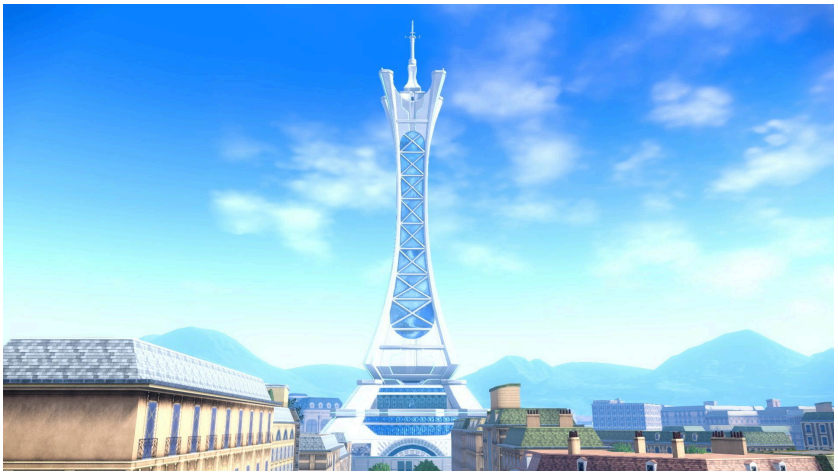
M164 CS2 Knowledge Technologies

Fall 2025-2026
Homework III
Out: *January 6th, 2026*
Due: *February 6th, 2026. There will be no extensions to this deadline.*
Total marks: ***40%***

Knowledge Graph Data Description

In the *Documents* folder on the course's eClass web page (https://eclass.uoa.gr/courses/DI548/) you will find two knowledge graphs for HW3, tagged as *Part 1* and *Part 2* respectively. Load those on your RDF store of choice (as you have done in the previous assignments), but please keep them as separate graphs. Do not combine the two knowledge graphs by loading them in the same RDF data repository.



The Adventure Begins…

In the morning of December 22nd, *Ash Ketchup* and his trusted friend *Pikachu* arrived in the train station of ***Lumiose City***. Exhausted by the long journey, but also excited in the thought of all the adventurers and friends that awaited them in the world famous City of Lights, they quickly made their way to the central plaza (***Centrico Plaza***).
After taking a moment to admire the renowned ***Prism Tower***, Ash exclaimed:
- "*Pikachu, I'm so hungry! We should go and grab something to eat!*".
- "*Pika-pi!*" Pikachu chirped, his tiny paw pointing toward ***Restaurant*** **Le Wow**, a charming corner shop where the windows were piled high with golden-brown croissants (🥐).
With his stomach growling and his appetite ever growing, Ash ran towards the shop's entrance. His eagerness to eat as many pastries as his mouth could fit, was surpassed only by the fear that his companion would get to them first.

nom nom nom nom* eating sounds *nom nom nom nom nom

As Ash was eating his fifth croissant the amused pastry chef said to him:

- “I see that you are indeed very hungry my friend! You must have made quite a trip! But tell me, what are you doing on our beautiful city? Are you here to meet friends or are you more of a lonely traveller?”
*- “My name is Ash Ketchup and I am a Pokemon trainer! My quest is to become the most famous Pokemon trainer in the entire world! But I am not alone, I am accompanied by my best friend… **Pikachu**!”*
…
…
…
“PIKACHU!!!!!????!!!!!” screamed Ash, as he realized that he was indeed alone, because Pikachu was nowhere to be seen.

Instantly, he jumped on his feet and ran outside the restaurant, desperately searching for signs of Pikachu who had vanished so suddenly…

… time for the Assignment!

For this assignment you will be asked to write and execute (Geo)SPARQL queries on a geospatial knowledge graph to reunite Ash with Pikachu. The description of the required queries will be written in *italics* to help guide you towards the solution. In addition, specific knowledge graph nodes and predicates will be given in parentheses to help you write your queries. In your answer sheet you must include both the answer and the (Geo)SPARQL query that produced it.

Keep in mind that we use the following prefix declaration:
PREFIX kg: <http://www.ai.di.uoa.gr/pokemon/>

A) Ash went around the plaza and asked if anyone present saw Pikachu.

1) *Write a query that finds everyone (**kg:Person**) present in Centrico Plaza (**kg:CentricoPlaza**).*
Hint: You must use a geospatial relation to find “people within Centrico Plaza”.
*2) Expand your previous query to also retrieve the information known by every person in Centrico Plaza (**kg:hasInformation**).*

Check your answer: You should have retrieved instances of “kg:Person” where each one has an information string. One of the information strings should include the URI of a police station which will be used in the next query.

