

# Bridging Linguistic Divides - A Cross-Lingual Summarization Dataset for Geography Education

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**Abstract:** *The world is a multilingual tapestry, yet access to information remains largely confined to individual languages. This language divide hinders cross-cultural communication, limits access to diverse perspectives, and impedes the flow of knowledge. Cross-lingual text summarization, the task of generating concise summaries of text in one language for readers of another language, holds the potential to bridge this divide. However, the development of effective cross-lingual summarization models is hampered by the scarcity of high-quality multilingual datasets. To address this challenge, we present a novel dataset for cross-lingual text summarization, consisting of English paragraphs paired with their respective summaries in Hindi and Kannada. This dataset is the first of its kind to provide summaries in two Indian languages, catering to a vast and diverse population. The dataset was carefully constructed to ensure high quality and relevance, with each summary accurately representing the key information and sentiment of the original English paragraph. These models can be applied to various domains, including news summarization, scientific literature review, and educational content adaptation. Moreover, the dataset can be used to create multilingual information access systems, personalised learning materials, and tools for promoting cultural understanding.*

**Keywords:** Text summarization, Cross-lingual summarization, Hindi, Kannada, Dataset, Machine learning, Large Language Models

## 1. Introduction

In the digital age, the relentless proliferation of information and the sheer volume of text data available pose significant challenges for information retrieval and comprehension. One crucial aspect of this challenge is the need for effective text summarization techniques, enabling users to extract the essence of a document without going through its entirety. While there has been considerable progress in text summarization, many existing solutions primarily focus on English, often neglecting languages of equal importance and rich cultural heritage, such as Hindi and Kannada. Our dataset comprises English paragraphs paired with their summarizations in Hindi and Kannada, providing a valuable resource for cross-lingual text summarization.

Multilingual text summarization is a vital area of research due to the increasing diversity of online content and the need for global accessibility. English, Hindi, and Kannada represent a particularly interesting set of languages for such a study. English serves as a lingua franca in international communication, while Hindi and Kannada are two of the most widely spoken languages in India.

Our research paper makes a substantial contribution through the creation of a comprehensive dataset specifically tailored for cross-lingual text summarization. We have meticulously curated and annotated a collection of English paragraphs from the geography books of middle and high school from the NCERT book in India. These paragraphs have been paired with high-quality summarizations in both Hindi and Kannada, ensuring a rich resource for training and evaluating summarization models. Our dataset offers researchers an opportunity to explore and advance the state of the art in multilingual text summarization, addressing the scarcity of such resources for Hindi and Kannada.

In this paper, we outline our research objectives, which include not only the description and analysis of our dataset but also the development and evaluation of a novel multilingual text summarization model. We will discuss the methodology employed, experiments conducted, and the evaluation metrics used to assess the performance of the model. Furthermore, we will present the results of our experiments, demonstrating the effectiveness of our approach in generating high-quality summaries in Hindi and Kannada.

## 2. Literature Survey and Existing Datasets

### 2.1 KanCMD [1]

Language pair	Kannada-English
Number of Tokens	64,997
Vocabulary Size	20,667
Number of Posts	7,671
Number of Sentences	8,472
Average number of Tokens per post	8
Average number of sentences per post	1

Fig. 1. Dataset statistics of KanCMD [1]

The KanCMD dataset is a collection of code-mixed Kannada-English YouTube comments that have been annotated

for sentiment analysis and offensive language detection. The dataset consists of 7,671 comments that were annotated by at least three different people. The annotators showed a high level of agreement, with a Krippendorff's alpha of 0.73 for sentiment analysis and 0.78 for offensive language detection.

To establish a basic benchmark, the researchers used several conventional machine learning algorithms, including Logistic Regression (LR), Support Vector Machine (SVM), Multinomial Naive Bayes (MNB), K-Nearest Neighbors (KNN), Decision Trees (DT), and Random Forest (RF), to perform both sentiment analysis and offensive language detection on the KanCMD dataset.

