Psychoanalytic Studies in the Digital Humanities: Employing Topic Modeling with an LLM to Decode Dreams During the Brazilian Pandemic

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Abstract

This paper reports on an interdisciplinary project involving the compilation a corpus of dream reports collected over the period between March of 2020 and March of 2021. The corpus encompasses narratives of images and scenes dreamed during the initial months of intense anxiety of the SARS-Cov-2 pandemic. The pandemic dreams corpus originated in a practicum in psychoanalytic clinic for Psychology majors at University sersidade Federal de Minas Gerais. In response to social distance security requirements, the critical data was compiled through online media. We aim to discuss the possibilities opened by topic modeling as a way to gather insights on a valuable corpus, bridging the gap between different areas to create a digital humanities trans-disciplinary endeavor.

1 Introduction

We report partial findings of an interdisciplinary project involving the compilation and analysis of a corpus of dreams collected over the period between March of 2020 and March of 2021. The corpus encompasses narratives of images and scenes dreamed during the initial months of the SARS-Cov-2 pandemic. The pandemic dreams corpus originated in a practicum in psychoanalytic clinic for Psychology majors at the Universidade Federal de Minas Gerais (Brazil), which moved online in response to social distance security requirements. This particular historical moment established the cultural background in which a set of socially-shared representations might appear as dream imagery, therefore allowing for common references to recur in the highly individual mental activity of dreaming.

This study leverages the topic modeling capabilities of the GPT-3.5 model for the analysis of dreams during the SARS-Cov-2 pandemic. The cutting-edge NLP technology of GPT-3.5, through its topic modelling capabilities, provides a unique opportunity to explore the unconscious mind's response to unprecedented global events, as manifested in dreams. Our research is guided by three pivotal questions: Firstly, we aim to assess the degree of alignment between the GPT-3.5 model's interpretations through topics and the participants' own feelings about the pandemic, as indicated in their responses and the interpretations of their dreams. This comparison seeks to understand the extent to which an AI generated topic is aligned with subjects' dream interpretation and self-reported emotional states.

Secondly, we intend to explore what deeper insights generative AI can uncover about latent feelings embedded within dream narratives. This involves probing beyond the surface level of dream reports to reveal subtler, perhaps unconsciously held emotions and thoughts. Here we will test whether the topic modeling capabilities of GPT-3.5 are particularly suited for this task. Finally, we

are interested in investigating whether the topics generated by the GPT-3.5 model reflect feelings or thoughts that are not explicitly reported by the dreamers. This aspect of the study could reveal the potential of AI in offering alternative perspectives or unearthing hidden dimensions of psychological experiences. Such findings would not only contribute to our understanding of dream analysis in the context of the pandemic but also demonstrate the utility and potential of AI in psychoanalytic research. By addressing these research questions, we aim to bridge the gap between traditional psychoanalytic dream interpretation and modern AI-driven linguistic analysis, offering new insights into the human unconscious under the strain of a global crisis.

2 Theoretical background

For psychoanalysis, dreams are invaluable manifestations of mental life. Such manifestation has a central role in the clinical approach of diverse psychoanalytic schools (Freud, 1997; Khan, 1962; Quinodoz, 2005; Ogden, 2018), and this clinical relevance is equally recognized in research that attempts to bridge the neuroscientific hypothesis that dreaming activity reflects information integrative processing by the sleeping brain and the psychoanalytic viewpoint of dreams as the royal road to the unconscious mind (Fonagy et al., 2018; Zhang and Guo, 2018). Dreams have also been a cornerstone of the development of psychoanalytic theory. The psychological processes of condensation and displacement described as the fundamentals of dreamwork in Sigmund Freud's masterpiece]*The Interpretation of Dreams* (Freud, 1997), which are acknowledged as the primary processes of unconscious functioning, have expanded into key concepts of an overarching theory of mental activity. These concepts account for an array of phenomena that includes slips, jokes, free associations guiding psychoanalysis patients' discourses, and neurotic symptoms (Freud, 1916). All such phenomena play roles both in psychoanalytic therapy and in the Freudian conception of the psychic apparatus.