B) After having learned all that he could, Ash walked rapidly towards the police station. When he arrived his first thought was to ask if any lost Pokemon had been recently found:

1) Write a query that retrieves every Person or Pokemon present in the police station along with their names. The results are ordered alphabetically on the names retrieved.

Unfortunately Pikachu was not there, so Ash asked a Police Officer that he had known since the very beginning of his journey for help.

*2) Write a query that retrieves the police officer who is present in the police department and who has previously been stationed in a town that borders **Pallet Town** (**kg:PalletTown**).*

How to check your answer: The name of the police officer is Jenny.

C) Police Officer Jenny frowned upon hearing Ash's story. She said:

- "*Sadly, this isn't the first Pokémon abduction in recent times. Time is of the essence! It's highly probable they'll attempt a getaway by car instead of fleeing on foot. Our priority is locating the closest parking area to the kidnapping site".*

Officer Jenny opens a map and starts searching

*1) Write a query to find the 5 parking locations (**kg:Parking**) which are nearest to the place of abduction (Centrico Plaza).*
*2) Write a query to retrieve all clues (**kg:Clue**) that are found in these locations, as well as the location that holds the clue.*
3) Write a query that calculates the number of square meters per clue for each location.

D) Having gathered all the clues, Ash and Officer Jenny knew where to look. The abductors, who fit the description of the infamous Team Rocket, were supposed to go to a nearby town which is bordered by three forests, crossed by a river, its name starts with the letter D and is less than 50km.

1) Write a query that finds this town. Your query should output the URI of the town and its name, nothing else.
Hint: Use the SPARQL function STRSTARTS

E) Having found the destination of the kidnappers, Officer Jenny and Ash hopped on her motorcycle. After a short trip, they arrived at their destination. Immediately after entering the town, they were greeted by Anne, the local Gym Leader. Officer Jenny, who had known Anne for years, introduced her to Ash.

1) Write a query that returns Anne's Pokemon that she has trained to level 60 or higher, have competed in a tournament that took place in a gym whose type is Ice, and is more than 80km away from Anne's current location.

F) After learning why Ash and Officer Jenny had traveled to her town Anne said:

- *“Ash, the suspects you’re describing are at my gym! They said they want to watch the upcoming matches, but they might be planning to snatch other Pokemon too! Let’s run there to catch them and save Pikachu!”*

    1) Write a query that returns the distance between Anne’s current location and her Gym.

    2) Write a query that compares the distance found by the previous query, with the distance between Centrico Plaza and the police department of Lumiose City.

G) When Ash, Officer Jenny and Anne arrived at the gym they came face to face with Team Rocket; Jessie, James and Meowth.
- “*You are late! Hahahahaha! We have snatched all Pokemon in the gym! We are the greatest Pokemon trainers in the world!*”, boasted Meowth.
- “*Correct!! We have trapped the Pokemon in this special Pokeball that can only be opened by answering 6 riddles! You will never save them! Look at your desperate faces. You amuse me. I will even give you a chance, answer these riddles and I will free the Pokemon!*”, Jessie said while laughing maniacally.

*You must now write 6 queries to answer Jessie’s riddles and free the Pokemon. The queries must target the **PART 2** knowledge graph.*

1) Which districts hold a part of Belfast?
2) Is there any river that crosses at least two districts of Northern Ireland?
3) Compute the minimum bounding box of the geometry of Northern Ireland.
4) Which district of Northern Ireland has the most neighbouring districts and how many are its neighbors?
5) Which district intersects with the second largest lake in Northern Ireland?
6) Which of the three largest districts has the most population and what is the population?

After you have answered the riddles, you can see the end of the story in the following link: https://ai-team-uoa.github.io/M164-HW3-CTF-2026/

The passkey to free Pikachu and his friends is the following:
X1 = Number of districts returned by query 1) e.g., *2*
X2 = *YES or NO* depending on the results of query 2)
X3 = First 3 digits of bounding box of query 3) without commas or other symbols, e.g., *897*
X4 = Number of neighbors in query 4) e.g., *9*
X5 = The URI of the resulting district in 5), e.g., *http://yago-knowledge.org/resource/sergios*
X6 = The population returned by query 6), e.g., *9864*

Passkey: **X1-X2-X3-X4-X5-X6**

Submission Instructions

Submit your answer as a ***PDF*** file on the ***e-class*** Assignments page. Your PDF should contain the (Geo)SPARQL query and retrieved answer for each query described in this document.
Non-PDF submissions or submission with missing information will be penalized.