

An Introduction to Research Practices in Computer Science

- Tiny details for doing research



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Outline

- Preamble
 - Motivation
 - Abstraction
 - Terminologies
- Doing research
 - CS Research areas
 - Workflow
 - Discussion and Idea
- Writing up research
 - Methods
 - Standard Template
 - General Tips
- Demo



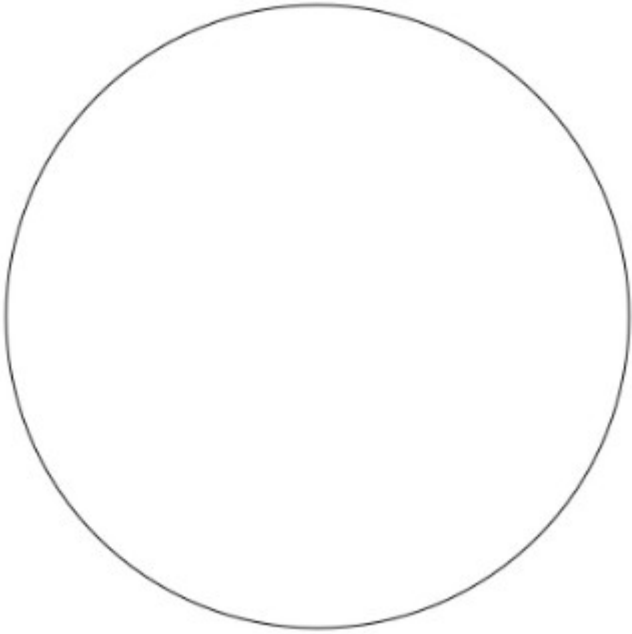
Motivation

Seeking to find answers to the unknown (why?)
Questions are a natural thing of
a curious mind.

E.g. A child with a new toy

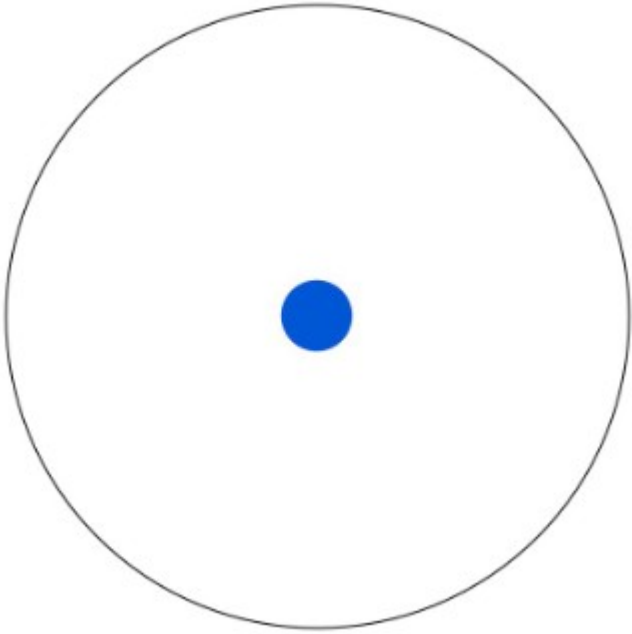


Research: 10000-feet view



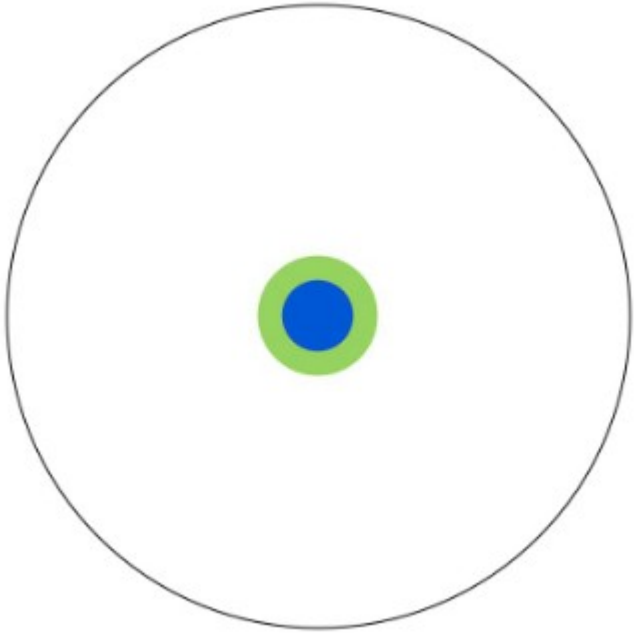
Prof. Matt Might's blog <https://matt.might.net/articles/phd-school-in-pictures/>

