Improve Your Academic Reading Skills

from two strategies:
Extensive and Intensive Reading

Jiayi Shen, Fatemeh Gholamzadeh Nasrabadi

MultiX

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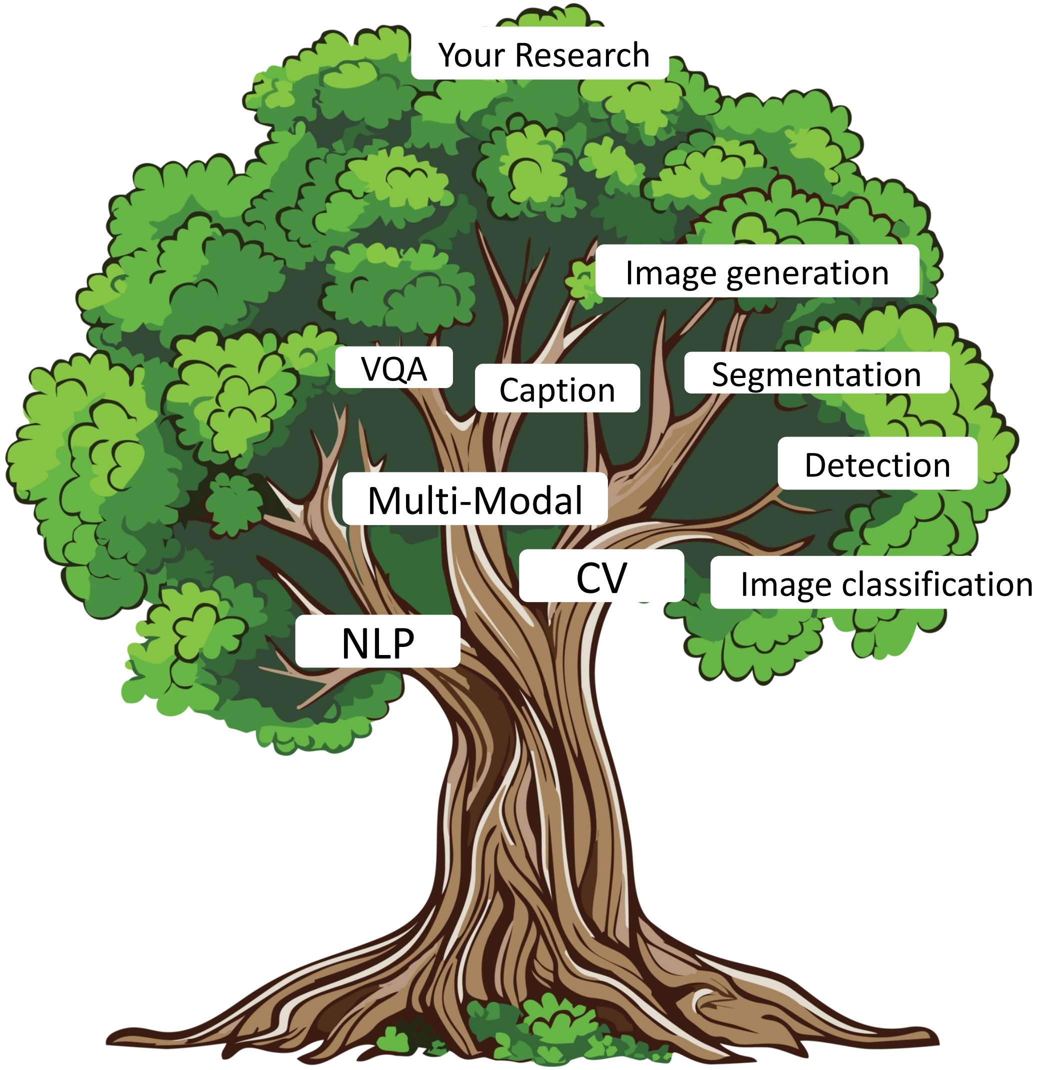
Outline

