

**DEGREE: MSc in Artificial Intelligence**

**Module: Chatbot Analytics and Optimization**

**Assignment Title: Evaluating and Optimizing Intelligent Chatbots through  
Data Analytics**

**Assignment Type: Report**

**Word Limit: 3000 words (+/- 300)**

**Weighting: 100%**

**Issue Date: 15-12-2025**

**Submission Date: 30-01-2026**

**Feedback Date: 10-03-2026**

**Issued by: Dr. Syed Arslan Abbas Rizvi**

**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 identifying chatbot issues, using performance metrics, proposing and applying optimum solutions for all stakeholders including End Users, Investors, and Programmers.

### **Your tasks:**

#### **Task 1 – Practical Implementation and Evaluation of Chatbot Analytics (LO1 and LO2) - (40 marks)**

- 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 using Natural Language Processing (NLP), data analysis techniques and data visualization methods. It should be 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

Prepare a dashboard of the chatbot analytics and present it well with proper labeling and stories about any of your observations from the analysis.

## **Task 2 – Chatbot Performance and Data Analysis (LO1, LO2 and LO3)**

### **1. Use a chatbot log file to determine the chatbot's performance (LO1) ( 20 Marks)**

By using a dataset (logfile) you must determine the intent recognition accuracy of the chatbot. Your results should include a confusion matrix and any other details that you obtained as a result of carrying out the analysis. As an example, you can choose a dataset from the following sources and obtain the intent recognition accuracy, response time, time to first response, completion rate and clearly describe them in your own words.

You can choose any of the mentioned dialogue Dataset or can use one of your own chatbot's log file.

**Source:** Kaggle/GitHub

- <https://github.com/RasaHQ/rasa/tree/main/examples>
- <https://www.kaggle.com/datasets/elvinagammed/chatbots-intent-recognition-dataset>
- <https://github.com/facebookresearch/ParlAI>
- <https://www.kaggle.com/datasets/the/devastator/dailydialog-unlock-the-conversation-potential-in>
- <https://www.kaggle.com/datasets/thoughtvector/customer-support-on-twitter>

### **2. Perform exploratory data analysis on the given dataset and the scenario to answer the following. (15 Marks)**

In exploratory data analysis, you will find different statistical descriptors of the performance metrics and describe their impact clearly from the chatbot's perspective. This task aligns with LO2 and you are required to describe the hidden patterns that you come across in your datasets.

Justify your selection of analytics types (e.g., A/B testing, funnel analysis, etc.) and how they contribute to innovation in performance evaluation.

### **3. Deep-Dive Metric Analysis (10 Marks)**

In line with LO2 and LO3, this is the core of your report. Analyze the metrics in clusters by describing the following in detail, Conversion Rate, CSAT, and NPS Impact. Argue how these metrics drive long-term customer lifetime value (LTV) and competitive advantages while also keeping the concepts of ethical and fair data usage and data protection in view.

### **4. Propose Optimization Strategies (10 Marks)**

Suggest optimization strategies for both the chatbots during such divergence so that the overall performance may be increased.

### **5. Conclude Your report (5 marks)**

Conclude your report by presenting a critical assessment of your findings. Describe what did you observe during the analysis.

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.
- Use 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.

**Students are encouraged to explore additional reputable sources in the digital library beyond the list provided to strengthen their individual research and critical analysis skills. The unit lecturer can help with recommending additional literature.**

**The criteria for successfully passing the units with two assessment components require passing both components successfully. Passing marks for BSc and MA/MSc levels are different and are stated at the end of the assignment brief. Please find the examples below:**

- **Example 1** (e.g., pass mark: 50)
  - Component 1 (50% weighting) - 55
  - Component 2 (50% weighting) - 55
  - Final average: 55
  - Result: **Pass (both components passed and therefore the unit is passed)**
- **Example 2** (e.g., pass mark: 50)
  - Component 1 (50% weighting) – 80
  - Component 2 (50% weighting) – 30
  - Final average: 55
  - Result: **Fail (because although the average is above 50, one of the components is a failure)**