Research: 10000-feet view



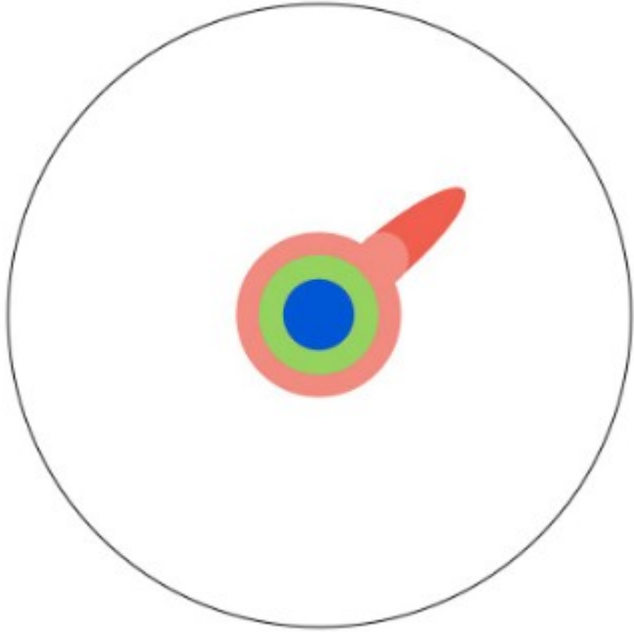
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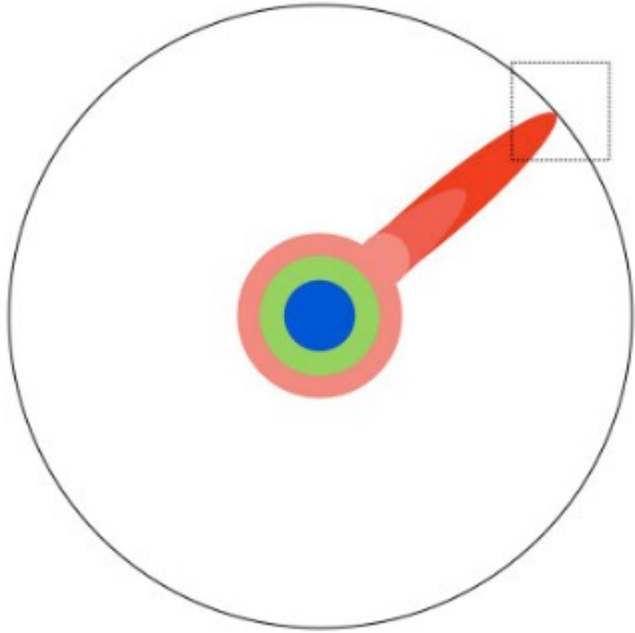
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Research: 10000-feet view



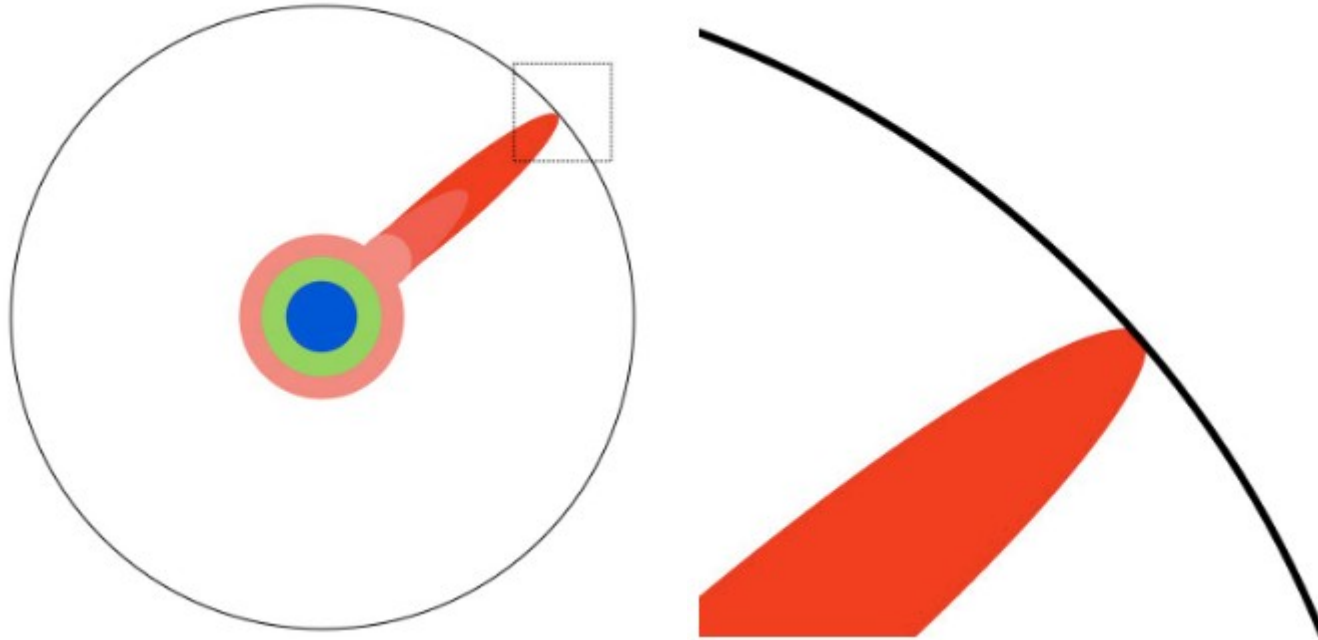
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Research: 10000-foot view



