Metropolitan University of Tirana
Data Structures
Fundamental Concepts

1.1   Data structures: to computer science and beyond

Choose one of the following topics related to data structures, their role and applications in computer science and beyond. **Submit either a one-page paper discussing the topic or make a five-minutes presentation on the topic.**

1. How have advancements in data structure design impacted the development of modern computing technology? Provide examples of technologies or applications that have been enabled by advances in data structures.

2. What is the relationship between data structures and algorithm design? How do data structures affect the time and space complexity of an algorithm? Provide examples of algorithms that illustrate the importance of data structures.

3. How have data structures evolved over time, and what trends do you see in their development? What factors have driven these changes in data structure design?

4. How can data structures be used to solve real-world problems in fields such as biology, medicine, or finance? Provide examples of research or applications that have leveraged data structures to address complex problems in these fields.

1.2   Programming is not about typing, it's about thinking

Address the following tasks. You may use any programming language of your choice

1. Write a function (`findUnique`) that takes a list of strings as input and returns a new list containing only the unique strings from the original list, in the order they first appear

2. Write a function (`findEven`) that takes a list of integers as input and returns a new list containing only the even integers from the original list, in the order they first appear.

3. Write a function (`findKthSmallest`) that takes a list of integers as input and returns the k-th smallest integer in the list, where k is an integer parameter passed to the function.

4. Write a function that takes a list of integers as input and returns the longest increasing subsequence in the list. For example, given the input list [1, 3, 2, 4, 3, 5, 4, 6], the function should return [1, 3, 4, 5, 6].

5. Write a Java program that takes a list of integers as input and returns the longest subsequence of consecutive integers in the list. For example, if the input list is [3, 2, 3, 5, 4, 8, 9, 10], the program should return [8, 9, 10].

What to submit:

All the code that we develop will be pushed to a GitHub repository. For that reason, make sure that you have (created) a GitHub account. Use `UMT_data_structures` for the repository name. When solving these exercises, put them in a folder named `data_structure_warm_up`