

Introduction to Research

(4) Core of PhD: Research and Paper Writing

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Research Discussion

- Research discussion is key to great research
- Schedule **additional research discussions** in addition to 1:1s (which could also serve other purposes)
- 3 levels of discussion patterns
 - Please avoid any practice in the **ineffective** category
 - Aim to achieve **effective and productive** discussions

Research Discussion (1)

- **Ineffective** research discussion pattern
- Before meeting
 - Research thoughts **un-organized** (a ppt with random ideas that are not coherent)
 - Please be prepared to go through your thoughts **clearly and concisely**
 - Experimental results **missing or not analyzed** (very few relevant experiments to support the claim; no figures;)
 - **Do not record / address** previous meeting comments, suggestions and TODOs
- During meeting
 - Talk about **bugs / reproducibility challenges / simple blockers** during meeting
 - These should be resolved through additional emails or meetings and should not be the main focus of research discussion

Research Discussion (2)

- **Expected** research discussion pattern
- Before meeting
 - Clearly state the TODOs / suggestions from previous meetings and **how they are addressed (I should not be the one to remind you “we talked about XXX last meeting, did you try it?”)**
 - Some slides, doc or notion that **effectively communicates** what are being done and what are the findings (no aesthetic requirement)
 - Highlight **main discussion points**
 - Think about potential solutions and improvements to problems that arise
- During meeting
 - **Note down** the comments, suggestions and TODOs for the next meeting
 - Thoroughly present the experimental results including **analysis and directions to improve**

Research Discussion (3)

- **Effective and Productive** research discussion pattern (in addition to everything that is **expected**)
- Before meeting
 - Comprehensive survey of existing works. Classify them into groups of methods and propose / rethink the **“angle of attack”**
 - Think thoroughly on what **innovation** could we achieve
- During meeting
 - Lead the discussion: provide **comprehensive overview** of advantages and disadvantages of current approaches
 - Do not simply run experiments and collect results, but **extract insights**. Based on findings and analysis, propose **improvements, new directions, theoretical justifications**

After Acceptance

- **Project website**
 - Let's put them under the group website
 - <https://github.com/Graph-and-Geometric-Learning/Graph-and-Geometric-Learning.github.io>
- **Github repo**
 - Under the group's GitHub organization
- **Camera-ready / Arxiv**
 - Additional review to ensure that the paper is bullet-proof
 - Make changes according to reviewers' comments
- **Talk slides (long / short)**
 - Give a talk in group meetings beforehand
- **Posters**

Paper Writing Tutorial

- Jennifer Widom

<https://cs.stanford.edu/people/widom/paper-writing.html>

- Please read carefully

Overleaf

- **Review mode**: learn from review suggestions
- **Goal**: try not to make the same mistake that I point out during paper writings
- **Proofreading** is very important! It will help you avoid many grammar mistakes and make your reviewers less confused

Overleaf: General Tips

- Do not write long paragraphs (>25 lines if double-column)

- Use `\xhdr{}` to highlight the paragraph

```
\newcommand{\xhdr}[1]{\noindent\bfseries #1.}
```

Training objective. With the aim of minimizing |CLOSE| after search, our goal is to train a parameterized heuristic function $h_\theta : \Psi \times \mathcal{V} \times \mathcal{V} \rightarrow \mathbb{R}$ to predict ground-truth node distances h^* and use h_θ within a greedy best-first policy π_θ at test time. More specifically, we assume access to a distribution over graphs $P_{\mathcal{G}}$, a start-goal node distribution $P_{v_{sa}}(\cdot | \mathcal{G})$, and a time horizon T .

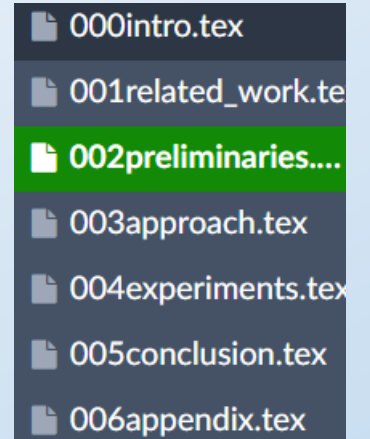
- Use environments (assumption, lemma, proposition, theorem, remarks ...)

Assumption 4. The loss function in Eq. (8) is L -smooth,

$$\|\nabla f(\mathbf{W}_1) - \nabla f(\mathbf{W}_2)\|_2 \leq L\|\mathbf{W}_1 - \mathbf{W}_2\|_2 \quad \text{for all } \mathbf{W}_1, \mathbf{W}_2 \in \mathbb{R}^{d \times c}. \quad (10)$$

Overleaf: General Tips

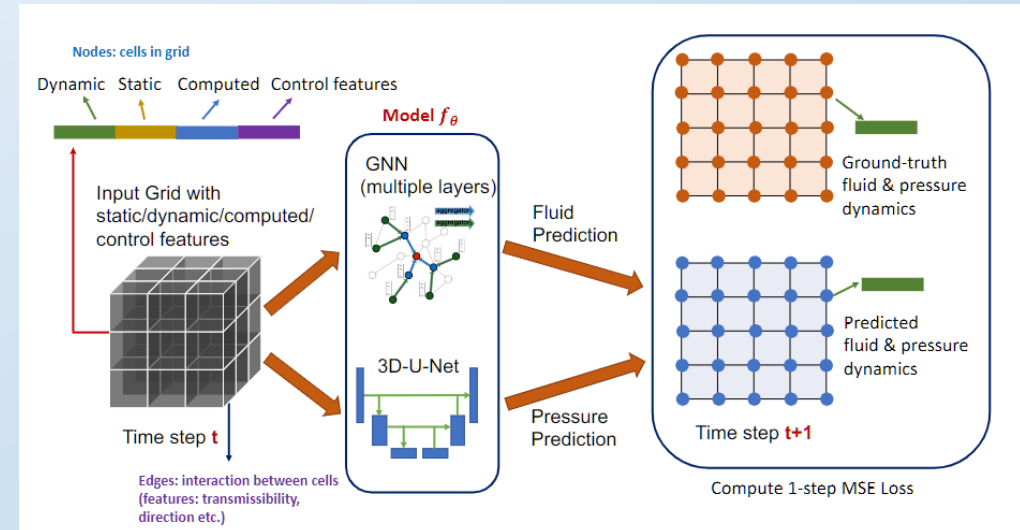
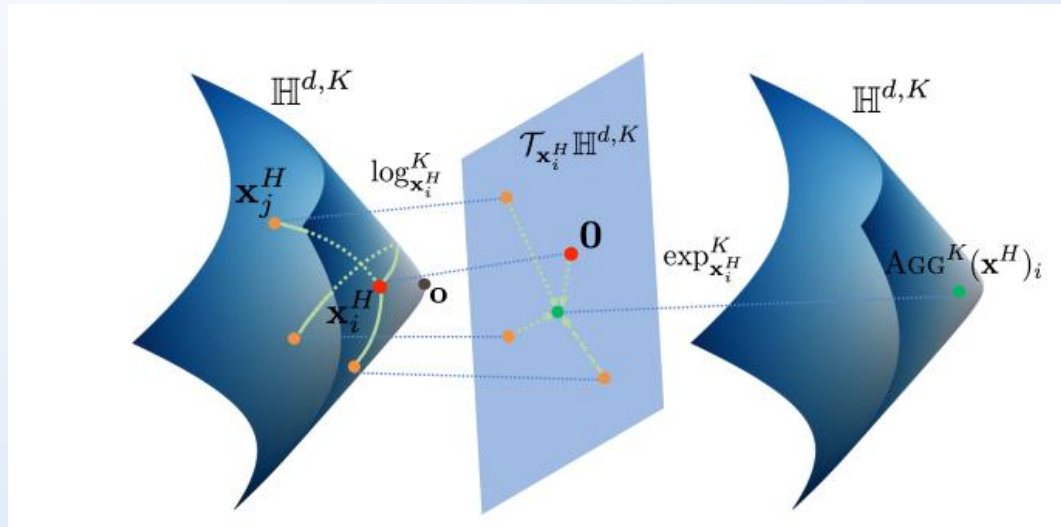
- Use 00abstract.tex, 01intro.tex, ... to organize the .tex files
- Figs folder for all figures
 - Include raw vector graphics



- Avoid dangling words (last line of the paragraph has only **1 word**)
- Always specify the Appendix section (A, B, ...) when referring to it
 - E.g. [See Appendix A.4](#)

Overleaf: Figures

- Use .pdf or .eps (vector graphics if possible)
- Try to use figures to explain something complex
- Font size



Make Sure Figures are well-captioned

- Figure caption should explain the figure and what readers should pay attention to (more about figures in next session)

