

# What is ChatGPT and its Present and Future for Artificial Intelligence in Trans-Disciplinary Communications?

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## ABSTRACT

The development of ChatGPT and introduction in November 2022 by OpenAI has generated a turbulence in the conversational Artificial Intelligence (AI) arena with a new technology that generates written answers in response to verbal input as written queries such as that used in Chatbots, AI system conversations, and virtual assistants. All of the references used in this paper are publications in the year 2023. This paper provides a brief introduction to what is ChatGPT and its development, its benefits and limitations, illustration of how ChatGPT works and its future in AI and Trans-Disciplinary Communications such as Trans-AI/DS the transformative transdisciplinary and translational artificial intelligence and data science (DS).

**Keywords:** Artificial Intelligence (AI), ChatGPT, GPT-4, Natural Language Processing (NLP), Neural Networks, Trans-AI/DS, Trans-Disciplinary Communications.

## 1. INTRODUCTION: WHAT IS CHATGPT?

ChatGPT stands for Chat Generative Pre-Trained Transformer and was developed by an AI research company, OpenAI and released in November 2022. It is an artificial intelligence (AI) chatbot technology that can process our natural human language and generate a response.

ChatGPT in its current form seems to perform well in chatbots, language translation, and answering simple questions. But GPT-4 is smarter, can understand images, and process eight times as many words as its predecessor.

Unlike ChatGPT, which accepts only text, GPT-4 accepts prompts composed of both images and text, returning textual responses. As of May 2023, the parameter count of training data is estimated to be 1 trillion when using GPT-4 (Google (2023))

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questions. But GPT-4 is smarter, can understand images, and process eight times as many words as its predecessor.

ChatGPT is based on GPT-3, the third model of the natural language processing project. The technology is a pre-trained, large-scale language model that uses GPT-3 architecture to sift through an immense pool of internet data and sources to reference as its knowledge base. (Entrepreneur, 2023)

**Table 1:** Stages of GPT Model Development

| GPT Model | Release Date  | Distinguishing Features      | Parameter count of Training Data |
|-----------|---------------|------------------------------|----------------------------------|
| GPT-1     | June 2018     | 12-level headed decoder      | 117 million                      |
| GPT-2     | November 2019 | Modified normalization       | 1.5 billion                      |
| GPT-3     | May 2020      | Text only                    | 175 billion                      |
| GPT3.5    | March 2022    | Deep-learning                | 175 billion                      |
| GPT-4     | March 2023    | Audio, Video, Images, & Text | 1 trillion                       |
| ChatGPT   | November 2022 | Fine-tuned                   | 100 trillion                     |

Table 1 is derived from Wikipedia (2023) & Google (2023).

Hunter (2023) provides a comparison of the development speed to reach 1 million users of ChatGPT with that of Netflix, Facebook, and Instagram with statement "ChatGPT took 5 days while Netflix took 41 months, Facebook 10 months, and Instagram 2.5 months".

ChatGPT is not connected to the Internet because it is a priority model owned by Open AI and connection to the Internet could be security risk to its closely guarded secrets. (Natheem (2023), p.7)

Other facts about ChatGPT include: (Entrepreneur, 2023)

(i.) ChatGPT is *large-scale*. It has over 175 billion parameters, making it one of the largest language models ever.

(ii.) ChatGPT is *pre-trained*. The program has a "set it and forget it" quality, meaning all the legwork to make it function has already happened.

(iii.) ChatGPT is *capable of multitasking*. The program has more than one language function, so it can simultaneously juggle translation, summarization and answering questions.

(iv.) ChatGPT *responds in real time*. Like a chatbot you'd find while online shopping, ChatGPT responds very quickly after you ask it a question or complete a task.

### 1.1 Trans-AI/DS

According to Cao (2023), Trans-AI features the “transformative, transdisciplinary and translational AI/DS (Artificial Intelligence/Data Science) in terms of thinking, paradigms, methodologies, technologies, engineering and practices”. Cao (2023) states that “Trans-AI/DS encourages big and outside-the-box thinking beyond the classic AI, data-driven, model-based, statistical, shallow and deep learning hypotheses, methodologies and developments”.

