DEGREE: MSc in Artificial Intelligence

Module: Chatbot Analytics and Optimization

Assignment Title: Designing, Evaluating, and Optimizing Intelligent Chatbots through Analytics

Assignment Type: Report

Word Limit: 3000 words (+/- 300)
Weighting: 100%
Issue Date: 4/9/2025
Submission Date: 6/10/2025
Feedback Date: 27/10/2025

Plagiarism:

When submitting work for assessment, students should be aware of the InterActive/Canvas guidance and regulations concerning plagiarism. All submissions should be your own, original work.

You must submit an electronic copy of your work. Your submission will be electronically checked.

Learner declaration
I certify that the work submitted for this assignment is my own and research sources are fully acknowledged. **Student signature:** **Date:**

Harvard Referencing:

The Harvard Referencing System must be used. The Wikipedia, UKEssays.com or similar websites must **not** be used or referenced in your work.

Learning Outcomes:

LO1: Design and implement analytics strategies for chatbots, apply natural language processing (NLP) techniques to analyse user interactions and sentiment, fostering innovation in chatbot performance evaluation.

LO2: Conduct comprehensive research on industry-specific chatbot optimization challenges, critically analyse case studies and emerging trends to develop data-driven optimization strategies tailored to real-world applications.

LO3: Actively engage with practical projects to optimize chatbot performance, focusing on user-centric design, personalized responses, and ethical considerations, and communicate their findings effectively to non-technical stakeholders, bridging the gap between theory and practical implementation.

Overview:

This assignment challenges students to explore, implement, and critically evaluate a wide range of chatbot analytics techniques, from foundational performance metrics to advanced testing, personalization, and visualization strategies. Through a combination of research-driven analysis and hands-on experimentation, students will address real-world challenges in chatbot optimization. The final report will demonstrate technical proficiency in using analytics tools, a user-centric and ethical approach to design, and the ability to communicate insights clearly to both technical and non-technical stakeholders.

Task 1: Strategic Design of Chatbot Analytics Framework (20 Marks) (LO1)

- Design a comprehensive analytics strategy for a customer support chatbot used in a retail banking environment.
- Your strategy should include relevant chatbot performance metrics, user interaction logging, and business KPIs.
- Justify your selection of analytics types (e.g., A/B testing, funnel analysis, etc.) and how they contribute to innovation in performance evaluation.

Task 2: Research and Critique of Industry Optimization Approaches (20 Marks) (LO2)

- Select two industry-specific case studies involving chatbot optimization (e.g., travel, healthcare, or e-commerce sectors).
- Analyze how these organizations used analytics tools, retention/churn modeling, or ROI analysis to optimize chatbot performance.
- Compare these approaches with current trends such as adaptive dialog flow models, multivariate testing, and prompt engineering for LLMs.

Task 3: Practical Implementation and Evaluation of Chatbot Analytics (25 Marks) (LO3)

- Choose one of the following chatbot options as your base:
    - A chatbot you developed in the previous semester (e.g., using Rasa, Dialogflow, or BotPress).
    - A free, ready-made open source chatbot (e.g., from Rasa GitHub examples, BotPress demo bots, or Hugging Face spaces).
- Using your selected chatbot, integrate or simulate an analytics feature focused on one of the following areas:
    - Session heatmaps (e.g., user click paths or time-on-node visualizations)
    - User segmentation & personalization (e.g., by intent frequency, channel usage)
    - Accessibility or fallback optimization techniques
- You may use tools such as:
    - Python with Plotly/Dash for interactive visualizations
    - Rasa Analytics plug-ins or telemetry integrations
    - Flask with Matplotlib or Seaborn for simple analytics dashboards
    - Google Colab for running and showcasing the implementation
- Discuss how your implementation:
    - Help improve chatbot performance and user satisfaction
    - Addresses ethical design, transparency, and explainability

Task 4: Critical Evaluation and Testing Strategy (20 Marks) (LO1 & LO3)

- Propose a robust evaluation strategy for your chatbot use:
    - A/B testing
    - Statistical testing for dialogs
    - Dialogue anomaly or intent drift detection
- Critically reflect on how each testing method supports user-centric improvements and innovation.

Task 5: Insightful Reporting and Visualization (15 Marks) (LO1, LO2 & LO3)

- Propose a final dashboard design for your chatbot analytics using real or simulated data.
- Your dashboard should:
    - Present cross-platform performance, user journey attribution, and feedback/implicit signals
    - Support decision-making through visual insights
- Reflect on how this reporting structure helps non-technical stakeholders understand performance insights.

Data Source:

You can choose any of the mentioned dialogue Dataset or can use one of your own.

- **Source**: Kaggle/GitHub
- https://github.com/budzianowski/multiwoz
- https://github.com/RasaHQ/rasa/tree/main/examples
- https://www.kaggle.com/datasets/elvinagammed/chatbots-intent-recognition-datasethttps://github.com/facebookresearch/ParlAI
- https://www.kaggle.com/datasets/thedevastator/dailydialog-unlock-the-conversation-potential-in
- https://www.kaggle.com/datasets/thoughtvector/customer-support-on-twitter

Submission Instructions:

- Ensure that your report is clear, well-organized, and visually appealing
- Prepare a document using the BSBI assignment template available on Canvas.
- Upload your submission as a single file (PDF or DOC) on the BSBI portal.
- Python scripts or Jupyter notebooks should be uploaded to a repository platform (e.g., GitHub) with a shared link included.
- User Harvard referencing style for your bibliography.
- Refer to the Essay-Guide available on Canvas for further instructions.
- Submit your assignment electronically by the specified deadline.