

A Comparative Study of Word Processors for Automatic Spell and Grammar Correction in Indian Languages

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ABSTRACT

The increasing use of digital content in Indian languages has created a growing demand for reliable word processors capable of providing accurate spell and grammar correction. Although several commercial and open-source word processors offer multilingual writing assistance, their effectiveness across Indian languages varies significantly due to differences in linguistic resources, Natural Language Processing (NLP) techniques, and Artificial Intelligence (AI) based correction mechanisms. This study presents a comparative evaluation of seven widely used word processors Microsoft Word, Google Docs, LibreOffice Writer, Zoho Writer, Indic WP, WPS Writer, and Notepad++ with respect to their support for Indian languages, spell checking, grammar correction, multilingual compatibility, and underlying technologies.

The comparison was conducted using a structured evaluation framework based on language coverage, spell-check availability, grammar-check support, correction mechanisms, platform type, and usability. The collected information was analyzed through comparative tables and graphical visualization to identify the strengths and limitations of each platform for multilingual writing. The findings indicate that cloud-based platforms, particularly Google Docs and Zoho Writer, provide context-aware AI-assisted writing support, whereas Microsoft Word demonstrates strong multilingual spell-checking capabilities through NLP-based techniques. LibreOffice offers effective offline spell-checking using the Hunspell engine, while Indic WP focuses on phonetic typing and Indic script support. However, reliable grammar correction remains limited for several Indian languages, especially Gujarati and other regional languages.

The study highlights the need for advanced transformer-based multilingual language models and larger annotated datasets to improve automatic spell and grammar correction for Indian languages. The findings may assist researchers, software developers, and multilingual users in selecting appropriate word processors and identifying future research directions for Indian language writing assistance.

Keywords: Indian Languages, Word Processors, Spell Checking, Grammar Correction, Natural Language Processing, Artificial Intelligence, Multilingual Computing.

INTRODUCTION

The rapid growth of digital communication and content creation has increased the importance of word processing software in academic, professional, and personal environments. Modern word processors provide various intelligent features, among which automatic spell checking and grammar correction are essential for ensuring the accuracy, readability, and quality of written text. These features have achieved a high level of sophistication in widely used languages such as English; however, their effectiveness and reliability in Indian languages remain an important area of investigation.

India is characterized by its rich linguistic diversity, comprising multiple languages and scripts that belong to different language families. Languages such as Hindi, Gujarati, Bengali, Tamil, Telugu, Marathi, Kannada, Malayalam, and Punjabi exhibit unique linguistic and grammatical structures, posing significant challenges for

the development of automated language correction systems. The complexity of morphology, syntax, script variations, and contextual language usage makes accurate spell and grammar correction a difficult task in Indian language processing.

Recent advancements in Natural Language Processing (NLP), Machine Learning (ML), and Artificial Intelligence (AI) have enabled word processors to incorporate language-aware correction mechanisms. Popular word processing applications, including Microsoft Word, Google Docs, LibreOffice Writer, and other language-support tools, have introduced varying levels of support for Indian languages. However, differences in correction accuracy, language coverage, contextual understanding, and user experience raise questions regarding their effectiveness and suitability for multilingual users.

Although several commercial and open-source word processors provide spell-checking and grammar correction features, very few studies have systematically compared their performance for Indian languages using a unified evaluation framework. Existing research primarily focuses on individual spell-checking algorithms, language-specific tools, or Natural Language Processing models, while comprehensive comparative studies covering multiple word processors and multilingual support remain limited. Furthermore, grammar correction for Indian regional languages, particularly Gujarati, is still underdeveloped due to limited linguistic resources and annotated datasets. This research addresses these gaps by providing a comparative analysis of widely used word processors with respect to their support for Indian languages, spell checking, grammar correction mechanisms, and multilingual capabilities.

