**Purpose of Project Work outline**

The Project Work outline should give an overview of the work they intend to pursue for Project Work and present a time schedule of their planned tasks or milestone events.

The proposal submitted by the student will be evaluated by the institute. The evaluation would typically include the following issues.

1. Problem definition, clarity of the proposed work by the student and the proposed outcome of the work

2. Quality of work to qualify as Project Work

2. Justification for **16 weeks of work,** which is the assigned duration for Project Work

3. Proposed action plan for carrying out the work.

Once prepared and submitted it serves as the specification document for carrying out the work. If the outline is prepared with care and in detail with sufficient inputs, it will become a plan document and will aid the student to complete the tasks effectively within the stipulated duration.

The students are requested to prepare the outline keeping this in mind and submit it in the format prescribed in the “guidelines for Project Work outline”, which is presented below in this document.

Once the outline is prepared the students may start working on the Project Work, without waiting for any approval by the institute. Modifications, if any, are required to be made. The Project Work feedback will be provided by the Institute within a period of two weeks.

**I. Format of the Cover Page of the Dissertation**

(Title of the Dissertation)

DISSERTATION

Submitted in partial fulfillment of the requirements of the

Degree : MTech in ………………………………………………….

By

(Name of the student)

(BITS ID No.)

Under the supervision of

(Name and Designation of Supervisor)

BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE

Pilani (Rajasthan) INDIA

(Month, Year)

**II. The following format for Dissertation Abstract should be used**

**BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI**

**SECOND SEMESTER 2023-24**

DSECLZG628T **/ AIMLCZG628T DISSERTATION**

Dissertation Title : Leveraging GenAI with NLP in E-commerce

Name of Supervisor : HariPrasad Bobbala

Name of Student : BRIJENDER AHUJA

ID No. of Student : 2022AA05026

Courses Relevant for the Project & Corresponding Semester: 1. NLP – Sem 2

2. NLP Appliaction – Sem 3

3. Information Retrival – Sem 2

4. MLOps- Sem 3

## Abstract

(Contents of the abstract is to be given here)

##### Abstract (in about 500 words)

This dissertation explores the fusion of Generative AI (GenAI) with E-commerce dynamics, focusing on Natural Language Processing (NLP) to streamline product information handling and bolster chatbot functionality. It also investigates the deployment of a Continuous Learning Pipeline (CLP) through Machine Learning Operations (MLOps) on Microsoft Azure.

The research begins with a thorough literature review, highlighting the relevance of NLP and GenAI in E-commerce while addressing conventional challenges in product data processing and chatbot development. Through empirical studies, various NLP models and techniques are evaluated for their effectiveness in extracting structured data from unstructured product descriptions.

A novel architecture is proposed and implemented to integrate NLP-driven product information ingestion into chatbot frameworks. This architecture not only enhances chatbot responses' accuracy and relevance but also enables real-time updates of its knowledge base with newly ingested product data, fostering continuous learning.

Operationalization of the proposed system is achieved through the adoption of MLOps practices on Azure. This entails designing and deploying scalable pipelines for model training, evaluation, and deployment, ensuring seamless integration of AI capabilities into E-commerce infrastructure.

The dissertation evaluates the proposed system's performance and scalability through extensive experimentation and validation against real-world E-commerce datasets and scenarios. Results demonstrate significant improvements in chatbot accuracy, response time, and user satisfaction, showcasing the transformative potential of GenAI in E-commerce interactions.

**Key Words:**

Generative AI

E-commerce

Natural Language Processing (NLP)

Chatbot

Continuous Learning Pipeline (CLP)

Machine Learning Operations (MLOps)

Azure

Product Information Ingestion

Personalization

Customer Experience

(***Note:*** *The Abstract should briefly describe the work done with respect to the goals, in about 500 words).*

**BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI**

**II SEMESTER 23-24**

DSECLZG628T **/ AIMLCZG628T DISSERTATION**

**Dissertation Outline**

**BITS ID No: 2022aa05026 Name of Student : Brijender Ahuja**

**Name of Supervisor:** HariPrasad Bobbala

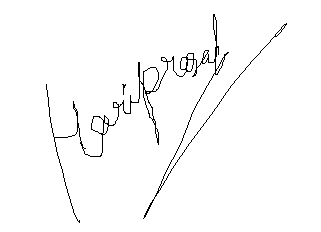
**Designation of Supervisor**: Sr Data and Ai consultant

**Qualification and Experience: Master Degree in ML and AI 13 yr**

**Official E- mail ID of Supervisor :** [**hbobbala@microsoft.com**](mailto:hbobbala@microsoft.com)

**Topic of Dissertation**: GenAI Empowerment in E-commerce: NLP for Chatbot Augmentation and Continuous Learning with Azure MLOps





(Signature of Student)

(Signature of Supervisor)

Date:08/06/2024 Date: 08/06/2024

The following pages give basic guidelines regarding the Project Work requirement and the outline preparation.

