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Study Tools #1:

ZincBase

Intelligent Systems II

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1.
Introduction

ZincBase is a state of the art **knowledge base** and **complex simulation suite**. It does the following:

- Store and retrieve graph structured data efficiently.
- Provide ways to query the graph, including via bleeding-edge graph neural networks.
- Simulate complex effects playing out across the graph and see how predictions change.

release date

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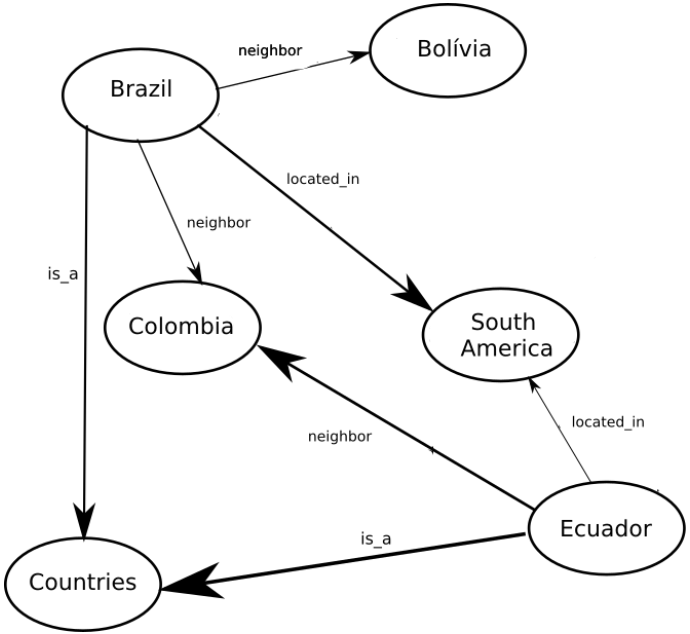
Zb
ZincBase

- What is the probability that Brazil neighbours Ecuador?
- Which countries belong to South America?
- Classify countries location into South America or Europe?
- What happens if South America neighbours Africa? (simulations)



2.
Main features

Efficient storage and retrieval of graph structured data

Querying graphs using neural networks

Probabilities estimations

Machine learning techniques to classify nodes in graphs based on predicate relations (binary and multi-class)

Web UI capable of serving live-updating graphs in 3D to a web browser

3.

Packages

ZincBase Package

The main ZincBase package.

Logic Package

Implements the **Prolog**-like implementation of the knowledge base.

NN Package

Implementation of knowledge graph embedding models using **neural networks**.

Utils Package

Support methods to help on machine learning aspects, string processing and type checks.

Knowledge Base (KB)

KB is where all data related to a specific domain is stored. It serves as the foundation for the system's search and retrieval capabilities.

Knowledge Graph (KG)

KG is a visual representation of the data in the knowledge base. It helps users visualize the relationships between different entities in the domain of interest.

Common and important methods

Method	Definition
from_csv()	Reads a knowledge base into memory from a CSV
build_kg_model()	Build the dictionaries and KGE model.
train_kg_model()	Train a KG model on the KB.
store()	Store a fact/rule in the KB.
query()	Query the KB.
get_nearest_neighbors()	Get the nearest neighbors to entity.
get_most_likely()	Return the k most likely triples to satisfy the input.

4.

Logic Programming

>> Is it possible to integrate Prolog with ZincBase?

The answer is **yes**!

We can easily define Prolog syntax using ZincBase's KB module, as we can see in this image.

An example in python language

```
from zincbase import KB

# define our knowledge base
kb = KB()

kb.store('is(tom, human)')
kb.store('has_part(john, head)')

kb.store('is(X, human) :- has_part(X, head)')

kb.solidify('is')
print(kb.to_triples())
# [('tom', 'is', 'human'), ('john', 'has_part',
'head'), ('john', 'is', 'human')]
```

5.

Demonstration

our code on github here

References

- ZincBase Documentation
- GitHub - complexdb/zincbase: A state of the art knowledge base
- Build Your Own Knowledge Graph With Zincbase
- Chat GPT