## GRADING DESCRIPTORS: LEVEL 7

EXPERIMENTATION & INNOVATION								
	FAIL			PASS				
Threshold Criteria	0-29%	30-39%	40-49%	50-59%	60-69%	70-79%	80-89%	90-100%
Deals with complex issues both systematically and creatively demonstrating self-direction and originality in tackling and solving problems	Little to no ability to use techniques to deal with complex issues systematically (including those of ethics and sustainability) and creatively to solve problems and/or make decisions.	Low utilisation of established techniques to deal with complex issues systematically (including those of ethics and sustainability) and creatively to solve problems and/or make decisions, but with limitations in techniques or approach.	Limited research or advanced scholarship to their area of study by using a range of information and established and advanced techniques	Competent understanding of solving problems, through own research or advanced scholarship displaying a comprehensive understanding of established and advanced techniques	Good understanding of solving problems through own research and advanced scholarship critically selecting and displaying a comprehensive understanding of established and advanced techniques.	Very Good problem-solving skills displaying a comprehensive understanding of techniques applicable to their own research or advanced scholarship	Excellent range of extremely well-developed problem-solving skills displaying an understanding of techniques applicable to their own research or advanced scholarship beyond which is taught.	Exceptional problem-solving skills with sophisticated evaluation and application of a wide range of advanced information and techniques to undertake projects.
Comprehensive understanding of techniques applicable to their own research or advanced scholarship	Little to no understanding of techniques applicable to their own research or advanced scholarship or their limitations and ambiguities.	Low understanding of techniques applicable to their own research or advanced scholarship including their limitations and ambiguities.	Limited understanding of key techniques applicable to their own research or advanced scholarship including their limitations and ambiguities.	Competent understanding of techniques applicable to their own research or advanced scholarship including their limitations and ambiguities	Good understanding of techniques applicable to their own research or advanced scholarship and a some understanding of more specialised techniques.	Very good understanding of techniques applicable to their own research or advanced scholarship and a some understanding of more specialised techniques.	Excellent understanding of techniques applicable to their own research or advanced scholarship and mastery of some more specialised areas.	Exceptional understanding of techniques applicable to their own research or advanced scholarship and mastery of some more specialised areas.

## GRADING DESCRIPTORS: LEVEL 7

RESEARCH & ANALYSIS									
	FAIL			PASS					
Threshold Criteria	0-29%	30-39%	40-49%	50-59%	60-69%	70-79%	80-89%	90-100%	
Systematic understanding of knowledge, and a critical awareness of current problems and/or new insights, much of which is at, or informed by, the forefront of their academic discipline, field of study or area of professional practice	Little to no knowledge of the subject with limited breadth or depth or deficiencies in major areas or currency.	Low knowledge of the subject lacking coherence, breadth, or detail with only some reference to ideas or arguments at the forefront of any part of the subject.	Limited knowledge to deal with terminology, facts and concepts some of which is informed by the forefront of defined areas of the subject.	Competent knowledge of ideas or arguments at the forefront of any part of the subject sufficient to deal with current issues in the discipline, generally more descriptive than critical or analytical.	Good knowledge of ideas or arguments at the forefront of any part of the subject showing a clear, critical insight into the discipline as whole and current issues/problems.	Very good knowledge of ideas or arguments at the forefront of the subject some of which are significantly beyond what has been taught and show a critical insight into the discipline and current issues/problems.	Excellent knowledge of ideas or arguments at the forefront of the subject many of which are significantly beyond what has been taught and show a critical insight into the discipline and current issues/problems.	Exceptional knowledge of ideas or arguments at the forefront of the subject most of which are significantly beyond what has been taught and show a critical insight into the discipline and current issues/problems.	
Conceptual understanding that enables the student to display originality in the application of knowledge	Little to no conceptual understanding or argument and a focus on descriptive explanations which do not comment on arguments of others or alternative views.	Low conceptual understanding and arguments are weak or poorly constructed, and the work does not critically evaluate the arguments of others or consider alternative views.	Limited conceptual understanding and argument construction with critical evaluation of alternative views or comment on advanced scholarship.	Competent conceptual understanding and argument construction with critical evaluation of a range of views and consistent engagement with advanced scholarship.	Good conceptual understanding which critically evaluate and synthesise other views and information with a thoughtful interpretation of advanced scholarship.	Very good conceptual understanding which systematically synthesises a wide range of views with a critical insight into advanced scholarship.	Excellent conceptual understanding which critically apply a wide range of views through a perceptive use of advanced scholarship.	Exceptional conceptual understanding of publishable quality with systematic engagement and usage of advanced scholarship.	