## 2.2 Hind\_encorp [2]

The Hind\_encorp is a dataset containing English-Hindi pairs whose data comes from the following sources:

1. Tides, which contains 50K sentence pairs taken mainly from news articles. This dataset was originally collected for the DARPA-TIDES surprise-language contest in 2002, later refined at IIIT Hyderabad and provided for the NLP Tools Contest at ICON 2008.
2. Commentaries by Daniel Pipes contain 322 articles in English written by a journalist Daniel Pipes and translated into Hindi.
3. EMILLE. This corpus (Baker et al., 2002) consists of three components: monolingual, parallel and annotated corpora.

The dataset contains the source identifier, alignment type, alignment quality, English and Hindi segments. The segments are delimited with <s> if there are more than one segments in the text field.

## 2.3 WAT 2019 Hindi-English Dataset [3]

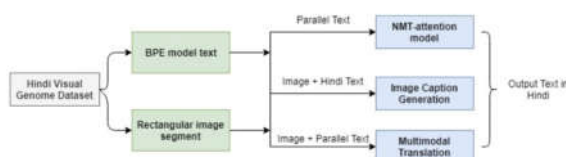


Fig. 2. System Architecture [3]

The WAT 2019 is a dataset that inputs an image, rectangular region in the image and the caption in English. It outputs the caption in Hindi. It contains 32,925 in Text, JPEG file format.

The translation of English to Hindi on the Hindi Visual Genome dataset is done in 3 separate tasks: Using only the text dataset, Using only the image dataset and Using both the text and image dataset. The text dataset is first preprocessed into a Byte Pair Encoding format. The image and description in the HVG dataset are structured in such a format that the caption describes only a selected rectangular portion of the image. Using the processed text data, the translation of English-Hindi is carried out on a neural machine translation open-source tool based on OpenNMT. For generating the caption in Hindi for the processed images, a 4096-dimensional vector generated by the VGG16 for each image is then fed to the RNN Model with BEAM search. In the final task of multimodal translation of English to Hindi, the processed text and image dataset are fed into their model.

## 3. Proposed Methodology

### 3.1 Data Collection

We have curated a dataset that contains paragraphs that are taken from the geography NCERT textbook which is used in middle and high school of CBSE and State board Indian schools. Our decision to draw paragraphs from this authoritative source serves a twofold purpose. First, it guarantees the relevance and accuracy of the content, as it adheres to the prescribed syllabus for geography education. Second, it ensures that the dataset is educationally valuable, as it is derived from a resource used to foster a deeper understanding of geographical principles among students. This alignment with the curriculum makes our dataset particularly suitable for text summarization research aimed at enhancing comprehension and accessibility of educational materials in multiple languages. Our dataset's foundation in the geography NCERT textbook ensures not only its academic integrity but also its potential to facilitate cross-lingual knowledge dissemination in the context of geography education.

### 3.2 Data Preprocessing

Effective cross-lingual summarization relies heavily on robust pre-processing techniques to harmonise diverse textual data. In this section, we outline a series of essential steps undertaken to standardise and optimise the input text column for subsequent cross-lingual summarization tasks, to ensure quality and consistency:

**1. Text Normalisation:** Text normalisation was performed to ensure consistency in the dataset. This included tasks such as converting text to lowercase, removing diacritics, and standardising punctuation marks. By applying these normalisation techniques, we aimed to reduce the variability stemming from differences in text formatting.

**2. Stopword Removal:** Stopwords, commonly occurring words (e.g., 'and', 'the', 'is') that carry little semantic

meaning, were removed from the text. This step was executed to reduce noise in the dataset and focus on content-carrying words crucial for summarization.

**3. Lemmatization or Stemming:** To further normalise the text, lemmatization or stemming techniques were applied. Lemmatization involved reducing words to their base or dictionary form (lemmas), whereas stemming involved reducing words to their root form. This process aimed to consolidate variations of words and improve the summarization quality.

**4. Handling Special Characters and Numerical Values:** Special characters, symbols, and numerical values were handled appropriately, given that the input is derived from a school textbook

These pre-processing steps collectively prepared the input text column, ensuring uniformity, language-specific treatment, and optimal representation for subsequent cross-lingual summarization task

### 3.3 GPT 3.5 Turbo for text summarization

The implementation of the GPT-3.5 model for text summarization entails a meticulous process that extends beyond utilising OpenAI's turbo model. It involves configuring the system as a specialised assistant dedicated to generating concise summaries from educational content.