Cao (2023) states that “this new-generation of AI/DS builds on the consilience and universology of science, technology and engineering”, and “Trans-AI/DS pursues foundational and original AI/DS thinking and practices from the essence of intelligence and complexities inherent in humans, nature, society, and their creations”. The theoretical proposition is now how ChatGPT that is a new Artificial Intelligence (AI) tool can be used in Trans-AI/DS that is defined as the “transformative, transdisciplinary and translational artificial intelligence (AI) and data science” tool.

Ramer (2023) response to ChatGPT is that “its successors should be one that encourages open, interdisciplinary discourse and supports research investigating AI from every angle”.

Figure 1 from Cao (2023) illustrates Multidisciplinary AI/DS with Interdisciplinary AI/DS and Transdisciplinary AI/DS noting that both Interdisciplinary AI/DS and Transdisciplinary AI/DS have the intersection of common areas while Multidisciplinary AI/DS does not.

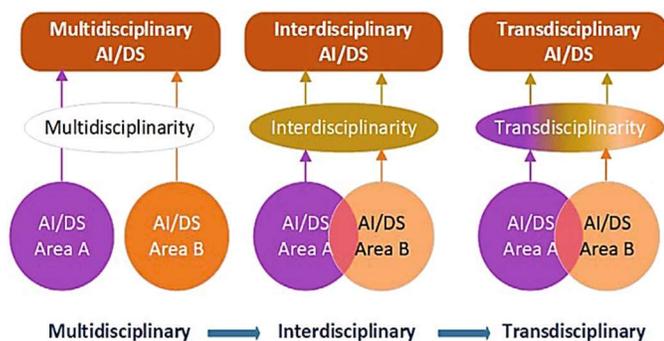


Figure 1: Comparison of Multidisciplinary AI/DS with Interdisciplinary AI/DS with Transdisciplinary AI/DS (Source: Cao (2023); Source: <https://link.springer.com/article/10.1007/s41060-023-00383-y>)

## 2. WHAT ARE THE BENEFITS AND LIMITATIONS OF CHATGPT?

### 2.1 Benefits

ChatGPT Pro (2023) states that the some of the potential applications of ChatGPT include:

- (i.) Text generation of human-like responses to queries.
- (ii.) Translation of Foreign languages.
- (iii.) Generation of summaries of long documents or articles.
- (iv.) Sentiment Analysis of given text such as customer feedback.

Enterprise DNA (2023) add to these benefits by discussing wide domain knowledge and “scalability and adaptability” and including potential applications of ChatGPT to also include (1.) Interactive Gaming and Storytelling, and (2.) education such as generation of quizzes and lesson plans for teachers and study materials for students with subject-specific Tutoring such as generation of practice exam questions.

Willingham (2023) authored an entire article with “ChatGPT can write sermons” in the title. Numerous books and open-source articles have been published in 2023 on “What is ChatGPT and what is it used for” and “ChatGPT: Everything you need to know about the AI-powered chatbot”. These books include those authored by: Adelson (2023), Cooke (2023a), Cooke (2023b), Floyd (2023), Hamilton (2023), Issaacs (2023), Natheem (2023). These articles include those authored by Hern (2023), Pocok (2023), Stringer & Wiggers (2023).

With ChatGPT, you can automate repetitive tasks and improve customer engagement by using AI-powered text-based artificial intelligence. Through the use of natural language processing algorithms, it recognizes and responds to rudimentary questions accurately.

The biggest advantage of ChatGPT is its ability to understand natural language and have a text conversation with people. The system can answer questions about nearly any subject with authority and even understand a customer's intent.

Another major difference is that ChatGPT only has access to information up to 2021, whereas a regular search engine like Google has access to the latest information. So, if you ask the free version of ChatGPT who won the World Cup in 2022, it wouldn't be able to give you a response, but Google would.