- Introduction
- Extensive Reading
- Intensive Reading
- Summary

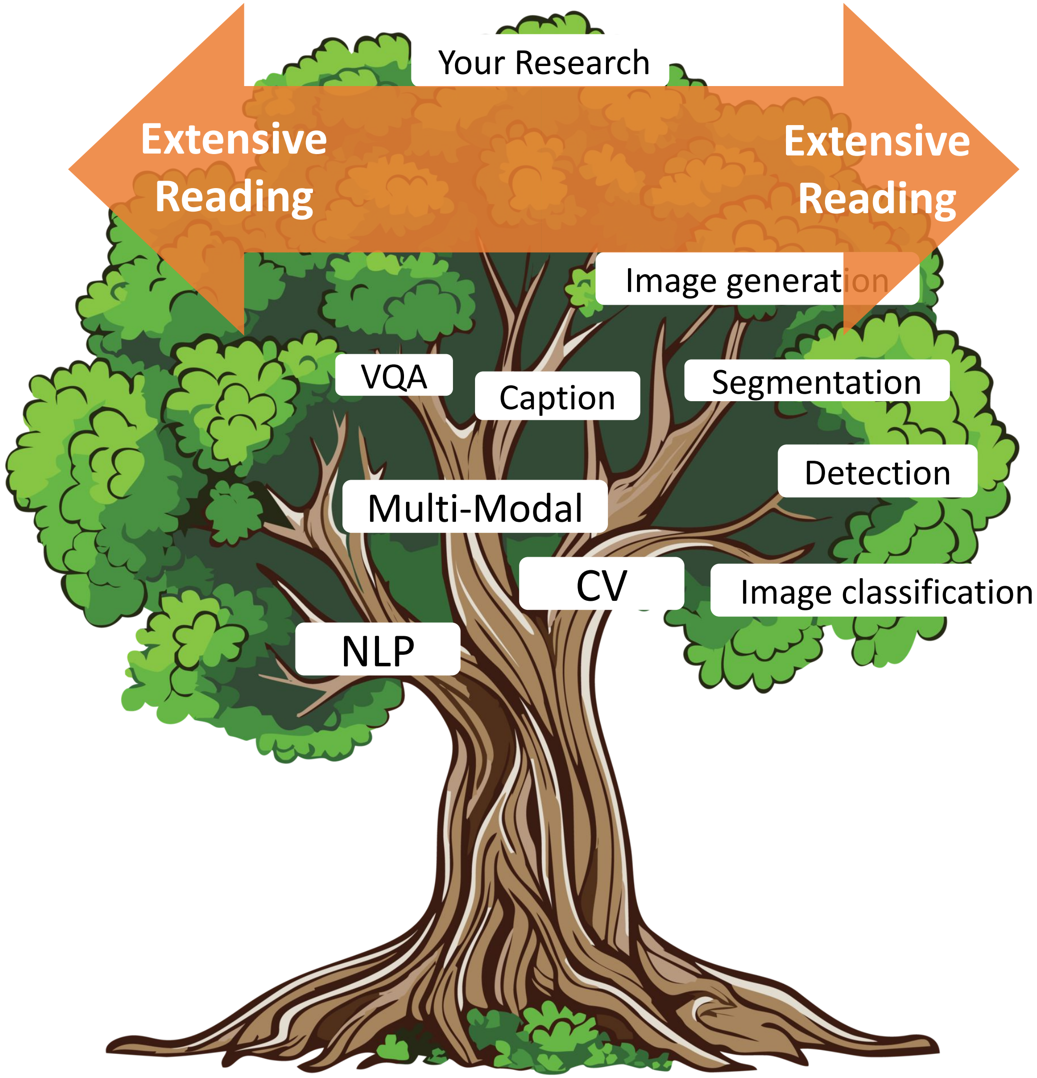
Introduction

- ❑ Locate your research



Introduction

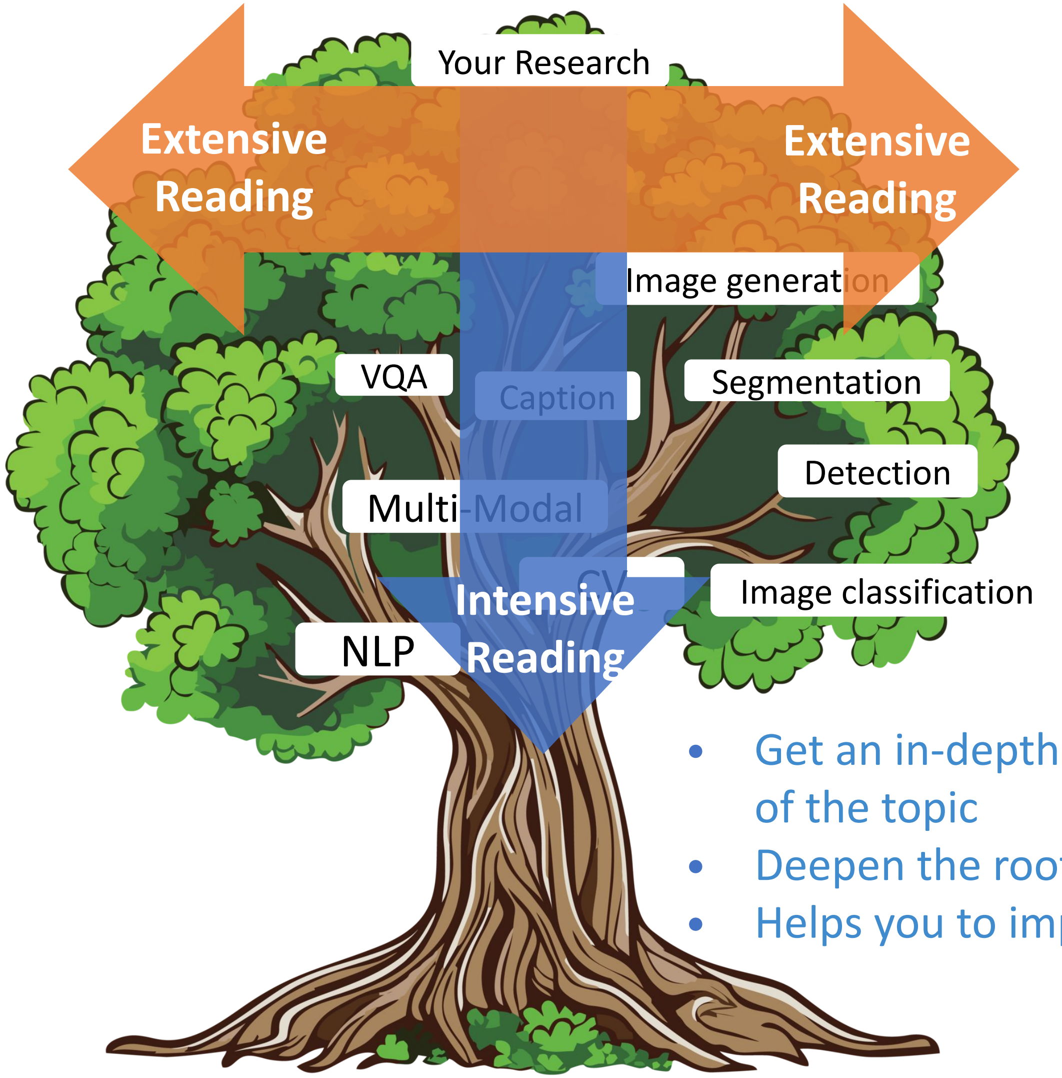
- ❑ Locate your research
- ❑ Extensive reading



- Build your knowledge graph.
- Efficiently inspire new ideas.
- Trend of related research fields.

Introduction

- ❑ Locate your research
- ❑ Extensive reading
- ❑ Intensive reading



- Build your knowledge graph.
- Efficiently inspire new ideas.
- Trend of related research fields.

- Get an in-depth and concentrated understanding of the topic
- Deepen the root of you knowledge tree
- Helps you to implement your ideas

Outline

- Introduction
- Extensive Reading
- Intensive Reading
- Take-away messages

Extensive Reading

- **Why to read extensively?**

  Build your knowledge graph.
  Efficiently inspire new ideas.
  Trend of related research fields.