**Model Configuration:** To operationalize the GPT-3.5 model, we designated a specific role within the system dedicated to text summarization. Leveraging this role, the model processes input text by processing the original content as a prompt. This prompts the model to generate succinct summaries tailored to educational contexts.

**Prompt Engineering Strategies:** In conjunction with model configuration, prompt engineering serves as a critical element in guiding the GPT-3.5 model towards producing contextually relevant summaries. Through carefully crafted prompts that include specific cues regarding the educational material's nature, we guide the model's attention toward extracting salient points for summarization.

**Fine-tuning Techniques:** Recognizing the inherent limitations of the default GPT-3.5 model for educational summarization, we embarked on fine-tuning endeavours. These involved a series of experiments, where we intricately adjusted several critical parameters to optimise the quality and relevance of generated summaries.

#### Additional Fine-tuning Parameters:

- **Learning Rate Adjustment:** Fine-tuning the learning rate played a pivotal role in calibrating the model's adaptability to educational content. By tuning this parameter (e.g., `learning_rate=0.0001`), we guided the model to better comprehend and summarise diverse educational materials.
- **Epoch Iterations:** We meticulously varied the number of training iterations or epochs during fine-tuning to capture nuances in educational content comprehensively. Adjusting epoch iterations (e.g., `epochs=5`) allowed the model to refine its understanding and summarization capabilities over multiple passes through the dataset.
- **Temperature:** By adjusting the temperature parameter, we control the randomness of the generated text. Higher values (e.g., 0.7) introduce more randomness, while lower values (e.g., 0.2) produce more deterministic responses. To ensure that the model provides succinct summaries on a diverse range of topics, a higher temperature value was set for greater randomness.
- **Max\_tokens:** We limit the length of the generated summary by setting the `max_tokens` parameter. This ensures that the summaries remain concise and within the desired length.
- **Top-p (Nucleus Sampling):** By setting the `top-p` parameter (e.g., 0.9), we control the diversity of the generated text. It helps to avoid repetitive or irrelevant information by sampling from a subset of the most likely tokens.
- **Frequency Penalty and Presence Penalty:** These parameters allow us to fine-tune the model's behaviour regarding the repetition and relevance of generated text. By adjusting the penalties (e.g., `frequency_penalty=0.5`, `presence_penalty=1.0`), we encourage the model to generate more unique and contextually relevant summaries.

**Code Implementation:** The code implementation for fine-tuning involved utilising OpenAI's API interface along with custom Python scripts. Leveraging this interface, we meticulously adjusted these parameters within the script, enabling seamless integration of the fine-tuning process into the summarization pipeline. These implementation details encapsulate the comprehensive approach taken to configure, and integrate the GPT-3.5 model for educational text summarization, ensuring its adaptability and efficacy across diverse educational materials.

### 3.4 Text Translation

Employing the Google Translator API for text translation involved a meticulous approach, leveraging its capabilities while fine-tuning parameters to ensure nuanced language conversions. Delving into the intricacies of this API, we optimised its functionalities, refining the translation process to attain a more sophisticated and precise transformation of textual content across languages.

## 4. Dataset

### 4.1 Dataset Description:

The dataset consists of the following data for each frame:

1. **English Text** - Text obtained from the geography NCERT textbook of middle and high school. This is entered manually.
2. **English Summary** - Summarised text of the first column which is done using the GPT 3.5 model without any translation.
3. **Hindi Summary** - Summarised text of the first column which is done using the GPT 3.5 model and then translated to Hindi.
4. **Kannada Summary** - Summarised text of the first column which is done using the GPT 3.5 model and then translated to Kannada.

4.2 Dataset Snippets:

1.

English Text	English Summary
Apart from the stars, planets and satellites, there are numerous tiny bodies which also move around the sun. These bodies are called asteroids. They are found between the orbits of Mars and Jupiter (Figure 1.2). Scientists are of the view that asteroids are parts of a planet which exploded many years back.	Asteroids are small bodies that move around the sun. They are found between the orbits of Mars and Jupiter. Scientists think that asteroids are pieces of a planet that exploded a long time ago.