Dreams are an inherently individual experience. The Freudian approach to dream interpretation departs completely from any sort of listed interpretive keys linking fixed meanings to oneiric images. Instead, this approach focuses on the emergent meanings that derive from analysands' free associations as they tell their dreams in the psychoanalytic setting. This individuated and subjectivity-bound method for interpretation notwithstanding, dream contents can often be nested in shared cultural references. This was fully acknowledged in Freud's presentation of dream theory as a discussion of symbolism in dreamwork (Freud, 1916). The symbolic images and their hypothesized usual meanings discussed in Freud's work are clearly derived from folklore, therefore being construed as borrowings from materials such as traditional chants and widespread sayings. In other words, the symbolic imagery and their somewhat predictable meanings that may be recurrent in dreams by more than one dreamer come from collectively shared discourses belonging to Freud's milieu, images and associated meanings that were passed from individual to individual through language and common parlance.

It should be noted that symbols as relevant components of dreams have long been an anathema for practicing psychoanalysts. Discussion of symbolic meanings is often framed as precisely the type of interpretive key that is stereotypically construed as a dream dictionary, with equations of images (for example, an umbrella) with meanings (for example, evoked sexuality because of analogy with the male erected sexual organ). This type of cliché interpretation of fixed meanings runs counter the core of psychoanalytic dream theory, as well as being at odds with the practice of dream analyses in psychoanalytic clinical work. In both theory and clinical practice, it is the dreamer's associations that spring from the reported dream contents, along with the very fact that that dreamer has chosen to report that dream in the discourse he or she directs to that analyst at that point in the progress of his or her analysis, that are of paramount value for the construal of significance of a dream in a given subject's psychological experience. This has led Freud's chapter-long discussion of dream symbolism (Freud, 1916) to be an often-overlooked theme in present-day psychoanalytic thinking.

Speech and language are inseparable from psychoanalysis as either a theory of the human mental experience and as a clinical method (Forrester, 1980; Arrivé, 1992; Dunker and Kupermann, 2016; Bonfiglio, 2023). Language and linguistic theory are instrumental in Jacques Lacan's contributions to psychoanalysis, especially regarding his critical assessment of post-Freudian trends in psychoanalytic thinking and practices (Lacan et al., 2020). Lacan's proposal that the unconscious is structured as language actually sets psychoanalysis free from

certain commitments to localist understandings of the Freudian psychic apparatus, as expressed by the imaginary conception of the unconscious as some sort of cellar where undesirable or emotionally painful memories are forcefully kept. Within this perspective, the unconscious is an effect of language and its polysemy and ambiguity, of its imposing, inescapable structure but also of its paradoxical inadequacy as a fully transparent means of expression. Language is the sole material of psychoanalysis, as clearly stated by Lacan: "Whether it wishes to be an agent of healing, training, or sounding the depths, psychoanalysis has but one medium: the patient's speech." (Lacan et al., 2020). It is perfectly natural that the grammar of dreams is linguistically bound, as Lacan demonstrates by equating displacement with metonymy and condensation with metaphor.

Cultural and linguistic grounding of dream contents opens the possibility of a rekindled interest in symbolic meanings for psychoanalytic dream theory. We assume that such a renewed interest may depend on studies of large databanks of texts reporting dreams. We further assume that AI generated pattern analysis of texts of dream reports may provide a cognitive model for the recognition of socioculturally motivated references in dreams. The present study aims at probing precisely this hypothesis.

3 Related work

A notable trend in recent studies is the exploration of the pandemic's psychological repercussions, not only on conscious behavior and mental health (e.g. (Borghi et al., 2021; Vindegaard and Benros, 2020), but also on the unconscious processing of these circumstances, as reflected in dreams. In this realm, Natural Language Processing (NLP) emerges as a pivotal tool. By applying NLP techniques to dream narratives, researchers are uncovering the intricate ways in which the pandemic influences our unconscious minds. This approach aligns with the interdisciplinary nature of the present study, marrying psychoanalytic insights with topic modeling and generative AI. For instance, (Mota et al., 2020) employed various NLP techniques, such as the analysis of emotional word proportions within dream reports, verbosity, the presence of anger or sadness-related terms, and semantic similarities to words like "contamination" and "cleanness." Their study aims to provide insights into the semantic and emotional features of dreams both before and during the pandemic, allowing for a comparison of their dissimilarities. Their findings revealed that pandemic dreams exhibit a higher proportion of words associated with anger and sadness than other words, as well as greater average semantic similarities to terms like "contamination" and "cleanness."