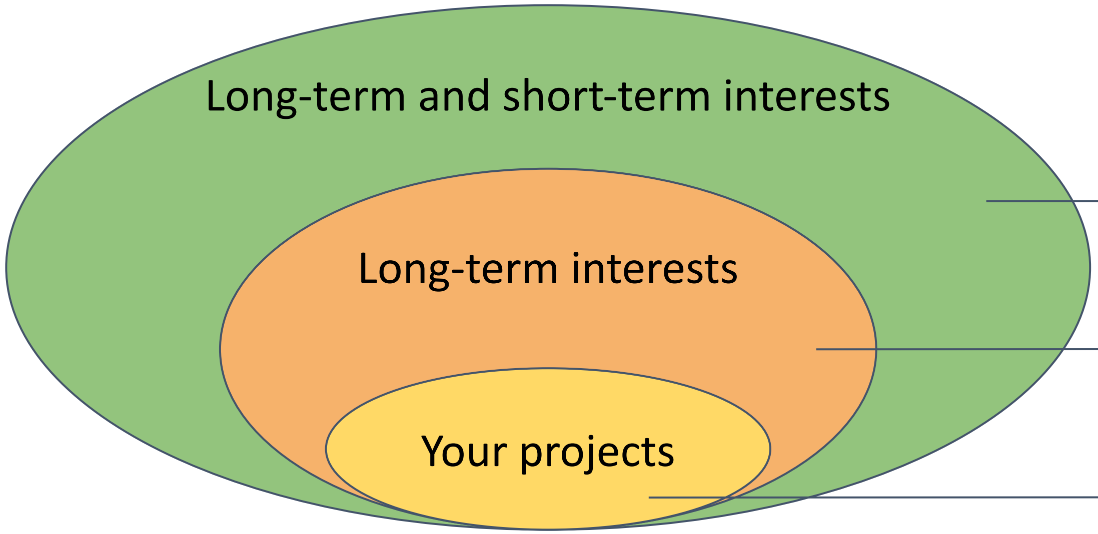
- **When to read extensively?**

  When you start your projects.
  When you stuck in your projects and needs new ideas.
  When you write related work for your papers.

Extensive Reading

❑ **What to read extensively?**

1. Choose your topics.



For example:

LLMs, Generative AI, Diffusion models
Multi-modal foundation models…

Domain generalization, Meta-learning,
Probabilistic modeling, Deep Bayesian Inference

Multi-task learning, Multi-task optimization

Interest Scope

Extensive Reading

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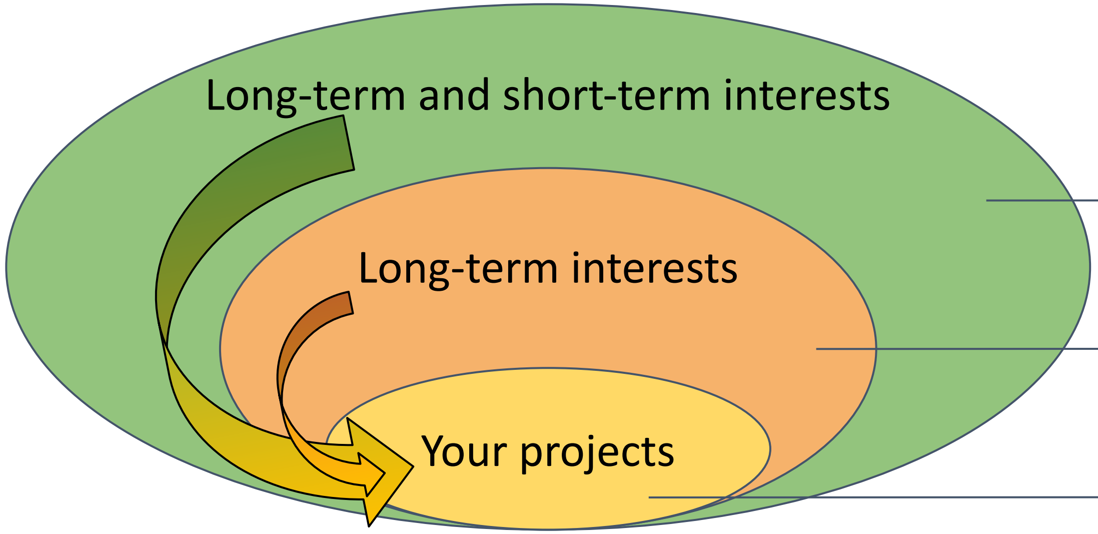

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Extensive Reading

❑ **What to read extensively?**

1. Choose your topics.
2. “Safari” papers based on your topics.

Extensive Reading

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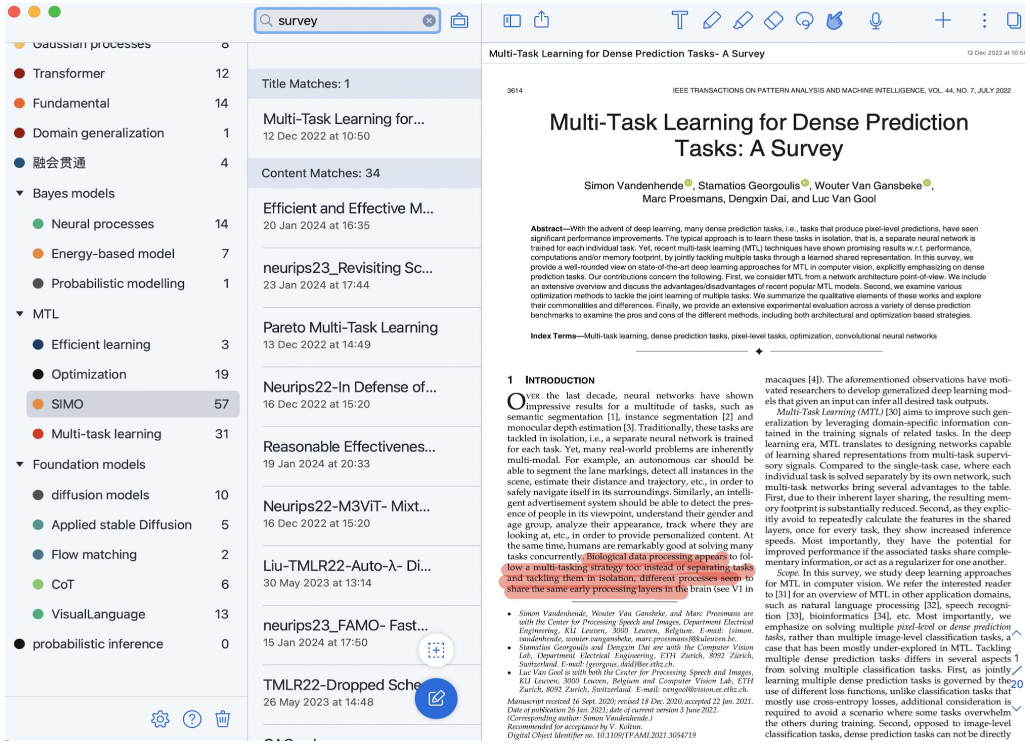
Extensive reading on your project