Fig. 3. Snippet 1 of the dataset - English text and summary

Hindi Summary	Kannada Summary
क्षुद्रग्रह छोटे पिंड हैं जो सूर्य के चारों ओर घूमते हैं। ये मंगल और बृहस्पति की कक्षाओं के बीच पाए जाते हैं। वैज्ञानिकों का मानना है कि क्षुद्रग्रह किसी ग्रह के टुकड़े हैं जिनमें बहुत समय पहले विस्फोट हुआ था।	ಕ್ಷುದ್ರಗ್ರಹಗಳು ಸೂರ್ಯನ ಸುತ್ತ ಚಲಿಸುವ ಸಣ್ಣ ಕಾಯಗಳಾಗಿವೆ. ಅವು ಮಂಗಳ ಮತ್ತು ಗುರು ಗ್ರಹದ ಕಕ್ಷೆಗಳ ನಡುವೆ ಕಂಡುಬರುತ್ತವೆ. ಕ್ಷುದ್ರಗ್ರಹಗಳು ಬಹಳ ಹಿಂದೆಯೇ ಸ್ಫೋಟಗೊಂಡ ಗ್ರಹದ ತುಣುಕುಗಳು ಎಂದು ವಿಜ್ಞಾನಿಗಳು ಭಾವಿಸುತ್ತಾರೆ.

Fig. 4. Snippet 1 of the dataset - Hindi and Kannada summary

2.

English Text	English Summary
You will see that on 21st June, the Northern Hemisphere is tilted towards the sun. The rays of the sun fall directly on the Tropic of Cancer. As a result, these areas receive more heat. The areas near the poles receive less heat as the rays of the sun are slanting. The North Pole is inclined towards the sun and the places beyond the Arctic Circle experience continuous daylight for about six months. Since a large portion of the Northern Hemisphere is getting light from the sun, it is summer in the regions north of the equator. The longest day and the shortest night at these places occur on 21st June. At this time in the Southern Hemisphere all these conditions are reversed. It is winter season there. The nights are longer than the days. This position of the earth is called the Summer Solstice.	On June 21st, the Northern Hemisphere is tilted towards the sun. This means that areas near the Tropic of Cancer receive more heat because the sun's rays fall directly on them. However, areas near the poles receive less heat because the sun's rays are slanting. The North Pole and places beyond the Arctic Circle have continuous daylight for about six months. In these regions north of the equator, it is summer with longer days and shorter nights on June 21st. On the other hand, in the Southern Hemisphere, it is winter with longer nights than days at this time. This position of the earth is called the Summer Solstice.

