PES INSTITUTIONS

Scoring Algorithm for Short Answers & Essays

Team Members

P Karan Jain 1PE12IS065

Sushma N 1PE12IS106

Steffi Crasta 1PE12IS414

Problem Statement

To design and implement a system to evaluate Short answers and Essay, and provide a score to them.

Literature Survey

Short Answers

- Regular expressions are being used to evaluate short answers, but the expressions need to be manually entered for every answer. This tool is used in “Moodle” and is known “RegExp Short Answer question”.
- Leacock and Chodorow developed the use of a short-answer scoring system called C-rater, which focuses on semantic information in the text. This is also known as LC Similarity measure technique.
- Bachman proposed the use of a short answer assessment system called WebLAS. They extracted regular expressions from a model answer to generate the scoring key.

Essays

- Mahana, Johns and Apte used Linear Regression model to learn from features such as total word count per essay, sentence count, number of long words, part of speech counts etc.
- Lukic and Acuna used a simple naïve Bayes predictor and closed-form solution to linear regression. They extracted several features of the essays, ranging from simple numerical data such as word count and average word length, content specific numerical data such as misspelled word count and adjective count, and structural data such as average degree and diameter of the essays' noun-verb relatedness graphs.

Citations

[1] Lakshmi Ramachandran, Jian Cheng & Peter Foltz "Identifying Patterns For Short Answer Scoring Using Graph-based Lexico-Semantic Text Matching

[2] Manvi Mahana, Mishel Johns, Ashwin Apte. (2012). Automated Essay Grading using Machine Learning, Stanford University.

[3] Likic, A., & Acuna, V.(n.d.). Automated Essay Scoring, Rice University.