Extensive reading on long-term interests

Extensive reading on short-term interests

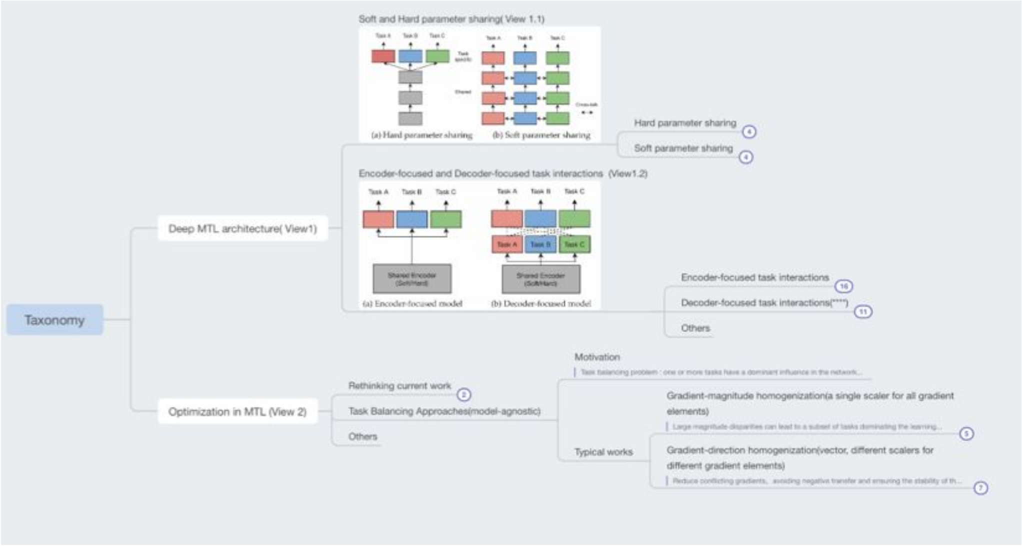
Survey papers (2~4)
High-citation papers (40+, last 7~8 years)
Recent papers on top-tier conferences
(20+, last 2~3 years)

Notability



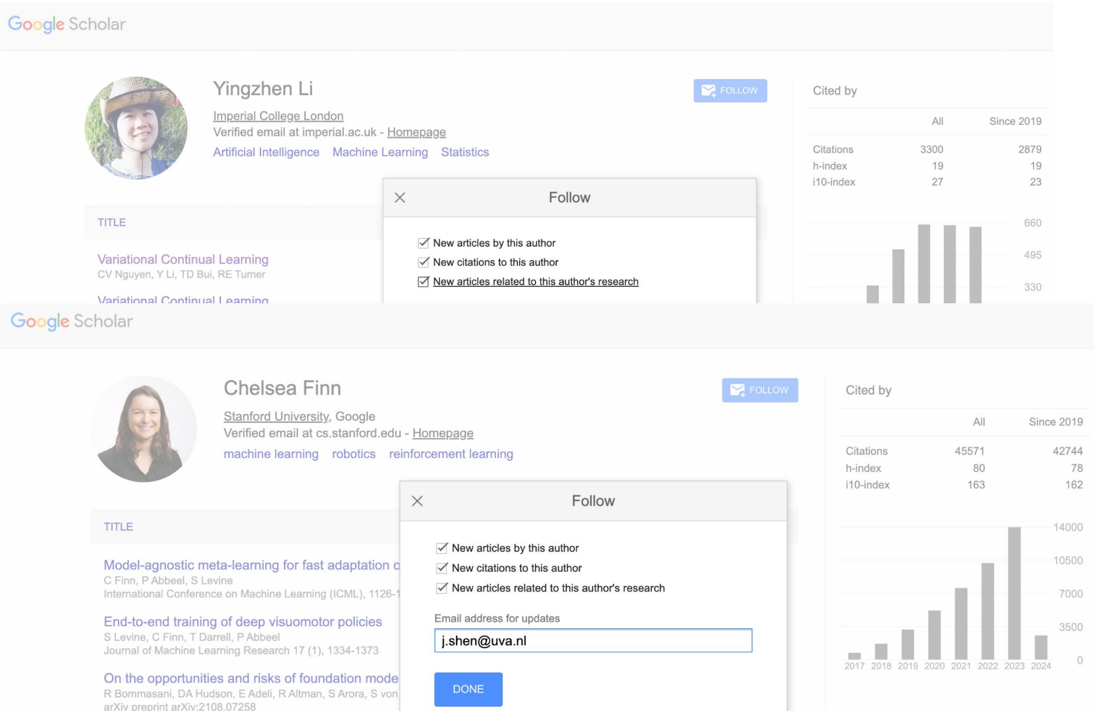
Extensive reading
on your project

Build your knowledge graph
when you start a new project
and write related works.



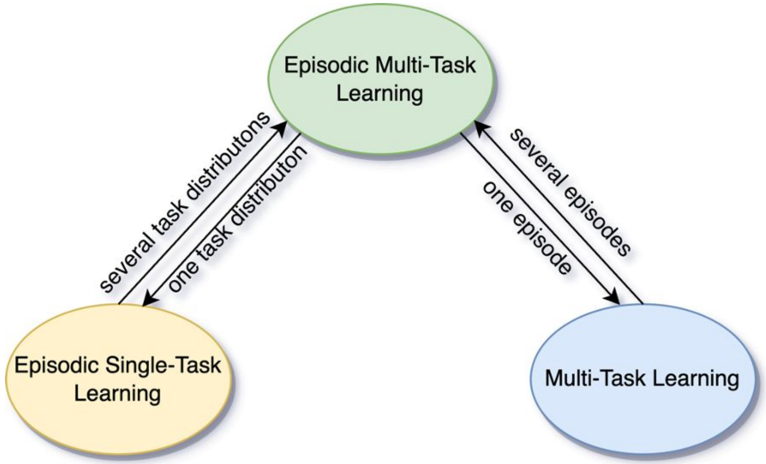
High-citation papers (20+, last 7~8 years)
Recent papers on top-tier conferences (10+, last 2~3 years)

