

AI-POWERED CHATBOTS IN CUSTOMER SUPPORT USING TRANSFORMER MODELS & SENTIMENT ANALYSIS

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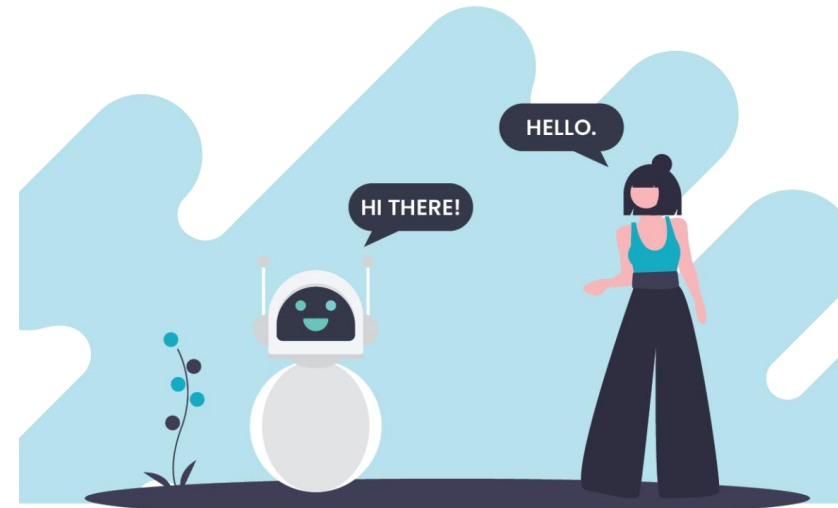
ATHISH THOMAS PAUL