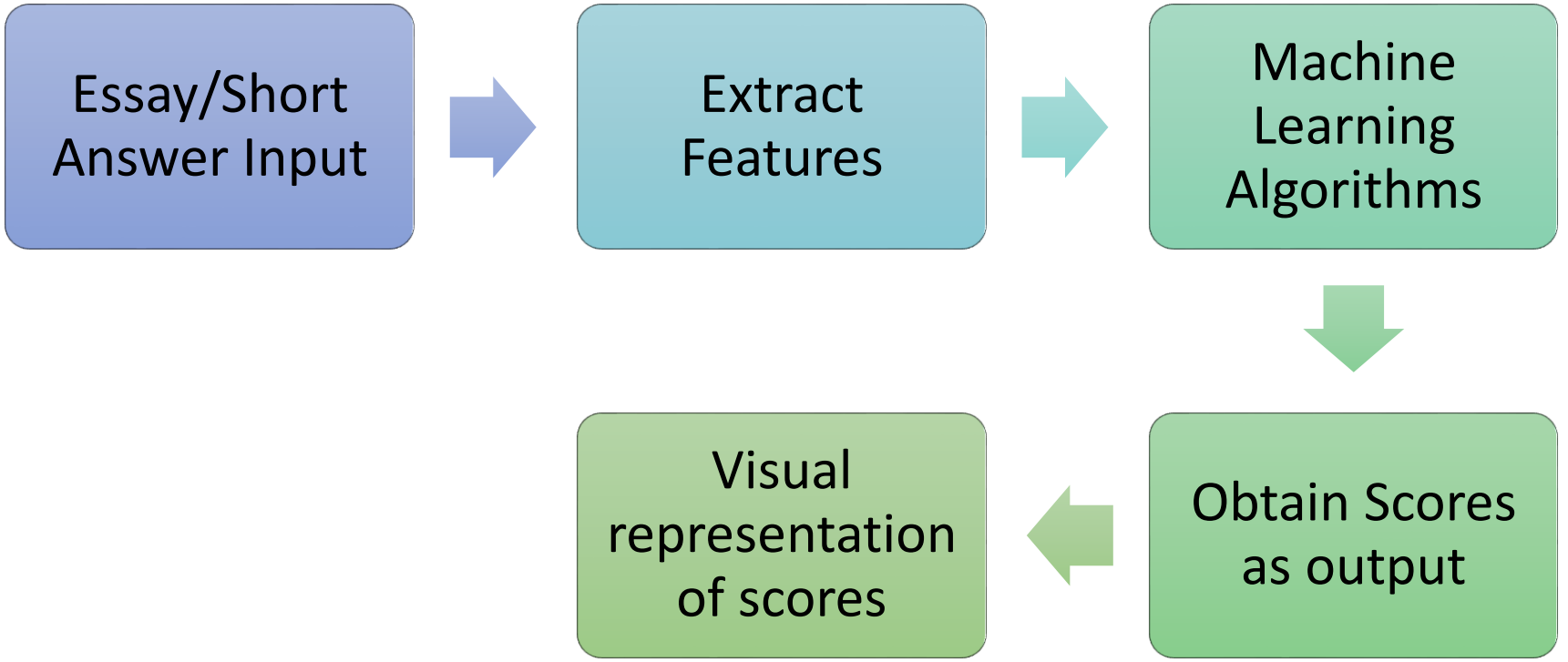
Functional Requirements

- Accept Short answers and Essays as Input from the user
- Evaluation of short answers and Essays by Machine learning algorithms
- Obtain Scores as output
- Comparison of Human graded Scores and Predicted scores
- Visual representation of Scores

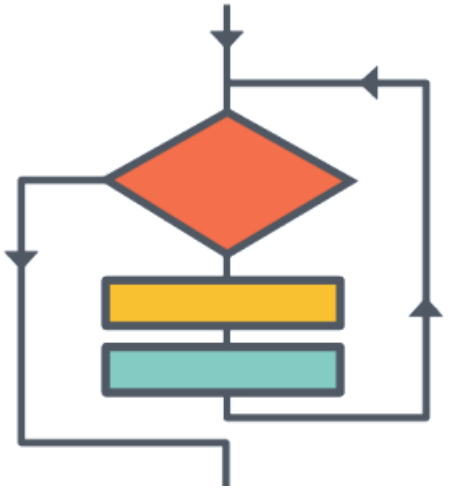
Non-Functional Requirements

- Performance : Grades provided by the system should be consistent with Human graded scores.
- Reliability : System should always be able to accept user input and process input.
- Scalability : System should be able to store attributes related to essays and short answers.