The positive side is that students can now get information and brainstorm any time of the day and regardless of their location. The negative side, however, is that critical thinking and making it easier for students to cheat have

been a concern that needs tackling.

## 2.2. Limitations

Enterprise DNA (2023) also discusses limitations of ChatGPT such as “lack of common-sense reasoning” and “incomplete or outdated knowledge” because “the model’s training data goes up to September 2021 and may not have the latest information on some subjects ... and may not every topic or domain comprehensively”.

Thorbecke (2023) discussed in an entire article that one should “not tell anything to a chatbot you want to keep private”. Roose (2023) indicated that “the worst risks are the ones we cannot anticipate”. Metz and Collins (2023) state that GPT-4 is “still flawed” and that the new GPT-4 bot “could not formulate entirely new ideas” and “May generate text that is completely false.”

If you input a long text into ChatGPT and command it to summarize the information, it will do so. You should not expect ChatGPT to summarize full-length novels, but a few pages of text are possible as it can handle up to 4095 tokens. (Entrepreneur, 2023)

## 3. HOW DOES CHATGPT WORK?

According to Wolfram (2023), ChatGPT works from a “linguistic feature space” where the words such as nouns for example might be connected or related. These words may be related as nouns only or to words of other parts of speech such as shown in the following figures from Wolfram (2023, pp. 65-66). Figure 2 located in APPENDIX shows the sentence structure that includes noun phrase, verb phrase, punctuation, and parts of speech such as adjective and noun for the sentence “**The best thing about AI is its ability to learn from experience.**”

Wolfram (2023) discusses how the grammatical structure can be used to define the “parse tree”. According to Wolfram (2023), ChatGPT does not have knowledge of rules but in its training is able to “discover them”. ChatGPT traces out a trajectory in linguistic feature space such as that shown in Figure 3 of APPENDIX from Wolfram (2023) for single words that are all nouns in which the “semantically similar words” are placed nearby. Figure 4 shown in APPENDIX also from Wolfram (2023) shows the words connected to different parts of speech such as nouns, verbs, adjectives, adverbs and pronouns.

Wolfram (2023) discusses and presents additional figures of how ChatGPT works with Feature Spaces when words have more than one meaning and “words nearby in meaning”, as well as “trajectory that a prompt for ChatGPT follows... where at each step we’re picking the word that ChatGPT considers the most probable .... But we can also ask what words can ‘come next’ with what probabilities at a given point”.

Table 2 below is a summary of the necessary steps of how ChatGPT uses huge neural network to generate human-like language.

**Table 2:** Steps describing how ChatGPT works.  
[Created upon reading (Entrepreneur, 2023).]

| STEPS IN ChatGPT PROCESSING                  | ChatGPT ACTIVITY  |
|--|---|
| STEP 1:<br><i>Input Processing</i>           | The human user types commands or questions into ChatGPT’s text bar.                         |
| STEP 2:<br><i>Tokenization</i>               | Program divides into individual words to be analyzed.                                       |
| STEP 3:<br><i>Input Embedding</i>            | Tokenized Text is inputted into Neural Network Transformer.                                 |
| STEP 4:<br><i>Encoder-decoder Attention</i>  | Transformer encodes the text input and generates the distribution for all possible outputs. |
| STEP 5:<br><i>Text Generation and Output</i> | ChatGPT generates output answer and send response to human user.                            |

