

Introduction to Teaching and Learning with Chatbots Powered by Student-In-the-Loop Knowledge Bases



Zhengyuan Wei, Alex Kiang, Albert T.L. Lee*, S.M. Yiu, Victor C.S. Lee, and K.H. Lam

* Corresponding email: tlalee@eee.hku.hk

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Abstract

Problem

Face-to-face interactions with individual students to give timely responses to their questions certainly makes the learning process more effective and pleasant. Unfortunately, this is hard to achieve in practice with an ever-growing number of engineering students against limited manpower and resources [1].

Approach

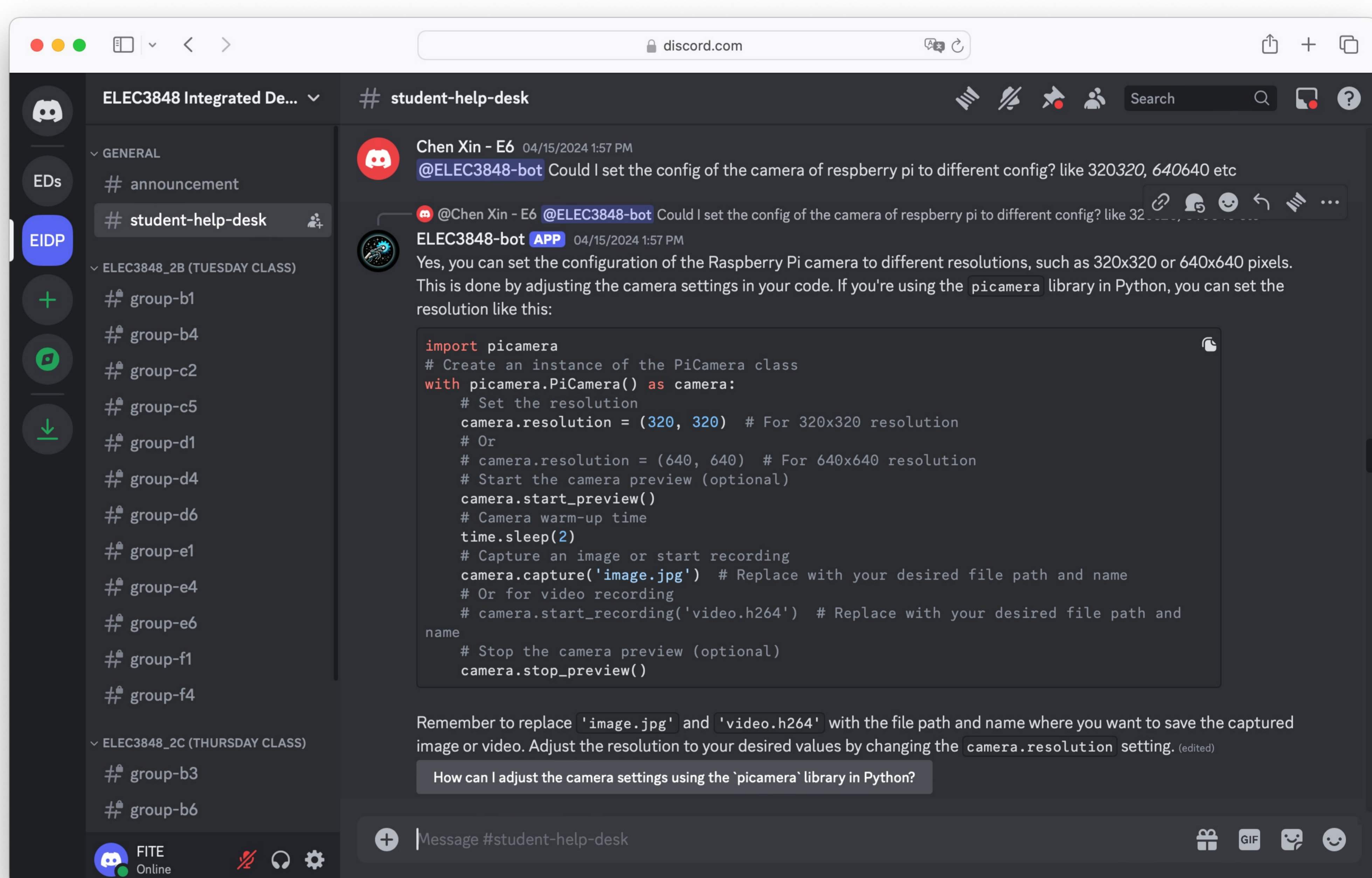
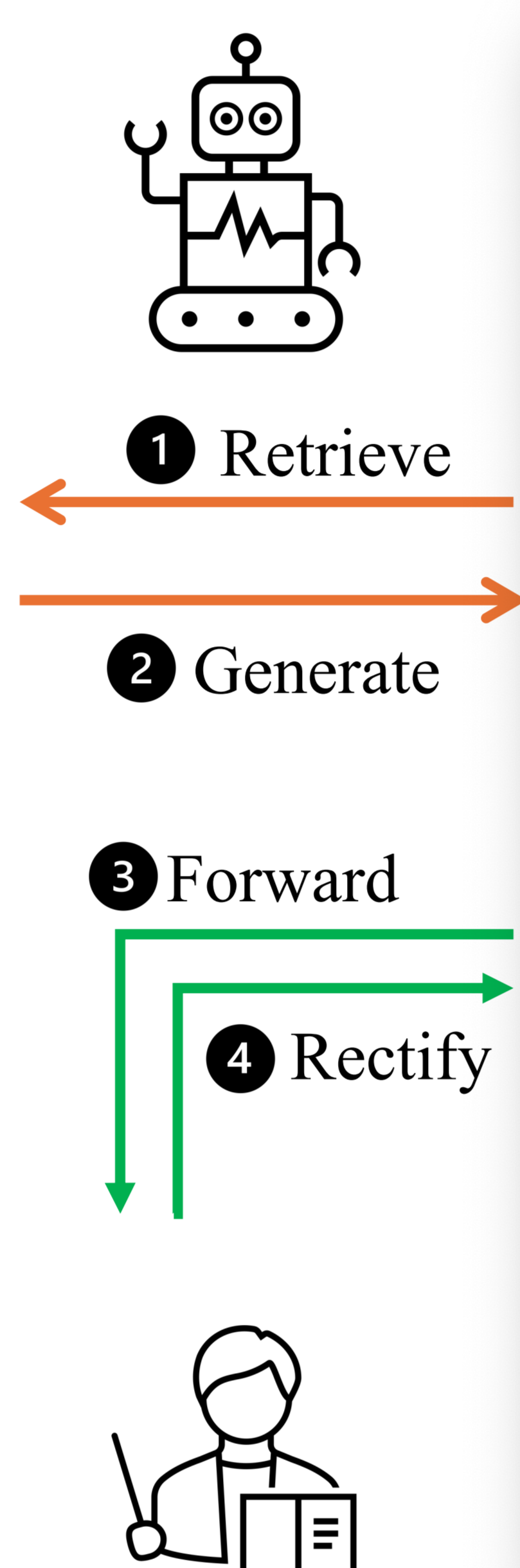
- To enrich students' learning experience and reduce the workload of teaching staff, knowledge-based GenAI chatbot is developed to enable students receive immediate responses to their course-specific queries.
- Retrieval-augmented generation has been demonstrated to be highly effective in generative AI applications, significantly improving the accuracy of the chatbot.