(Šćepanović et al., 2022) investigated whether the content of dreams during the pandemic is consistent with the dreamers' waking experiences. To this end, they used a recurrent neural network designed to extract mentions of any medical conditions and health-related phrases from free-form text. This method is applied to two datasets collected during the pandemic: 2888 dream reports (reflecting dreaming life experiences) and 57 million tweets (representing waking life experiences) that mentioned the pandemic. The common health expressions found in both sets predominantly revolved around typical COVID-19 symptoms, such as cough, fever, and anxiety. This observation suggested that dreams indeed mirrored people's real-world encounters.

More recently, (Barrett, 2023) employed a deep learning algorithm to distinguish between discussions about COVID-19 in waking life conversations and dreams reported during the pandemic. These studies collectively highlight the efficacy of NLP techniques in aiding researchers and mental health professionals in comprehending the unconscious processes that unfold during crises like the COVID-19 pandemic. Moreover, they serve as valuable tools for testing hypotheses, including Freud's day-residue hypothesis, which posits that elements experienced during the preceding days can be identified through careful scrutiny of dreams.

However, to the best of our knowledge, this paper represents a pioneering effort to investigate the insights that topic modeling using generative AI can provide for understanding the underlying emotions at play during the pandemic by analyzing dream reports. Below we report our methodological approach.

4 Methodology

4.1 Collecting dreams during COVID-19 Pandemic

The data was collected by groups of researchers from the universities UFMG, USP and UFRGS. The collection resulted in a database with 1158 dream narratives. The collection was carried out

through a written form, with open-ended questions with no character limit for the dream-related fields, and closed questions regarding each participant's experience with the pandemic in general, as well as basic demographic information (e.g., race, gender, age, occupation, etc.)

The form contained 4 open-ended questions about the dream, described by the following requests: (1) *Report your dream. Try to tell what you remember. Write freely*; (2) *Do you remember anything you thought, saw, heard, read, and/or experienced on the day(s) before the night of the dream that may be related to the dream and that you think is important to report?*; (3) *Try to jot down what is going through your mind right now, even if it is unrelated to the dream*; (4) *How do you understand, interpret, or explain this dream?*

The theoretical foundation for each of these questions is as follows: given the deterministic nature of the unconscious and the dream as a less indirect access to the unconscious, the meaning of the dream is contained not only in the dreamer's own report (1) but also depends on what Freud called "day residues" (Freud, 1997) (2) or memories and post-dream free associations. Additionally, we added a question guided by the ethics of psychoanalysis, according to which the dreamer is also the interpreter of their own dream (3). In addition to these long-text open-ended questions (narrative or descriptive), each participant was asked to describe their thoughts or feelings about the pandemic in 3 to 5 words (question: *Write down 3-5 words that describe your thoughts or feelings related to the pandemic*). The idea behind this request was to detect conscious thoughts or feelings of the subjects, in order to verify their correlation or not with the content of the dreams. Finally, various questions about the dreamer's life context were added, covering aspects such as whether the city they live in was in isolation or quarantine measures; to what extent the pandemic has affected the dreamer's routine; whether the participant works in essential services related to the pandemic; whether the participant or someone close was infected by the Sars-COV-2 virus; if there was any loss of relatives and friends, and so on. Additionally, in the following year, questions about vaccination were added. Among the participants, their gender is distributed as follows: 893 identify as female, 233 as male and 33 did not answer. The ages of participants range from 12 up to 73 years old, with a mean value of 33. Most participants (42%) are between 20 and 30 years old.