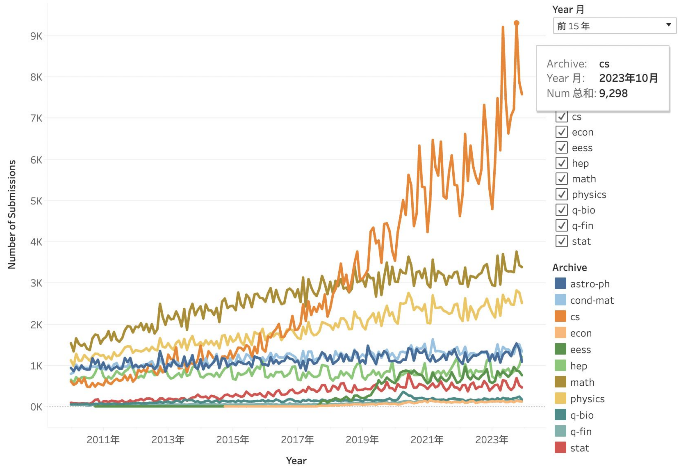
Google Scholar

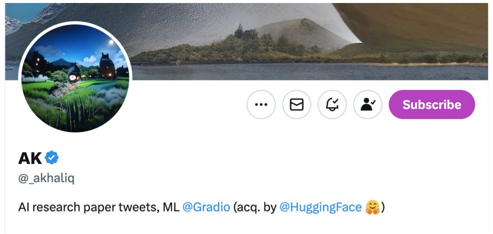


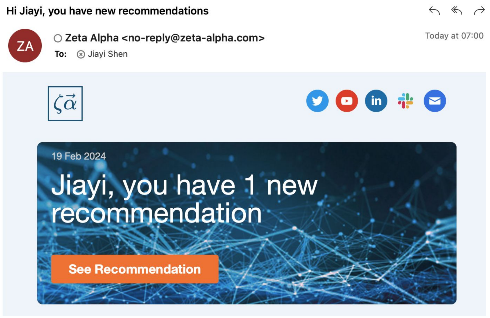
Extensive reading
on long-term interests

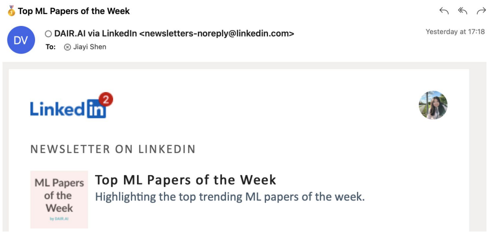
Efficiently inspire new ideas
when you stuck in your projects.











Extensive reading
on short-term interests

Trend of related research fields,
preparations for your future work

Building habits (once a week, about ten papers)
Job hunting, Social impacts, Potential collaborations.

Extensive Reading

- **What to read extensively?**

1. Choose your topics.
2. "Safari" papers based on your topics.

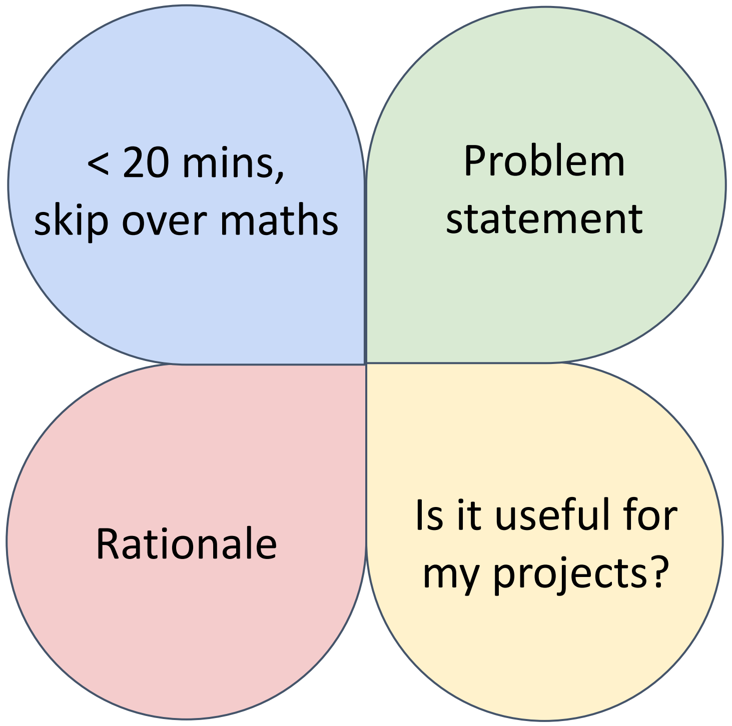
Extensive reading on your project → Extensive reading on long-term interests → Extensive reading on short-term interests

- **How to read extensively?**

Extensive Reading

- **How to read extensively?**

After the paper “safari”, you probably know its title/abstract/main figures.



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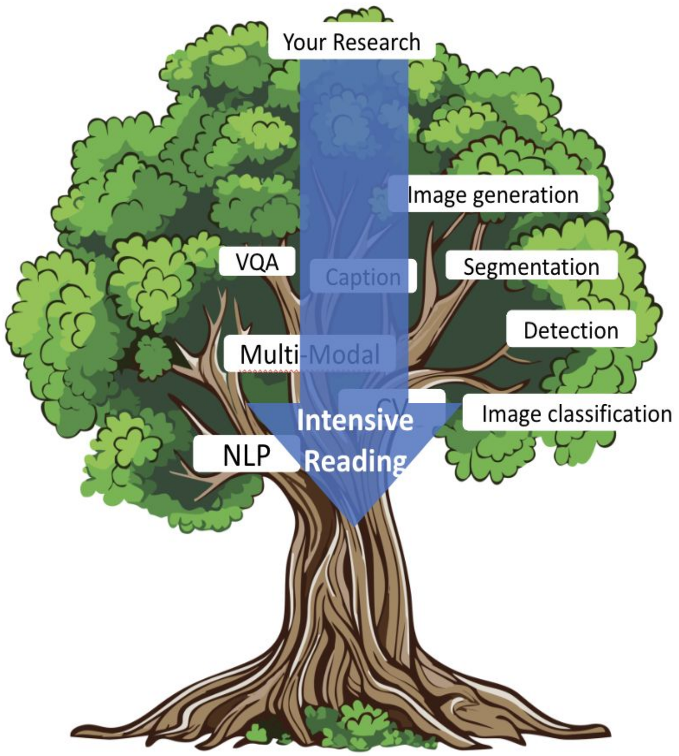
Tom and Jerry Reading – if only scientific journals were as fun!

Intensive Reading

- reading in detail with specific learning aims and tasks



❑ Why to read intensively?

get an in-depth and concentrated understanding of the topic
deepen the root of you knowledge tree
helps you to implement your ideas

❑ When to read intensively?

when you have gained an overall understanding of the topic
when you narrowed down your research topic
when you want to re-implement other's research or improve their results

How to read Intensively

The key idea:

read the paper in three passes

How to Read a Paper

S. Keshav
David R. Cheriton School of Computer Science, University of Waterloo
Waterloo, ON, Canada
keshav@uwaterloo.ca

ABSTRACT

Researchers spend a great deal of time reading research papers. However, this skill is rarely taught, leading to much wasted effort. This article outlines a practical and efficient *three-pass method* for reading research papers. I also describe how to use this method to do a literature survey.