Outcome

- Increasing willingness to ask questions
- Dramatically reduce response time
- Contribute to higher satisfaction levels
- Scalable solution to manage student queries

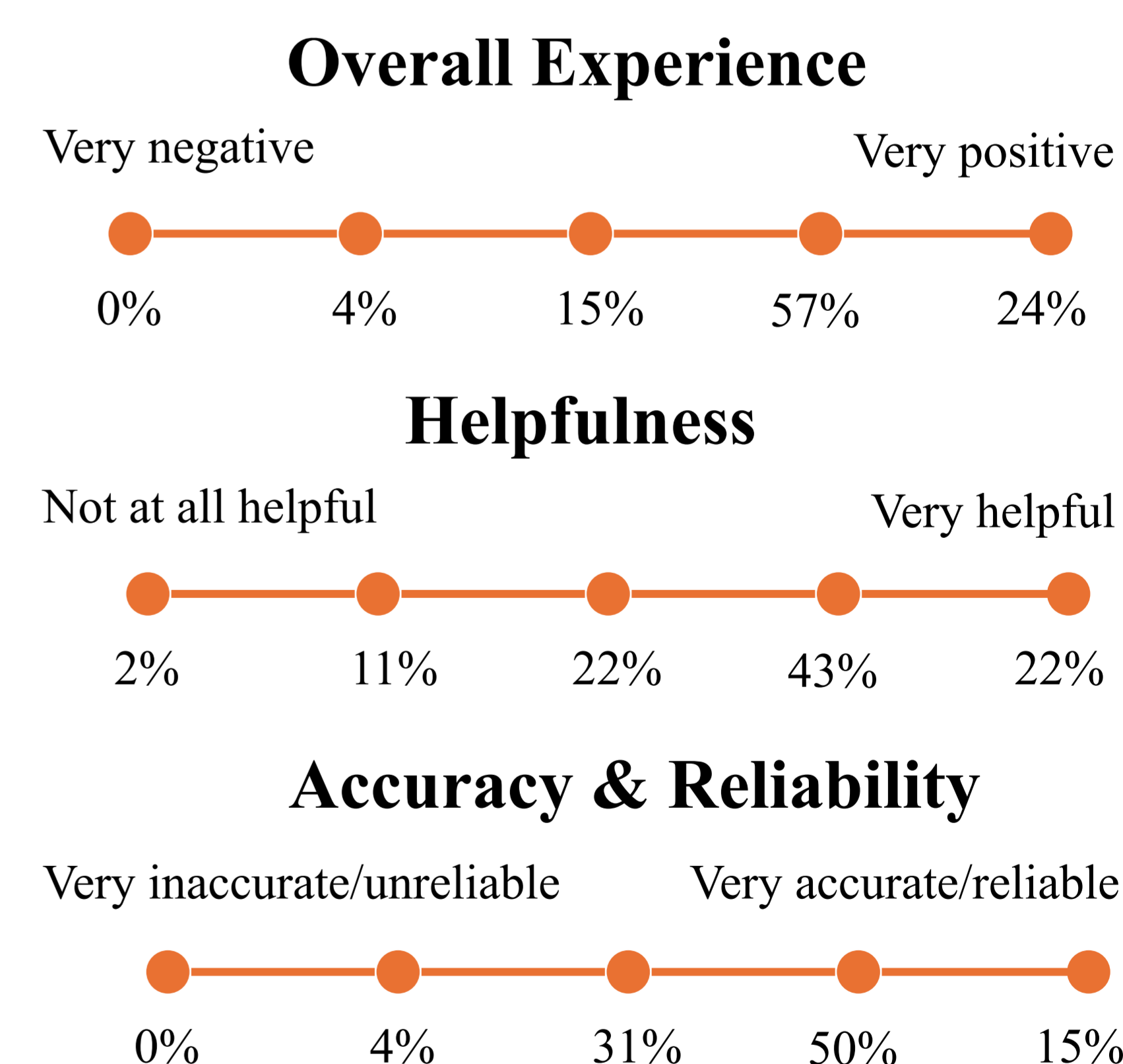
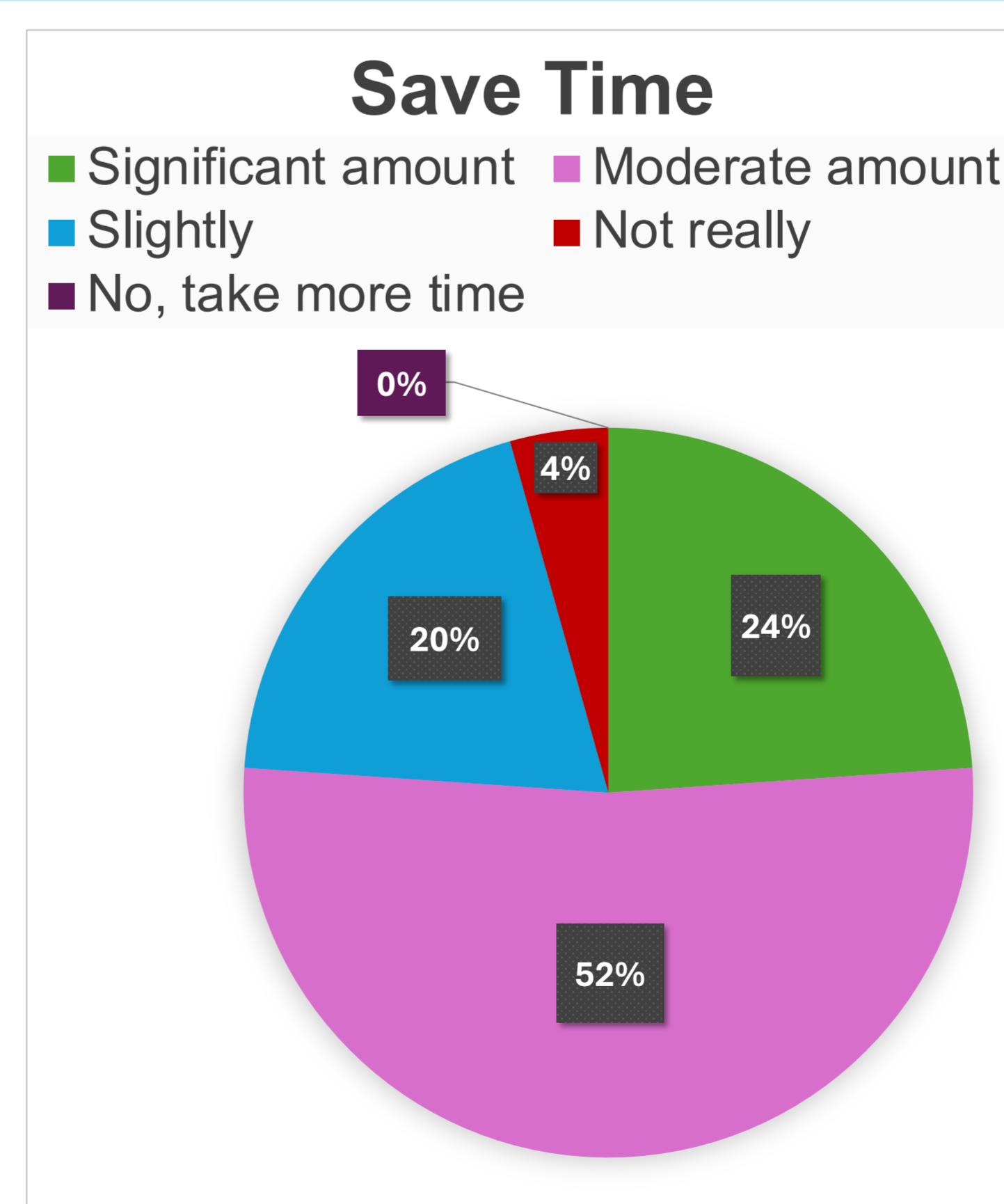
