2025 IB Computer Science Case Study: The Perfect Chatbot

Introduction

This workbook is designed guide you to research the 2025 IB Computer Science Case Study: 'The Perfect Chatbot.' In each section, you will be provided with links to resources from Computer Science Cafe to help you research the key concepts related to chatbot development, optimization, and ethical concerns. After conducting research, you will answer a series of closed and open questions to assess your understanding.

Section 1: About the Case Study

The 2025 case study focuses on the development of a chatbot by RAKT Insurance. The chatbot was designed to handle customer queries, but has received complaints regarding its performance. The goal of this case study is to explore the challenges and improvements required to create a highly efficient and ethical chatbot.

Research:
Visit the Computer Science Cafe to read more about the case study and its context:
https://www.computersciencecafe.com/ib.html

To make the most out of completing this document - you could print a copy and write the answers using a pen.

Questions

1. Summarize the key challenges faced by RAKT Insurance's chatbot. [4 Marks]

2. How does the case study relate to real-world applications of chatbots in industries like insurance and banking? [6 Marks]

Section 2: Latency

Latency refers to the time it takes for a chatbot to respond to user queries. High latency can negatively impact the user experience, as customers expect fast and accurate responses. In this section, you will explore the causes of latency and ways to reduce it.

Research:
Read more about latency and performance optimization here:
LATENCY

Questions

1. Define latency in the context of chatbots. [2 Marks]

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2. List two causes of high latency in chatbots. [4 Marks]

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3. Explain how reducing latency can improve user experience. [6 Marks]

Section 3: Linguistic Nuances

Linguistic nuances refer to the subtle differences in language that can affect how messages are understood by a chatbot. This includes understanding tone, emotion, context, and ambiguity. Addressing linguistic nuances improves a chatbot's ability to generate accurate responses.

Research:
Explore how chatbots handle linguistic nuances here:
LINGUISTIC NUAMCES

Questions

1. What are linguistic nuances, and why are they important for chatbots? [4 Marks]

2. Describe how emotion detection in chatbots can improve user satisfaction. [6 Marks]

3. What challenges do chatbots face in handling ambiguous statements? [8 Marks]

Section 4: Architecture

The architecture of a chatbot determines how it processes and generates responses. It includes the Natural Language Processing engine, machine learning models, and other components. This section focuses on different types of chatbot architectures, such as Recurrent Neural Networks (RNNs) and Transformer Neural Networks.

Research:
Learn more about chatbot architecture here:
ARCHITECTURE

Questions

1. What is the role of the NLP engine in chatbot architecture? [4 Marks]

2. Compare Recurrent Neural Networks (RNNs) and Transformer Neural Networks in chatbot design. [6 Marks]

3. Explain the importance of scalability in chatbot architecture. [8 Marks]

Section 5: Dataset

A chatbot's performance heavily depends on the quality of the dataset used to train it. This section explores the importance of diverse and well-labeled data, as well as the challenges of handling biased datasets.

Research:

Read more about chatbot datasets here:

DATASET

Questions

1. Why is dataset diversity important for training chatbots? [4 Marks]

2. Identify two types of biases that can affect a chatbot's performance. [6 Marks]

3. Discuss the role of data augmentation in improving chatbot performance. [8 Marks]

Section 6: Processing Power

Processing power refers to the computational resources needed to handle large datasets and complex models in chatbot systems. In this section, you will explore the hardware and software optimizations that improve chatbot performance.

Research:
Explore more about the importance of processing power here:
PROCESSING POWER

Questions

1. How does processing power affect the speed and accuracy of a chatbot's responses? [4 Marks]

2. Explain how GPUs and TPUs can improve the performance of machine learning models in chatbots. [6 Marks]

3. Discuss the benefits of cloud-based infrastructure in scaling chatbot performance. [8 Marks]

Section 7: Ethical Challenges

As chatbots become more integrated into daily life, they raise ethical concerns, such as data privacy, bias, and accountability. This section focuses on the ethical challenges that arise in chatbot development and deployment.

Research:
Learn more about ethical challenges in chatbot development here:
ETHICAL CHALLENGES

Questions

1. What is bias in chatbot datasets, and how can it affect user experience? [4 Marks]

2. Why is data privacy a critical concern for chatbots? Provide examples. [6 Marks]

3. Discuss two strategies to ensure accountability in chatbot development. [8 Marks]

Section 8: Further Research

To deepen your understanding of 'The Perfect Chatbot' case study, it is important to conduct further research on emerging trends in AI and chatbot technology. This section encourages you to explore additional resources and case studies.

Research:
Explore further research on chatbot technology here:
FURTHER RESEARCH

Questions

1. Predict two future trends in chatbot development and explain their impact on industries. [6 Marks]

2. How will advancements in emotional intelligence and AI improve chatbot interactions? [8 Marks]