Fig. 5. Snippet 2 of the dataset - English text and summary

Hindi Summary	Kannada Summary
21 जून को उत्तरी गोलार्ध सूर्य की ओर झुका हुआ होता है। इसका मतलब यह है कि कर्क रेखा के पास के क्षेत्रों में अधिक गर्मी होती है क्योंकि सूर्य की किरणें सीधे उन पर पड़ती हैं। हालाँकि, ध्रुवों के पास के क्षेत्रों में कम गर्मी होती है क्योंकि सूर्य की किरणें तिरछी होती हैं। उत्तरी ध्रुव और आर्कटिक सर्कल से परे स्थानों पर लगभग छह महीने तक लगातार दिन का प्रकाश रहता है। भूमध्य रेखा के उत्तर के इन क्षेत्रों में 21 जून को लंबे दिन और छोटी रातों के साथ गर्मी होती है। दूसरी ओर, दक्षिणी गोलार्ध में इस समय सर्दी होती है और दिन की तुलना में रातें लंबी होती हैं। पृथ्वी की इस स्थिति को ग्रीष्म संक्रांति कहा जाता है।	ಜೂನ್ 21 ರಂದು, ಉತ್ತರ ಗೋಲಾರ್ಧವು ಸೂರ್ಯನ ಕಡೆಗೆ ವಾಲುತ್ತದೆ. ಅಂದರೆ ಕರ್ಕಾಟಕ ಸಂಕ್ರಾಂತಿ ವೃತ್ತದ ಸಮೀಪವಿರುವ ಪ್ರದೇಶಗಳು ಹೆಚ್ಚು ಶಾಖವನ್ನು ಪಡೆಯುತ್ತವೆ ಏಕೆಂದರೆ ಸೂರ್ಯನ ಕಿರಣಗಳು ನೇರವಾಗಿ ಅವುಗಳ ಮೇಲೆ ಬೀಳುತ್ತವೆ. ಆದಾಗ್ಯೂ, ಧ್ರುವಗಳ ಸಮೀಪವಿರುವ ಪ್ರದೇಶಗಳು ಕಡಿಮೆ ಶಾಖವನ್ನು ಪಡೆಯುತ್ತವೆ ಏಕೆಂದರೆ ಸೂರ್ಯನ ಕಿರಣಗಳು ಓರೆಯಾಗಿರುತ್ತವೆ. ಉತ್ತರ ಧ್ರುವ ಮತ್ತು ಆರ್ಕ್ಟಿಕ್ ವೃತ್ತದ ಆಚೆಗಿನ ಸ್ಥಳಗಳು ಸುಮಾರು ಆರು ತಿಂಗಳವರೆಗೆ ನಿರಂತರ ಹಗಲು ಬೆಳಕನ್ನು ಹೊಂದಿರುತ್ತವೆ. ಸಮಭಾಜಕದ ಉತ್ತರದಲ್ಲಿರುವ ಈ ಪ್ರದೇಶಗಳಲ್ಲಿ, ಜೂನ್ 21 ರಂದು ದೀರ್ಘ ಹಗಲುಗಳು ಮತ್ತು ಕಡಿಮೆ ರಾತ್ರಿಗಳೊಂದಿಗೆ ಬೇಸಿಗೆ ಇರುತ್ತದೆ. ಮತ್ತೊಂದೆಡೆ, ದಕ್ಷಿಣ ಗೋಲಾರ್ಧದಲ್ಲಿ, ಈ ಸಮಯದಲ್ಲಿ ಹಗಲುಗಳಿಗಿಂತ ದೀರ್ಘ ರಾತ್ರಿಗಳೊಂದಿಗೆ ಚಳಿಗಾಲವಾಗಿದೆ. ಭೂಮಿಯ ಈ ಸ್ಥಾನವನ್ನು ಬೇಸಿಗೆಯ ಅಯನ ಸಂಕ್ರಾಂತಿ ಎಂದು ಕರೆಯಲಾಗುತ್ತದೆ.

Fig. 6. Snippet 2 of the dataset - Hindi and Kannada summary

3.

English Text	English Summary
Geo thermal energy refers to the heat and electricity produced by using the heat from the interior of the Earth. Geothermal energy exists because, the Earth grows progressively hotter with increasing depth. Where the geothermal gradient is high, high temperatures are found at shallow depths. Groundwater in such areas absorbs heat from the rocks and becomes hot. It is so hot that when it rises to the earth's surface, it turns into steam. This steam is used to drive turbines and generate electricity. There are several hundred hot springs in India, which could be used to generate electricity. Two experimental projects have been set up in India to harness geothermal energy. One is located in the Parvati valley near Manikarn in Himachal Pradesh and the other is located in the Puga Valley, Ladakh.	Geothermal energy is a type of energy that comes from the heat inside the Earth. As we go deeper into the Earth, it gets hotter. In some places where it's really hot near the surface, water absorbs this heat and becomes steam. This steam can be used to make electricity by turning turbines. In India, there are many hot springs that could be used to generate electricity. They have set up two experimental projects in places called Parvati valley and Puga Valley to try using geothermal energy for power.