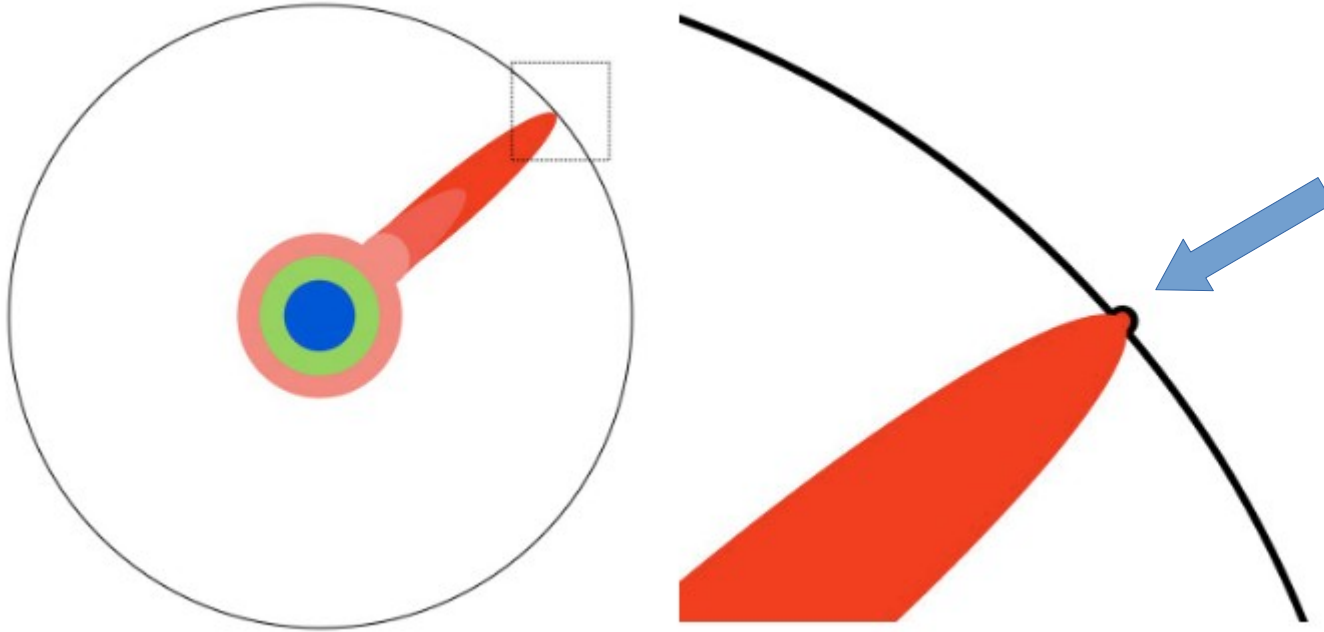
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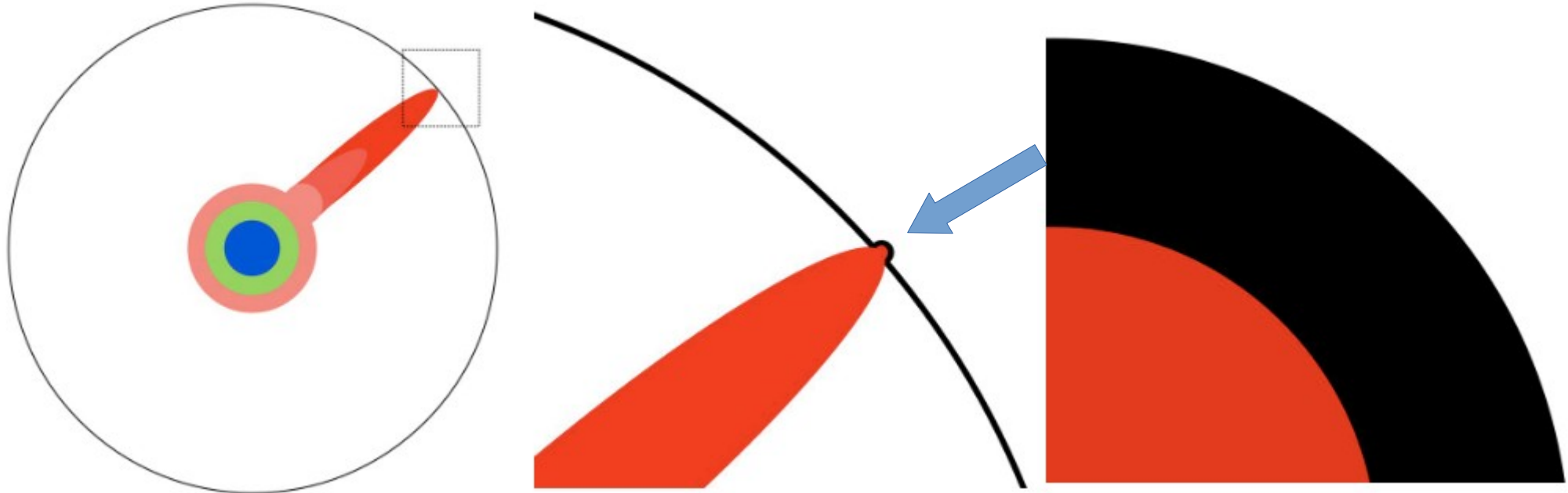
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Research: 10000-foot view