## GRADING DESCRIPTORS: LEVEL 7

ENGAGING WITH PRACTICE									
	FAIL			PASS					
Threshold Criteria	0-29%	30-39%	40-49%	50-59%	60-69%	70-79%	80-89%	90-100%	
Practical understanding of how established techniques of research and enquiry are used to create and interpret knowledge in the discipline	Little to no evidence of background investigation, analysis, research, enquiry, ethical awareness, and/or study.	Low evidence of background investigation, analysis, research, enquiry, ethical awareness, and/or study.	Limited background investigation, analysis, research, enquiry, ethical awareness, and/or study using established techniques, with the ability to extract relevant points.	Competent investigation, analysis, research, enquiry, ethical awareness, and/or study using established techniques accurately, and can critically appraise and use academic sources.	Good background investigation, analysis, research, enquiry, ethical awareness, and/or study using established techniques accurately, and possesses a well-developed ability to critically appraise a wide range of sources.	Very good, independent, extensive and appropriate investigation, analysis, research, enquiry, ethical awareness, and/or study beyond the usual range, and critically evaluates this to advance the work and/or direct arguments.	Excellent independent, extensive and appropriate investigation, analysis, research, enquiry, ethical awareness, and/or study well beyond the usual range, and critically evaluates this to advance the work and/or direct arguments.	Exceptional investigation, analysis, research, enquiry, ethical awareness, and/or study which demonstrates carefully considered depth and breadth and critically synthesises this to advance the work and/or direct arguments.	
Originality in the application of knowledge	Little to no technical, creative or artistic skills related to their area of study.	Low technical, creative or artistic skills related to their area of study.	Limited technical, creative or artistic skills required for area of study.	Competent technical, creative or artistic skills required for area of study.	Good technical, creative or artistic skills required for area of study.	Very good range of technical, creative or artistic skills.	Excellent range of technical, creative or artistic skills	Exceptional range of technical, creative or artistic skills	
Independently advance your own knowledge and understanding, and to develop new skills to a high level.	Little to no contribution to group activity and/or undertaking further training at a high/advanced level.	Low contribution to group activity and/or undertaking further training at a high/advanced level.	Limited contribution to group activity and/or undertaking further training at a high/advanced level.	Competent contribution to group activity and/or independently undertakes further training at a high/advanced level.	Good contribution to group activity and/or independently undertakes further training at a high/advanced level with an understanding of team roles	Very good contribution to group activity and/or independently undertakes further training at a high/advanced level with an understanding of team roles	Excellent contribution to group activity and/or independently undertakes further training at a high/advanced level with teamwork and leadership	Exceptional contribution to group activity and/or independently undertakes further training at a high/advanced level with teamwork and strong leadership.	

## GRADING DESCRIPTORS: LEVEL 7

REALISATION & COMMUNICATION								
	FAIL			PASS				
Threshold Criteria	0-29%	30-39%	40-49%	50-59%	60-69%	70-79%	80-89%	90-100%
Communicate information, ideas, problems and solutions to both specialist and non-specialist audiences.	Little to no clarity in the communication of ideas, problems and solutions to audiences.	Low clarity in the communication of ideas, problems and solutions to audiences.	Limited clarity in the communication of ideas, problems and solutions to audiences.	Competent communication of ideas, problems and solutions to audiences.	Good, confident and clear communication of ideas, problems and solutions to audiences in a range of means / media.	Very good, confident and clear communication of ideas, problems and solutions to audiences in a range of means / media.	Excellent communication of ideas, problems and solutions to audiences in a range of means / media.	Exceptional communication of ideas, problems and solutions to audiences in a range of means / media.