We exemplify our corpus by reproducing two narratives below (translated by the authors):

1) *I dreamed that I was walking towards my parents' house. It was night, but I could see the street and the cars passing by clearly. I was naked, walking, talking to someone on the phone. This person was asking me for something, and I kept responding in a repetitive manner, "I'm naked in the street, do you know what it's like to be naked in the street? I need to go home, I can't help you." The person on the other end of the line laughed and kept asking for help. I hung up. I kept walking, and then the street that was leading me to my parents' house changed, leading me to my childhood home, also my parents'. I walked, afraid of being recognized and seen naked, until a man managed to locate me. With his gaze, he bothered me, and so, in the dream, I wished that he wouldn't touch me. That's when the dream turned dark, the streetlights turned off, everything turned pitch black, but I was still there, naked, yet calm, because of the impossibility of the man's gaze.* 2) *I was in the center of Belo Horizonte, near my grandmother, who is very active and always crosses the area several times a day. Then I realized I wasn't wearing a mask and no one else was either. Somehow I managed to walk back to Santa Luzia, where my friends and maternal family live. I ended up going towards a quarry with a very large and clean lake that doesn't exist there, where many people were having fun. There were arches and arrows all around the lake, but more on the shore. I entered the lake and my mother was there. I haven't seen her since all of this started and I left home. She asked me, "Why didn't you come back home? Do you want me to die?"*

4.2 Data Preprocessing

As mentioned in the previous section, participants were requested to freely write their dream reports and answers to the questions using an online form. As a result, these reports may contain non-standard words, including abbreviations, acronyms, slang, and unconventional orthography and punctuation. To address these potential challenges, we utilized the Python library ENELVO (Bertaglia and Nunes, 2016), designed for normalizing noisy words present in user-generated Portuguese content. This software utilizes data from a word embedding model to identify the appropriate standard Portuguese word to replace the noisy ones. Additionally, all numerical values written as digits were

omitted. For the analysis detailed in this paper, we opted to retain punctuation and stop words, enabling a more comprehensive analysis of the entire dream report by the AI tool.

This exact pipeline was applied to all columns in our collected dataset, meaning that the dream reports, interpretations and other responses were all submitted to the same transformations.

4.3 Topic Modeling Using Generative Pre-trained Transformers

This study employs a Large Language Model (LLM) for the task of topic modeling, specifically using the GPT-3.5 (text-davinci-003) model accessed via the OpenAI Python library which facilitated interaction with the GPT-3.5 model. A critical parameter in our methodology is the 'temperature' setting, which governs the model's generative creativity and the diversity of the resultant text. A high temperature parameter, such as 1.5, results in text that is varied and inventive. Conversely, a lower temperature (e.g. 0.5) yields text that is more predictable and concentrated. Our aim was to generate deterministically relevant topics; thus, the temperature was set at 0.5 to mitigate the risk of deriving extraneous topics.

We processed 1158 dream narratives through the model, instructing it to identify a single, distinct topic for each dream. The prompt was phrased as follows:

"I am presenting you with a dream description from the COVID-19 pandemic. Identify, in one word, the broader category or the high-level topic of this dream. Please respond in Brazilian Portuguese."

Using this method, the GPT-3.5 model generated 324 unique topics. The most frequent topic, found in 204 out of 1158 dream narratives, was 'fear' (Portuguese: "medo"). Owing to its prevalence, we focused our analysis on the narratives categorized under "fear". This focus allowed us to explore if the model's topic of 'fear' accurately reflects the participants' emotional responses to their dreams when requested to answer the question *Write down from 3 a 5 words that better describe your thoughts or feelings related to the pandemic*. Furthermore, we extended our analysis by prompting the model to assign topics to the participants' interpretations of their dreams when they answered the question *How do you understand, interpret, or explain this dream?*. This step aimed to determine if the model consistently identified 'fear' or related topics in the participants' own interpretations, thereby ascertaining whether the topic of 'fear' emerged from the model's interpretation of unconscious sentiments rather than mere keyword detection.

This comparative analysis was crucial in determining if the 'fear' topic assigned by the model represented an underlying emotion not explicitly expressed by participants when describing their dream-related feelings. Additionally, it allows us to investigate the model's capability to uncover latent topics implicit within the dreams that were not explicitly identified by participants.

With this methodology, we aim to answer the following research questions:

- What is the degree of agreement and disagreement of the GPT model regarding participants' feelings about the pandemic ?
- What is the degree of agreement and disagreement of the GPT model regarding participants' interpretation of their dreams?
- What insights can the GPT reveal about latent feelings in dreams?
- Is the model capable of uncovering feelings or thoughts not explicitly reported by dreamers?

