

EC-ENG 535/635 (Fall 2024)

Report / Paper Writing

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Why write and publish a good report/paper?

- Community outreach and advancing research
 - You communicate your ideas
 - Community can build on top of your work
 - Community can benefit from the quality of your work
 - You get credit for your work
- Working in silos, doesn't do much beyond your own gratification

What does a good report/paper have?

- It is like a story
- You start with what the problem is, why the problem is worth solving, how did you solve it, and what are the results
- Be very specific about the problem you are addressing
- Highlight the challenges in technical terms
- Highlight your contributions
- Support your claims with empirical evidence
- Detailed description of your setup
- Describe the limitations of your work
- Communicate what did not work, so community can learn from it and plan better use of its resources

Components of a research paper

- Abstract
 - It's a 200 word summary of your paper – an advertisement
- Introduction
 - It includes overview of the field you are working in, where does your work fit in the bigger picture, what is the motivation behind your work, brief statement of the challenges you are addressing and listing your contributions
- Literature Review
 - It gives a summary of other research work that solves the same problem as yours and how your solution stands out
- Background
 - It conveys certain basic ideas that your research builds upon. Often optional, but good to have
- System Design
 - The most important section in the paper. It starts with a holistic description of your work often accompanied by a block diagram of the system
 - It also explains each system block in detail: lays out the challenge each block addresses and your solution to the challenge

Components of a research paper

- **Implementation**
 - Often describes the hardware/software tools you used in your experimentation or to build your prototype
 - It also lays out the environment in which the experiments were conducted, any simplifications or assumptions that were made while conducting the experiments
- **Evaluation**
 - It describes the evaluation metrics, why are they used for evaluation
 - Presents the benchmarks used and why were they chosen
 - This section lays out the results of the experiments. The results are presented and interpreted
 - Also includes comparisons with previous solutions from the literature
 - Finally, it lays out any trade-offs involved in your design
- **Conclusion & Discussion**
 - It summarizes the work while highlighting contributions. It also discusses the limitations and the future directions
- **References**
 - List of all the resources cited in your work. It includes the websites, articles and research papers among other things. Make sure to cite high impact work in your area of research

Components of a research paper

- This is a good starting point for your first few research papers
- With experience,
 - you may find better templates to communicate your work
 - Get to understand different writing styles for different kind of research

