Kuwait University
Faculty of Science
Computer Science Department
CS 513: Theory of Complexity
Spring 2023/2024
Assignment: 1

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1 About Graphs: write a paragraph that summarize your understanding about Graphs.

Graphs are networks of points connected by lines. They are used to depict connections and communications between elements in complex frameworks. Graphs have various types, such as complete, cycle, star, wheel, linear, and grid. They are important for scientific literacy and are used in fields like mathematics, physics, and computer science. Graphs can be represented in a computer using sequential representation or linked representation. They are used for various applications, such as determining shortest paths and extracting minimum cost spanning trees.

*** List of references with citation in the text/content.**

https://www.cs.cmu.edu/afs/cs/academic/class/15210-f14/www/lectures/graph-intro.pdf
https://www.cuemath.com/learn/introduction-to-graphs/
https://web.cecs.pdx.edu/~sheard/course/Cs163/Doc/Graphs.html
https://brilliant.org/wiki/graphs/

2 Machine Learning (Neural Networks): Write a summary paragraph on each type of Machine Learning.

Neural networks are a class of artificial intelligence/machine learning tools that have been widely used in various fields. There are various types of neural networks, each designed for specific tasks. Common types include Feedforward Neural Networks (FNN): Basic structure with information flowing in one direction. Convolutional Neural Networks (CNN): Effective for image and video analysis, utilizing convolutional layers. Recurrent Neural Networks (RNN): Suitable for sequence data, with connections allowing information persistence. Long Short-Term Memory (LSTM) Networks: A type of RNN with improved memory capabilities. Generative Adversarial Networks (GAN): Comprising a generator and discriminator, used for generating new data. Autoencoders: Focus on encoding and decoding input data, often used for dimensionality reduction. Radial Basis Function (RBF) Networks: Utilizing radial basis functions as activation functions.

*** List of references with citation in the text/content.**

https://www.algolia.com/blog/ai/what-is-a-neural-network-and-how-many-types-are-there/
https://www.ibm.com/topics/neural-networks
https://www.geeksforgeeks.org/neural-networks-a-beginners-guide/amp/types-of-neural-networks
https://towardsdatascience.com/6-types-of-neural-networks-every-data-scientist-must-know-9c0d920e7fce

3 GNN: Summarize your understanding about how GNN works.

GNNs operate on graphs, updating information for each node based on its neighbors. Through iterative refinement, they capture complex relationships in the data, making them powerful for tasks like node classification and graph-level predictions.

*** List of references with citation in the text/content.**

https://seon.io/resources/dictionary/graph-neural-network-gnn/
https://neptune.ai/blog/graph-neural-network-and-some-of-gnn-applications
https://www.analyticsvidhya.com/blog/2022/03/what-are-graph-neural-networks-and-how-do-they-work/
https://towardsdatascience.com/a-gentle-introduction-to-graph-neural-network-basics-deepwalk-and-graphsage-db5d540d50b3