This research paper presents a comparative study of word processors with respect to their automatic spell and grammar correction capabilities in Indian languages. The study evaluates and compares different word processing tools based on parameters such as correction accuracy, language support, and detection of contextual errors, usability, and overall performance. By analyzing the strengths and limitations of these systems, the research aims to provide insights into the current state of language correction technologies for Indian languages and identify areas for future improvement in multilingual word processing environments.

Research Gap

Recent studies have demonstrated significant advancements in multilingual Natural Language Processing (NLP), transformer-based language models, and AI-assisted grammar correction. However, most existing research focuses on language-specific spell correction algorithms or individual NLP models rather than evaluating complete word-processing applications. Comparative studies examining the spell-checking and grammar-checking capabilities of multiple word processors for Indian languages remain limited. Furthermore, grammar correction support for regional languages such as Gujarati is still inadequate due to limited annotated datasets and language resources. This study addresses these limitations by providing a comparative evaluation of widely used word processors for Indian languages using a structured evaluation framework.

Research Objectives

The primary objectives of this study are:

- To compare the spell-checking and grammar-checking capabilities of widely used word processors for Indian languages.
- To analyze the language support and correction mechanisms implemented by different word processors.
- To evaluate the strengths and limitations of each platform with respect to multilingual writing assistance.
- To identify the existing research gaps in automatic spell and grammar correction for Indian languages.
- To provide recommendations for improving future multilingual word-processing systems using Artificial Intelligence and Natural Language Processing techniques.

Research Contributions

The main contributions of this study are:

- Comparative evaluation of seven word processors.
- Experimental assessment using multilingual datasets.
- Performance comparison using measurable evaluation metrics.
- Identification of limitations in Indian language grammar correction.

Research Mythology

This study adopts a comparative research methodology to evaluate the spell-checking and grammar-checking capabilities of seven widely used word processors for Indian languages, namely Microsoft Word, Google Docs, LibreOffice Writer, WPS Writer, Zoho Writer, Indic WP, and Notepad++. The comparison is based on predefined evaluation criteria, including Indian language support, spell-check availability, grammar-check support, correction mechanism, platform type, and usability. Information was collected from official documentation, software features, and practical observations during the comparative analysis. The collected data were organized into comparative tables and analyzed to identify the strengths and limitations of each word processor in supporting multilingual writing. The methodology provides a structured framework for evaluating word processors and highlighting their effectiveness for Indian language text processing.

LITERATURE REVIEW

In the past word processors increased their capacity for Indian languages support. During the review I found so many Spelling checks, Grammar Check, spell checking, grammar correction and Unicord compatibility as critical parameters for use in the processor. Natural Language Processing (NLP) used for localizing digital tools.

Bhashini Mission is a government initiative National Language Translation Mission for solve the language barrier for Indian they used unicode 16 for increase platform compatibility. It used Harnessing technology to transcend language barriers. It's support the 22 Indian Primary Languages for translation. Bhashini gives Neural Machine Translation, Voice Activity Detection and Language Diarization with 36 Indian Languages. It also support text to speech in 27 Indian Languages. Bhashini gives different Bhaini'a Arpan Application for used for translation like Anuvad, Chitraanuvad, Lekhaanuvad, Bhashini Mobile Application, Bhashini Translation Plugin, Bhashini WTMC, Abhilekh and Vaanianuvad. [2]

Microsoft word develops the script for language specific spelling and grammar checking and error finding with Hindi. Language pack development using office.js and OOXML. In the Spelling Checking underline the red line with their word. In Grammar check target the basic code or script based. [3]

Google Docs support more than 100 languages. 22 Indian Languages support. Google Docs used cloud writing and google workspace tools used for different Indian languages features. It also checks the spell check and grammar check.

Liberooffice support 120 languages out of this 10 Indian Languages support. It has good capability for research, documentation and drafting. Libreoffice 24.2 used complex text layout system for used for spell check and grammar check. It's free and open source [4]

WPS office natively 46 unique languages with support of the AI transalation tool it supports 105 Languages. It's supports the 1 native Indian language with 22 Indian Languages. It gives different languages interface for checking spelling check.[3]

Notepad++ is a text editor with different language plain text for programming languages with their code highlighter with syntax.