Fig. 7. Snippet 3 of the dataset - English text and summary



Hindi Summary	Kannada Summary
भूतापीय ऊर्जा एक प्रकार की ऊर्जा है जो पृथ्वी के अंदर की गर्मी से आती है। जैसे-जैसे हम पृथ्वी की गहराई में जाते हैं, यह गर्म होती जाती है। कुछ स्थानों पर जहां सतह के पास बहुत गर्मी होती है, पानी इस गर्मी को अवशोषित कर लेता है और भाप बन जाता है। इस भाप का उपयोग टरबाइनों को घुमाकर बिजली बनाने में किया जा सकता है। भारत में ऐसे कई गर्म झरने हैं जिनका उपयोग बिजली पैदा करने के लिए किया जा सकता है। उन्होंने बिजली के लिए भूतापीय ऊर्जा का उपयोग करने के लिए पार्वती घाटी और पुगा घाटी नामक स्थानों में दो प्रायोगिक परियोजनाएं स्थापित की हैं।	ಭೂಶಾಖದ ಶಕ್ತಿಯು ಭೂಮಿಯೊಳಗಿನ ಶಾಖದಿಂದ ಬರುವ ಒಂದು ರೀತಿಯ ಶಕ್ತಿಯಾಗಿದೆ. ನಾವು ಭೂಮಿಯ ಆಳಕ್ಕೆ ಹೋದಂತೆ, ಅದು ಬಿಸಿಯಾಗುತ್ತದೆ. ಮೇಲ್ಮೈ ಬಳಿ ನಿಜವಾಗಿಯೂ ಬಿಸಿಯಾಗಿರುವ ಕೆಲವು ಸ್ಥಳಗಳಲ್ಲಿ, ನೀರು ಈ ಶಾಖವನ್ನು ಹೀರಿಕೊಳ್ಳುತ್ತದೆ ಮತ್ತು ಉಗಿ ಆಗುತ್ತದೆ. ಈ ಹಬೆಯನ್ನು ಟರ್ಬೈನ್‌ಗಳನ್ನು ತಿರುಗಿಸುವ ಮೂಲಕ ವಿದ್ಯುತ್ ತಯಾರಿಸಲು ಬಳಸಬಹುದು. ಭಾರತದಲ್ಲಿ, ವಿದ್ಯುತ್ ಉತ್ಪಾದಿಸಲು ಬಳಸಬಹುದಾದ ಅನೇಕ ಬಿಸಿನೀರಿನ ಬುಗ್ಗೆಗಳಿವೆ. ಭೂಶಾಖದ ಶಕ್ತಿಯನ್ನು ಶಕ್ತಿಗಾಗಿ ಬಳಸಲು ಪ್ರಯತ್ನಿಸಲು ಅವರು ಪಾರ್ವತಿ ಕಣಿವೆ ಮತ್ತು ಪುಗಾ ಕಣಿವೆ ಎಂಬ ಸ್ಥಳಗಳಲ್ಲಿ ಎರಡು ಪ್ರಾಯೋಗಿಕ ಯೋಜನೆಗಳನ್ನು ಸ್ಥಾಪಿಸಿದ್ದಾರೆ.

Fig. 8. Snippet 3 of the dataset - Hindi and Kannada summary

## 5. Comparison Results

Unlike most existing datasets that are either plain translation from English to Hindi or English to Kannada, our dataset is different in a way that firstly contains cross-lingual summarisation in two languages. This differentiation allows various use cases including in education which promotes learning in regional languages, summarisation of large documents in particular regional languages and enables global accessibility.

By providing summarizations in both Hindi and Kannada, our dataset empowers students in India and other regions where these languages are spoken. It makes high-quality educational content accessible in regional languages, fostering inclusivity and aiding comprehension among learners. Students can now grasp complex geographical concepts more effectively in their native languages, enhancing the educational experience.

In contrast to most datasets in this field which are designed for a specific application or research domain, our dataset's cross-lingual nature broadens its applicability. It can be used for educational purposes, linguistic analysis, summarization research, and more, making it a versatile resource for a wide range of research and development endeavours.

### 5.1 Evaluation of translation through BLEU scores:

BLEU, or the Bilingual Evaluation Understudy, is a score for comparing a candidate translation of text to one or more reference translations. The idea is that the closer the predicted sentence is to the human-generated target sentence, the better it is.