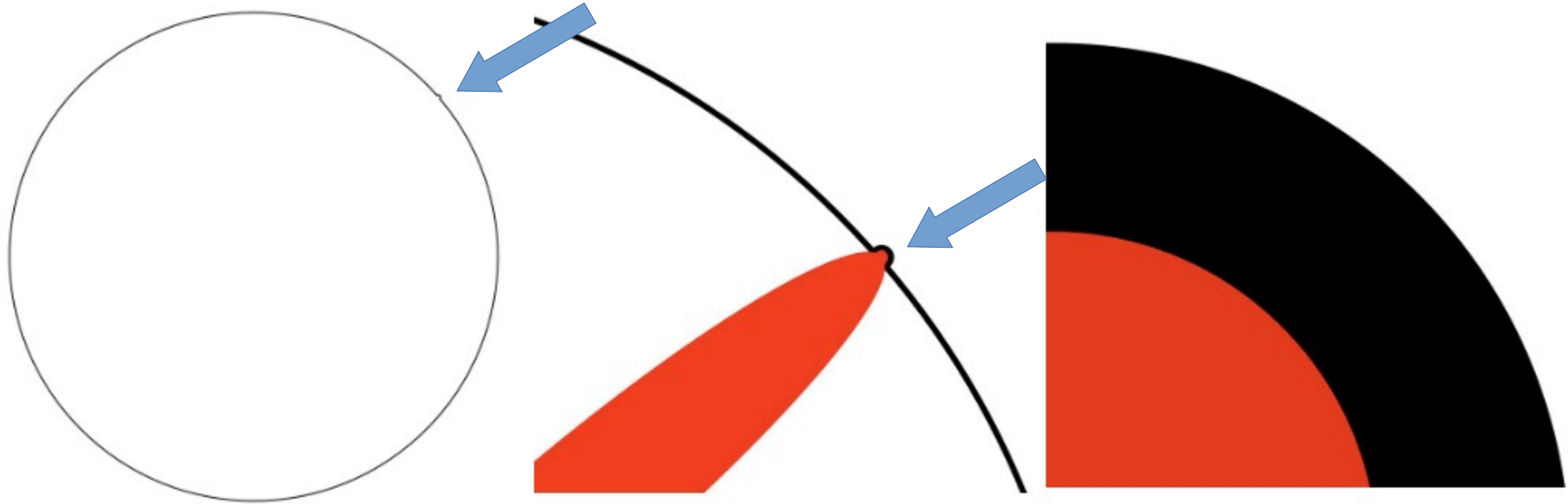
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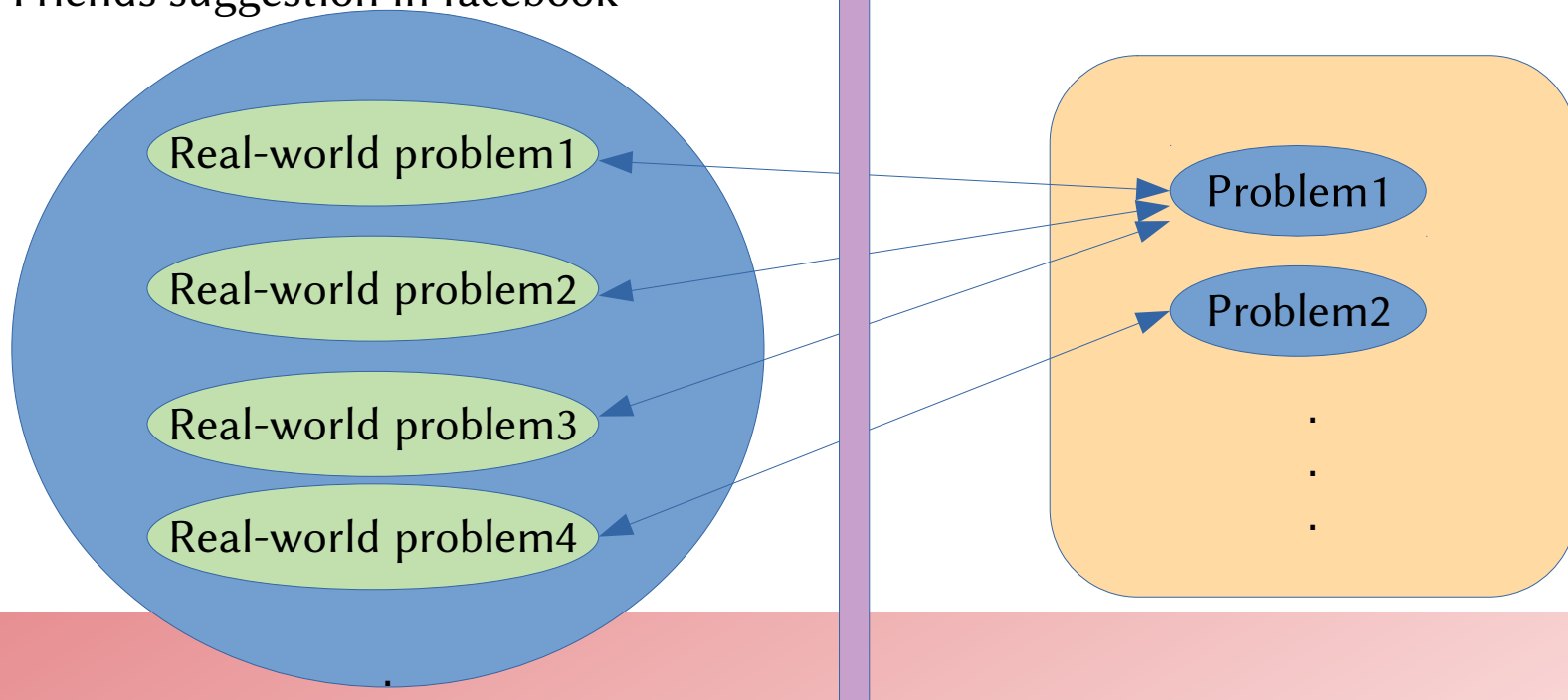