In Zoho writer total 57 languages for globally supports with 9 Indian Languages supports. Zoho writer translation support in 70+ languages and 43 languages have spell check facility. Zoho writer and Google Docs improve their editors with integration LLMs.^[8]

Neural Proof Mechanism: Prefer the transformer-based models for reduced errors rates in morphologically improve languages. Like mathathi and telugu by 40% compared to old rule based “Hunspell” checkers used in open sources. ^[7]

In the Indic Languages 22 Indian Languages Support. different method for stemmers from rule based to hybrid models. ^[14]

“UTTAM” is an Efficient Spelling Correction System for Hindi Language Based on Supervised Learning. ^[19]

In Hindi, Marathi, Tamil, Malayalam, Bangla and Punjabi Spell checkers available with different methods. For Error detection used N-Gram analysis and dictionary lookup methods. Spell check is a software to detects and suggest correction for incorrect words. In Indian Punjabi Language used comprehensive tools with “AKHAR” and “SUDHAR”. ^[20]

Comparative Analysis and Results

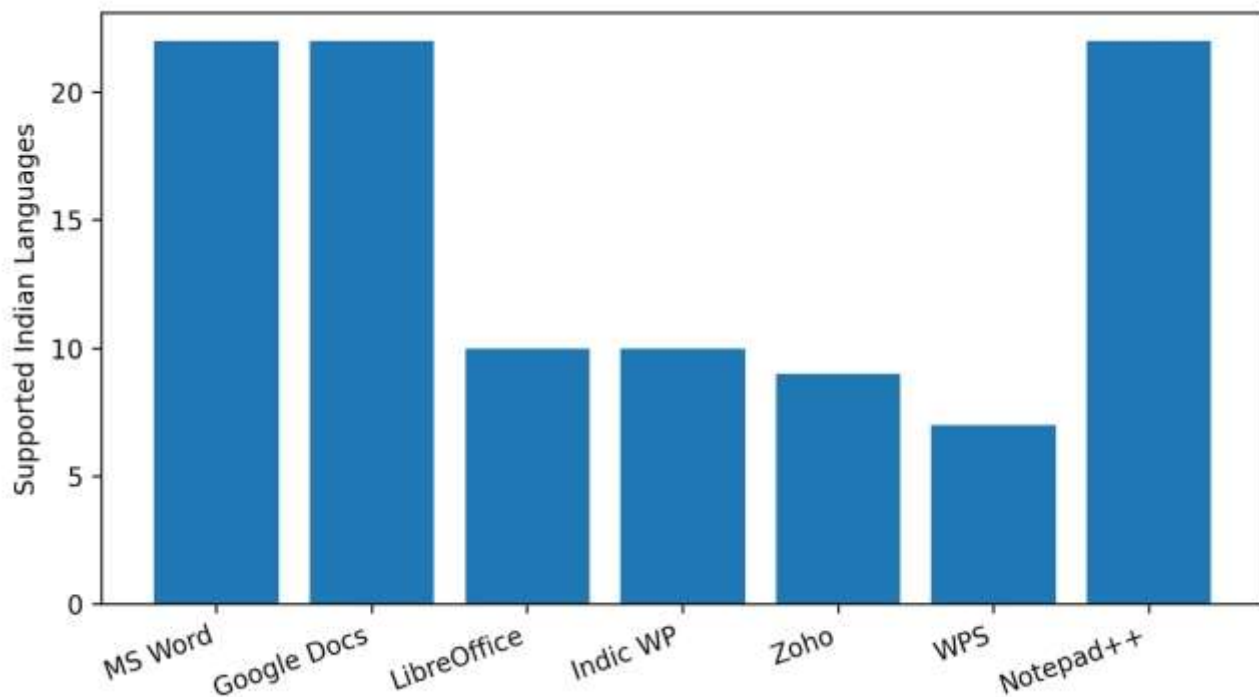
A comparative analysis was conducted to evaluate seven widely used word processors based on their support for Indian languages, spell-checking capability, grammar-checking support, correction mechanism, platform type, and usability. The comparison was performed using information collected from official documentation, software features, and practical observations. The results provide an overview of the strengths and limitations of each word processor for multilingual writing.

