**Report on Aspect-Based Sentiment Analysis System**

**Introduction**

Aspect-Based Sentiment Analysis (ABSA) focuses on identifying and summarizing opinions about specific aspects within a text. This report details the development and evaluation of an ABSA system for restaurant reviews. The system comprises data preprocessing, model training, testing, and evaluation through a 10-fold cross-validation approach.

**Data**

The XML dataset consists of restaurant reviews, annotated with aspects and sentiment polarities. It was split into 10 parts, each containing 35 reviews.

**Model**

A logistic regression model trained using TF-IDF features extracted from the text of the reviews. The trained model tested on specified test data and evaluates its accuracy.

**Experimental Results**

**Cross-Validation Procedure**

A 10-fold cross-validation was performed, where each fold used one part of the data as the test set and the remaining nine parts as the training set. The logistic regression model was trained and evaluated for each fold.

**Results**

* **Part 1 as Test Set:** Train Score: 0.904, Test Score: 0.697
* **Part 2 as Test Set:** Train Score: 0.908, Test Score: 0.790
* **Part 3 as Test Set:** Train Score: 0.909, Test Score: 0.724
* **Part 4 as Test Set:** Train Score: 0.907, Test Score: 0.663
* **Part 5 as Test Set:** Train Score: 0.901, Test Score: 0.711
* **Part 6 as Test Set:** Train Score: 0.906, Test Score: 0.722
* **Part 7 as Test Set:** Train Score: 0.905, Test Score: 0.736
* **Part 8 as Test Set:** Train Score: 0.904, Test Score: 0.757
* **Part 9 as Test Set:** Train Score: 0.910, Test Score: 0.734
* **Part 10 as Test Set:** Train Score: 0.842, Test Score: 0.372

**Average Accuracy Score:** 0.691

**Analysis**

* **Training Accuracy:** The model achieved high training accuracy across all folds, ranging from approximately 84% to 91%.
* **Testing Accuracy:** The test accuracy varied more significantly, ranging from about 37% to 76%. The lower accuracy for Part 10 indicates that the model may not generalize well to all data splits, possibly due to different characteristics in that subset.
* **Average Accuracy:** The average test accuracy across all folds is approximately 69.1%, suggesting a reasonably good performance overall but with variability depending on the test subset.

The ABSA system was successfully developed and evaluated using a logistic regression model with TF-IDF features. The 10-fold cross-validation provided a robust assessment of the model’s performance, revealing strengths in handling most test sets but also highlighting areas for improvement.

**Next Steps:**

* **Feature Enhancement:** Explore additional features such as POS tags or embeddings to improve model performance.
* **Model Optimization:** Investigate other machine learning algorithms or hyperparameter tuning to enhance accuracy.
* **Consistency in Vectorizer:** Ensure consistency in feature extraction by saving and loading the TfidfVectorizer used during training.