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Abstraction

Researcher

- Google Map: Route from home to College
- Internet: Routing protocol
- Google Map: Show me the restaurants nearby
- Friends suggestion in facebook
- Shortest Path Problem
- Single Source Shortest Problem



Terminologies

- Research Work
 - Research Problem
 - Literature
-
- Write-up = Text version of idea
 - Venue = Conference/Journal
 - Paper = Published work
 - Manuscript = Unpublished work

CS Reseach

- Theory CS
- Systems Engineering
- Intelligent Systems

CS Research

- Theory CS
- Systems Engineering
- Intelligent Systems



Thanks to <https://www.csa.iisc.ac.in/category/research/>

CS Research

- Theory CS
- **Systems Engineering**
- Intelligent Systems



Thanks to <https://www.csa.iisc.ac.in/category/research/>

CS Research

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How to choose research area/problem

- Most frequently asked question!



Courtesy: Tinkerbell [2008] Disney Animation Movie

How to choose research area/problem

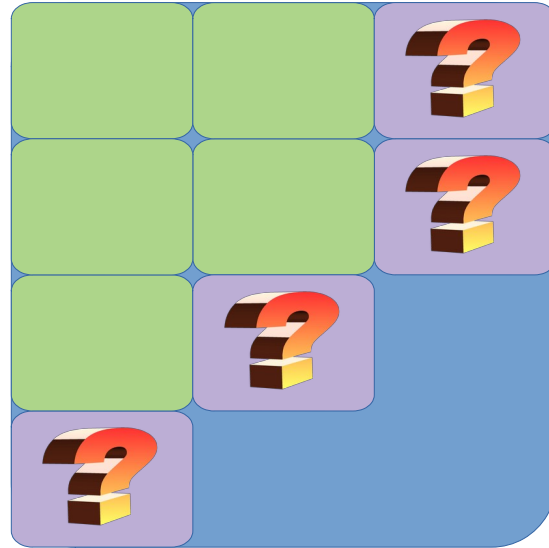
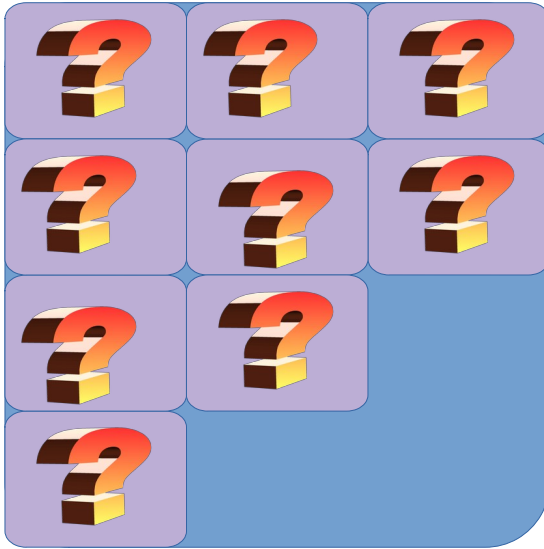
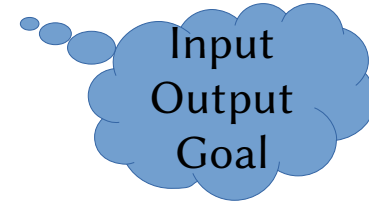
- Through Courses
- Attend research seminars/talks
- Attend conferences talks
- Read Survey papers

Useful Websites

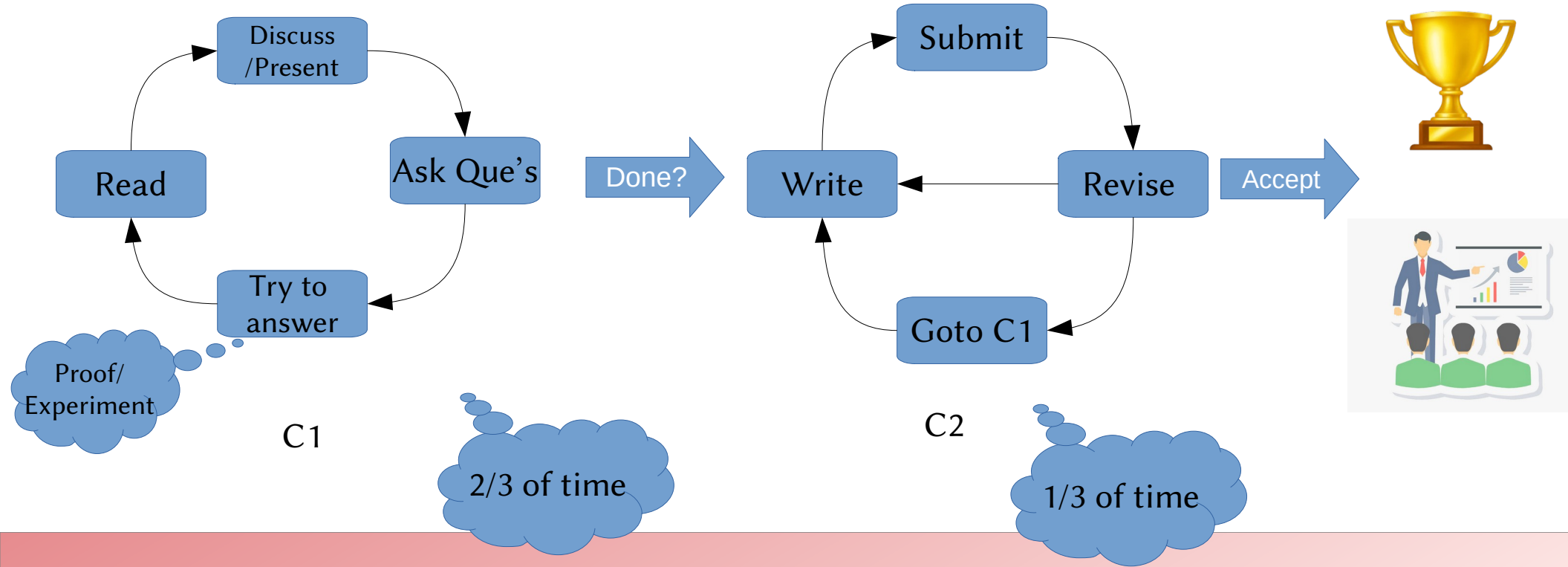
- [Google Scholar](#)
- [DBLP](#)

Doing research – Ask and answer question

- Play with small examples --> properties
- Ask a lot of small questions
- Answer some of those
- There is a bigger question //which no one knows the answer yet!

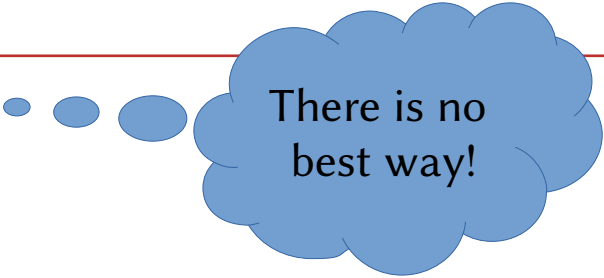


Workflow of any research work



Reading papers

- What is best way to read a paper?
- Read
 - Abstract and Conclusion
 - Section heading
 - Figures, Plots
 - Remaining Sections
 - Read multiple times



There is no
best way!

Reading papers

- Video-presentation in conference or,
- Seminar Talk of a Paper
- Presentation slides of a Paper

- To understand a paper better
 - While reading, in-between
 - Pause and think how would you answer the question posed?
 - Your answer might be wrong
 - But, the process helps to understand techniques in paper better :-)