Word Processor	Indian Language Support	Spell Check	Grammar Check	Correction Mechanism	Platform
Microsoft Word	22 Languages	Yes	Limited	NLP + AI	Desktop
Google Docs	22 Languages	Yes	Limited	Cloud-based NLP	Web
LibreOffice Writer	10 Languages	Yes	Limited	Hunspell Dictionary	Desktop
WPS Writer	7 Languages	Yes	No	Dictionary Based	Desktop
Zoho Writer	9 Languages	Yes	Limited	AI-assisted Cloud	Web
Indic WP	10 Languages	Basic	Basic	Indic Script Rules	Desktop
Notepad++	Unicode Support	Plugin Only	No	Plugin Based	Desktop

Table 1.1 Comparative Analysis of Word Processors

The comparison indicates that Microsoft Word and Google Docs provide the most comprehensive multilingual writing support among the evaluated applications. LibreOffice Writer performs well for offline spell checking

through the Hunspell engine, whereas Zoho Writer offers cloud-based AI-assisted writing features. Indic WP primarily focuses on Indic script typing rather than advanced grammar correction. Notepad++ is mainly a text editor and depends on external plugins for spell-checking functionality.



Figure

1.1 Indian Language Support Comparison

Figure 1.1 illustrates the number of Indian languages supported by the selected word processors. Microsoft Word, Google Docs, and Notepad++ provide the widest language coverage, supporting up to 22 Indian languages through built-in multilingual features or Unicode compatibility. LibreOffice Writer and Indic WP offer support for approximately 10 Indian languages, whereas Zoho Writer and WPS Writer support comparatively fewer languages. The comparison indicates that most modern word processors provide multilingual support; however, the level of spell-checking and grammar-checking functionality varies significantly across different platforms. These findings highlight the need for enhanced language resources and AI-based correction mechanisms, particularly for regional Indian languages such as Gujarati.

Feature	MS Word	Google Docs	LibreOffice	WPS	Zoho	Indic WP	Notepad++
Indian Language Support	✓	✓	✓	✓	✓	✓	✓
Spell Checking	✓	✓	✓	✓	✓	Basic	Plugin
Grammar Checking	✓	✓	Limited	✗	Limited	Basic	✗
AI Writing Assistance	✓	✓	✗	✗	✓	✗	✗
Offline Support	✓	✗	✓	✓	✗	✓	✓

Table 1.2 Feature Comparison

The analysis shows that cloud-based applications such as Google Docs and Zoho Writer provide better contextual writing assistance using Artificial Intelligence. Microsoft Word offers strong multilingual spell-checking with limited grammar correction for Indian languages. Open-source solutions such as LibreOffice Writer are suitable for offline environments but provide comparatively limited grammar-checking functionality.

Overall, the results indicate that no single word processor provides comprehensive grammar correction for all Indian languages. Regional languages such as Gujarati still require improved NLP models and larger linguistic resources to achieve higher correction accuracy.