## GRADING DESCRIPTORS: LEVEL 7

PERSONAL & PROFESSIONAL CONNECTIVITY								
	FAIL			PASS				
Threshold Criteria	0-29%	30-39%	40-49%	50-59%	60-69%	70-79%	80-89%	90-100%
Independently advance your own knowledge and understanding, and develop new skills to a high level.	Little to no contribution to group activity and/or undertaking further training at a high/advanced level.	Low contribution to group activity and/or undertaking further training at a high/advanced level.	Limited contribution to group activity and/or undertaking further training at a high/advanced level.	Competent contribution to group activity and/or independently undertakes further training at a high/advanced level.	Good contribution to group activity and/or independently undertakes further training at a high/advanced level with an understanding of team roles	Very good contribution to group activity and/or independently undertakes further training at a high/advanced level with an understanding of team roles	Excellent contribution to group activity and/or independently undertakes further training at a high/advanced level with teamwork and leadership	Exceptional contribution to group activity and/or independently undertakes further training at a high/advanced level with teamwork and strong leadership.
Qualities and transferable skills necessary for employment requiring: (a) the exercise of initiative, ethical and personal responsibility (b) decision-making in complex and unpredictable contexts	Little to no ability to manage learning and/or exercise initiative, ethical and personal responsibility and/or decision-making in complex and unpredictable situations	Low ability to manage learning and/or exercise initiative, ethical and personal responsibility and/or decision-making in complex and unpredictable situations	Limited ability to manage learning and exercise initiative, ethical and personal responsibility, and decision-making in complex and unpredictable situations	Competent ability to manage learning, and exercise initiative, ethical and personal responsibility, and decision-making in complex and unpredictable situations	Good ability to systematically manage learning, and exercise initiative, ethical and personal responsibility, and decision-making in complex and unpredictable situations	Very good ability to systematically manage learning, and exercise initiative, ethical and personal responsibility, and decision-making in complex and unpredictable situations	Excellent ability to manage learning on own initiative, and exercise initiative, ethical and personal responsibility, and decision-making in complex and unpredictable situations	Exceptional ability to manage learning on own initiative, and exercise initiative, ethical and personal responsibility, and decision-making in complex and unpredictable situations
	Little to no use of appropriate terminology, limited vocabulary and many errors in spelling, grammar and syntax.	Low use of appropriate terminology, with many errors in spelling, vocabulary and syntax.	Limited expression, style and appropriate vocabulary with errors in spelling, grammar and syntax which affect understanding.	Competent expression, style, and appropriate vocabulary with some errors in spelling, grammar and syntax which do not affect understanding.	Good expression, style and appropriate vocabulary with minimal errors in spelling, grammar and syntax.	Very good expression, style and appropriate vocabulary with minimal errors in spelling, grammar and syntax.	Excellent expression, style and appropriate vocabulary with no errors in spelling, grammar and syntax.	Exceptional expression, style and appropriate vocabulary with no errors in spelling, grammar and syntax.

## GRADING DESCRIPTORS: LEVEL 7

Little to no evidence of basic numeracy or digital literacy, hardware and software skills	Low evidence of basic numeracy or digital literacy, hardware and software skills competency.	Limited evidence of numeracy or digital literacy, hardware and software skills competency.	Adequate evidence of numeracy or digital literacy, hardware and software skills competency.	Good evidence of numeracy or digital literacy, hardware and software skills competency.	Very good evidence of numeracy or digital literacy, hardware and software skills	Excellent evidence of numeracy or digital literacy, hardware and software skills competency.	Exceptional evidence of numeracy or digital literacy, hardware and software skills competency.
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competency.				competency.		
Does not demonstrate achievement of professional competence when assessed against the requirements of a professional, statutory or regulatory body (PSRB).				The student has demonstrated achievement of professional competence when assessed against the requirements of a PSRB.		
Inaccurate use of terminology with limited vocabulary and many errors in spelling, grammar and syntax. Inaccurate terminology, with many errors in spelling, vocabulary and syntax.				The student has adhered to the appropriate rules and/or conventions set by regulators or the industry.		