Reading papers

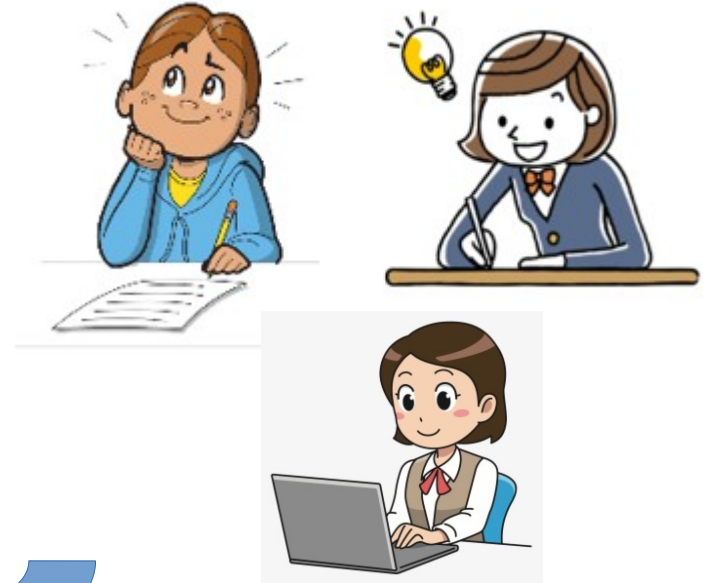
Have a different perspective!



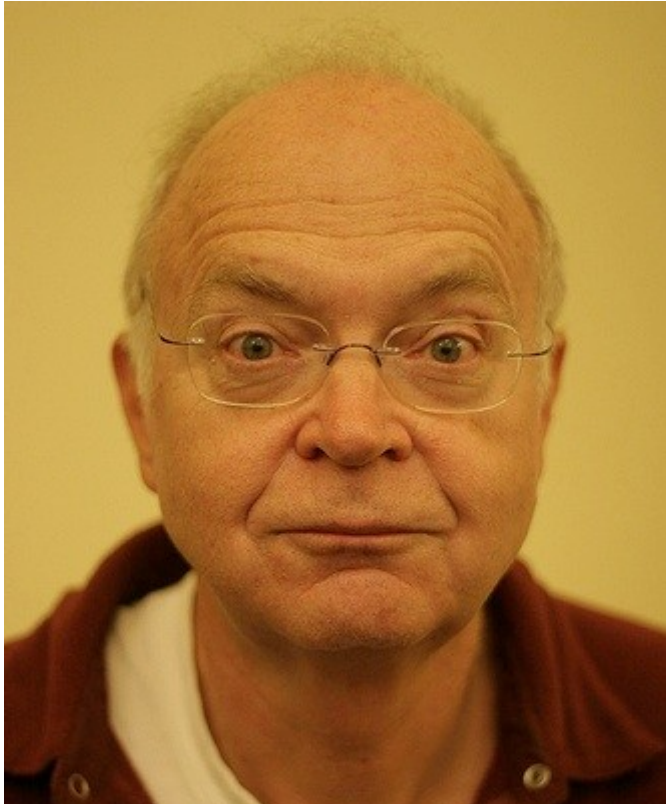
Courtesy: Big hero 6, [2014] Disney Animation Movie

Discussion and Ideas

Ideas are important



Writing up Research



“Of equal importance to solving a problem is the communication of that solution to others.”
- Donald Knuth

