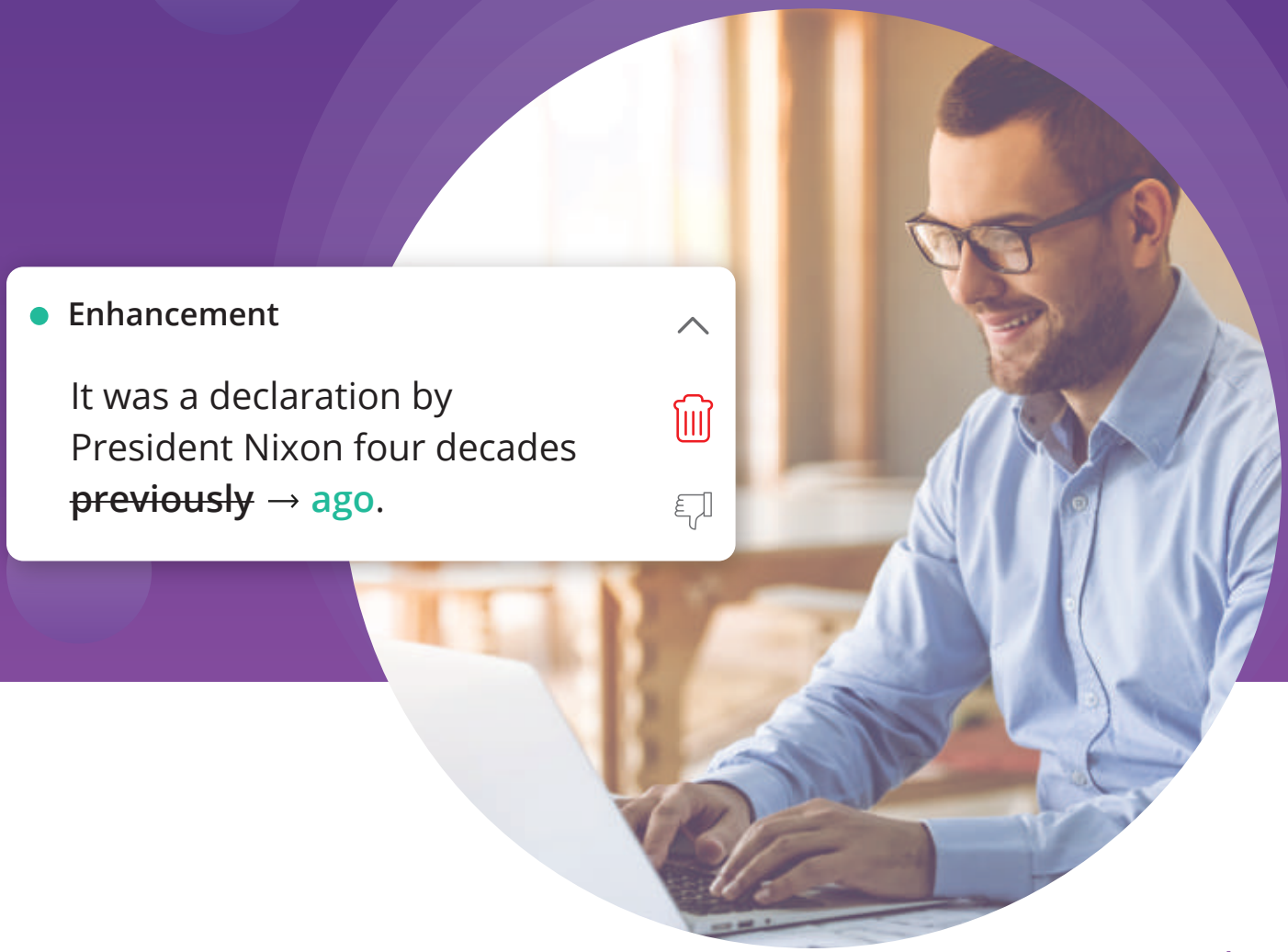
TRINKA

WHITE PAPER

A Comparison of Trinka with Grammarly and LanguageTool on Academic Text



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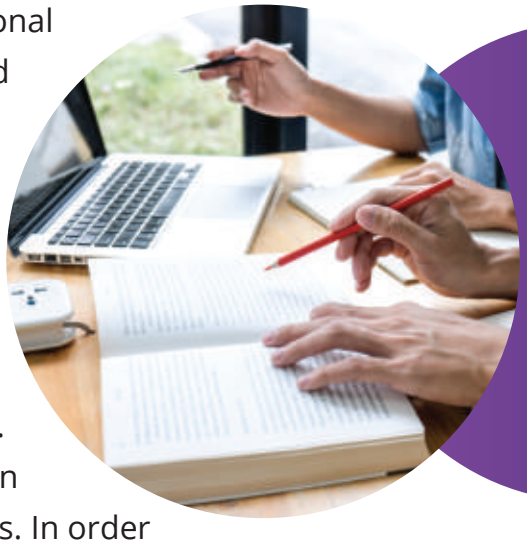
SUMMARY

1. Several grammar checkers are available for general English, but there are very few that specifically focus on academic English writing, terminology, scientific convention, and publication-readiness-related issues.
2. We tested Trinka, an AI-powered academic writing assistant, on 258 sentences from five academic domains. We also compared Trinka with Grammarly Premium and LanguageTool on the same sentences with regard to the accuracy of corrections and the coverage of various language error categories.
3. Our results showed that Trinka's performance on deep language and subject-specific usage and terminology issues is much better than that of Grammarly and LanguageTool.
4. Trinka's performance on grammar and style issues is comparable with that of Grammarly, while LanguageTool did not perform well.
5. Among the three grammar checkers, Trinka is the one that suits academic writing the best because of its fine balance between accuracy and coverage, and its publication-readiness-specific features.

BACKGROUND



English is the language of international communication and the undisputed lingua franca of science communication. Using idiomatic language and standard English grammar is an essential skill assessed in a host of career-oriented activities in academia, business, and education. Good writing skill is especially tied in with a researcher's career prospects. In order to be successful, scientists and researchers who use English as a second language (ESL) or English as an additional language (EAL) are pressured to publish their work in international English journals. On the one hand, they have to grapple with linguistic and cultural issues that hinder the successful publication of their research[1]. The scholarly publishing industry, on the other, is constantly looking for solutions to manage the increasing numbers of submissions and the publication needs of ESL/EAL scholars as well as the perceived bias toward their writing[2,3]. Most often, these researchers approach academic peers, native English-speaking colleagues, or language service companies to make their papers ready for publication.

While there are a plethora of grammar and spellcheckers available for the general writer, there are hardly any that researchers can truly use. Academic writing differs from general writing. Such writing is mainly objective, precise and structured; uses the formal tone; contains domain-specific terms and citations; and is intended for specific academic communities.

Most grammar checkers check spelling at the very least and superficial grammar at the most. However, a simple grammar and spellcheck is not sufficient for a manuscript to be submitted for publication in a journal. There is a strong need for a writing assistant that can not only provide discipline-specific language corrections and enhancements but also help the researcher handle publication-specific requirements such as style guide adherence, consistency checking, and word count limits.

GRAMMAR CHECKERS

Currently, some grammar checkers are present in the market for general text. For example, Grammarly Premium[4] and LanguageTool[5]. Grammarly is a world leading grammar correction application and is the natural candidate to compare with. LanguageTool is a widely adopted, open-source proofreading tool that provides grammar and spelling correction. Although these tools are successful to a varying degree, they are not designed for academic content.

To address this gap, Trinka was developed to improve manuscripts for academic English usage and technical vocabulary, and prepare them for publication. Trinka automatically corrects grammar, spelling, usage, and domain-specific errors, and aims to help scholars communicate their research in English in a clear, concise, and engaging manner.