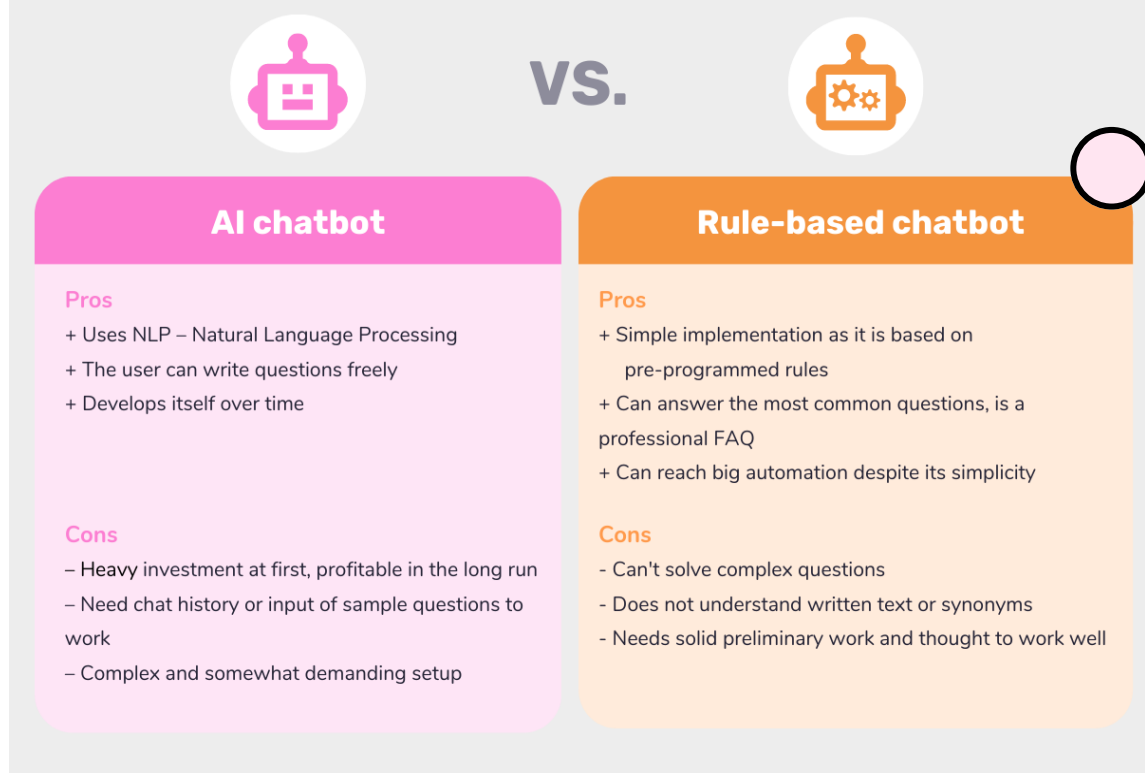
STUDENT ID: 2406092

MODULE: RESEARCH METHODS AND
PROFESSIONAL DEVELOPMENT[ACFA7004]

COURSE: MSC IN SOFTWARE ENGINEERING & AI

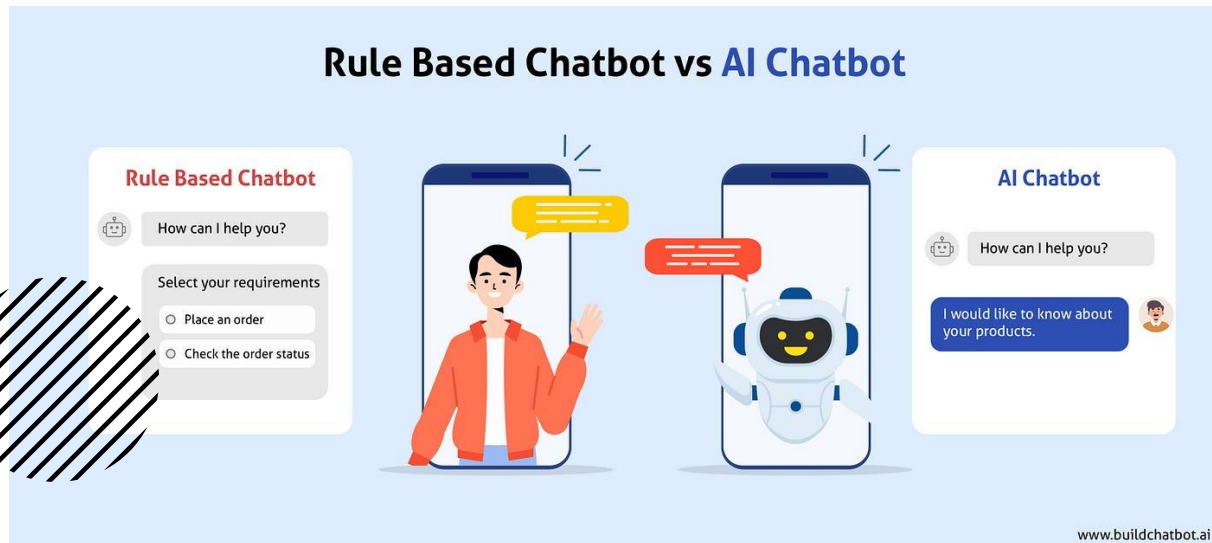
SUPERVISOR: DR. SEENA JOSEPH





Research Context

- AI chatbots are **computer programs** that use **artificial intelligence** to simulate human-like conversations with users.
- AI chatbots are widely used in customer support to handle queries, complaints, and requests.
- Traditional chatbots rely on rule-based or keyword-matching methods.
- **Problem:** They often fail to understand the emotions behind customer messages.
- **Solution:** Advanced AI models like **Transformer-based chatbots** combined with **Sentiment Analysis** can improve responses.