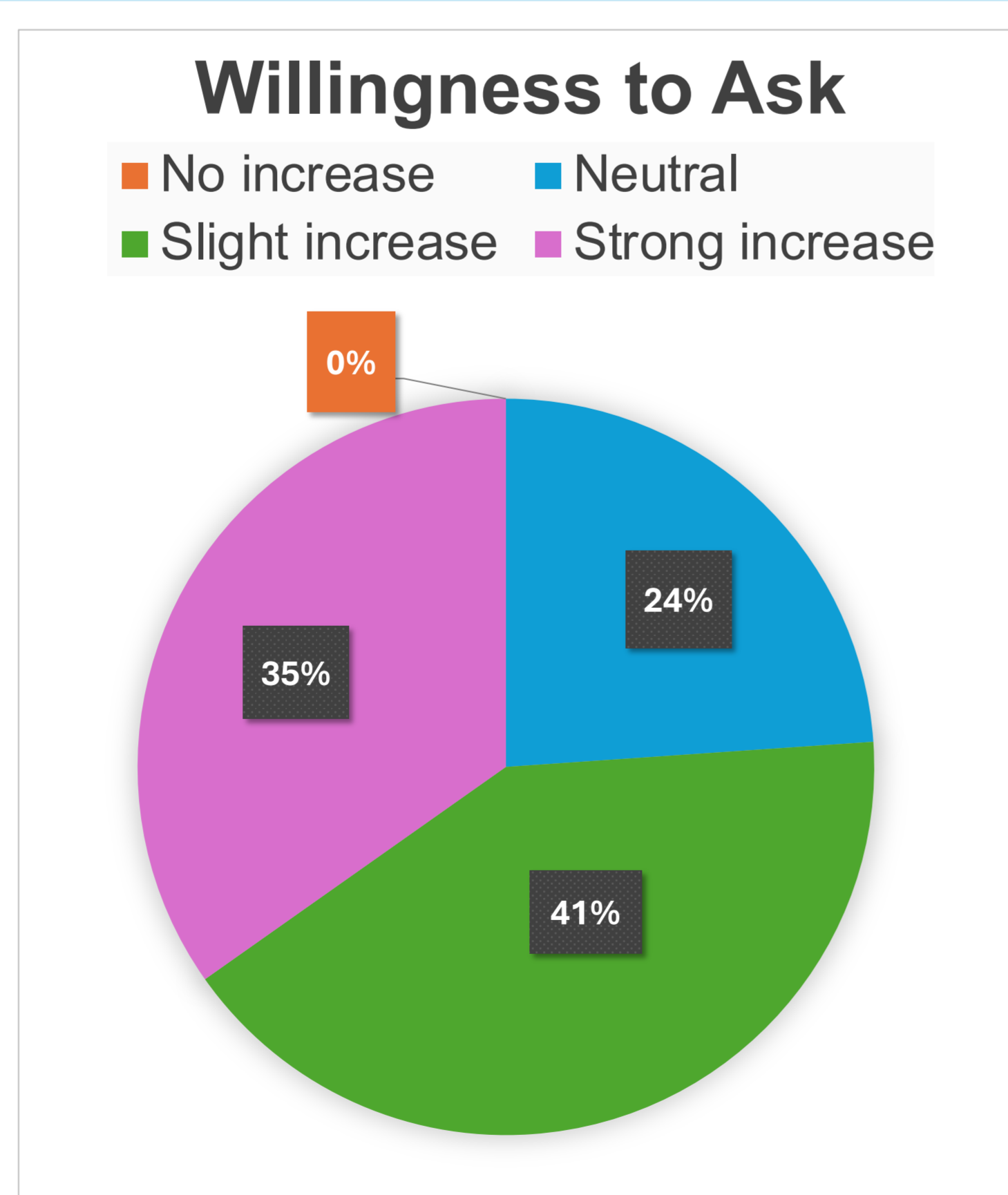
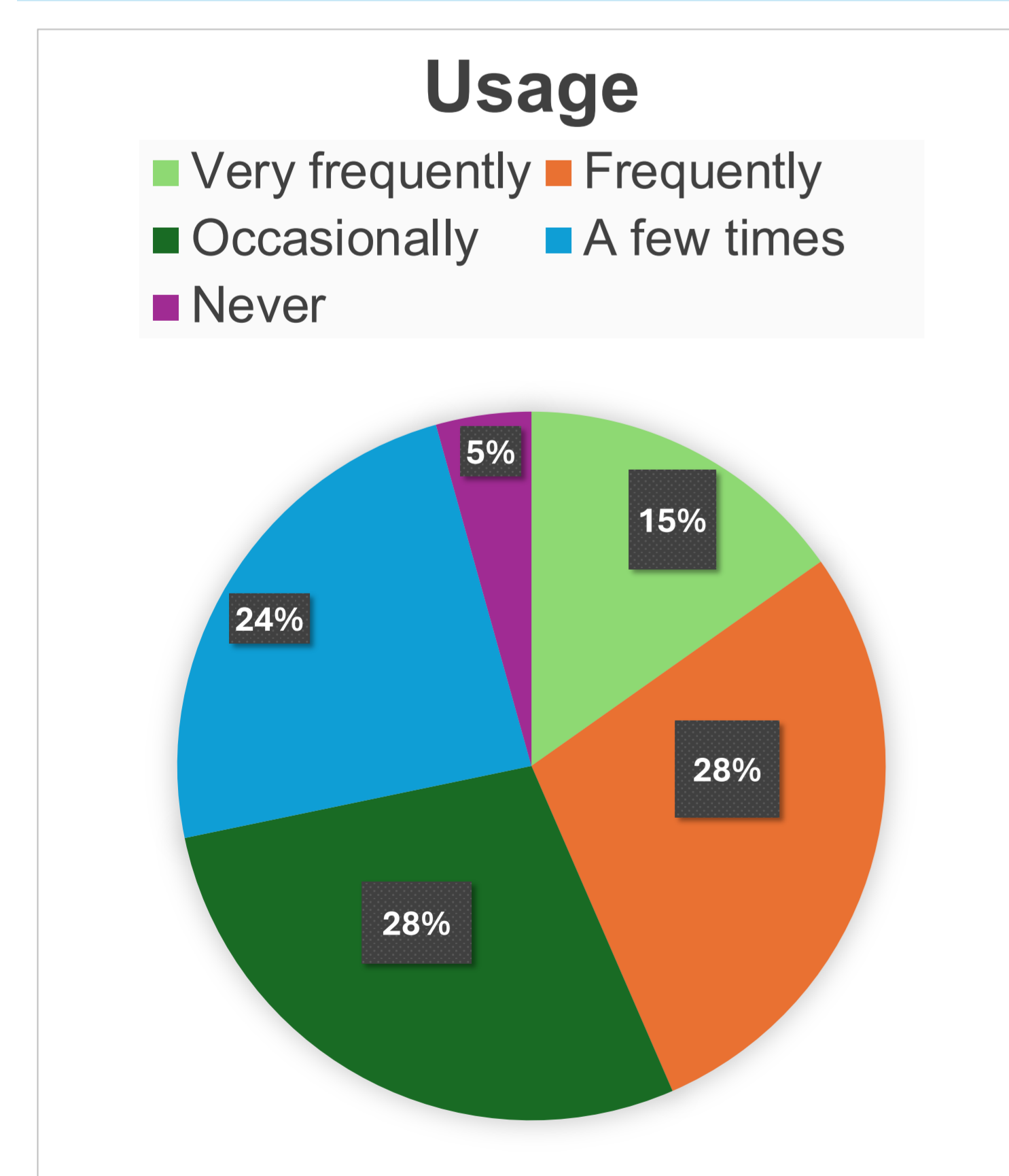
Methodology