ANALYSIS

To analyze the correction capability of Trinka and how it differs from other grammar checkers, we compared the performance of Trinka, LanguageTool, and Grammarly on 258 sentences (5778 words) randomly selected from five academic domains (Table 1).

Domain	Sentences (n = 258)	Word count (n = 5778)
Life Sciences	56	1170
Engineering	47	1172
Economics	41	923
Social Sciences & Humanities	57	1540
Medicine	57	973

Table 1. Domain-wise count of sentences and words

We classified the corrections into the following categories: Domain, Grammar, Usage, Spelling, Punctuation, and Style. See Table 2 for the description of each category.

Category	Description
Domain	Technical word choice, scientific convention, symbol use, etc.
Grammar	Noun number, verb forms, subject-verb agreement, articles, etc.
Usage	Word/phrase choice, syntax, redundancy, idiomatic phrases, etc.
Spelling	Typographical errors, confusables
Punctuation	Comma, semicolon, colon, hyphen, etc.
Style	US–UK style spelling and punctuation, capitalization, spacing, etc.

Table 2. Error categories

ANALYSIS

The 258 sentences were edited using the online editors of Grammarly,Trinka, and LanguageTool. The edits were evaluated by a professional academic copyeditor with 12 years of experience. In total, there were 437 errors in the 258 sentences. Table 3 shows the correct and incorrect edits as well as errors that were missed.

System	Correct	Incorrect	Missed
Grammarly	203	52	234
Language Tool	37	7	400
Trinka	223	44	214

Table 3. Count of edits by system

THE RESULT

Our analysis results show that, overall, Trinka and Grammarly covered all the categories shown in Table 2. Trinka made the highest number of corrections in domain, usage, and style, while Grammarly made the most corrections in grammar and punctuation. LanguageTool lagged far behind. The overall accuracy scores for each system were the following: Trinka 51%; Grammarly 46.4%; LanguageTool 8.4%.

Category	Trinka	Grammarly	LanguageTool
Domain	15	3	0
Grammar	77	89	6
Usage	12	4	0
Spelling	9	9	9
Punctuation	22	44	4
Style	58	51	13

Table 4. Category-wise correction count

CORRECTION ANALYSIS OF TRINKA, GRAMMARLY, AND LANGUAGETOOL

Our results indicate that Grammarly and Trinka achieve comparable results in terms of the volume of correct and incorrect edits. So we dug a little deeper to check the nature of the corrections.

Table 4 shows that while Grammarly corrected more grammar, spelling, and punctuation errors than Trinka, Trinka corrected many more domain-related, style, and language usage errors. LanguageTool made very few corrections in all categories. Given below are a few examples of the sentences revised by Trinka. These are sentences that were not corrected by Grammarly or LanguageTool.

Domain

Geology:

Along with giving an overview of oil and gas exploration theories, oil accumulation laws in the ~~Ordos~~ Mesozoic Ordos Basin are discussed. [Technical word choice]

The domain term was incorrectly ordered.

Medicine:

The pre-pathogenic course of ~~novel Covid~~ COVID-19 as well as the risk factors and medical intervention has not yet been determined. [Redundancy]

The term 'novel Covid-19' has been corrected to its official term COVID-19.

Usage

Medicine:

Observing the nutritional status of pregnant women and ~~keeping~~ maintaining their health is important for the success of this venture. [Word/phrase choice]

The word 'keeping' is not idiomatic in the context, so it has been changed to 'maintaining'.

Law:

The present proceeding is an appeal from a judgement of the Federal Magistrates Court ('FMC') of 17th August 2005 dismissing the appellants' applications for review on the basis of the Anshun estoppel. [Word/phrase choice]

The use of 'basis' in place of 'on the basis of' or 'based on' is usually seen in marketing content. Here Trinka replaces it, keeping intact the formal tone of the sentence.