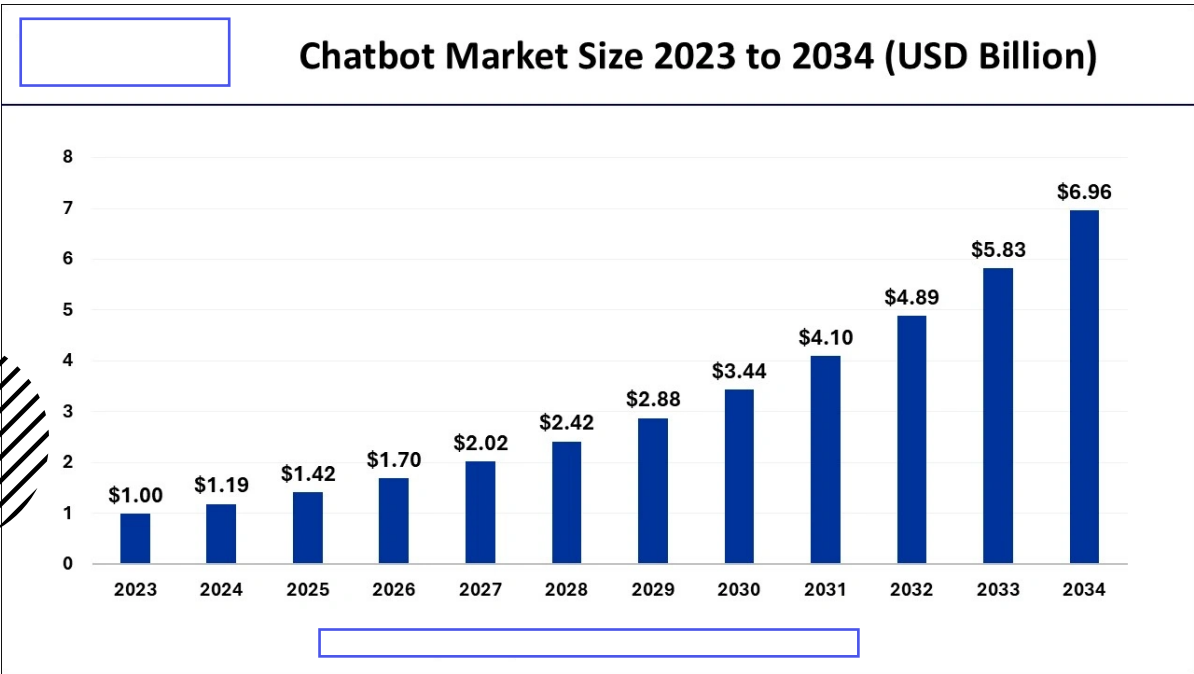


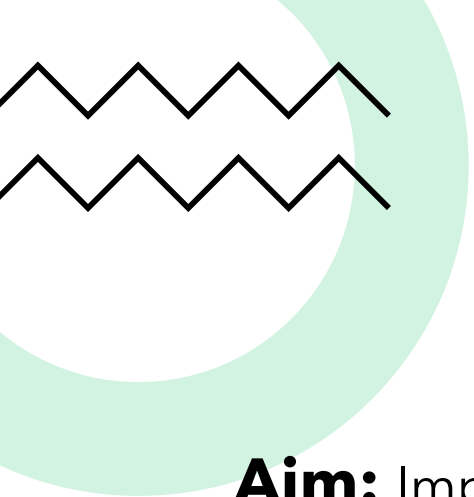
Chatbot Challenges
Lack of Empathy
- Misunderstanding
- No Emotional Support
Incorrect Responses
- Misinformation
- Lack of Context
Frustration
- User Dissatisfaction
- Repetitive Answers



Research Problem & Literature Gap

- **Problem Statement:** Current AI chatbots struggle to provide human-like, empathetic customer service.
- **Challenges:** Lack of deep understanding of customer **sentiments, context, and intent.**
- **Literature Gap:** Existing research focuses on chatbot efficiency but lacks **sentiment-aware chatbots for improved user experience.**[2]
- **Our Contribution:** Investigate Transformer-based models (GPT, BERT) with Sentiment Analysis for smarter chatbots.[1]