Knowledge Base	
Q1	Q: What is the password for ELEC3848 wifi? A: "password"
Q2	Q: What are the use of essential libraries imported? A: `jetson.inference` contains pre-trained neural network ...
Q3	Q: No camera detected when using Raspberry Pi. A: Check the configuration of Raspberry Pi. Go to raspiconfig ...
More questions and answers...	



- The incorporation of knowledge base into the chatbot enhances its accuracy. The quality of knowledge base is assured by the instructor.
- Students play an important role in discovering the deficiency of the adopted AI model, which helps to refine and enrich the knowledge base.
- The content of the knowledge base (including FAQ, troubleshooting tips, etc.) will grow and consolidate in a few more semesters since its debut.

Survey & Data Analysis



Benefits & Recommendations

- Commercial LLM performance
- Increased visibility of shared responses among groupmates
- Course-specific knowledge base augmentation
- Well-defined UI and pipeline to improve chatbot usability
- Improved accessibility and availability of multimedia contents

Highly recommended for other courses that contain:

- Intensive problem solving
- Practical group projects
- Repeated questions
- Multimedia materials

Conclusion & Future work

The positive feedback and comments from students demonstrate the efficacy of our teaching chatbot augmented by course-specific knowledge base for enhancing teaching and learning. Building upon this methodology, we aim to extend the chatbot to more courses and refine the knowledge base specific to such courses.

Reference

[1] National Academies of Sciences, et al. Assessing and responding to the growth of computer science undergraduate enrollments. National Academies Press, 2018.