## 4. CHATGPT IN FUTURE OF ARTIFICIAL INTELLIGENCE (AI)

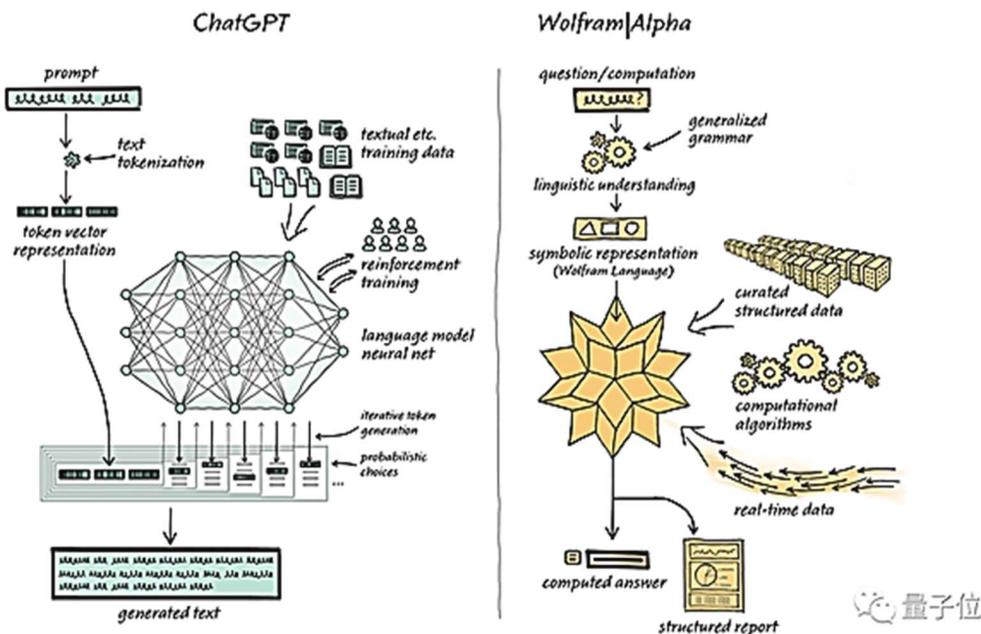
Authors of Edwards (2023), Guichard (2023) and Glover (2023) are each example of discussions of the presence of ChaptGPT in the future of artificial intelligence (AI) and each use the words “AI Race” in their titles. Edwards (2023) uses in title “The AI race heats up” with Google announcement of PaLM2 (Pathways Language Model” as its answer to GPT-4; Guichard (2023) discusses “The AI Arms Race” with Microsoft and Google investing in the future of AI; and Glover (2023) uses in title “ChatGPT will spark an AI arms race between Microsoft, Google, and other tech giants as they rush to capitalize on a \$800 billion market opportunity”. Adelson (2023) wrote an entire book titled “The ChatGPT Goldrush: Profiting from the AI Revolution”.

## 5. CONCLUSIONS & FUTURE DIRECTIONS

Natural Language Processing (NLP) is a subsection of AI dedicated to the interaction between humans and computers using language. Through algorithms and models, NLP can analyze, comprehend and use language with human diction. A neural network is a machine learning algorithm that functions like a human brain. Just as the brain has pathways where information is stored and functions are carried out,

AI uses neural networks to mimic that process to problem-solve, learn patterns and collect data. (Entrepreneur, 2023)

Figure 5 below a comparison of the current ChatPT of 2023 that starts with input of a prompt to a final generated output



**Figure 5:** Comparison of Flow Charts of ChatGPT of 2023 with that of Wolfram|Alpha of 2009 (Source: Wolfram (2023))

It should be noted from Figure 5 that ChatGPT differs from the earlier Wolfram method of 2009 in that ChatGPT uses “text tokenization” and “language model neural network” instead of “generalized grammar” with the “Wolfram symbolic representation”.

The “limitations” of ChatGPT are as stated in its initiation when login at chat.openai.com of:

- (i.) May occasionally generate incorrect information.
- (ii.) May occasionally produce harmful instructions on biased information.
- (iii.) Limited Knowledge of world and events after 2021.

The capabilities of ChatGPT as also stated on sign-up webpage of:

- (i.) Remembers what user said earlier in the conversation.
- (ii.) Allows user to provide follow-up corrections.
- (iii.) Trained to decline inappropriate requests.

