|  |  | Ahsanullah University of Science and TechnologyBangladesh |
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# The Internal Audit and Moderation Form for the Courses with Projects to address (1) Complex Engineering Problem Solving, and (2) Complex Engineering Activities

1. **Part 1: Moderation**

**1. Course Code & Section**: ***CSE 4114 & A1***

**2. Course Title**: ***Pattern Recognition Lab***

**3. Instructor(s)**: Mr. Faisal Muhammad Shah, Mr. Sajib Kumar Saha Joy, Md. Zahid Hossain

**4. Semester**: **Spring 2023**

**5. Title of the Project:** *BanglaHeartbeat: Mapping Emotional Echoes in Social Media Texts*

**6. Brief Description of the Project:**

Understanding emotions in written language is a growing area of research, especially for languages like Bangla that aren’t widely studied and have their own local expressions and cultural details. This study explores emotion analysis in the EmoNoBa dataset, focusing on 22,698 social media comments. We use machine learning models—Linear SVM, KNN, and Random Forest—with n-gram features from a TF-IDF vectorizer for linguistic analysis. We also examine the impact of PCA for dimensionality reduction. Additionally, we enhance decision trees with AdaBoost and employ a BiLSTM model with Word2Vec and FastText embeddings for deeper semantic understanding. Our work compares these approaches to identify effective methods for emotion detection in Bangla, aiming to advance sentiment analysis in languages with fewer resources.

**7. Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Bloom’s Taxonomy Level, Knowledge Profiles, Ranges of Complex Engineering (CE) Problem Solving, and CE Activities**

| Sl. No. | COs | POs | Bloom’s Taxonomy | | | Knowledge Profiles | Ranges of CE Problem Solving | Ranges of CE Activities |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| C | A | P |
| **1** | Apply the knowledge of traditional statistical techniques and their relationship to Machine Learning algorithms, particularly for the pattern recognition | **1** | **2** |  |  | ***K4*** | ***P1, P3*** |  |
| **2** | 1. Develop a variety of pattern recognition and machine learning algorithms for solving relevant problems | **3** |  |  | **2** | ***K5*** | ***P1*** |  |
| **3** | Analyze specific dataset through the machine learning techniques | **4** |  |  | **3** | ***K8*** | ***P1*** |  |
| **4** | Demonstrate effective communication skills | **10** |  |  | **3** |  |  | ***A1, A2, A3*** |
| **5** | Develop engineering solutions based on pattern recognition and machine learning algorithms which help to gain life-long learning capability | **12** |  |  | **5** |  |  |  |

**8. The Seven Ranges of Complex Engineering Problem Solving related to the Project**

| **"*Complex Engineering Problems have characteristic P1 and some or all of P2 to P7*"** |
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| **Range** | **Attribute** | **PO** | **Relevance in the Project** | | **Related CO** |
| --- | --- | --- | --- | --- | --- |
| **P1** | Depth of Knowledge Required | **PO1** | K4 (Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline) | ***This project requires data collection from Kaggle and also needs the knowledge of Natural Language Processing, Machine Learning, Boosting Algorithms, Lexical Feature and Deep Learning*** | ***CO2*** |
| **PO3** | K5 (Knowledge that supports engineering design in a practice area) | ***It requires knowledge*** ***in areas like NLP, Machine learning models, Recurrent Neural Network and Dimensionality reduction to create algorithms and models, demonstrating the essential role of engineering knowledge in the project's design and development.*** | ***CO1*** |
| **PO4** | K8 (Engagement with selected knowledge in the research literature of the discipline) | 1. ***This project requires study of existing state-of-the-art language, Machine learning models, Deep learning models, Boosting Algorithms and Feature extraction techniques.*** | 1. ***CO3*** |
| **P2** | Range of Conflicting Requirements |  |  | |  |
| **P3** | Depth of Analysis Required | **PO1** | ***Depth of analysis needed to choose specific state-of-the-art Deep learning and machine learning algorithms, as well as Boosting and feature extraction algorithms from many alternatives.*** | | ***CO2*** |
| **P4** | Familiarity of Issues |  |  | |  |
| **P5** | Extent of Applicable Codes |  |  | |  |
| **P6** | Extent of Stakeholder involvement and Conflicting requirements |  |  | |  |
| **P7** | Interdependence |  |  | |  |

**9. The Five Ranges of Complex Engineering Activities related to the Project (CO10)**

| **"*Complex activities means (engineering) activities or projects that have some or all of the following characteristics*"** |
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| **Range** | **Attribute** | **Relevance in the Project** |
| --- | --- | --- |
| **A1**: Involve the use of diverse resources (and for this purpose resources include people, money, equipment, materials, information and technologies) | Range of Resources | ***Requires access to the existing machine learning framework materials like scikit learn,Diverse Boosting Algorithms, Incorporation of Deep Learning Frameworks. High computational power is required also.*** |
| **A2** : Require resolution of significant problems arising from interactions between wide-ranging or conflicting technical, engineering or other issues | Level of Interaction | ***A better level of interaction is needed among the students and the course teachers to resolve conflicting technical problems like bias variance trade off and regarding model’s behaviours.*** |
| **A3**: Involve creative use of engineering principles and research-based knowledge in novel ways | Innovation | ***This project involves state-of-the-art Machine Learning, Deep learning models, Different Boosting and feature extraction algorithms to make a novel pipeline.*** |
| **A4**: Have significant consequences in a range of contexts, characterized by difficulty of prediction and mitigation | Consequences for Society and the Environment |  |
| **A5**: Can extend beyond previous experiences by applying principles-based approaches | Familiarity |  |

Signature of the Instructor/Course Coordinator: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date: **12/02/2024**

**10. Verifications** *(To Be Completed by the Moderator)*

|  | Moderator 1 |
| --- | --- |
| Recommended without any modification | □ |
| Recommended with some modifications (describe under the remark section below) | □ |
| Not recommended and the form should be rewritten and resubmitted (describe the reasons under the remark section below) | □ |

Remarks (if any):

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|  | Signature of the Moderator:  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Date:  Name: |
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1. **Part 2: Modifications (if any)**

| □ | All the required modifications have been done. |
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| □ | Some/all of the modifications have not been done due to the following reasons: |

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Signature of the Instructor/Course Coordinator: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date:

Name:

1. **Part 3: Approval by the Head of the Department**

Signature of the Head of the Department: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date:

Name: