

ADVANCING ADVERSE DRUG EVENT DETECTION IN SOCIAL MEDIA THROUGH KNOWLEDGE GRAPH AND GRAPHRAG LLM ARCHITECTURES

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Key Terms

Background

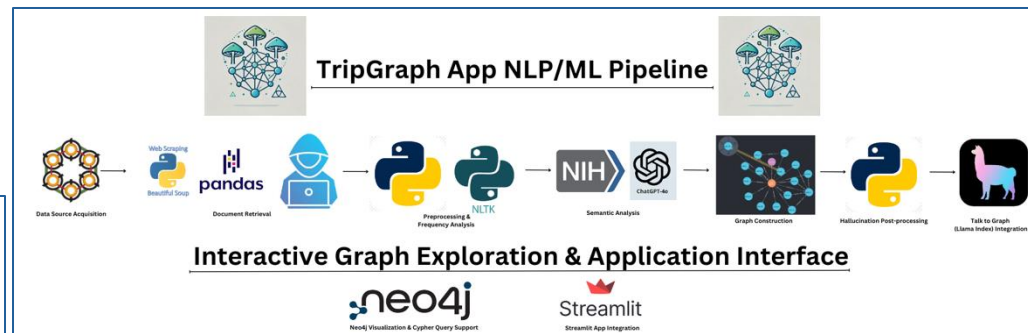
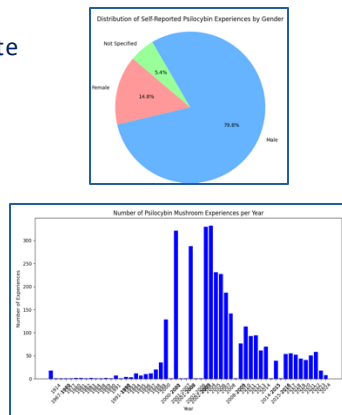
Results

- Psilocybin Mushrooms:** commonly referred to as “magic mushrooms”, have been used by humans for millennia due to their psychoactive compound, psilocybin.
- Knowledge Graphs (KGs):** structured representations of concepts and their interrelations, extracted from large-scale data; enable AI search engines to uncover novel attributes, reason over connections, and facilitate conversational interactions with relevant data entities.
- Erowid:** a leading online resource for psychoactive substances, including psilocybin mushrooms, housing one of the most extensive collections of user-reported drug experiences spanning several decades.

Problem: The resurgence of psilocybin mushroom use, both recreationally and therapeutically, may potentially lead to an increase in adverse drug events (ADEs). However, traditional clinical and pharmacological studies often lack comprehensive first-person data on these experiences, hindering a full understanding of the associated risks and safety profiles.

Solution & Purpose: This study bridges that data gap on ADEs associated with psilocybin mushroom use by leveraging NLP and ML techniques to construct and analyze a KG from 3,270 self-reported experiences on Erowid to gain structured insights into ADEs and their attributes. This approach enhances pharmacovigilance, informing safer psilocybin use practices and contributing to public health strategies.

Materials & Methods



Category	Identified Entities
Co-occurring Drugs	Elizolam, Painkillers, LSD, Trazodone, Vitamin C, OxyContin, Ecstasy, 5-MeO-MIPT, Alprazolam, 2C-I, Valium, Syrian Rue, Coke, Banisteriopsis caapi, Paxil, Acetaminophen, Ketamine, Clonazepam, 2C-B, Alcohol, Caffeine, Diazepam, Codeine, Tramadol, Zyan, Cocaine, Mescaline
Common ADEs	Agitated, Extremely Emotional, Ideal Dose, Regret, Scared, Restless, Loss of Identity, Sadness, Tingle, Slight Paranoia, Dread, Paranoia, Vomited, Hung over for Several Days, Paralyzed, Deathly Feeling, Vomited Violently, Shivering, Cold Chills, Dizziness, Paranoid, Chronic Fatigue, Violent Dreams, High Pitched Ringing, Heavy Lethargy, Motion Sickness, Anxiety
Practical Harm Reduction Strategies	Ensure a Safe Environment, Trusted and Experienced Guide, Low Initial Dose, No Mixing of Substances, Stable Mental and Physical Health, Medical Support Availability
Impact of Location/Setting	Nature Trails/Forests enhance tranquility and nature connection; Parties/Concerts amplify social interaction and sensory experiences; Context significantly impacts mood, perception, and psychological outcomes

Public Health Impacts

KGs trained on high-quality, abundant, unstructured, and user-generated data from people with lived experiences enables real-time interaction with drug surveillance efforts, making event detection efficient, data-driven and actionable across contexts. The following are of direct interest to public health:

- Automated adverse event detection: Querying KGs for increasing reports of negative reactions for certain drugs and drug classes
- Dynamic Drug Interaction Warning Signs: The KGs' relationships between substances can help researchers identify dangerous interactions in real time
- KGs trained on user-generated data from people with a history of drug use can help public health officials track shifting user patterns, including emerging street names

Pursuing KGs and other advanced AI approaches can significantly impact public health drug surveillance in an effort to understand US drug patterns and behaviors while promoting safety, knowledge, and education.

Erowid.org

Psilocybin Mushrooms

Botanical Classification: Family: Strophariaceae, Genus: Psilocybe, Species: cubense, panamense, semibarbatae, Genus: Panaeolus, Species: compactus, subaeratus, ...

Common Names: Shrooms, Magic Mushrooms, Sacred Mushrooms, Trippers

Effects Classification: Psychedelic

Description: There are more than 180 species of mushrooms that contain the psychedelic chemical psilocybin or psilocin. They have a long history of use in Mexico and are currently one of the most popular and commonly available natural psychedelics.

Node properties: entity, elementid: 428819347-28f-4f82-41b-49c04522ea00-41, ridb: 41, entity_type: ADE_EVENT, id: entity_experience_7_0, text: nausea, type: entity

Entity Selection Mode

Choose how to select entities:

- Show All Entities in Current Text
- Use High Priority Entities
- Select All Entity Types

High Priority Entities Selected

Select entity types to explore:

- ADE_EVENT
- ADE_TIMING
- EVENT_LOCATION
- MAIN_DRUG
- COOCCURRING_DRUG
- EXACERBATING_FACTOR

nausea (mention 1)
 due to the now severe case of "nausea" that had been creeping up sin

terrifying emotional roller coaster (mention 2)
 at part of my mind suffered a "terrifying emotional roller coaster" in the tent, beating myself

hysteria (mention 3)
 spring bag alternating between "hysteria" and tears. I saw the red edge

tears (mention 4)
 emanating between hysteria and "tears". I saw the red-edged tent too

total reality loss (mention 5)
 me sapien in the tent. It was "total reality loss". Very simply, I became aware

deja vu (mention 6)
 led to a pure and continuous "deja vu". My terrified ego desperately

awakening (mention 7)
 awakening. Alone in the tent, "awakening" (the belief that only the self

ego-death (mention 8)
 as a terrifying experience of "ego-death", it has been a fundamental fo

clausrophobia (mention 9)
 I had to get out. My sudden "clausrophobia" caused me to jump of my?

I was pulled out of this mind trip however, **approximately an hour after dosing**, due to the now severe case of **nausea** that had been creeping up since the beginning. The acute sensation brought me into a darker, grouchy emotional state as I stalked through the forest looking for a place to throw up. I had stamped about for about ten minutes wondering what to do when my friends appeared on the look out for me. They were also experiencing **nausea** and suggested we go smoke some pot to kill the feeling. It sounded like the best idea to me.

Experience: experience_7

Show Relationships

Entity Legend

- ADE_EVENT (8)
- ADE_TIMING (1)
- EVENT_LOCATION (1)
- MAIN_DRUG (1)
- COOCCURRING_DRUG (1)
- EXACERBATING_FACTOR (1)

All Relationships in Document

- caused_by (0 relationships)
- related_to (4 relationships)
- occur_at (1 relationships)
- combined_with (1 relationships)
- worsened_by (1 relationships)

Chat with your data!

Welcome to the Knowledge Graph Chat!

I can answer questions about the mushroom experiences in our knowledge graph. You can ask about substances, effects, experiences, or anything related to the data.

To get started, please load a knowledge graph index from the sidebar and then ask a question below

Your message:

Sample Questions

- What substances are mentioned in the knowledge graph?
- What is the relationship between dosage and effects?