Isaacs (2023) discusses different AI tools of Replicka, ChatSonic, LaMDA, Jasper, Chinchilla, Scikit-Learn, TensorFlow, PyTorch, CNTK, Caffe, Apache MXNet, Keras, OpenNN, AutoML, and H<sub>2</sub>O but almost all of these are not conversational AI tools, and those of these that are such as Replica and Jasper have chat interface that is built

of “generated text” with that of the Wolfram|Alpha concept conceived in 2009 for input of a question/computation to the flow chart for steps to generate a final output of a “Structured Report” (Wolfram (2023), pp. 79-81)

on GPT-4, with another remaining of LaMDA created by Google that has 137 billion parameters and is cited by Isaacs (2023) as the “finest of ChatGPT substitutes”.

Isaacs (2023) also discusses the applications of ChatGPT in different fields of sales and marketing, corporate [9communications, customer services, human resources, private finance and investments, at school and university, and for psychologists and coaches. Llano (2023) authored a book dedicated to smart and effective digital marketing with ChatGPT as a practical guide for beginners and experts that includes strategies, tactics, tools and more than 80 prompts that may be a question or statement that describes the task to be performed.

The future applications of ChatGPT and Trans-AI are endless and include those suggested by Muller (2023) for ChatGPT of virtual assistants, real-time translation, medical applications such as in medical diagnosis and treatment, creativity and entertainment such as for creating writing projects and entertainment applications such as writer for books and text generator for video games, and personalized recommendation systems for generation of personalized product suggestions, music recommendations and book recommendations based on individual preferences and behavior and needs of users.

Cao (2023) indicates “the new age of AI/DS is filled with ubiquitous, variational and forward-looking perspectives and opportunities. These will foster unlimited, nonexistent, and slow-to-respond changing orientations and discourses for transformative, transdisciplinary, and translational AI and data science”.

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## APPENDIX

Figure 2, Figure 3 and Figure 4 are shown below in horizontal format for clarity.