**Guidelines for Project Work outline document preparation**

The student should prepare a detailed **outline** of the Project Work in consultation with his/her Supervisor. Current literature (journals, books etc.) may be reviewed to support your work.

**Project Work Title**

Leveraging Generative AI in E-commerce: NLP-driven Chatbot Enhancement and Continuous Learning with Azure MLOps

**Discussion on the chosen topic**

This section should include:

1. The purpose of the work and expected outcome of the work

The purpose of this project is to explore the integration of Generative AI (GenAI) techniques within the domain of E-commerce, specifically focusing on leveraging Natural Language Processing (NLP) for enhancing chatbot interactions. The expected outcome is the development of a robust framework that enhances E-commerce chatbots' capabilities through the ingestion of product information using NLP, coupled with a Continuous Learning Pipeline (CLP) facilitated by Machine Learning Operations (MLOps) on Azure. This framework aims to improve customer experience, increase user engagement, and drive sales through personalized and efficient interactions.

1. Literature review done in connection with the work, if applicable:

A comprehensive literature review has been conducted to understand the current state-of-the-art in GenAI, NLP, E-commerce, and MLOps. Various research papers, journals, and books have been reviewed to gather insights into existing methodologies, techniques, and challenges in these areas. Relevant studies highlight the significance of NLP in E-commerce for product information extraction, chatbot development, and customer engagement. Additionally, research on CLP and MLOps provides valuable insights into continuous learning and deployment practices for AI systems.

1. Brief discussion on the existing process and its limitations

Traditional E-commerce chatbots often rely on predefined rules or keyword matching approaches, which can be rigid and limited in their ability to understand user queries or adapt to new product information. Furthermore, manual data ingestion processes for updating chatbot knowledge bases are time-consuming and prone to errors. These limitations hinder chatbot effectiveness, leading to suboptimal user experiences and reduced customer satisfaction.

1. Justification for selecting a particular methodology for completing the tasks

The methodology chosen for this project involves leveraging NLP techniques for extracting structured data from unstructured product descriptions, enabling chatbots to understand and respond to user queries more accurately. Additionally, the integration of a CLP using MLOps on Azure enables seamless updates to the chatbot's knowledge base, ensuring continuous learning and improvement over time. This methodology is selected for its effectiveness in addressing the limitations of traditional approaches and its potential to enhance E-commerce chatbot performance.

1. Brief discussion on the Project Work methodology

* Literature review to gather insights and inform the development process.
* Design and implementation of an NLP-driven chatbot framework.
* Integration of a CLP using MLOps on Azure for real-time updates.
* Evaluation of the framework's performance against real-world E-commerce datasets.
* Iterative refinement based on feedback and testing.

1. Benefits derivable from the work

* Enhanced chatbot accuracy and relevance in understanding user queries.
* Real-time updates to the chatbot's knowledge base for continuous learning.
* Improved user engagement and satisfaction through personalized interactions.
* Increased sales and revenue for E-commerce businesses through more effective customer support.

1. Any other details in support of the work

The project aligns with current trends in AI-driven E-commerce and addresses pressing challenges in chatbot development and deployment. The integration of GenAI techniques with E-commerce has the potential to revolutionize customer interactions and drive business growth in the digital marketplace. Additionally, the use of Azure MLOps ensures scalability, reliability, and efficiency in managing AI models and pipelines, further enhancing the project's impact and sustainability.

**Detailed plan of work`**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Serial Number** | **Tasks/Subtasks** | **Start Date - End Date** | **Planned Duration (weeks)** | **Specific Deliverable** |
| 1 | Literature Review | 08/01/2024 - 08/15/2024 | 2 | Literature Review Report |
| 2 | Framework Design | 08/16/2024 - 08/29/2024 | 2 | Framework Architecture Design |
| 3 | Chatbot Development | 08/30/2024 - 09/12/2024 | 2 | NLP-driven Chatbot Prototype |
| 4 | CLP Implementation | 09/13/2024 - 09/26/2024 | 2 | Continuous Learning Pipeline on Azure |
| 5 | Integration and Testing | 09/27/2024 - 10/10/2024 | 2 | Integrated System Testing Report |
| 6 | Performance Evaluation | 10/11/2024 - 10/24/2024 | 2 | Performance Evaluation Metrics Report |
| 7 | Dissertation Writing | 10/25/2024 - 11/07/2024 | 2 | Complete Draft of Dissertation |
| 8 | Final Review and Submission | 11/08/2024 - 11/14/2024 | 2 | Final Dissertation Submission |