Categories and Subject Descriptors: A.1 [Introductory and Survey]

General Terms: Documentation.

Keywords: Paper, Reading, Hints.

1. INTRODUCTION

Researchers must read papers for several reasons: to review them for a conference or a class, to keep current in their field, or for a literature survey of a new field. A typical researcher will likely spend hundreds of hours every year reading papers.

Learning to efficiently read a paper is a critical but rarely taught skill. Beginning graduate students, therefore, must learn on their own using trial and error. Students waste much effort in the process and are frequently driven to frustration.

For many years I have used a simple approach to efficiently

4. Glance over the references, mentally ticking off the ones you've already read

At the end of the first pass, you should be able to answer the *five Cs*:

1. *Category*: What type of paper is this? A measurement paper? An analysis of an existing system? A description of a research prototype?

2. *Context*: Which other papers is it related to? Which theoretical bases were used to analyze the problem?

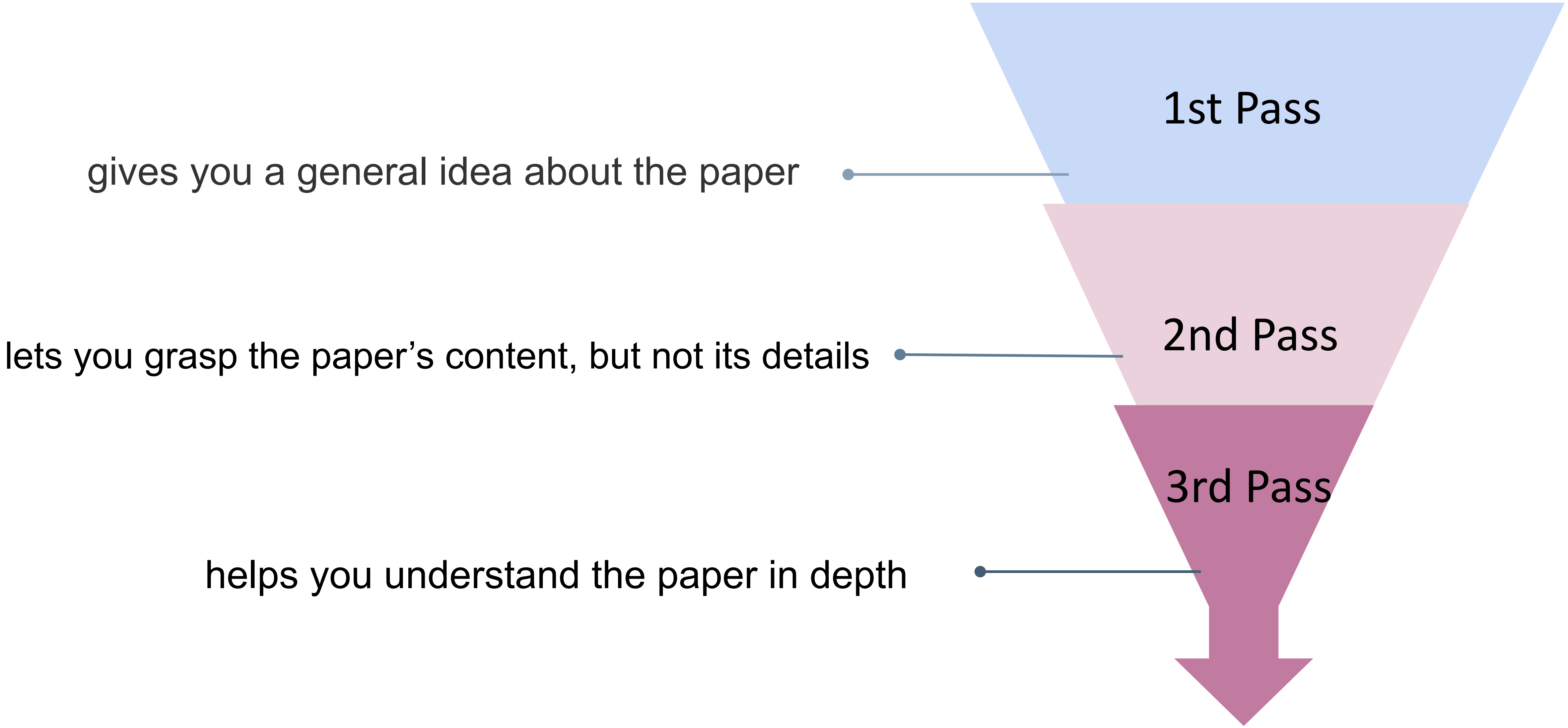
3. *Correctness*: Do the assumptions appear to be valid?

4. *Contributions*: What are the paper's main contributions?