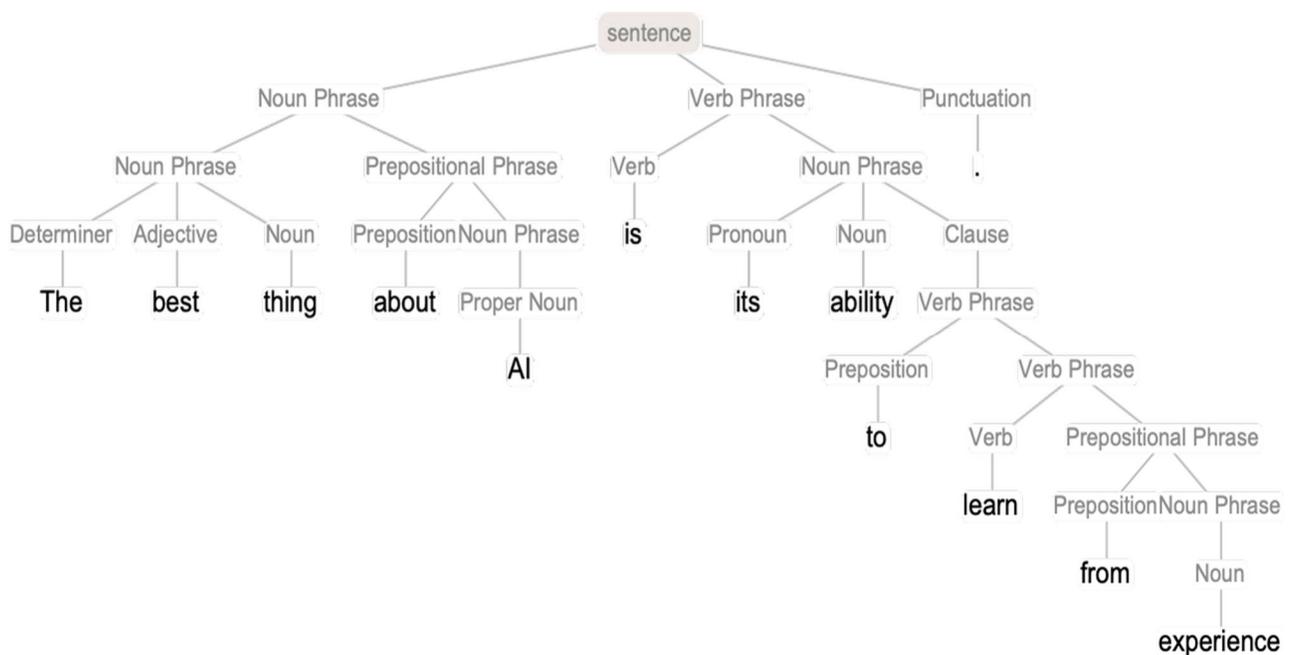


Figure 2: Syntax of Language using Parse Tree (Source: Wolfram (2023, p.60))

