Understanding Research Papers Using Prompt-Engineered LLMs

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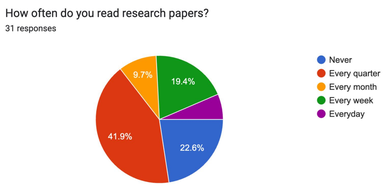
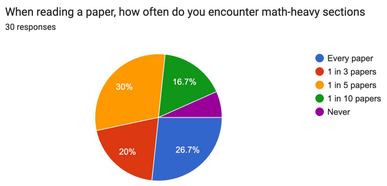
User Research

Generalized survey.
We created a survey to learn about how users read research paper and the tools they employ.

Semi-structured interview.
We conducted 17 one-on-one interviews with think-aloud and observational studies to understand users' workflow and pain points.





Personas

Beginner + Skim	**Beginner + Deep Dive**
Expert + Skim	**Expert + Deep Dive**

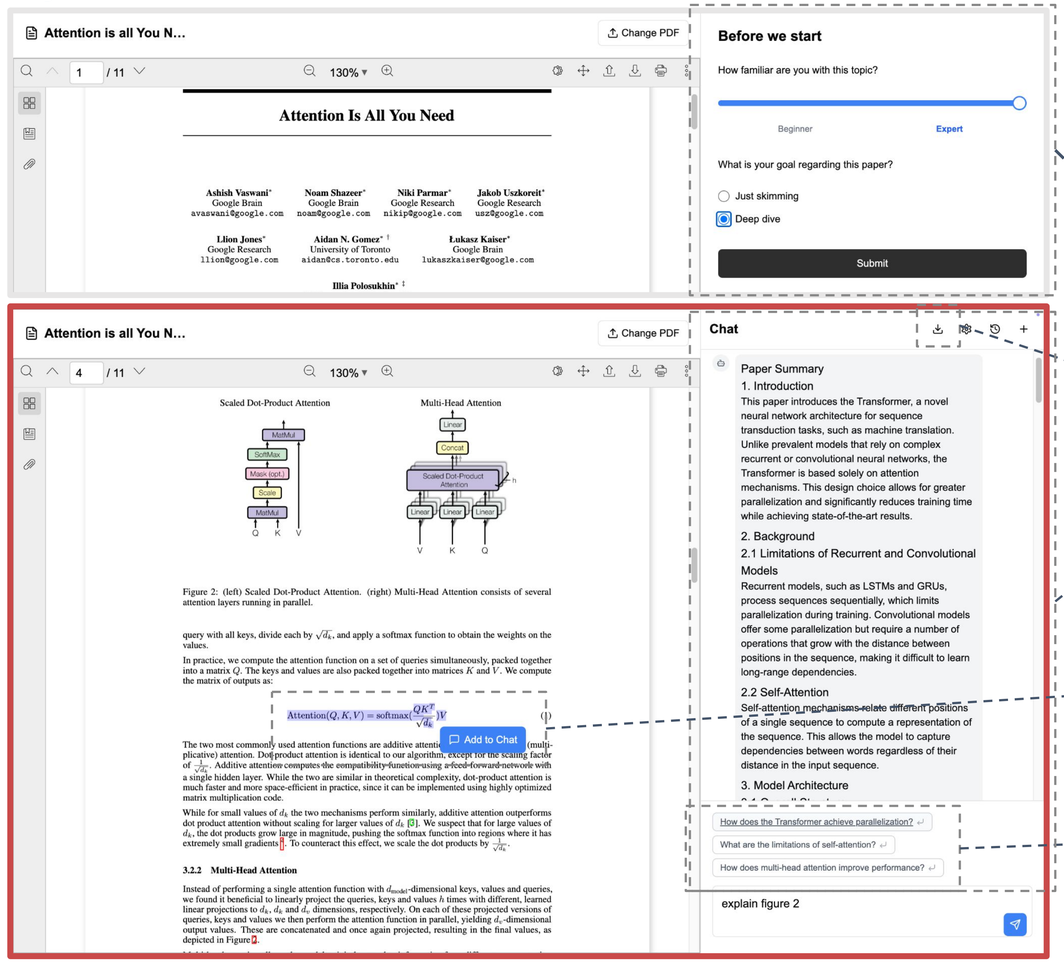
Problem Statement

Reading research papers can be challenging for CS students and researchers due to lack of background knowledge in mathematics required to understand complex equations. We aim to enhance their understanding by supporting a structured workflow with guided use of LLMs.

Example Scenario: Expert Deep Dive

PhD students reads paper frequently to stay informed of current research developments. While they are comfortable with most math concepts, the dense notation and deviations in some literature are nonetheless challenging and time-consuming. Suggested questions and in depth explanations support expert-level understanding and research integration.

System Overview and Features



Our tool leverages LLMs to help users organize their workflow and better understand complex mathematical concepts, theories and applications.

- **Personalized Reading Experience and Goal**
- **Transcript Download**
- **Automated Summary**
- **Text Selection to Chat**
- **Suggested Questions**

Evaluation

✅ **Personalization enhances workflow.**
Allowing users to set reading goals and experience levels individually enhances productivity and efficiency.

✅ **Suggested questions aligns with learning progress.**
The suggested questions follow users' thought process and help them engage deeper with the paper.

⚠️ **Unclear signage confuses system navigation.**
An onboarding tutorial or tooltip to familiarize users with the interface can reduce first-time confusions.

⚠️ **Limited readability without LaTeX formatting.**
A proper equation rendering can make mathematical content easier to read and follow.