

## Automated Essay Grading System

Janam Sarmalkar<sup>1</sup>, Mohid Shaikh<sup>2</sup>, Shivam Samaleti<sup>3</sup>, Foram Shah<sup>4</sup>

<sup>1,2,3</sup>(Student, Department Of Computer Engineering, Atharva College Of Engineering, Mumbai, India)

<sup>4</sup>(Assistant Professor, Department Of Computer Engineering, Atharva College Of Engineering, Mumbai, India)

**Abstract :** Proposed Work Aims To Study An Intelligent Essay Recommender And Grader Using Nlp Techniques. A Data Set Can Be Acquired And The Grading Engine Will Be Used To Grade The Essays. An Enhancer Will Be Constructed Which Will Help Students Improve Their Essays. It Is An Interesting Topic Based On Machine Learning And Can Be Used To Make Quality Education More Achievable. The Predictions Will Closely Match Human Analysis. The Grading System Model Will Be Trained Using Word Features And Essay Statistics From The Various Essays Procured From The Data Set.

**Keywords** – Essay Grading, Recommendation System, Natural Language Processing, Student Writing

### I. INTRODUCTION

As Computer Intelligence Is Rapidly Growing, There Are Lots Of Powerful Tools That Could Help Teachers Become More Efficient. Every Week Some Or The Other Research Emerges That Has The Potential To Disrupt The Education System. One Of The Tools Under Great Research Is Automatic Computer Grading Of Written Essays. For Concerned Institutes Dealing With Immense Amounts Of Essays Such As Mooc Providers Or Examination Boards That Include Essays As Part Of Their Examinations, The Thought Of Having The Grading Work Done, By A Computer Is Fascinating, To Say The Least. The Big Question Is How Smart A Computer Is To Be Capable Of Recognizing Small But Significant Differences That Can Mean The Difference Between A Good Essay And A Great Essay.

The Need For Automated Computer Grading Is Increasing. Due To Economic Constraints From Every Essay Having To Be Graded Manually By Humans (Here, Teachers), Examinations With A Subjective Analysis Of The Student Has Become Increasingly Costly. This Cost Has Led To Many Boards Avoiding This Important Part Of Assessment Tests. Therefore, Developing Systems That Can Automate Grading For These Essays Can Help Reduce Costs In A Great Way And May Facilitate Better Feedback For The Students. Many Years Ago, Researchers Have Sought To Develop Applications That Automate The Education Process, Especially Essay Grading And Evaluation. Research In This Field Began In The Early 1960s And Has Been Extremely Constructive[1]. Spearhead Work In Automated Feedback Began In The Early 1980s.

There Exist A Variety Of Branches Within Education To Which Our System Can Be Applied. At The Basic Level, This System Could Be Used As A Consistency Checker, In Which The Teacher Grades The Essays Manually And Then The System Re-Grades The Essays And Indicates Differences Between The Two Grades. Since This System Would Obviously Not Show Signs Of Biases, Fatigue Or Even Deadlines, It Can Provide A Consistent View Of The Quality Of The Essays. It Can Further Be Used In Large-Scale Standardized Testing, By Serving As An Automatic Grader. At A More Interactive Level, It Can Be Used To Help Students Improve Their Writing By Assessing And Commenting On It. By Providing Instantaneous Feedback About The Quality Of Their Essays, As Well As Indications Of Information Missing From Their Essays, Students Can Use It As A Tool To Practice Writing Content-Based Essays. The System Permits Students To Receive Writing Practice Without Requiring All Essays To Be Evaluated By The Teachers. Because Our System's Evaluations Will Be Immediate, Students Can Receive Feedback And Make Multiple Revisions Over The Course Of One Session[2]. Finally, Our Recommendation System Will Help A Student Achieve Better Scores By Showing Tips And Advice Based On The Student Inputted Essay. This Subsystem Will Gradually Help A Student Get Better In Writing Essays And Aim For That Perfect Score.

