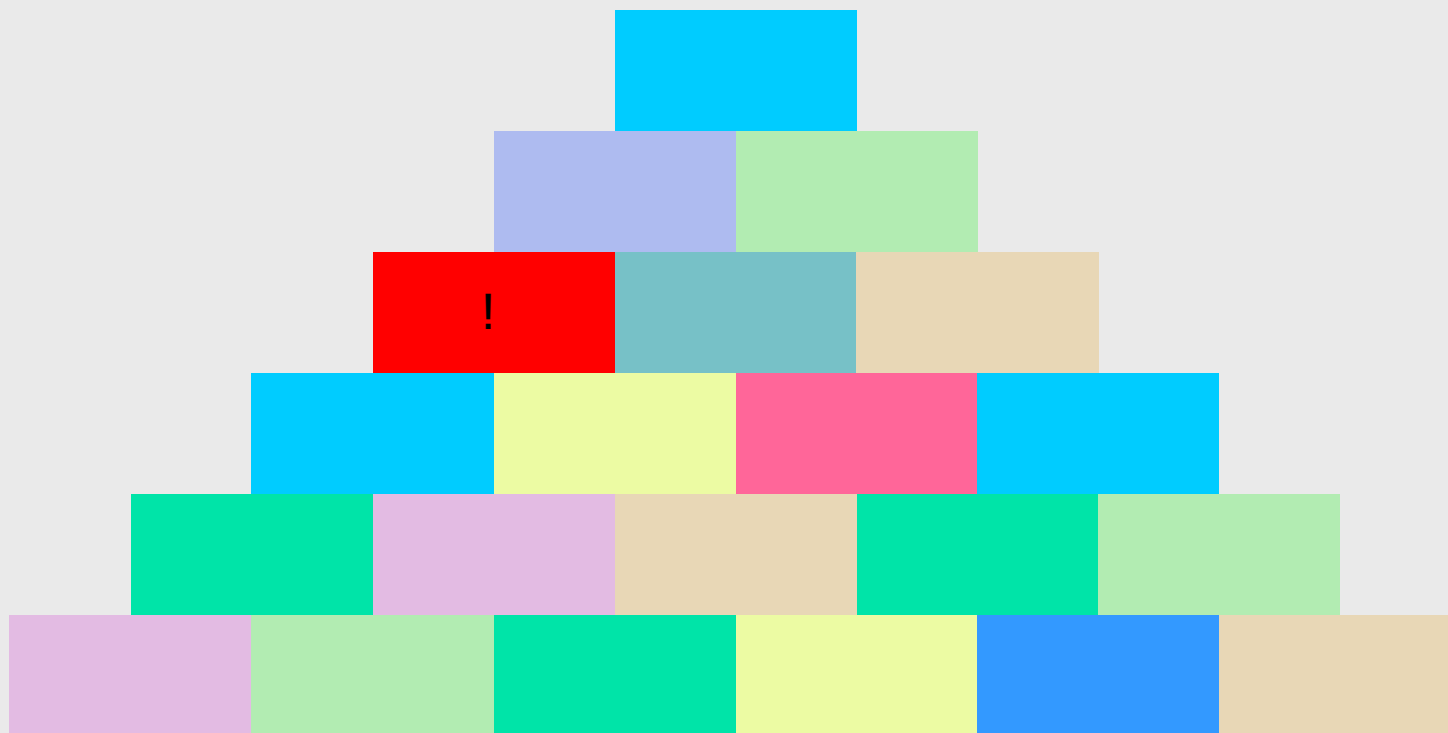
Research Question

- Statement of the goal of a research project
- States clearly what the study will investigate or attempt to prove
- Based on previous discoveries









Good Research Questions

- Make a significant contribution to knowledge
- Non-trivial (i.e., not speculative, not self-evident)
- Neither too limited nor too narrow
- Researchable: you are able to collect evidence that would answer the question.
- Doable: given your time and material constraints.
- Inspiring: potential to hold your interest
- A good question is situated in the discourse of science

Not so good Research Questions

- Questions that have already be answered
- Questions not empirically testable
"Are medical libraries necessary?"
- Start with "What are..." (invites listing, not analysis)
"What is the state of the introduction of SNOMED CT in the UK?"
- Start with "How can I..."
"How can I improve the navigation in computerized Patient Records"
- Are rhetorical (Suggest a "yes" or "no" answer)
"Does stem cell research challenge bioethics?"
- Are unimportant (answer does not interest anybody) "
Does the use of the delete button in my software correlate with the user's age and gender?"
- Lack clarity (Include vague or ambiguous language)
"What can be done to prevent violations of privacy in health networks?"
- Are no questions (general topics, no claim of analyzing anything)
"Terminologies in Electronic Healthcare Records"

Question your Research Question

- Are you trying to find out rather than prove something?
- Do you expect to get surprised by what you find in your data?
- Can you imagine that you decide – based on your data – that your previous ideas were wrong?
- What will you do with the answer if you get it?
- Do you know how an answer would look like ?
- Who will benefit from an answer?

Research Questions in Computer Science (I)

- CS: difficult to sustain traditional scientific and models of research, especially empirical research
- Building of demonstrator artifacts: build something and then let that artifact stand as an example for a more general class of solutions: Example:
 - Risk: artifact fails -> we don't learn anything about the conclusion that we want to support.
 - ignores the formation of any clear hypothesis or conclusion until after the artifact is built.

Research Questions in Computer Science (II)

- Research question that can be assessed by Mathematical Proof
 - verification / refutation
- Hermeneutics
 - operation and use of an artifact within its intended working environment.

Examples for Research Questions (I)

- What are adequate security measures for the exchange of health information in which settings using which EHR technology?
- What are the differences in inter-rater reliability between ICD-9-CM and ICD-10-CM codes for the same disease condition?
- Which SNOMED codes exhibit the highest difference in inter-rater reliability?
- What causes cancer?
- Is terminological reasoning decidable?
- What are the limiting factors in practitioner's uses of computers?
- Which is the prognostic ability of polymorphisms of A, B, C...for patients diagnosed with squamous cell carcinoma.
- To develop software for automated registration and intensity calibration of serial dental radiographs for the analysis of longitudinal changes in bone density.
- To develop a relevancy-ranking algorithm for a search interface to Boolean online public access catalog systems.

Examples for Research Questions (II)

- Medical Term Mapping: Can false cognates be automatically identified by using unaligned corpora?
- Does the current use of Internet health information impact on three health behaviors: smoking cessation, weight control, and exercise.
- Decomposing Swedish medical compounds during query expansion and indexing in information retrieval
- Information Systems for microarrays and their integration in clinical environments
- Is conjunctive query answering over DL knowledge bases decidable if transitive roles are admitted in the query ?
- A natural language system for the extraction of medical information from finding reports.
- To understand current use of Internet health information and to examine its relationship to four health behaviors: smoking cessation, abstaining or restraining from drinking alcohol, weight control, and exercise.
- Does the use of Internet health information change health behaviour ?

Examples for Research Questions (III)

- SNOMED CT in Health Care
- Will computerized decision-support have a positive impact on life expectancy?
- Early Detection of Dementia
- Microarray Visualisation with uncertainty
- Parameter estimation for biochemical models in a variety of parameter landscapes
- Which are the regions of Increased Gene Expression in the mouse MHC loci upon infection with mCMV and/or priming with IFN-gamma
- A clinical decision support system devoted to prescription integrated to the HEGP information system
- Terminologies in Electronic Healthcare Records
- Evaluation of practice individualization with the help of electronic health records
- Navigation in Patient Record Overviews
- What is the state of the HIV epidemic in India?