

EXPERIMENT NO. 6

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Semester /Section: Semester-V – AIML-V-B (AL-3)
Link to Code: NCU-Lab-Manual-And-End-Semester-Projects/NCU-CSL347-AAIES-Lab_Manual at main · Piyush-Gambhir/NCU-Lab-Manual-And-End-Semester-Projects (github.com)
Date: 16.09.2023
Faculty Signature:
Grade:

Objective(s):

- Understand and study about Triples in a knowledge graph.
- Form triples and implement a knowledge graph from it.

Outcome:

Students will be familiarized with Triples creation and knowledge graph implementation from it.

Problem Statement:

Form triples based on the following paragraph:

"Alice is enrolled in Computer Science 101. Bob is enrolled in Physics 201. Charlie is enrolled in Mathematics 301. Computer Science 101 is taught by Professor Smith. Physics 201 is taught by Professor Johnson. Mathematics 301 is taught by Professor Brown."

Use the above to paragraph extract triples and build a complete graph representing the relationships between students, courses, and instructors in a university setting.

Background Study:

Triples creation involves representing data using three components: subject, predicate, and object, which describe relationships between entities. A knowledge graph is a data structure that utilizes triples to organize and store information in a graph format. It enables efficient storage, retrieval, and analysis of complex relationships, making it valuable for gaining insights and answering questions about interconnected data. Knowledge graphs find applications in various domains, such as AI, recommendation systems, and semantic web technologies, as they facilitate comprehensive knowledge representation and inference.

Question Bank:

1. What is the format of Triples?

The format of Triples in the context of knowledge graphs typically follows the RDF (Resource Description Framework) format, which consists of three parts: Subject, Predicate, and Object. These parts are represented as <Subject, Predicate, Object>. For example, <John, hasAge, 30> represents the triple where John has an age of 30.

2. Explain how triples help in creating a knowledge graph.

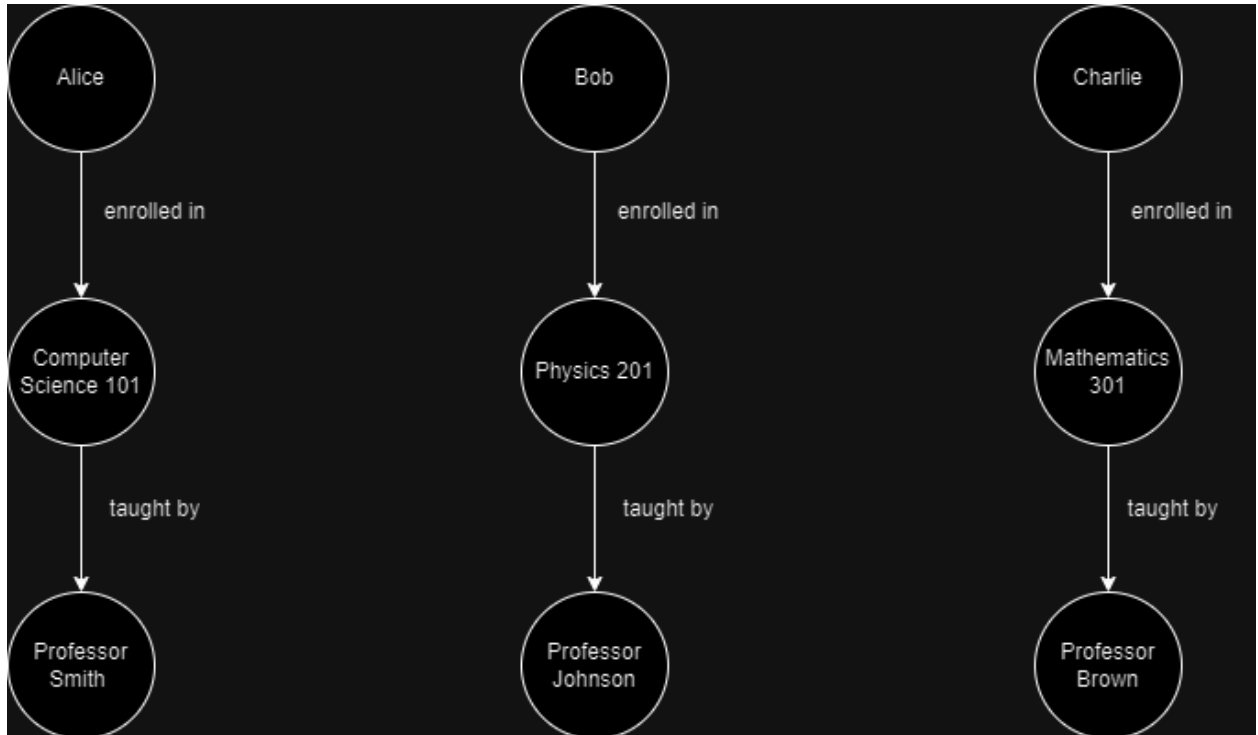
Triples help in creating a knowledge graph by representing structured information in a way that's easily understandable by both humans and machines. Each triple encodes a specific

