




# Textual Spotlight Chrome Extension

CS410 Fall 2023 Final Project

Hermann Rösch, Sudeshna Pal & Ahmad Albarqawiz



# Understanding Text Embeddings and Cosine Similarity

- **Process:** AI models or LLMs like GPT analyze the text and map its semantic features to a vector. Each dimension of this vector corresponds to a feature learned by the model from large datasets.
  - **Appearance:** An embedding is essentially a list of numbers. Consider a simple text phrase like "Hello, world!" an AI model might represent this as an embedding like embedding might look like  $[0.23, -1.45, 0.88, \dots]$ . Each number in this vector represents a different aspect or feature of the text as understood by the model.
  - **Functionality:** These embeddings allow the AI models to 'understand' text in mathematical terms, enabling operations like cosine similarity comparison, which would be impossible with raw text.
- 

# Embeddings in Textual Spotlight

- **Embedding Generation:** When a user selects text and an action (explain, summarize, paraphrase), the popup.js script sends the original and AI-processed text to IntelliServer, which uses the chosen AI model to generate embeddings for both the original text and the AI-processed text.
- **Cosine Similarity Calculation:** The matcher.js script then calculates the cosine similarity between these two sets of embeddings; this metric measures the cosine of the angle between two vectors, providing a value between -1 and 1. A value closer to 1 indicates high similarity.
- **Practical Application:** By calculating this score, Textual Spotlight quantitatively evaluates how closely the AI's response matches the original text's meaning; this is particularly useful in assessing the effectiveness and accuracy of the AI model in understanding and processing the user's request.




# Future Improvements

**Integrate additional LLMs:** Expand the range of supported models by incorporating open-source LLMs from Hugging Face and similar platforms.

**Enhance vector similarity accuracy:** Dedicate a third-party model specifically for vector generation to improve relevance scoring and reduce biases inherent in using the same model for both response generation and vector calculation.

**Semantic search functionality:** Intended to allow users to input a query and find semantically related segments in highlighted text using cosine similarity; this feature is considered a potential enhancement to the main usage of the extension.





Thank you  
for watching!

Hermann Rösch — [hrosch2@illinois.edu](mailto:hrosch2@illinois.edu)

Sudeshna Pal — [sp92@illinois.edu](mailto:sp92@illinois.edu)

Ahmad Albarqawi — [ahmada8@illinois.edu](mailto:ahmada8@illinois.edu)

Textual Spotlight — CS410 Fall 2023 Final Project