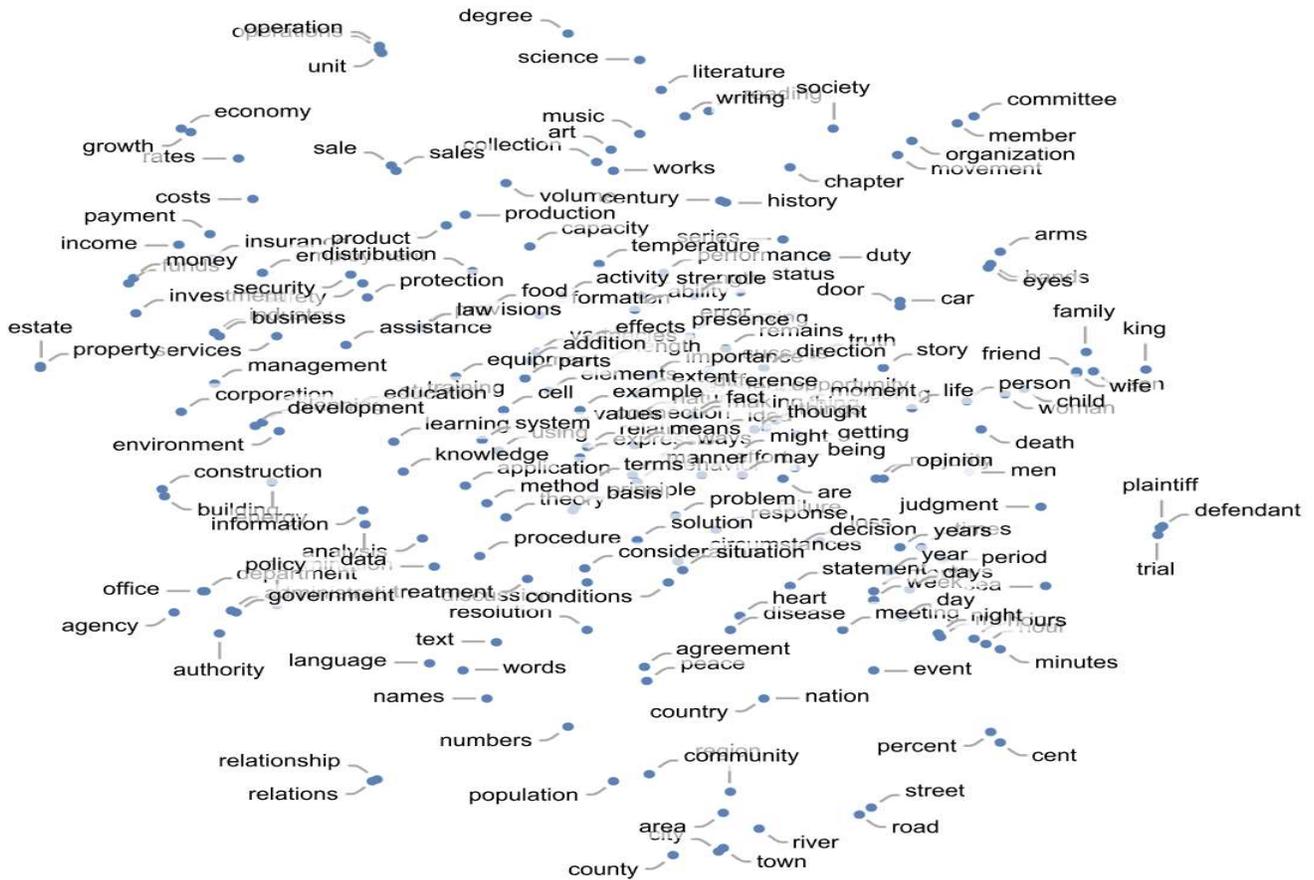


Figure 3: Example of Linguistic Feature Space using Interconnected Nouns only. (Source: Wolfram (2023, p. 65))

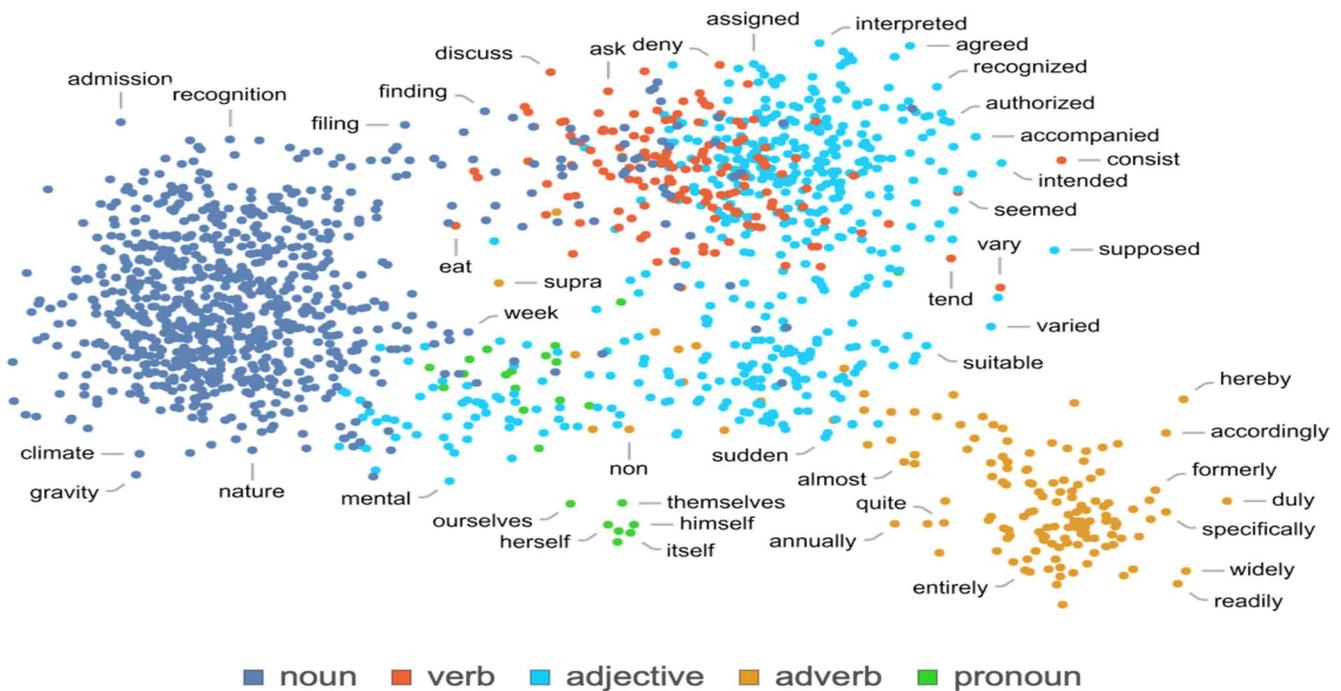


Figure 4: Example of Linguistic Feature Space using Nouns, Verbs, Adjectives, Adverbs and Pronouns. (Source: Wolfram (2023, p. 66))