CORRECTION ANALYSIS OF TRINKA, GRAMMARLY, AND LANGUAGETOOL

Grammar

Physics:

Four KB mirrors were pressed on two conical reference cones by ball plungers and then ~~be~~ aligned in the tangential and sagittal directions. [Verb form]

This sentence has one subject and two predicates—"were pressed..." and "be aligned...". They are not grammatically parallel. The revision corrects the predicate.

Engineering:

In modern times it demands more efficient methods for the oil/water and ~~emulsions~~ emulsion separation. [Noun number]

When plural nouns are used to describe other nouns, the singular form is generally used. There are a few exceptions. However, in this sentence, the noun 'emulsions' should have been 'emulsion'.

Physics:

We study metal ionophores for ~~the property of~~ anticancer properties in both in vivo and in vitro cancer. [Syntax]

The phrasing is ungrammatical as the prepositional object is an adjective. The object is usually a noun, pronoun, or an adjective that works as a noun (e.g., the affluent).

Next, we examined the errors that Trinka and Grammarly marked incorrectly or missed altogether (Table 3). We have not considered LanguageTool here due to the small number of edits. We found that just as the nature of corrections was different in the two systems, the type of errors too differed.

Grammarly's top 3 categories for incorrect edits were Articles (11), Word/phrase choice (11), and Syntax (8). The top 3 categories for Trinka were Articles (13), Commas (4), and Noun number (3).

Regarding missed edits, Grammarly's top 3 categories are Articles (38), Word/phrase choice (23), and Commas (14), while those for Trinka are Articles (53), Commas (28), and Noun number (16).

GOING BEYOND GRAMMAR: ACADEMIC WRITING FEATURES IN TRINKA

Apart from grammar checking, both Trinka and Grammarly provide enhancements such as revisions for conciseness, consistency, and formal register. Such enhancements, although not corrections, improve the quality of the writing. In this regard, we found that Trinka provides a greater variety of enhancements not just for the above-mentioned three categories but also for inclusive/unbiased language and style guide adherence. We show a few examples below.

Psychiatry:

~~The study by~~ Menzo et al. found that 15 of 83 patients with Parkinson's disease fulfilled the criteria for anxiety disorder. [Conciseness]

Medicine:

Individuals ~~confined to~~ using a wheelchair cannot board a plane on their own; hence, special procedures and infrastructure are required to enable their travel. [Inclusive/Unbiased language]

In addition to technical terminology, many academic publications follow specific style guides. Such style guides have strict requirements on various aspects of the written text. For example, whether there should be a space before and after a mathematical symbol (e.g., 2+2=4 vs. 2 + 2 = 4), whether a number and its associated unit should be hyphenated when used as a modifier (4 mm strip vs. 4-mm strip), among others. Below, we show an example of a revision based on the American Medical Association (AMA) Manual of Style, 11th edition.

Medicine:

The combination of QT prolongation in the ~~EKG~~ ECG and syncopal attacks resulting from ventricular fibrillation must be regarded as the same genotypic entity. [Abbreviation, AMA Manual of Style, 11th]

CONCLUSION

We tested 258 sentences from five domains on Trinka, Grammarly Premium, and LanguageTool. We found that Trinka is the writing assistant that suits academic writing the best as it is most accurate and covers a wide range of writing issues. It is also best suited for handling journal or book publication requirements, which was not seen in other grammar checkers, thus fulfilling its role as a writing assistant.

Sentences and words can be interpreted in different ways by professional editors, readers from different subject areas, and the general reader. Hence, further evaluation by more assessors from different domains and having different communicative goals is required to reduce any subjectivity in evaluation.

In any machine learning system, there is a known trade-off between recall and precision. Recall is the percentage of correct edits predicted among all the edits made and missed. Precision is the percentage of the number of correct edits from the total edits made. Any adjustment for a higher recall often leads to a negative impact on the precision and vice versa. How well an automated writing assistant treads this fine balance defines the value of the assistant. Our results clearly show that Trinka provides the best balance, be it between its coverage and accuracy or between language and domain error correction. In conclusion, Trinka performed the best among the three grammar checkers and is well attuned to academic and scientific writing across domains.

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