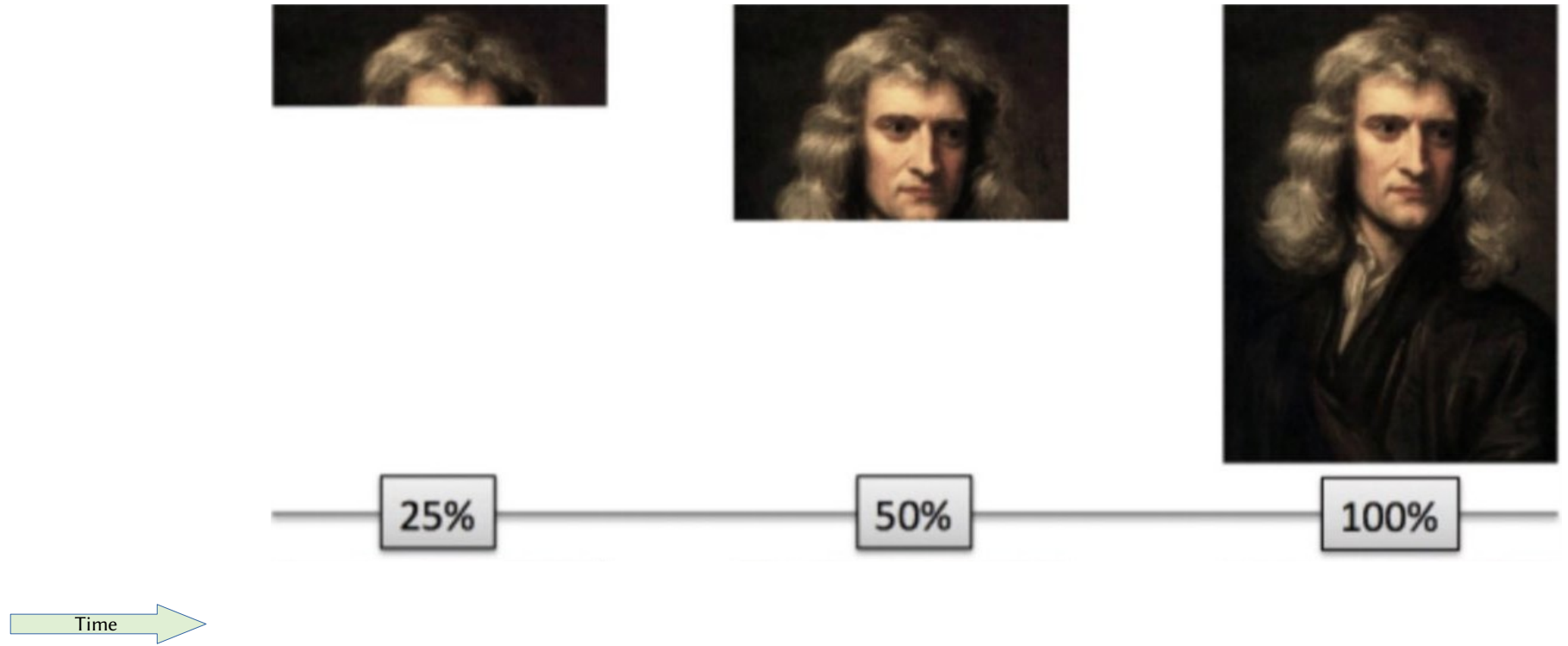
Writing – Standard Template

- Title = Concise
- Abstract = Trailer
- Section
 - Introduction
 - Related works
 - <ABC> Algorithm/Idea
 - Results/Experiments //Tables, Figs., Plots
 - Conclusion
 - References // BibTex
- Remember the flow of the story
- Grammer and spell-check

Writing – Ways to write



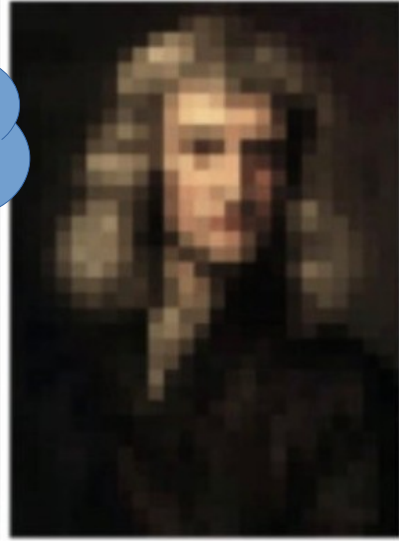
Writing – Method 1



Source: https://twitter.com/david_perell/status/1411852869804904450

Writing – Method 2

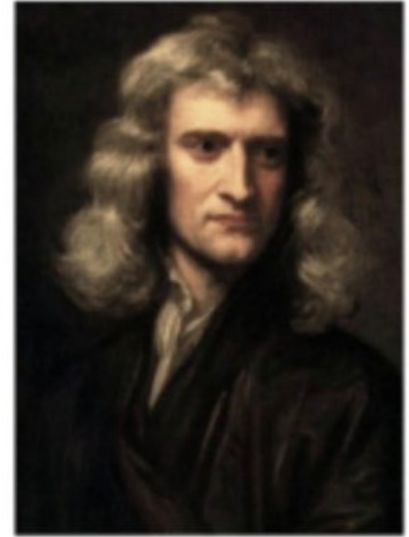
This method works for majority of people



25%



50%



100%

Time →

Source: https://twitter.com/david_perell/status/1411852869804904450

Writing – Submitting

- Conference or Journal format (.docx or TeX)
 - Page-limit (12-15pages)
 - Use overleaf and LaTeX //Must know for a CS researcher
 - No Plagiarism!
 - Stay away from predatory Journals!
-
- 45 to n days for decision
 - Review type
 - Single-blind
 - Double-blind

Demo

- LaTeX
 - [Overleaf](#) - How write?
 - Why it is useful?
 - Documentation
- Searching Paper in
 - [Google Scholar](#)
 - [DBLP](#)
- Subscribing for email alerts //Google Scholar
 - Experts in field
- Searching Conference
 - [WikiCFP](#)

Admission to IIT Madras

- M.Tech
 - GATE Exam <https://gate.iitm.ac.in>
 - AIR ~150-1100 <http://mtechadm.iitm.ac.in>
 - Common Offer Acceptance Portal <https://iitk.ac.in/coap2024/>
 - Based only scores
 - GATE Rank + Interviews //Some IIT M.Techs
- Direct PhD and M.S (Research)
 - AIR ~2500
 - Written test + Interview
 - <https://research.iitm.ac.in>
- PhD
 - Masters + Bachelors CGPA
 - Written test (GATE Level) One hour
 - Interview to two areas.

References

- Donald Knuth, ACM Turing awardee [Post1](#) [Post2](#) [Post3](#)
- Manas Thakur, Assistant Professor, IIT Mandi. [Post1](#)
- Biswabandan Panda, Assistant Professor, IIT Bombay. [Post1](#) [Post2](#) [Post3](#)
- Thanks to my advisors, professors, students and friends at IIT Madras for the wisdom.
- Thanks to Google Images for pictures. :-)



Questions?

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