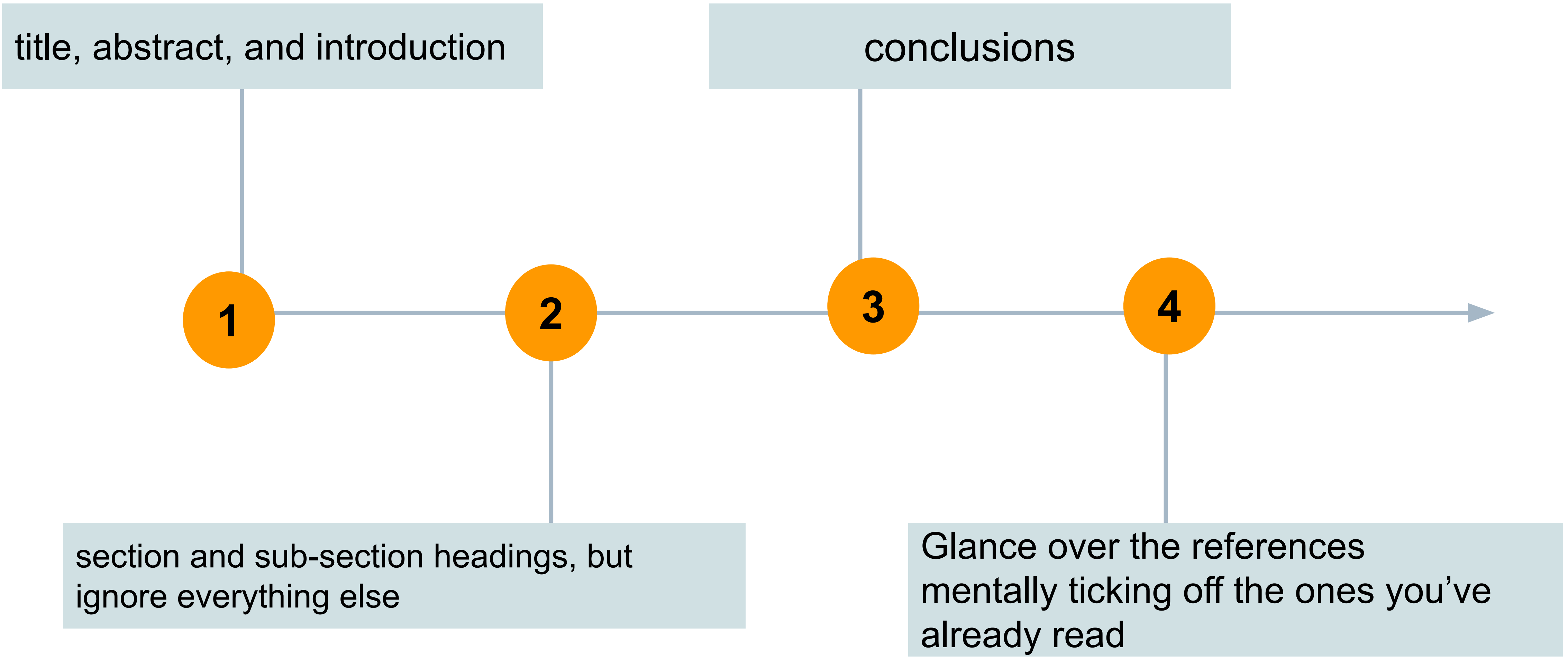
5. *Clarity*: Is the paper well written?

Using this information, you may choose not to read further. This could be because the paper doesn't interest you, or you don't know enough about the area to understand the paper, or that the authors make invalid assumptions. The first pass is adequate for papers that aren't in your research area, but may someday prove relevant.

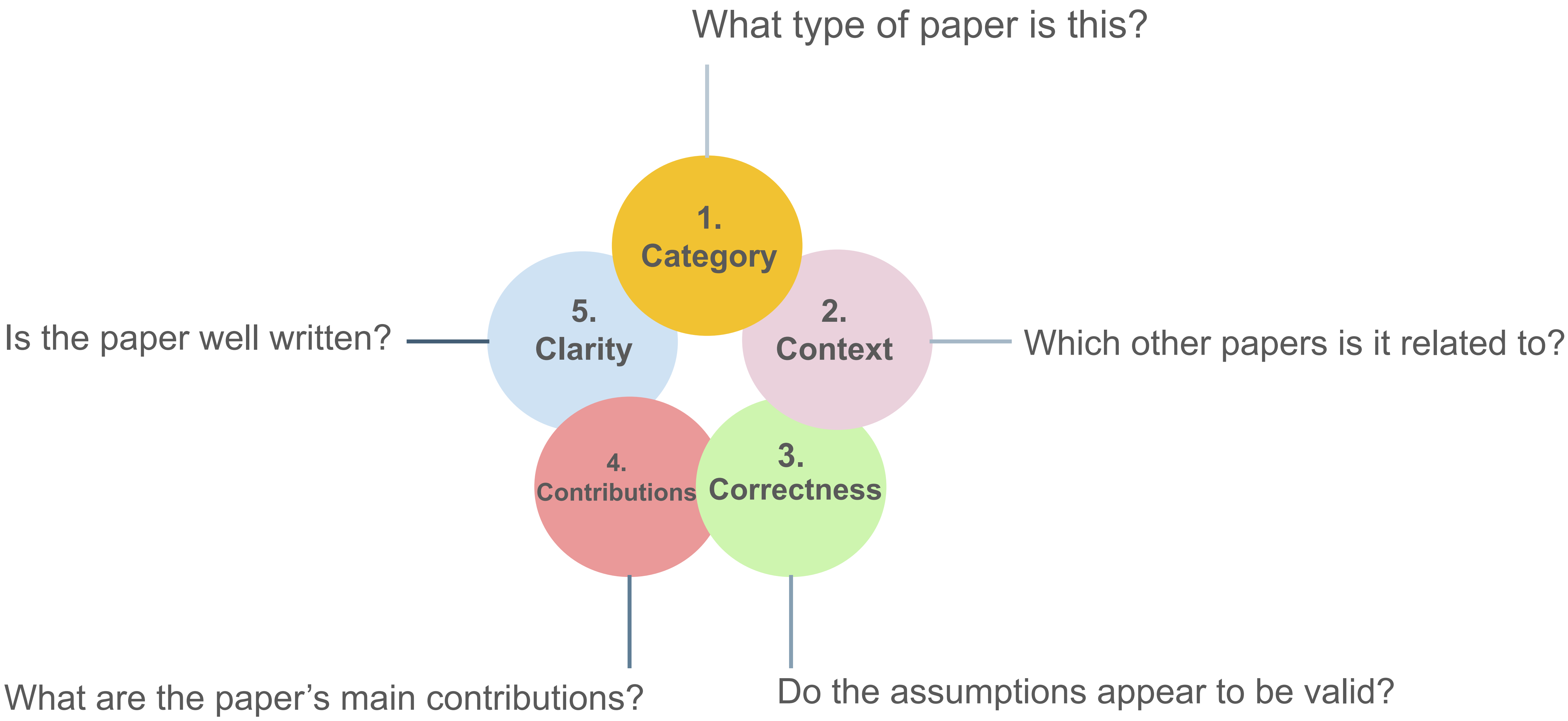
The Three Pass Approach



First Pass


title, abstract, and introduction
conclusions
1
2
3
4
section and sub-section headings, but ignore everything else
Glance over the references mentally ticking off the ones you’ve already read

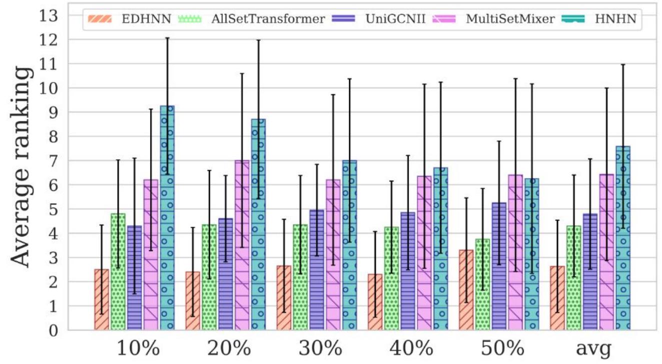
End of first pass: 5 Cs



First Pass Key Points

- You may choose **not to read further**
- Enough for **non research area papers**
- Most reviewers make **one** pass over papers
- Choose **coherent** section and subsection titles and write comprehensive abstracts