5 Results

As described in our methodology, GPT-3.5 model was employed to relate each dream report to a topic. 324 unique topics were assigned. Table 1 reports the five most frequent topics.

Topic	**# of occurrences**
Fear	204
Nightmare	30
Anxiety	27
Pandemic	23
Travel	20

Table 1: Top five topics assigned by GPT-3.5

In order to investigate the degree of agreement and disagreement of the GPT's topic regarding participants' feelings we analyzed participants' answers to the question *Write from 3 to 5 words that better describe your thoughts or feelings related to the pandemic*, i.e., the key words that the participants employed to describe how they feel about the pandemics, results show that the word *fear*

("medo") is the most frequent. Table 2 presents the five top frequent words in column (W).

Portuguese	English	# of occurrences
Medo	Fear	432
Ansiedade	Anxiety	257
Tristeza	Sadness	176
Angústia	Anguish	171
Incerteza	Uncertainty	90

Table 2: Most frequent words used by participants to describe their thoughts and feelings related to the pandemic

We restrain our analysis to the prevalent topic, by filtering our dataset to keep only the dreams under the topic 'fear'. Our objective was to explore the extent to which the model's most frequently assigned topic, which encompasses an emotional description ('fear'), aligns with participants' reported feelings. Specifically, we aimed to gauge the level of agreement between the model's identified topic, centered on the topic fear, and the participants' self-reported experiences expressed through keywords. Additionally, we investigated whether the narratives labeled as 'fear' by the model were explicitly linked to the word 'fear' within the dream narratives or whether they represented implicit inferences made by the model.

Our results show that, among the 204 corresponding dream narratives whose assigned topic was fear, we observe that only 26% contain the word fear explicitly, and only 33% of participants' interpretations in key words employed this word. Consequently, there was agreement between the model and participants in only 33% of the dataset.

Next, we investigated whether the reports and interpretations contained words in the same semantic field of 'fear'. To this end, we created the following list of Portuguese words: *angústia, pavor, terror, temor, amedrontado, assustado, apavorado, aterrorizado, amedrontado*, which can be approximately translated as *anguish, dread, terror, fear, intimidated, scared, horrified, terrified, frightened*. Results showed again that only 26% of reports contained any of these words. Consequently, it appears that the frequency of the 'fear' topic is not strongly associated with the semantic field of the word "fear."

However, it's worth noting that when considering the entire set of words participants used to describe their pandemic-related thoughts and feelings, 'fear' remained the most frequent word (see 2. This observation led us to hypothesize that the higher frequency of the 'fear' topic could be influenced by the prevalence of the word 'fear' in the overall dataset of dream narratives to which the model was exposed. To further explore this hypothesis, we calculated the frequency of nouns in the entire dataset of dream narratives. 3 shows the results.

Nouns	# of occurrences
Dream	1122
House	966
People	767

Table 3: The most frequent nouns within the corpus of dreams narratives

The results revealed that the three most frequent nouns were "sonho" ('dream') with 1122 occurrences, followed by "casa" ('house') with 966 occurrences, and "pessoas" ('people') with 767 occurrences. Remarkably, the word fear ranked 51st in frequency, with only 185 occurrences. Consequently, it is clear that the contribution of the word 'fear' to the model's frequent assignment of the 'fear' topic is indeed marginal. The model's topic assignment is likely influenced by a range of factors beyond simple word frequency, necessitating further investigation to gain a deeper understanding of its behavior in this context. Interestingly, this finding suggests that the GPT model is capable of inferring the presence of the emotion 'fear' based on the situations described in participants' dream narratives, rather than solely relying on explicit keywords. Further, this finding suggests that the model can identify feelings that are not explicitly mentioned, which prompted us to explore whether the model could align with participants' own interpretations of their dreams as fear.

The rationale behind this additional analysis is the following: if the model consistently assigns the 'fear' topic to participants' interpretations of their dreams, it could potentially serve as a valuable tool for psychologists and psychoanalysts seeking to better understand emotions and thoughts that may not be explicitly articulated in dream narratives or when participants are queried about their feelings and thoughts related to their dreams or situations.

