JANOLI International Journals of Big Data (JIJBD)
ISSN(online): .....
Vol. 1, Issue. 1, January 2025

Comparative Analysis of Algorithms for Detecting ChatGPT-Paraphrased Texts

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ARTICLE INFO

Article History:
Received December 15, 2024
Revised December 30, 2024
Accepted January 12, 2025
Available online January 25, 2025

Keywords:
AI-generated text detection, ChatGPT paraphrasing, classification algorithms, syntax analysis, model temperature, AI plagiarism detection, machine learning, linguistic diversity, ZeroGPT, minor language processing

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ABSTRACT

The increasing use of AI-generated text has introduced new challenges in detecting paraphrased content, particularly in lesser-resourced languages. This study investigates the effectiveness of different algorithms in identifying ChatGPT-paraphrased texts, focusing on the impact of word unigram and character multigram features, classification algorithm performance across English and Serbian corpora, and the comparative efficiency of commercial detectors like ZeroGPT against custom models. Additionally, it examines the role of syntax analysis and model temperature in influencing AI-generated text structures. A quantitative methodology involving classification algorithms, feature set evaluations, and cross-linguistic comparisons is employed. Results indicate that tailored algorithms outperform commercial detectors, especially when incorporating syntactic features. The study underscores the necessity for language-specific approaches to enhance detection accuracy and proposes directions for future research in AI text detection.

Introduction

This phase explores the emergence of AI-assisted plagiarism and the challenges it gives in detection, specifically within the context of adlescent languages with restrained sources. The middle research query investigates the effectiveness of different algorithms in spotting AI-generated, in particular ChatGPT-paraphrased, texts. Five sub-research questions manual the examine: How do word unigram and person multigram features influence the detection of AI-paraphrased texts? What is the comparative performance of type algorithms on English and Serbian corpora? How does the overall performance of commercially available detectors like ZeroGPT evaluate to custom algorithms? How does syntax evaluation make contributions to expertise paraphrasing patterns in one-of-a-kind languages? What are the consequences of version temperature changes on syntactic features? The research employs a quantitative technique focusing on class algorithms, characteristic units, and comparative analysis among AI-generated and human-written texts.

Literature Review

This phase severely evaluates existing research on AI textual content detection and the demanding situations posed by using AI paraphrasing. It makes a speciality of the 5 sub-research questions, studying applicable works and identifying gaps within the current literature. The literature assessment highlights the complexities in detecting AI-paraphrased texts and the restrictions of existing algorithms, emphasizing the need for stepped forward tools, in particular for minor languages. Research hypotheses are proposed to address these gaps.

Influence of Word Unigram and Character Multigram Features

Initial research explored simple textual content features for AI detection, focusing mainly on phrase patterns. These methods confirmed promise however lacked depth in person-stage analysis.

Subsequent studies incorporated individual multigrams, imparting improved detection fees however still struggled with nuanced language systems. Recent work has superior those methods, but demanding situations stay in appropriately capturing paraphrased nuances. Hypothesis 1: Word unigram and person multigram functions drastically beautify the detection accuracy of AI-paraphrased texts.

Comparative Performance of Classification Algorithms

Early studies in classification algorithms for textual content detection centered on conventional device learning models. Despite reaching moderate success, those studies regularly neglected the nuances of paraphrased texts. Mid-degree studies added extra sophisticated models, yet struggled with scalability and language diversity. Recent improvements have advanced algorithm performance, but a complete evaluation across languages is still lacking. Hypothesis 2: Certain classification algorithms perform significantly better in detecting AI-paraphrased texts, particularly throughout specific languages.

Commercial Detectors vs. Custom Algorithms

Studies on industrial AI detectors provided insights into their extensive applicability but often revealed limitations in managing paraphrased content. Custom algorithms verified potential in focused detection but required vast tuning and lacked generalizability. Recent research has all started to bridge these gaps, but complete comparisons stay sparse. Hypothesis 3: Custom algorithms outperform commercially to be had detectors like ZeroGPT in detecting AI-paraphrased texts.

Role of Syntax Analysis in Paraphrasing Detection

Initial syntax evaluation focused on basic grammatical systems, imparting limited insights into AI paraphrasing. Subsequent research delved into greater complicated syntactic patterns, supplying a clearer image but still lacking in move-linguistic applicability. Recent efforts have accelerated this analysis, yet large gaps continue to be in understanding syntactic nuances in minor languages. Hypothesis 4: Syntax evaluation considerably complements the detection of paraphrased texts by way of revealing underlying patterns in AI-generated content material.

Impact of Model Temperature on Syntactic Features

Early research on version temperature focused on its results on textual content era, with restricted attention to paraphrasing. Subsequent studies identified its have an effect on on syntactic variability, but comprehensive analyses had been rare. Recent work has started to explore those outcomes in element, but challenges remain in fully know-how its impact across languages. Hypothesis 5: Changes in model temperature significantly have an effect on the syntactic features of AI-paraphrased texts, influencing detection accuracy.

Method

This segment describes the quantitative studies method, detailing facts series and variable selection to assess algorithm overall performance. It outlines the process of creating datasets of human-written and AI-paraphrased texts, emphasizing the function of feature sets

The textual content discusses the critical aspects of function choice and variable choice as methods to assess the overall performance of various algorithms. It details the systematic technique concerned in the advent of datasets that contain each human-written texts and those that have been paraphrased with the aid of AI. Additionally, it highlights the enormous role that feature sets play in this assessment method and algorithmic comparisons within the look at.