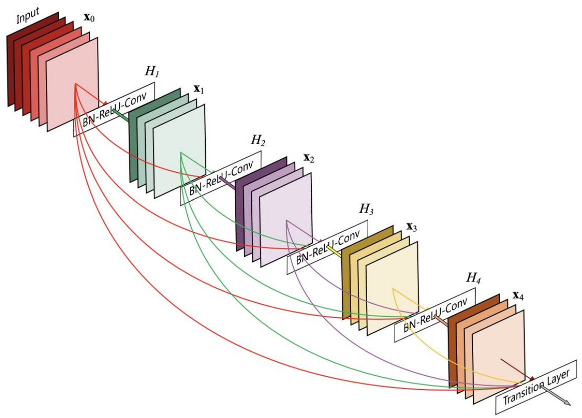
Second Pass

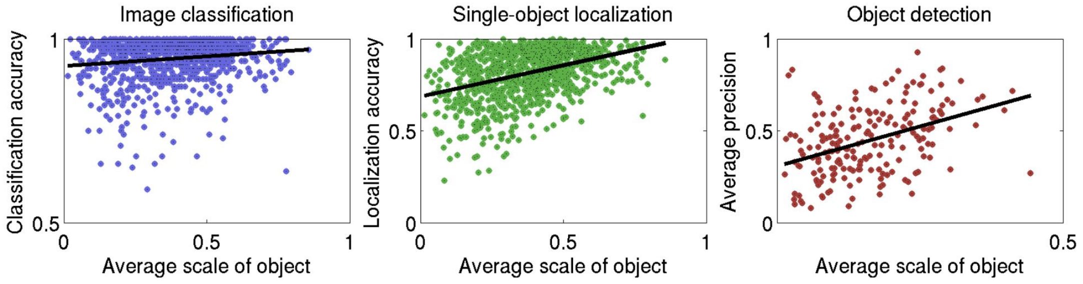


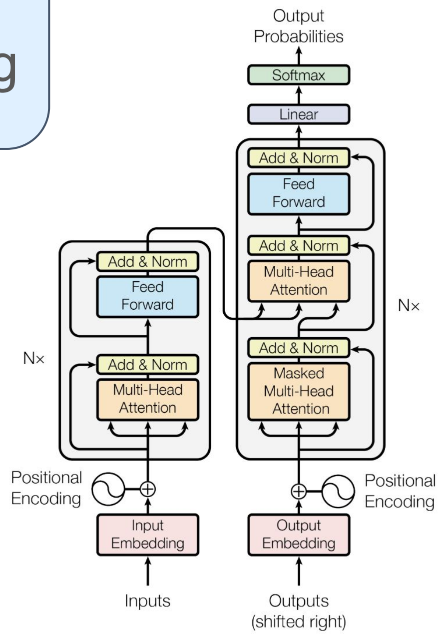
Read the paper with greater care, but ignore details such as proofs

1. Look carefully at the figures, diagrams and other illustrations in the paper.

2. Remember to mark relevant unread references for further reading







Second Pass Key Points

- you should be able to grasp the content of the paper

should take up to an hour

appropriate for a paper in which you are interested, but does not lie in your research speciality

Second Pass Key Points

If you don't understand paper:

1. Set the paper aside, hoping you don't need to understand the material
2. Return to the paper later, perhaps after reading background material
3. Persevere and go on to the third pass.

Third Pass

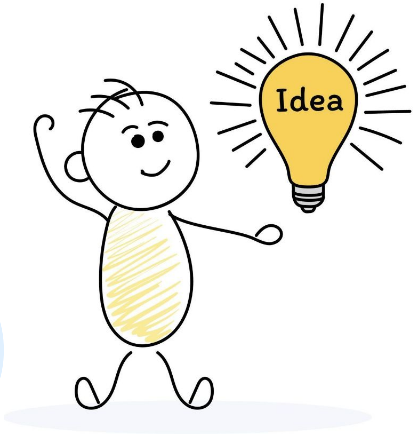
- To fully understand a paper
- The key: attempt to **virtually re-implement** the paper
- Attention to the algorithms and pseudo codes
- Requires great attention to detail
- challenge every assumption

Algorithm 1: ASA-GNN Approach

Input: TG $\mathcal{G} = (\mathcal{V}, \mathcal{R}, \mathcal{P}, \mathcal{W}eight, \mathcal{E})$,
number of layers K,
neighbourhood sample size $\hat{z}$,
$\mathcal{W}eight : \{w_1, ..., w_m\}$,
non-linear activation function σ.
Output: embedding representation h_v^K of each node v

$h_v^0 \leftarrow r_v, \forall v \in \mathcal{V}$; // Initialization
for *each layer* $k = 1, 2, \cdots, K$ **do**
  for *each* $i = 1, 2, \cdots, \hat{z}_k$ **do**
    // Neighbor sampling
    $\mathcal{N}_v^i \leftarrow$ select neighbors from $\mathcal{N}_v$ according to Eq. (7);
    if $c_v = 1$ **then**
      over-sample neighbors according to Eq. (8);
    end
  end
  for *each node* $v \in \mathcal{V}$ **do**
    // Aggregation
    $\alpha_{v,v'}^k \leftarrow$ Eq. (11) ;
    $h_{\mathcal{N}_v}^k \leftarrow$ Eq. (18) ;
    $g_v^k \leftarrow$ Eq. (14) ;
    $h_v^k \leftarrow$ Eq. (15) ;
  end
  $h_v^k \leftarrow h_v^k / ||h_v^k||_2, \forall v \in \mathcal{V}$;
end

Third Pass



you should think about how you yourself would present a particular idea

jot down ideas for future work

can take about four or five hours for beginners, and about an hour for an experienced reader

Third pass checklist

- Be able to reconstruct the entire structure of the paper from memory
- Be able to identify its strong and weak points
- Be able to pinpoint implicit assumptions, missing citations to relevant work, and potential issues with experimental or analytical techniques.

Summary

- Two strategies: extensive reading and intensive reading
- **When** and **why** and **how** to read Extensively/Intensively
- Intensive reading: Three pass approach

Thanks!