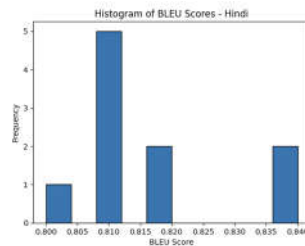


Fig. 9. Histogram of BLEU scores of 10 samples of Hindi translation

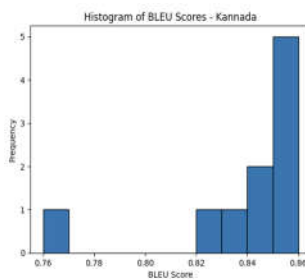


Fig. 10. Histogram of BLEU scores of 10 samples of Kannada translation

### 5.2 Comparisons of various summarisers:

We have compared various summarisation models while keeping in mind various factors such as the domain of interest and informativeness of the summary as shown in Fig. 11.

Models	Evaluation metrics			
	Rouge - 1	Rouge - 2	Rouge - L	chrF
Bart - large	0.30	0.11	0.27	tensor(0.3149)
T5 - base	0.25	0.10	0.23	tensor(0.2249)
Bert	0.21	0.09	0.19	tensor(0.5732)
GPT 3 - Davinci	0.39	0.16	0.35	tensor(0.5297)
GPT 3.5 - Turbo	<b>0.59</b>	<b>0.32</b>	<b>0.54</b>	tensor(0.8020)

Fig. 11. Evaluation and comparison of summarizers

## 6. Applications

- **Revision Material Generation:** This dataset can be used to generate concise and informative revision material in multiple languages, which can be used by students and learners to study and retain information.
- **Multilingual Question-Answering Systems:** Using the cross-lingual summarization dataset, we can develop multilingual question-answering systems that can understand and answer questions in multiple languages.
- **Language-Agnostic Information Retrieval:** The summaries from the dataset can be used to create language-agnostic information retrieval systems that can retrieve relevant information from documents in different languages. This is useful for cross-border collaborations, global research initiatives, and multinational businesses.
- **Language Learning Aids:** Summaries from different texts can be used as language learning aids, providing learners with materials in their native language and corresponding summaries in the language they are learning.
- **Automatic Document Summarization:** Using this dataset, we can create automatic document summarization tools that generate concise summaries in multiple languages. This is helpful for industries that deal with multilingual documents, such as the legal or diplomatic sectors.
- **Cross-Lingual Content Curation:** Platforms and content aggregators aiming to deliver diverse content to multilingual audiences can utilise this dataset for cross-lingual content curation. Summaries can be used to curate and present content in multiple languages, catering to a broader audience base.

## 7. Conclusion

In this research endeavour, we have presented a novel and invaluable dataset designed to revolutionise the field of cross-lingual text summarization. The dataset, comprising paragraphs from the geography NCERT textbook alongside their summarizations in Hindi and Kannada, addresses a critical need for multilingual knowledge dissemination and comprehension. Unlike most existing datasets that focus on plain translation, our dataset offers a distinct advantage through its cross-lingual summarization approach, preserving linguistic nuances, and ensuring the content's educational relevance.

The use of the geography NCERT textbook as the source material also assures a high standard of content quality, promoting accuracy and trustworthiness in the summaries. Beyond its immediate applications in education and research, our dataset paves the way for innovative approaches to cross-lingual text summarization. It offers a versatile tool for linguistic analysis, summarization research, and knowledge dissemination in regional languages.

As we move forward, we anticipate that our dataset will serve as a catalyst for the development of advanced cross-lingual summarization models, fostering global accessibility and enhancing comprehension for learners of diverse linguistic backgrounds. We encourage the research community to explore the possibilities this dataset presents, with the hope that it will lead to transformative advancements in multilingual text summarization and contribute to a more inclusive and interconnected world of knowledge dissemination.

## Acknowledgements

We extend our heartfelt gratitude to the NCERT organisation for their invaluable contribution, providing access to the geography textbook tailored for middle and high school students. This access has been instrumental in the creation of our dataset, and we recognize the pivotal role played by NCERT in making this project a reality. We would also like to express our sincere appreciation to PES University for affording us the opportunity to embark on this project.

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