**Format for the outline document to be submitted is presented in the following pages that has to be strictly followed.**

**Please note that: Outline document has to be uploaded on the viva portal.**

1. **Broad Area of Work**

The broad area of work for this project is the intersection of Artificial Intelligence (AI) and E-commerce. Specifically, it focuses on the integration of Generative AI techniques and Natural Language Processing (NLP) within E-commerce platforms to enhance customer interactions and streamline product information handling.

1. **Objectives**

The objectives of my project are as follows:

* To investigate the integration of Generative AI techniques, particularly NLP, within the domain of E-commerce.
* To develop a framework for NLP-driven chatbot enhancement in E-commerce, enabling more accurate and personalized interactions.
* To implement a Continuous Learning Pipeline (CLP) using Machine Learning Operations (MLOps) on Azure, facilitating real-time updates and improvements to the chatbot's knowledge base.
* To evaluate the performance and scalability of the developed framework in real-world E-commerce scenarios.

# 3. **Scope of Work**

The scope of this project includes:

* Conducting a comprehensive literature review on Generative AI, NLP, E-commerce, and MLOps to inform the development process.
* Designing and implementing an NLP-driven chatbot framework tailored for E-commerce applications.
* Integrating a CLP using MLOps on Azure to enable continuous learning and updates to the chatbot's knowledge base.
* Evaluating the performance of the developed framework using real-world E-commerce datasets and scenarios.
* Providing recommendations for further enhancements and potential applications of the developed framework in the E-commerce industry.

**4. Detailed Plan of Work (Sample)** (for 16 weeks)

The plan of work should have tangible weekly or fortnightly milestones and deliverables, which can be measured to assess the adherence to the plan and therefore the rate of progress in the work. The plan of work can be specified in the table given below:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Serial Number** | **Tasks/Subtasks** | **Start Date - End Date** | **Planned Duration (weeks)** | **Specific Deliverable** |
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| 5 | Integration and Testing | 09/27/2024 - 10/10/2024 | 2 | Integrated System Testing Report |
| 6 | Performance Evaluation | 10/11/2024 - 10/24/2024 | 2 | Performance Evaluation Metrics Report |
| 7 | Dissertation Writing | 10/25/2024 - 11/07/2024 | 2 | Complete Draft of Dissertation |
| 8 | Final Review and Submission | 11/08/2024 - 11/14/2024 | 2 | Final Dissertation Submission |

# Literature References

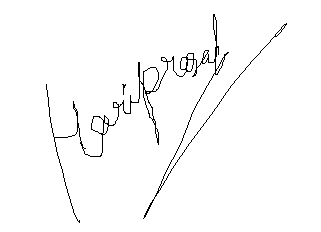
The following are referred journals from the preliminary literature review.

* *GPT-3: Language Models are Few-Shot Learners - Brown, Tom B., et al. (2020)*
* *"BERT: Pre-training of Deep Bidirectional Transformers for Language Understanding" - Devlin, Jacob, et al. (2018)*
* *"Attention Is All You Need" - Vaswani, Ashish, et al. (2017)*
* *"Transformers: State-of-the-Art Natural Language Processing" - Vaswani, Ashish, et al. (2020)*
* *"The Illustrated Transformer" - Jay Alammar (2018)*
* *"Effective Approaches to Attention-based Neural Machine Translation" - Luong, Minh-Thang, et al. (2015)*
* *"Sequence to Sequence Learning with Neural Networks" - Sutskever, Ilya, et al. (2014)*
* *"Neural Machine Translation by Jointly Learning to Align and Translate" - Bahdanau, Dzmitry, et al. (2014)*
* *"BERT for Question Answering" - Rajpurkar, Pranav, et al. (2019)*
* *"BERT for Sentiment Analysis" - Liu, Xiaobing, et al. (2019)*

**Supervisor’s Rating of the Technical Quality of this Dissertation Outline**

EXCELLENT / GOOD / FAIR/ POOR (Please specify): Excellent

**Supervisor’s suggestions and remarks about the outline (if applicable).**



Date 08/06/2024 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (Signature of Supervisor)

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Email Id of Supervisor: hbobbala@microsoft.com

Mob # of supervisor: 9985634450