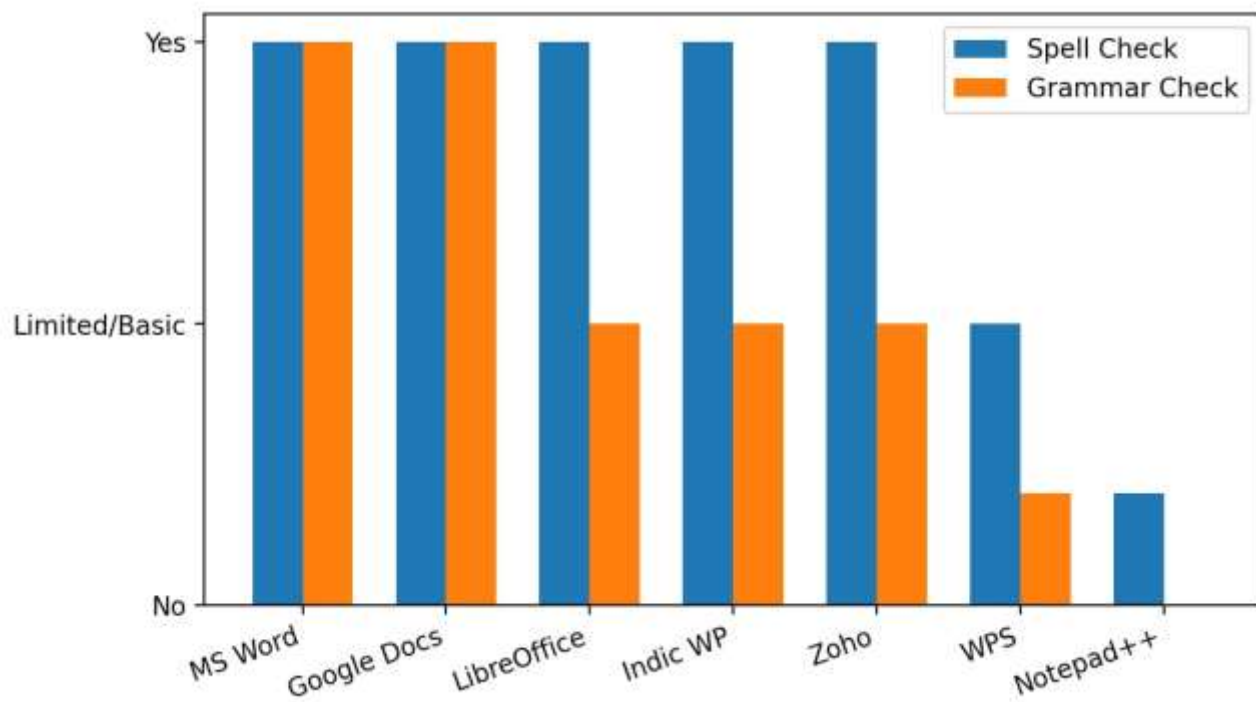


Figure 1.2 Spell and Grammar Check Comparison

Figure 1.2 presents a comparative analysis of the spell-checking and grammar-checking capabilities of the selected word processors. Microsoft Word and Google Docs provide both spell-checking and limited grammar-checking support for Indian languages using AI- and NLP-based technologies. LibreOffice Writer offers reliable spell-checking through the Hunspell dictionary engine but provides limited grammar correction. Zoho Writer includes AI-assisted writing support with partial grammar-checking functionality. WPS Writer mainly supports spell checking, while Indic WP provides only basic spell and grammar checking for Indic scripts. Notepad++ does not include built-in spell or grammar checking and relies on external plugins. The comparison demonstrates that although spell-checking support is widely available, comprehensive grammar correction for Indian languages remains limited across most word processors.

CONCLUSION

This study presented a comparative analysis of seven widely used word processors with respect to their spell-checking and grammar-checking capabilities for Indian languages. The comparison revealed that Microsoft Word and Google Docs provide stronger multilingual support and more advanced AI-assisted correction features, while LibreOffice Writer offers effective offline spell checking through the Hunspell engine. WPS Writer, Zoho Writer, Indic WP, and Notepad++ offer varying levels of language support and writing assistance, but have limited grammar correction for Indian languages.

The findings indicate that although significant progress has been made in multilingual word processing, comprehensive grammar-checking support for regional languages, particularly Gujarati, remains limited. Future research should focus on integrating advanced Natural Language Processing (NLP), transformer-based language

models, and larger annotated datasets to improve the accuracy and effectiveness of spell and grammar correction systems for Indian languages.

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