### II. BASIC THEORY

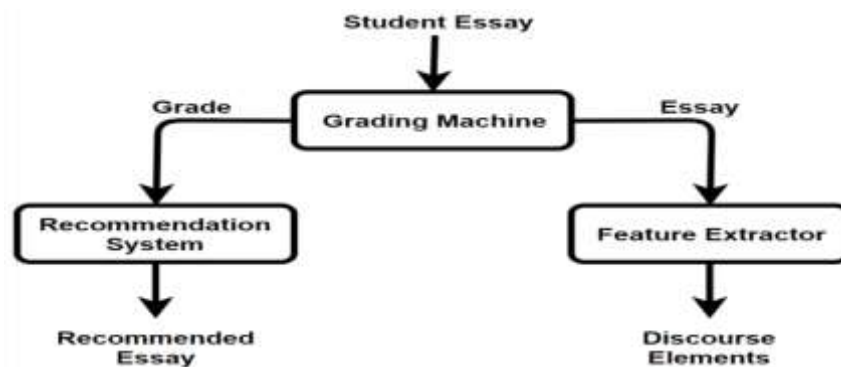
Natural Language Processing Is A Technology Used For Analysis Of Data In Textual Form. It Breaks Texts Into Tokens That Can Be Further Used For Computations. The Reason For This Conversion Is To Have An Easier Approach During Analysis. These Tokens Are Compared And Analyzed With The Adjacent Tokens To Make Sure The Sentences Are Grammatically As Well As Factually Correct. Various Methods Such As Stemming, Lemmatization, Discourse, Etc Are Used In Nlp[3].

Recommendation System Is A Unique Approach Undertaken That Will Act As A Guidance To Students To Help Them Secure Better Scores. It Works Similar To How Amazon, Google And The Likes Recommends Us Relevant Information Or Products Based On Our Search. In This Case, The Recommendation System Will Display The Immediate Best Essay Along With Suggestions On How To Improve The User-

Inputted Essay. Since We Can Have A Plethora Of Essays, The System Can Easily Be Able To Advice Essays On The Exact Same Topic And That Too By Highlighting Out The Similarities And Improvements.

### III. PROPOSED SYSTEM

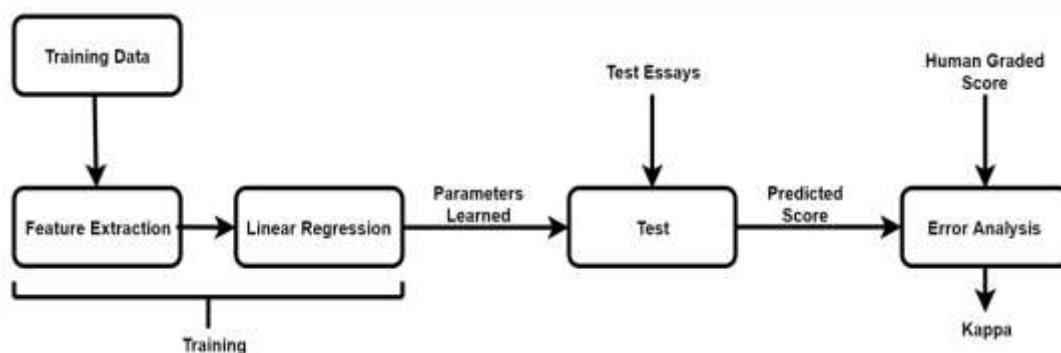
This System Consists Of Three Complementary Components Viz. The Grading Engine Component That Is Based On Linear Regression Which Will Be Trained On A Set Of Pre-Graded Essays By Human And Then Compute The Similarity Between The New Essay And The Pre-Graded Essays To Assign A Grade. The Second Component, Writing Feature Analysis, Consists Of A Series Of Programs That Evaluate And Give Feedback For Errors In Grammar, Usage, And Mechanics, Identify The Essays Discourse Structure, And Recognize Undesirable Stylistic Features That Are Based On Natural Language Processing (Nlp) Tools. The Third, A Recommendation Module Is Developed Which Will Recommend Certain Pre-Stored Essays To The User According To The Received Grade.



#### A. The Grade Machine

We Will Extract A Set Of Features From Each Essay. We Will Choose Features That May Serve As Proxies For What A Human Grader Might Look For While Grading The Essay. We Will Extract Features Such As Total Word Count Per Essay, Sentence Count, Number Of Long Words, Part Of Speech Counts Etc From The Training Set Essays. We Shall Be Using Linear Regression Model To Learn From These Features And Generate Parameters For Testing And Validation. Further, We Will Use Forward Feature Selection Algorithm To Arrive At A Combination Of Features That Gives The Best Score Prediction[4].

These Scores Will Then Be Compared Against Human Graded Scores To Arrive At An Error Metric. Quadratic Weighted Kappa, Which Measures Agreement Between Predicted Scores And Human Scores, Will Be Used As An Error Metric.