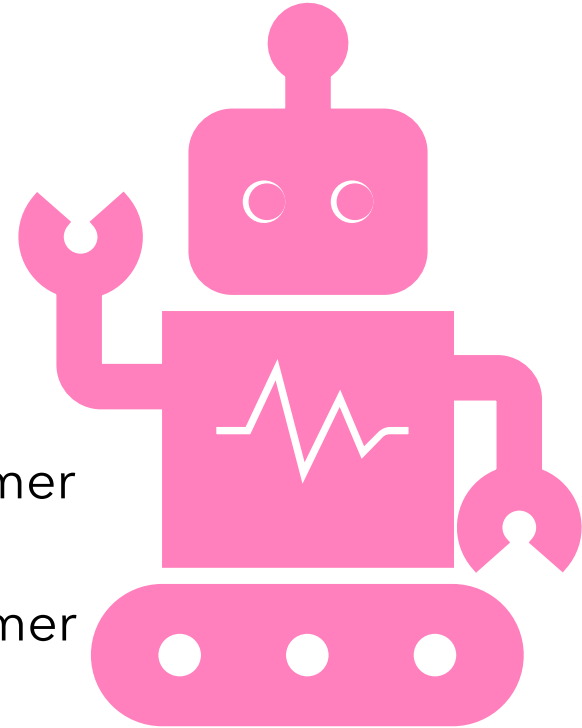


Research Aim & Objectives

Aim: Improve chatbot efficiency in customer support by integrating **Transformer Models & Sentiment Analysis**.

Objectives:

1. Study how **Transformer-based chatbots** process customer queries.
2. We will analyze the role of **Sentiment Analysis** in customer service chatbots.[2][4][5]
3. Implement a **prototype chatbot** that detects customer emotions for improved responses.





Brief Literature Review



Transformer Models (GPT, BERT, T5):

These models excel at understanding and generating human-like text.

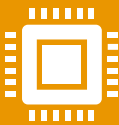
Pre-trained on large datasets and fine-tuned for customer support. [1] [5]



Sentiment Analysis Techniques:

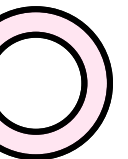
Uses AI to classify text as **positive, negative, or neutral.**

Techniques: **Lexicon-based, LSTM, Transformer-based sentiment models.**[1] [5]



Current Applications:

Used by Amazon, Google, and major banks to enhance customer experience.



Research Methodology

Data Collection:

- We will use real-world **customer support chat datasets** (e.g., Kaggle, OpenAI datasets).

Data Processing:

- Preprocessing techniques: removing noise, tokenization, vectorization.

Model Selection:

- Using **pre-trained Transformer models** (GPT, BERT) for chatbot responses. [3][4]

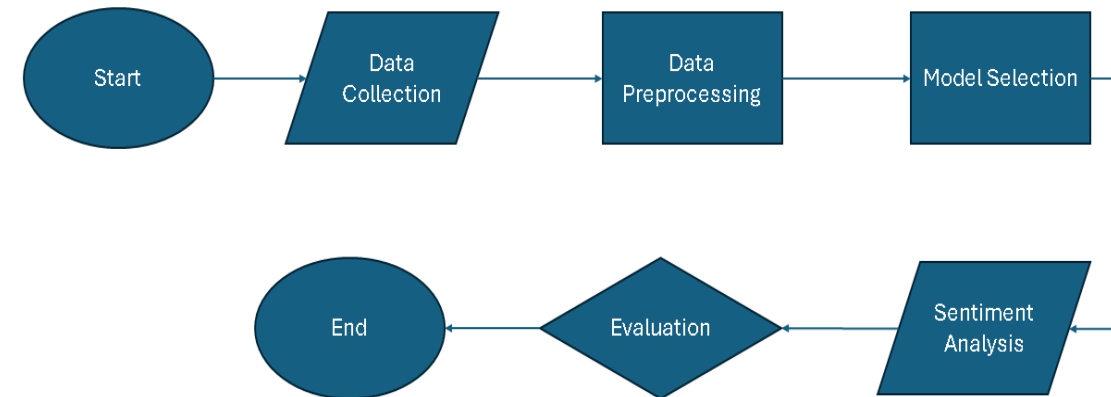
Sentiment Analysis Implementation:

- Integrating **Sentiment Analysis models** to detect emotions in customer messages.[5]

Evaluation Metrics:

- Performance measured by **accuracy, sentiment classification precision, and user satisfaction.** [5]

Flowchart



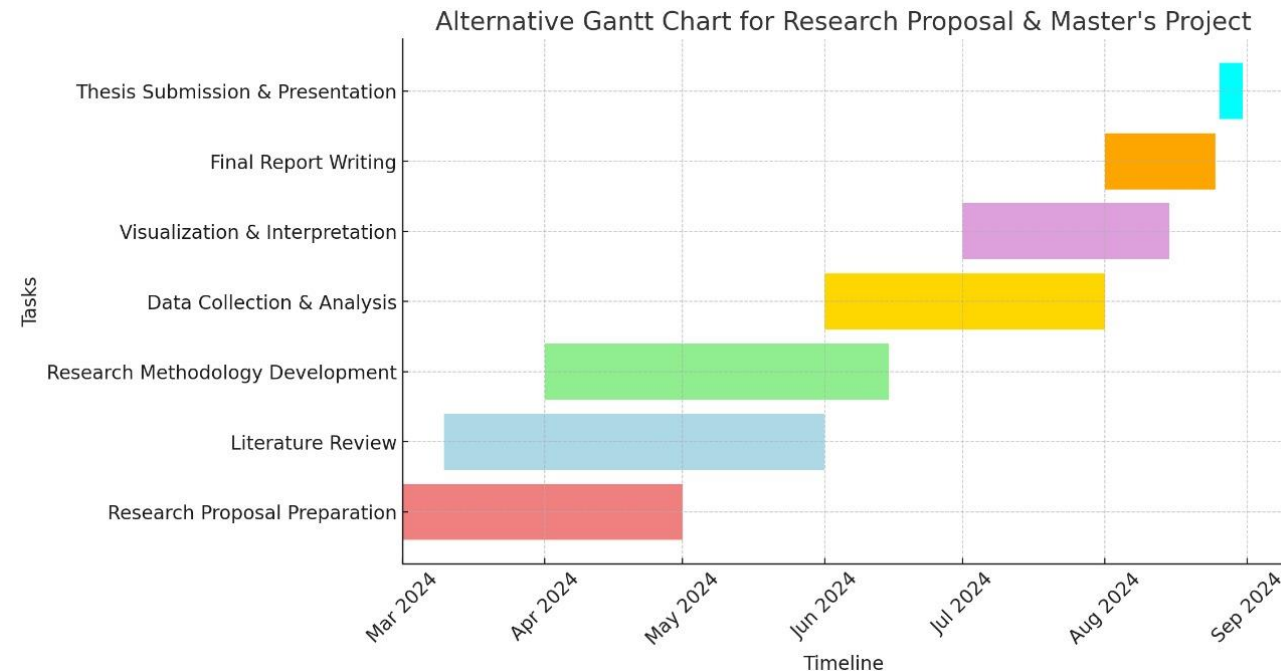
Project Planning & Resources

Project Timeline:

- **Month 1:** I will Research Transformer models, collect & preprocess data.
- **Month 2 to 3:** Implement chatbot prototype, integrate sentiment analysis, and evaluate performance.

Resources Needed:

- Python, TensorFlow, Hugging Face models, chatbot frameworks (Rasa/Dialogflow).
- Cloud computing for model training.



Project Impact & Limitations

- Impact:

Enhances chatbot-human interactions with **emotion-aware responses**.

Reduces **customer frustration and increases satisfaction** in customer service.

Useful for **banks, healthcare, e-commerce, and tech support**.