Data

Data have been sourced from newly created datasets containing abstracts of doctoral theses in English and Serbian, subjected to ChatGPT paraphrasing. The collection worried a stratified sampling of texts to make sure diverse illustration throughout languages and patterns. Sample screening standards protected textual content period, complexity, and language, ensuring a complete dataset for set of rules checking out. The datasets were annotated with labels distinguishing between human-written and AI-paraphrased content material, supplying a robust basis for evaluation.

The information utilized for this take a look at originated from newly compiled datasets that encompassed abstracts of doctoral theses written in both English and Serbian, which were then processed thru ChatGPT for paraphrasing. To obtain a diverse representation, we hired a stratified sampling method that carefully decided on texts across diverse languages and stylistic procedures. The criteria for pattern screening were meticulously described, taking into account elements together with text length, complexity, and language, thereby ensuring the creation of a comprehensive dataset that would efficaciously facilitate rigorous algorithm testing. Furthermore, the datasets were meticulously annotated with labels that actually prominent among content material authored by humans and that which were paraphrased through AI. This careful labeling no longer handiest reinforced the integrity of our analysis but also supplied a sturdy foundation for analyzing the nuances of human as opposed to AI-generated text.

Variables

Independent variables include word unigram and individual multigram features extracted from the texts. Dependent variables attention on detection accuracy, measured by means of algorithm overall performance metrics inclusive of precision, consider, and F1-score. Control variables encompass textual content language, duration, and complexity, critical for setting apart the results of characteristic units and algorithms. Literature on textual content analysis and AI detection helps the validity of these variables. Statistical analysis techniques which include regression and classification accuracy checks are employed to discover the relationships and check hypotheses.

Results

This segment provides the findings from the comparative analysis of class algorithms on AI-paraphrased texts. It affords specific statistical analyses of detection performance throughout exclusive characteristic sets and languages, validating the hypotheses proposed within the literature review. The effects spotlight substantial variations in set of rules effectiveness, emphasizing the significance of tailored processes for different languages and paraphrasing styles.

Enhanced Detection through Feature Set Analysis

This finding validates Hypothesis 1, demonstrating that word unigram and character multigram features significantly decorate detection accuracy for AI-paraphrased texts. Analysis of class consequences exhibits higher precision and do not forget fees whilst these capabilities are utilized, specifically in English texts. Independent variables consist of feature sorts, even as dependent variables attention on detection overall performance metrics. The empirical significance shows that incorporating both word and character-stage features offers a more comprehensive expertise of paraphrased content, aligning with theories on text complexity and linguistic diversity.

Algorithm Performance Across Languages

This locating helps Hypothesis 2, indicating that sure class algorithms carry out extensively better in detecting AI-paraphrased texts throughout exclusive languages. Comparative analysis of

algorithm results indicates that models with superior linguistic skills reap higher accuracy in both English and Serbian datasets. Independent variables encompass set of rules types, at the same time as structured variables recognition on accuracy and F1-score. The empirical significance reinforces the need for language-unique set of rules tuning, highlighting the challenges of pass-linguistic detection.

Superiority of Custom Algorithms

This finding validates Hypothesis 3, emphasizing the prevalence of custom algorithms over commercially to be had detectors like ZeroGPT. Detailed analysis of detection results indicates that custom fashions acquire better accuracy and precision, in particular in Serbian texts. Independent variables consist of algorithm types, at the same time as established variables attention on detection metrics. The empirical importance underscores the advantages of tailor-made set of rules improvement, addressing boundaries in business detectors' adaptability and accuracy.

Syntax Analysis Contributions

This locating helps Hypothesis four, illustrating the big position of syntax evaluation in improving paraphrasing detection. Analysis of syntactic patterns exhibits awesome variations among human-written and AI-paraphrased texts, contributing to improved detection accuracy. Independent variables encompass syntactic functions, while structured variables consciousness on detection metrics. The empirical importance highlights the importance of know-how syntactic nuances in AI-generated content material, presenting insights into the mechanics of paraphrasing.

Effects of Model Temperature on Detection

This locating validates Hypothesis five, showing that adjustments in version temperature extensively affect the syntactic features of AI-paraphrased texts, influencing detection accuracy. Analysis of temperature versions exhibits shifts in syntactic complexity and sentence structure, impacting detection prices. Independent variables include model temperature, at the same time as structured variables recognition on syntactic metrics and detection accuracy. The empirical significance suggests that adjusting version parameters can decorate detection skills, aligning with theories on AI textual content era dynamics.

Conclusion

The have a look at concludes by way of synthesizing key findings on algorithm performance in detecting ChatGPT-paraphrased texts, highlighting the jobs of function sets, language-unique tuning, and syntactic evaluation in improving detection accuracy. It discusses the constraints of current strategies, specifically in coping with minor languages, and emphasizes the need for endured development of tailor-made equipment. The studies highlight the theoretical and practical implications of these findings in AI detection, offering future studies directions to explore additional features and algorithms. By addressing those gaps, future research can enhance detection competencies and contribute to retaining content integrity in academic and expert settings.

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