To investigate this, we tasked GPT with assigning topics to participants' interpretations of their

dreams. Once again, the 'fear' topic emerged as the most frequently assigned topic, occurring 24 times out 110 unique topics. When we assessed the level of agreement between the 'fear' topic and participants' interpretation narratives, we observed that 18 participants used the word 'fear' in their dream interpretations, resulting in a substantial agreement rate of 75% between the model's assigned topic and the participants' own interpretations. In addition, we also found that the noun 'fear' was the most frequent noun within the entire set of participants' interpretation narratives.

6 Discussion and conclusions

The results of our analysis offer insights into the relationship between participants' self-reported feelings related to the COVID-19 pandemic and the topics assigned to their dream narratives by the GPT-3.5 model. Our study sought to unravel the complex interplay between the model's topic assignments and the emotional content expressed by participants in both explicit and, especially, implicit ways.

Initially, we observed that the word "fear" stood out as the most frequently employed term when participants described their thoughts or feelings in response to the pandemic. This finding highlights the prominence of fear as a prevailing emotional response during this period, aligning with previous research that has documented how heightened anxiety and apprehension during times of crisis tend to appear symbolically in oneiric activity (e.g.: (Beradt, 2022)).

However, our primary focus was on the 'fear' topic assigned by the model to dream narratives. Despite the word "fear" being a common theme in participants' pandemic-related vocabulary, we noted that the frequency of this word within the entire dataset of dream narratives was marginal, ranking 51st in terms of frequency of occurrence. This raises intriguing questions about the model's behavior in assigning topics. The GPT-3.5 model appears to go beyond simple word frequency when identifying the 'fear' topic within dream narratives, suggesting its capability to infer the presence of symbolic 'fear' based on the contextual dream situations narrated by participants. Furthermore, when we delved into the alignment between the model's 'fear' topic and participants' own interpretations of their dreams as fear, we discovered a notable agreement rate of 75%. This suggests that the model's topic assignment is not only effective at identifying implicit emotions but also tends to converge with participants' subjective understanding of their own dream experiences.

This capability of the model to detect implicit emotions within dream narratives is a noteworthy finding. It implies that the model can identify feelings that are not directly mentioned, therefore being capable of abstracting an effective meaning that is pervasive in a corpus of dream narratives belonging to a given sociocultural context but that is only expressed by discourse as diverse as the highly idiosyncratic and subjective experience of dreaming when translated into text by dreamers. This capability might become a valuable tool for psychoanalysis theorists, and perhaps even to practicing psychoanalysts and clinical psychologists, as it may be a tool to re-address the issue of symbols in Freudian dream interpretation theory. Our observations reveal that emotional colors associated with a given shared context – in other words, a given zeitgeist – might be identified beyond the detection of key words even by an AI digital tool such as the one employed in our study. This finding is relevant for the psychoanalytic theory of dreams because it sheds new light on the concept of symbolic meanings, bypassing the simplistic and definitely non-psychoanalytic view of symbols as merely a collection of dream dictionary entries with fixed meanings, and rather pointing towards an understanding of oneiric symbols and recurrent meanings that emerge out of dreamers lived experience in a given time and place in social history. In this respect, we understand the present study to be an inviting example of the introduction of AI-assisted digital humanities in the theoretical debates of psychoanalysis.

Our study thus highlights the potential utility of GPT-3.5 and similar language models in psychoanalytic, psychological and even neurocognitive dream theory. These models seem to have the capacity to unearth underlying psychological representations, providing a nuanced perspective that may complement traditional self-reporting methods in large scale studies or studies that seek to foster generalized psychic architectures and processes in human dreaming.

However, it is important to acknowledge that there can be critical limitations in our approach. While the model's performance is promising, it may not capture the full richness and subtlety of human emotions. Additionally, further research is

needed to understand the model's behavior with dream narratives from different cultural and linguistic contexts, especially from periods of time not so clearly marked by a collective crisis such as the SARS-Cov-2 pandemic of 2020. It should also be very important to further analyze the model in order to find its possible shortcomings and potential biases. These are issues to be dealt with in further steps of our research.

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