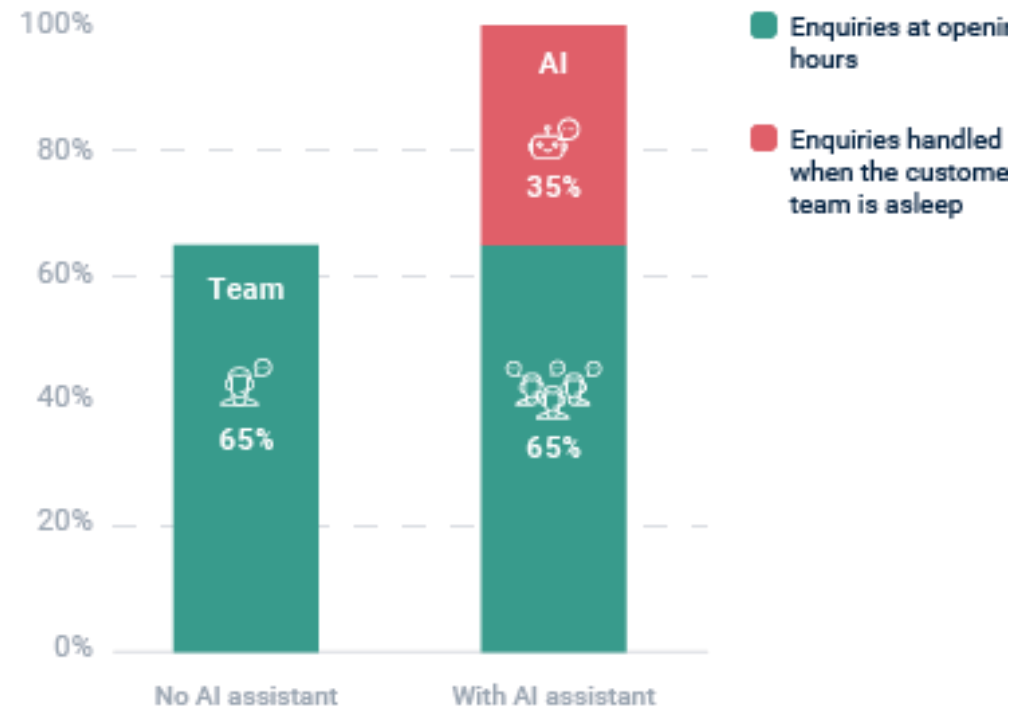
- Limitations:

Bias in AI models: Risk of incorrect sentiment detection.

Computational cost: Requires powerful hardware for deep learning models.

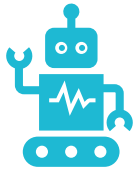
Privacy concerns: Customer data needs strict protection measures.

% of customer requests answered





Conclusion



AI chatbots are transforming customer service, but **emotional intelligence is still lacking.**



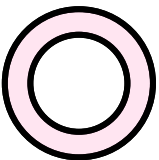
Our research aims to integrate **Transformer models & Sentiment Analysis** to improve chatbot responses.[2]



A successful chatbot can provide **personalized, human-like support, enhancing customer satisfaction.**



Next Steps: Implement a working prototype for real-world evaluation.



References

- [1] IJIRT. (2023). Comparing Transformer Architectures for Sentiment Analysis: A Study of BERT, GPT, and T5. *International Journal of Innovative Research in Technology*. Available: <https://ijirt.org/>
- [2] Springer. (2023). Comprehensive Review and Comparative Analysis of Transformer Models in Sentiment Analysis. *Springer Link*. Available: <https://link.springer.com/>
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- [4] The SAi. (2023). Transformer-Based Contextual Model for Sentiment Analysis of Customer Reviews. *The SAi Journal*. Available: <https://thesai.org/>
- [5] IEEE Xplore. (2023). Comparative Analysis of Different Transformer-Based Architectures Used in Sentiment Analysis. *IEEE Xplore*. Available: <https://ieeexplore.ieee.org/>

