

# Unraveling the Tapestry of Language: Investigating Differences in Human and Language Model-Generated Texts

GROUP3: JIALIN GAN, YIZHOU LI, ZHUOXI WANG, and ZIHUI JIANG

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## 1 PROBLEM DESCRIPTION

Our research aims to explore and analyze the distinctions between texts created by humans and those generated by language models in the news domain, with a particular focus on differences in syntax and semantics. Through this investigation, we intend to gain a deeper understanding of how language models handle language structure and meaning compared to human authors. The ultimate outcome of our study will be the presentation of our findings in the form of figures and tables, providing a visual representation of the observed disparities. We believe that this research topic is both intellectually stimulating and of great significance in the context of natural language generation and understanding.

## 2 BACKGROUND

### 2.1 Contrasting Linguistic Patterns in Human and LLM-Generated Text

This paper[5] delves into the research methodologies employed by authors to examine distinctions between human-generated texts and those generated by language models, with a specific focus on syntactic and semantic aspects. The authors explore various investigation approaches, including sentence length, vocabulary richness, and emotional expression, among others. The insights presented in this paper are of paramount importance in guiding our own research methodology on similar topics.

### 2.2 Transformer models for text-based emotion detection: a review of BERT-based approaches

The paper[1] is about transformer models for text-based emotion detection, which is a sub-branch of sentiment analysis that focuses on extracting fine-grained emotions from written texts. The paper reviews some of the recent works that use transformer-based models, such as BERT and its variants, to achieve state-of-the-art results in various emotion detection tasks. The paper also discusses the strengths and weaknesses of these models, the datasets used, and the future research directions in the field.

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Authors' address: Group3: Jialin Gan; Yizhou Li; Zhuoxi Wang; Zihui Jiang.

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### 2.3 Differentiate ChatGPT-generated and Human-written Medical Texts

Liao et al.[4] focused on analyzing the linguistic differences between medical text written by human experts and generated by ChatGPT in many aspects, including vocabulary and sentence feature analysis, part-of-speech (POS) analysis, dependency parsing, sentiment analysis, and text perplexity. Besides, they designed machine learning algorithms to detect medical texts generated by ChatGPT. The results show that medical texts written by humans are more diverse and specific, and the text written by ChatGPT can still be accurately detected by the algorithms.

### 2.4 Machine Generated Text: A Comprehensive Survey of Threat Models and Detection Methods

The document[3] highlights the increasing difficulty in distinguishing machine-generated text from human-authored text. It emphasizes the proliferation of powerful, open-source models and user-friendly tools that make generative models widely accessible. This accessibility, however, is accompanied by potential abuses, necessitating the development of effective detection methods for machine-generated text. These detection methods are crucial for mitigating the misuse of NLG models and ensuring their trustworthiness, robustness, and accountability

### 2.5 One-Class Learning for AI- Generated Essay Detection

In this paper written by Roberto Corizzo et al.[2], it proposes a method for detecting AI-generated essays using linguistic features and one-class learning models. The paper uses two datasets of essays written by L2 English and Spanish learners, and their AI-generated counterparts produced by ChatGPT. The paper evaluates the performance of different one-class models and feature sets on the essay detection task and finds that readability features are the most effective for both languages. It also discusses the challenges and implications of detecting AI-generated essays in academic settings and suggests directions for future research.

## 3 DATASET

We construct two datasets to analyze the difference between human-generated news and machine-generated news.

- Human-generated dataset: The original dataset, sourced from the New York Times, comprises news covering various topics, such as politics, business, sports et al. We retrieve news from the New York Times API and mainly focus on the abstract, headline, and leading paragraph.
- Machine-generated dataset: The synthetic dataset will be based on the human writing news headlines and the abstract of the news. The generated data will rely on the news published strictly after the release date of the models utilized in this project.

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