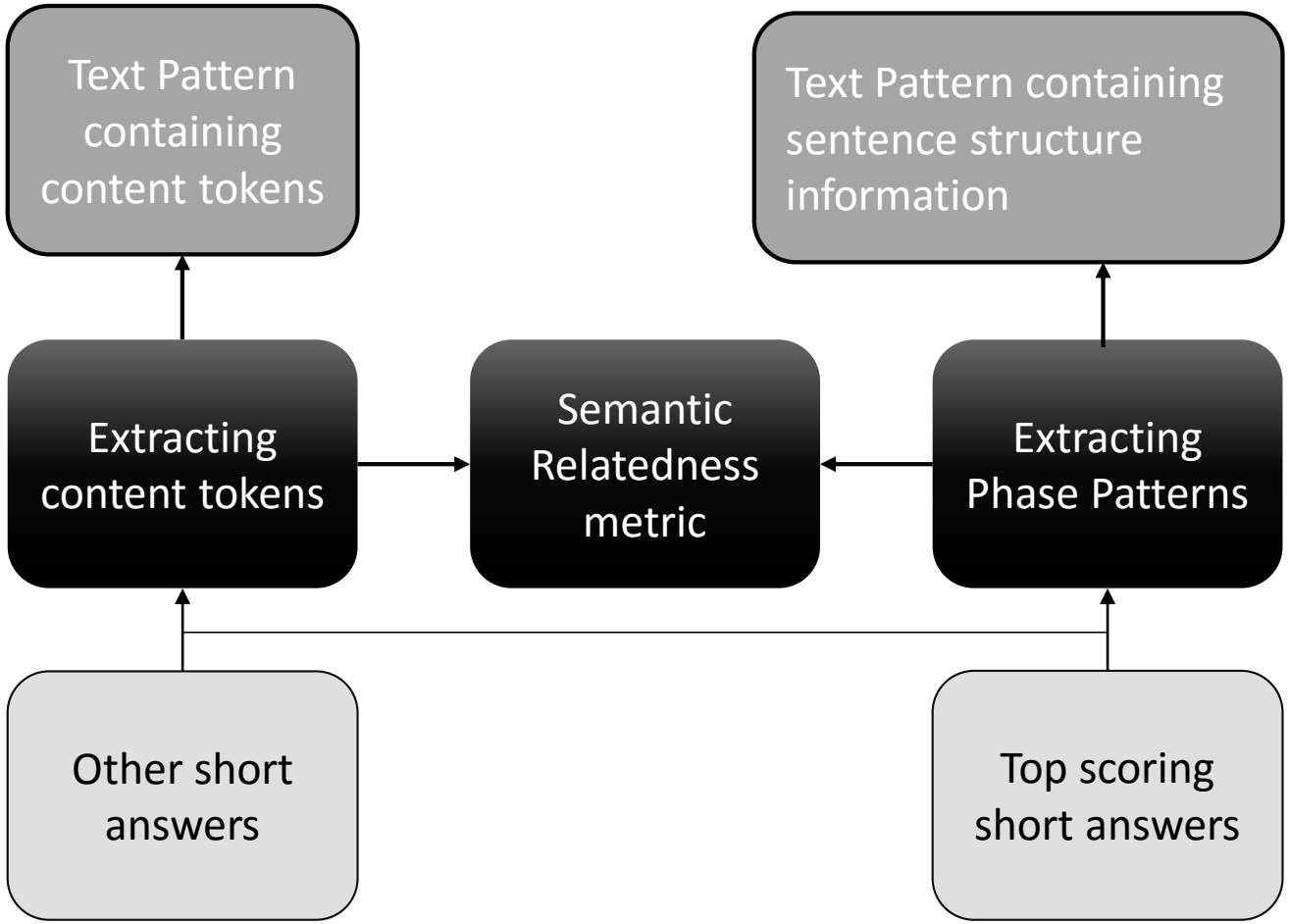
Architecture



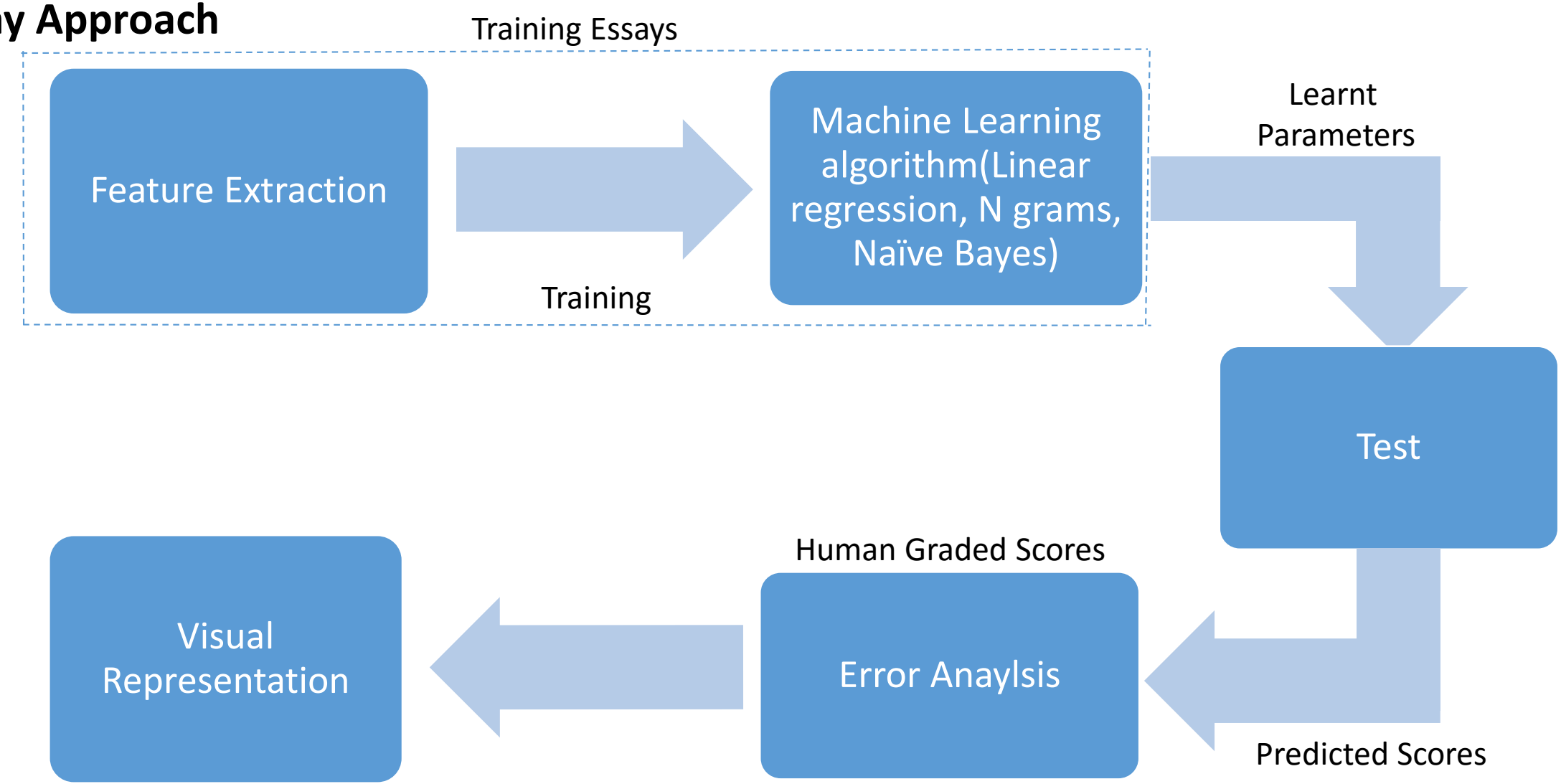
Visualization



Short Answers Approach



Essay Approach



Development/User environment

Hardware Requirements (Minimum requirements)

- Processor: Intel core i3
- Memory: 256 MB
- Hard disk : 2 GB

Software Requirements

Operating System

- Ubuntu 14.04 (Used for development and testing)
- Any Debian based system for usage.

Programming Languages used

- Python 2.7.x or Python 3
- R 3.2.3

Packages used

- Textmining(1.0) package for Python
- Natural Language Toolkit (NLTK) (3.0) package for Python
- Scikit-learn package for Python 2.3 Background modules

Dataset present in flat files.

- Dataset for Short answers provided by The William and Flora Hewlett Foundation (Hewlett Foundation) is sponsoring the Automated Student Assessment Prize (ASAP) hosted on Kaggle.
- Dataset for Essays provided by The William and Flora Hewlett Foundation (Hewlett Foundation) is sponsoring the Automated Student Assessment Prize (ASAP) hosted on Kaggle.

Current Status

- We are done with implementing the design architecture.
- Currently working on evaluation of Short Answers, the regular expression technique and graph based techniques.

Plan going forward

Deliverables	Deadline	Candidate Responsible
Graph Based Short Answer	2nd February	Karan
Regular Expression Short Answers	2nd February	Sushma
LC Based Similarity Short Answers	9th February	Steffi
Obtain Comparision Results for short answers	15th February	Sushma
Detailed Literature Survey for Essays	22nd February	Karan
Implementation of methods for Essays	1st March	All three