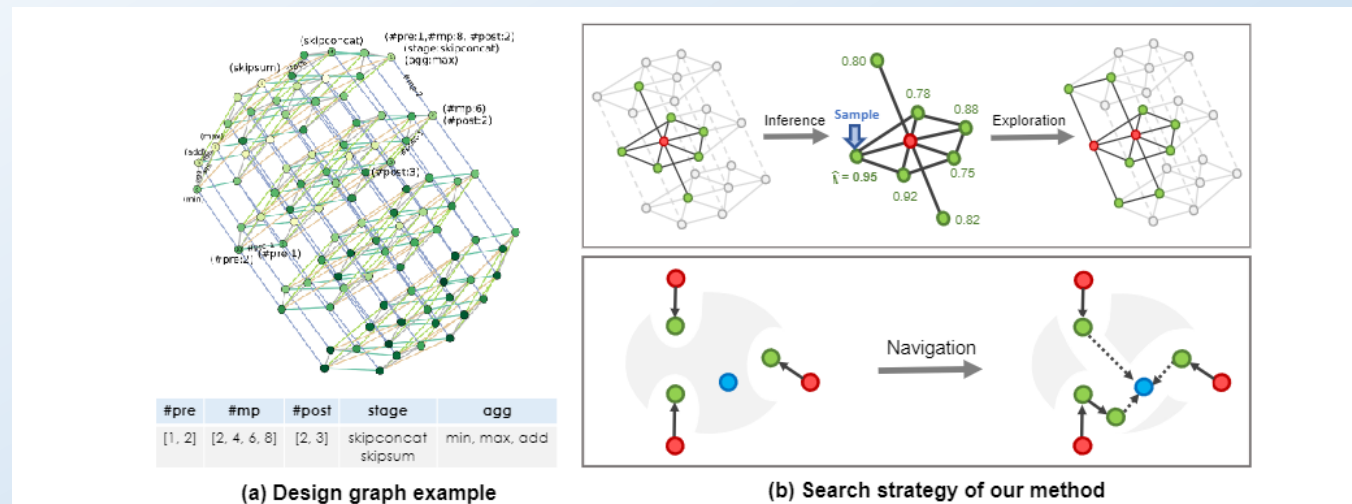


Figure 1: **Overview of FALCON.** (a) **Design graph example.** We present a small design graph on TU-COX2 graph classification dataset. The design choices are shown in the table, #pre, #mp, #post denotes the numbers of pre-processing, message passing, and post-processing layers, respectively. The better design performance, the darker node colors. (b) **FALCON search strategy.** Red: Explored nodes. Green: Candidate nodes to be sampled from. Blue: The best node. Gray: Other nodes. Locally, FALCON extends the design subgraph via a search strategy detailed in Section 3.3. Globally, FALCON approaches the optimal design navigated by the inductive bias of the design relations.

Rebuttal

- Remember you are also **writing to AC!**
- Start with a paragraph summarizing the pros of the paper (cite reviewers' words)
- For each paragraph, address one group of concerns from multiple reviewers (unless it's OpenReview)
 - Describe reviewer's concern
 - Use one sentence to say how it is addressed (a misunderstanding; already mentioned in paper ...)
 - Detailed explanation
 - How we will change the paper to address the concern (if required)

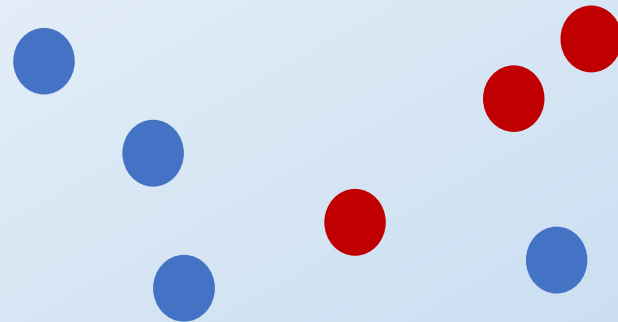
After Your Qual

- By now, you should have a few exploratory publications and have a good understanding about your interest and overall research direction
- You should now think about **a coherent story** that could connect some of your research works
- Fill in the missing pieces that you think would be necessary to complete this coherent story:



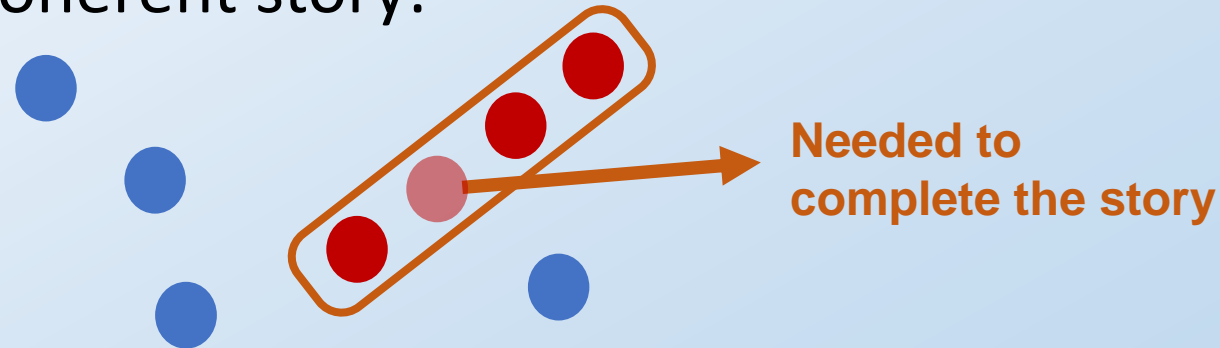
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Summary

- Research is about consistency
 - Try to aim for **Effective and Productive** research!
- After paper acceptance
 - Website, repo, camera-ready, talks, posters
- Incorporate and learn from writing feedbacks
 - Write good rebuttals
- After the qual: complete the coherent story (thesis)