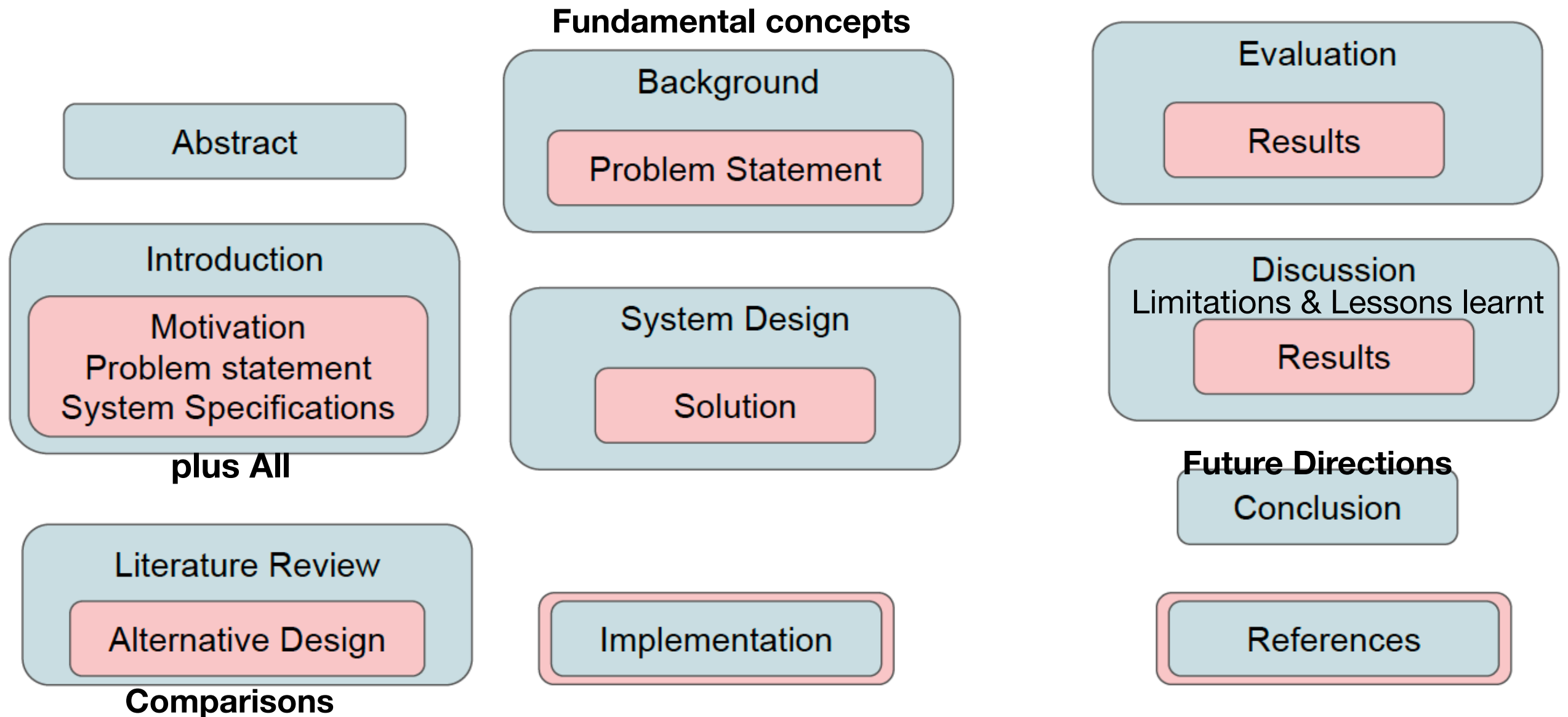
Writing the Introduction

- Motivation:
 - Motivate the problem you are solving with at least TWO important Use Cases with real world applications backed with references
- Problem Statement:
 - The exact problem you are trying to solve
 - This is relatively non-technical and straightforward
- System Specifications:
 - Technical definition of the problem statement
 - Performance metrics in the problem's space
- Design Alternatives:
 - What other designs are out there and what do they lack
 - Comprehensive design comparisons
 - Highlight design tradeoffs in terms of performance metrics for various alternative approaches

Writing the Introduction

- Solution:
 - What is your solution (architectural diagram), NOTE: This is NOT an implementation diagram but a general system level diagram
 - Highlight your technical contribution that sets your work apart from previous ones
 - What tradeoffs does it bring out
- Implementation:
 - Which platforms and devices are used for solution implementation
 - How is your testbed best to prototype your solution
- Evaluation & Results:
 - Use your performance metrics to evaluate your design on the implemented testbed
 - What are your benchmarks and why
 - Contrast your results with at least one prior approach in terms of exact results (if possible)
- Cite appropriate References:
 - Your references should be high impact and recent papers from known researchers

Writing Criteria & Research Paper



Before you write..

- Choose a template
 - Latex
- Choose a reference paper that you will follow
 - Maybe the paper you liked the most in discussions or critiques
 - Relevant reference papers for your chosen projects
- Use software that automates other writing aspects like formatting, citations etc
 - Overleaf - cloud based latex IDE
- Create an outline of key points
- Put in all the content you have so far e.g. literature review
- Start writing

What not to do!

- Don't put screenshots, draw your own graphs/design blocks
- Don't mix the implementation and design
 - Design refers to the principles that your system uses, the various components of your system and each component's function
 - Implementation describes the hardware/software technologies used to realize the design and other practical considerations
- Don't make arbitrary design choices
- Don't make unsubstantiated claims
 - Cite every claim you encounter

Implementation-focused papers

- Only differ from a research paper in terms of the content that gets highlighted.
Emphasize on:
 - Specific use cases e.g. where it can be deployed?
 - Experiences e.g. what problems you ran into while building the system
 - Demonstration experience e.g. list any issues that were discovered by using the system
 - System specifications
 - Differences are mostly in system design and discussion sections
- Some sample implementation papers are,
 - <https://dl.acm.org/doi/pdf/10.1145/3277883.3277892>
 - <https://dl.acm.org/doi/pdf/10.1145/3491101.3519883>
 - <https://dl.acm.org/doi/pdf/10.1145/3491102.3501884>

Project Report Deliverables

- Final project report due on Dec 18th (last day of semester)
 - Reports should follow the given template and should be 6-8 pages long
 - Use your midterm's Latex overleaf template: <https://www.overleaf.com/latex/templates/association-for-computing-machinery-acm-large-2-column-format-template/qwcgpbmkkvpq>
 - You have gone through enough papers & critiques to be familiar with research paper styles
- Put all your code and data on Github repositories and provide the link in your final report

Demo Deliverables Logistics

- **Demo Day on Dec 5th and Dec 10th** (10 am to 11:15 am during class time)
 - Prepare a software poster/presentation slide (Use any format)
 - Design tradeoffs
 - Technical Solution
 - Highlight one Result
 - Real time Demo (if applicable)
 - Your technical contribution and evaluation is most important in your project
- **In-person in-class demonstration**
 - Dec 5th Demos: total 15 projects
 - Multimodal FL (3), Heterogeneous FL (4), LLM Safety (8)
 - Dec 10th Demos: total 11 projects
 - FL Bias (3), Mixed Reality (1), Time Synchronization (5), Time Security (1), ARM TrustZone (1)
 - Each student in a group takes at most 2 minutes to present
- Communicating ideas effectively is the Key!
- Presentation quality - both oral and visuals - is vital for this course