NLP (2024-25)-*Dr Akshi Kumar*

Assessment 1

Coursework Project (50%)

Final Submission: 28-Mar-2025, 12 noon

Assessment Overview

- **Objective**: Students will apply NLP techniques to build a deployable system tailored to one of the following challenges:
    1. **Option A**: **Domain-Specific Chatbot** – Develop and deploy an interactive chatbot for a specific domain.
    2. **Option B**: **Text Summarization System** – Build and deploy a system for abstractive or extractive text summarization.
    3. **Option C**: **Bias Detection in Text Classification** – Create a text classification system with a focus on bias detection and mitigation.

- **Weight**: 50% of course grade.

Final Deliverables

1. **Weekly Worksheets**: Submit all completed worksheets. *(Link to folder will be provided for weekly uploads)*
2. **Consolidated Report** *(To be submitted on VLE on 28th March 2025, 12pm)*:
    - Introduction, methodology, results, and reflections (2,500–3,000 words).
    - Include all evaluation metrics and insights.
3. **System Demo**: Deployed system link or demo video for deployment (3-5 minutes).

Project Workflow

Each project option follows an **8-week structure** of lab activities **starting 28-01-2025**, where students complete incremental tasks and submit worksheets/checkpoints weekly. This will

Week 1: Understanding Requirements and Dataset Preparation

- **Task**:
  - Select a domain or task based on your chosen project option.
  - Collect or identify datasets and preprocess them.
- **Deliverables**:
  - Cleaned dataset.
  - Worksheet with domain/task description and preprocessing steps.
- **Worksheet**:

1. **Selected Project Option**:
   - Chatbot
   - Summarization
   - Bias Detection
2. **Domain/Task**:
   - Selected domain/task: _____
   - Dataset source: _____
   - Number of records: _____
3. **Preprocessing Steps**:
   - Text cleaning
   - Tokenization
   - Stopword removal
   - Lemmatization/Stemming
4. **Reflection**:
   - What challenges did you face in dataset preparation?

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Week 2: Initial Model Development

- **Task**:
    - Build a baseline model for your chosen project.
        - **Chatbot**: Basic intent classification and entity recognition.
        - **Summarization**: Extractive summarization (e.g., TextRank).
        - **Bias Detection**: Text classification with Logistic Regression or Naive Bayes.
- **Deliverables**:
    - A functioning baseline model.
    - Worksheet detailing methods, results, and challenges.
- **Worksheet**:

1. **Model Type**:
    - Chatbot: Intent classification, entity recognition.
    - Summarization: Frequency-based or graph-based.
    - Bias Detection: Logistic Regression or Naive Bayes.
2. **Performance Metrics**:
    - Accuracy: _____
    - Precision: _____
    - Recall: _____
    - F1-Score: _____
3. **Reflection**:
    - What are the limitations of this baseline approach?

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Week 3: Advanced Model Development

- **Task**:
  - Develop an advanced NLP model:
    - **Chatbot**: Add dialog flow with template-based responses.
    - **Summarization**: Train a neural model (e.g., T5, Pegasus).
    - **Bias Detection**: Implement a CNN or LSTM for classification.
- **Deliverables**:
  - An enhanced model.
  - Worksheet comparing baseline and advanced models.
- **Worksheet**:

1. **Advanced Model Type**:
   - Chatbot: _____
   - Summarization: _____
   - Bias Detection: _____
2. **Comparison of Results**:
   - Baseline performance: _____
   - Advanced model performance: _____
3. **Reflection**:
   - How does the advanced model improve upon the baseline?

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Week 4: Pre-Trained Models

- **Task**:
  - Use a pre-trained transformer (e.g., BERT, GPT) to enhance performance.
- **Deliverables**:
  - Pre-trained model integrated into your system.
  - Worksheet detailing the model's advantages and results.
- **Worksheet**:

1. **Transformer Used**:
   - BERT
   - GPT
   - Other: _____
2. **Input and Output Example**:
   - Input: _____
   - Output: _____
3. **Reflection**:
   - How does the pre-trained model enhance your system?

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Week 5: Domain-Specific Fine-Tuning

- **Task**:
    - Fine-tune your system for domain-specific tasks.
        - **Chatbot**: Add domain-specific intents/entities.
        - **Summarization**: Fine-tune summaries for the domain.
        - **Bias Detection**: Explore bias in your model's predictions.
- **Deliverables**:
    - Fine-tuned model.
    - Worksheet documenting the process.
- **Worksheet**:

1. **Fine-Tuning Dataset**:
    - Dataset source: _____
    - Number of records: _____
2. **Results Before and After Fine-Tuning**:
    - Before: _____
    - After: _____
3. **Reflection**:
    - What domain-specific challenges did you encounter?

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Week 6: Evaluation

- **Task**:
    - Evaluate your system using metrics:
        - **Chatbot**: Intent accuracy, BLEU for responses.
        - **Summarization**: ROUGE, BLEU.
        - **Bias Detection**: Fairness metrics, F1-Score.
- **Deliverables**:
    - Evaluation metrics.
    - Worksheet analyzing the evaluation results.
- **Worksheet**:

1. **Metrics Used**:
    - _____
2. **Results**:
    - Metric 1: _____
    - Metric 2: _____
3. **Reflection**:
    - How do the evaluation results guide your next steps?

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Week 7: Explainability

- **Task**:
    - Add explainability to your system using tools like SHAP or LIME.
- **Deliverables**:
    - Explainable system with visualization.
    - Worksheet documenting insights.
- **Worksheet**:

1. **Explainability Tool Used**:
    - SHAP
    - LIME
    - Other: _____
2. **Example**:
    - Input: _____
    - Explanation: _____
3. **Reflection**:
    - How does explainability improve your system?

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Week 8: Optimization

- **Task**:
    - Optimize your system for speed, accuracy, or efficiency.
- **Deliverables**:
    - Optimized model.
    - Worksheet documenting optimization strategies.
- **Worksheet**:

1. **Optimization Technique**:
    - Hyperparameter tuning
    - Pruning
    - Other: _____
2. **Before and After Results**:
    - Before: _____
    - After: _____
3. **Reflection**:
    - What trade-offs did you encounter during optimization?

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