relationship between a subject and an object using a predicate. When you have many such triples, they can be linked together to form a network of knowledge, where entities and their relationships are interconnected. This graph structure allows for efficient data retrieval, reasoning, and the discovery of new insights from the interconnected information.

Student Work Area

Algorithm/Flowchart/Code/Sample Outputs

Knowledge Graph:



Code:

Experiment 6

Problem Statement

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Code:

```
1 # To plot a networkx graph in pyvis
2 import networkx as nx
3 from pyvis.network import Network
4 from IPython.display import HTML
5 from IPython.display import display, IFrame
6 import matplotlib.pyplot as plt
```

[42] Python

Definition of the Triples

```
1 # Manually define the triples from the paragraph in the subject predicate and object format as a list of tuples
2 triples = [
3     ("Alice", "Computer Science 101", "enrolled_in"),
4     ("Bob", "Physics 201", "enrolled_in"),
5     ("Charlie", "Mathematics 301", "enrolled_in"),
6     ("Computer Science 101", "Professor Smith", "taught_by"),
7     ("Physics 201", "Professor Johnson", "taught_by"),
8     ("Mathematics 301", "Professor Brown", "taught_by")
9 ]
```

[43] Python

Graph Building using Networkx

```
1 # Function to build a NetworkX graph from extracted triples
2 def build_networkx_graph(triples):
3     """
4     Builds a NetworkX graph from a list of subject-predicate-object triples.
5
6     Args:
7         triples (list): A list of extracted triples, each represented as a tuple (subject, predicate, object).
8
9     Returns:
10        networkx.Graph: A NetworkX graph representing relationships between students, courses, and instructors.
11    """
12    # To-Do: Implement the code to build a NetworkX graph from the triples
13    # Initialize an empty NetworkX graph
14    G = nx.Graph()
15    for subj, obj, pred in triples:
16        G.add_edge(subj, obj, label=pred)
17    return G
```

[44] Python

Graph Visualize using Pyvis

```
1 # Function to save the graph as "university_relationship_graph.html" using PyVis
2 def save_graph_pyvis(graph):
3     """
4     Visualizes a NetworkX graph using PyVis and saves it as an HTML file.
5
6     Args:
7         graph (networkx.Graph): The NetworkX graph to be visualized.
8
9     Returns:
10        None
11    """
12    # Create an empty PyVis Network object
13    net = Network(notebook=True)
14
15    # Add nodes and edges to the PyVis graph
16    for node in graph.nodes():
17        net.add_node(node, label=node)
18
19    for edge in graph.edges():
20        net.add_edge(edge[0], edge[1], label=graph[edge[0]][edge[1]]['label'])
21
22    # Save the graph as an HTML file
23    net.show("university_relationship_graph.html")
```

[45] Python

Graph Visualize using Matplotlib

```
1 def draw_graph_matplotlib(graph):
2     plt.figure(figsize=(15, 10))
3     pos = nx.spring_layout(graph, k=1)
4     nx.draw(graph, pos, with_labels=True, node_color='gray', node_size=4000, font_size=10)
5     edge_labels = {(u, v): graph[u][v]['label'] for u, v in graph.edges()}
6     nx.draw_networkx_edge_labels(
7         graph, pos, edge_labels=edge_labels, font_color='red', font_size=10)
8     plt.show()
```

[46]

Python

Output:

✓ Main function to solve the problem

```
1 # Build a graph using the manually defined triples
2 graph = build_networkx_graph(triples)
3
4 # Save the graph using PyVis
5 save_graph_pyvis(graph)
6
7 draw_graph_matplotlib(graph)
```

Python

... Warning: When cdn_resources is 'local' jupyter notebook has issues displaying graphics on chrome/safari. Use cdn_resources='in_line' or cdn_resources='remote' if you have issues view university_relationship_graph.html