#### B. The Feature Extractor

Earlier Systems Were Always Based On A Large Number Of Features That Were Not Individually Described. The Writing Analysis Tools Identify Five Main Types: Grammar, Usage, And Mechanics Errors, Verb Formation Errors, Wrong Word Use, Missing Punctuation, And Typographical Errors. The Writing Analysis Tools Will Also Show Certain Aspects Of Writing Style That The Student May Wish To Revise, Such As The Use Of Passive Voice In Sentences, As Well As Very Long Or Very Short Sentences Within The Essay[5]. Another Type Of Undesirable Writing That The System Can Detect Is The Use Of Repetitive Words, A Feature Of The Essay That May Affect Its Grading Quality. The Purpose Of Developing Automated Tools For Writing Instruction Is To Enable The Student To Get More Practice Writing. If The Feedback Is To Help

Students Improve Their Writing Skills, Then It Should Be Similar To What An Instructor's Comments Might Be. Finally After The Pre-Mentioned Errors In Writing Are Detected And Displayed To The Student, A Common Feedback On His/ Her Answer Might Be Something Like One Of The Following: Your Essay Does Not Resemble Others Being Written On This Topic.

Your Essay Might Not Be Relevant To Assigned Topic.

Your Essay Appears To Be Restatement Of The Topic With A Few Additional Concepts. Compared To Other Essays Written On This Topic, Your Essay Contains More Repetition Of Words.[6]

### C. The Recommendation System

A Recommendation System Is Currently Very Widely Used Globally And Is Another Extension Of The Enhancement Engine Of The System. The System Is Responsible For Recommending Certain Essays To The User Based On His Grade And Quality Of The Essay. Assessed By Writing Feature Analysis, The Essay Might Be Lacking In Some Parts More Than The Others. Thus, Keeping This In Mind, An Essay Will Be Recommended With The Closest Grade And With The Complete Feedback Of What The User's Essay Lacks That The Recommended Essay Does Not. The Idea Of The Recommendation System Is Derived From Information Filtering. There Are Three Types Of Filtering:

Collaborative Filtering - Where The User's Past History Is Referred To For Recommending Similar Products, Or In This Context, Essays. K-Nearest Neighbors, Pearson Correlation Algorithms Work Well For This Type Of Filtering.

Content Based Filtering - Where The Content Of The User's Essay Is Taken Into Context While Recommending Essays. Bayesian Classifiers, Artificial Neural Network, Cluster Analysis, Work Well For Content Based Filtering.

Hybrid Filtering - Which Uses Both Of These Kinds Of Filtering For Recommendation System. The Essays Recommended To The User Will Be The Ones Closest To The Grade Of The User's Essay. For Example, If The User Gets A Score Of 2.5 Out Of 6. An Essay Recommended Along With Writing Feature Analysis Will Have A Grade Of 3. As The User Shouldn't Aim For A Grade Jump From 2.5 To 6, The Closest Ranked Essay Will Be Recommended. With An Aim To Do So, A Focused Research Into Information Retrieval Systems Is Made.

Information Retrieval Starts With A User Query. The Retrieval Engine Then Finds Necessary Documents From Its Corpus Or Database Related To That Queries And Sends It Back To The User. In Our Case We Have A Corpus Full Of Essays And The User Gives Us Input As A Query Is Another Essay. So If We Want To Find Relevant Essays From Our Dataset We Have To Consider The Input Essay As Query And Process It Further To Make The Suggestions.

## IV. EXPECTED RESULTS

The System Will Take Essays As Input, Process It Based On The Training Given With The Help Of The Datasets Acquired And Assign A Grade Based On Its Training With Results Matching Human Grades. Better Accuracy In Grades Can Be Achieved Via Trial And Error Of Different Algorithms We Have At Our Disposal. To Cater With The Limited Time Frame We Can Narrow Down The Domain Of Essays The System Will Evaluate. Finally, The Recommendation System Should Help The End User To Write Better Essays To Achieve Better Marks By Displaying Essays From The Database That Match The User Requirements.

## V. CONCLUSION

The Implementation Of Essay Grader And Recommendation System As A Web Service Is Not Yet Widespread And Common. Deploying It Online In The Near Future Would Make It A Habit. Also, Expanding This Project To Many Entrance Exams Can Be Made Possible. Since Thousands Of Essays Need To Be Evaluated During Exams, Automating The Process Would Help Reduce The Workload Considerably. Although The Project Focuses On English Language, The Target Language Can Be Changed By Adding Nlp Libraries For Certain Languages, For Eg. Indic Nlp Library Which Supports Many Indian Languages. This Would Increase Routine Usage In Other Languages And As India Is A Hub Of Many Languages, It Would Also Increase Penetration Of Aegs As A Necessity In Vernacular Mediums.

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