

CENG 420 | ELEC 569A

Assignment Two due date (June 23, 2017)

There are 2 pages and 4 questions in this assignment. Read the questions carefully before you attempt to answer the assignment

QUESTION 1) [CENG-420: 50 Points] [ELEC-569A: 50 Points]

Q1.1) Define a taxonomic description of your city (or province, or state). Find a similarity measure that compares parts of the city at different levels of the taxonomy with respect to the social and/or economic structure. Find a similarity measure that compares parts of the city with respect to house prices. [hint: the taxonomy could be a labeled graph (e.g. edges has types and weights)] 25 Points

Q1.2) For each of the following objects (Movie, Soccer Team, House, and Pizza) list at least **seven** attributes (properties) we can use to describe these objects. Sort these attributes by importance. Think of two different applications that affect the importance of these attributes. For one of the above object define a distance function that we can use to measure the distance between two objects of the same type. Describe one way to transform this distance value into a similarity value in the interval $[0, 1]$

QUESTION 2) [CENG-420: 100 Points] **Undergraduate Only**

Q2.1) Engineer the N-Queen problem as a genetic algorithm problem. Provide detailed description of the following:

- Problem Encoding.
- Fitness Functions.
- Population Initialization.
- Parent Selection
- Crossover
- Mutation
- Termination Condition

Q2.2) Using any programming language implement either:

- A brute force approach to solve the Knapsack problem
- A greedy search approach to solve the knapsack problem

Compare the performance of the approach you implemented to solve the knapsack problem with the genetic algorithm python implementation we covered in the class (naive genetic algorithm). In your comparison discuss the run time and the fitness of the final solution. Run your test with a knapsack that has the following settings

- Number of **Items 10**, items weights between [1, 50], items profits between [10, 100], and knapsack **capacity is 25**
- Number of **Items 15**, items weights between [1, 50], items profits between [10, 100], and knapsack **capacity is 35**
- Number of **Items 20**, items weights between [1, 50], items profits between [10, 100] and knapsack **capacity is 50**

QUESTION 3) [ELEC-569A: 10 Points] Graduate Only

Using the genetic algorithm python implementation we covered in the class for the knapsack problem. Study the effect of the population size, mutation (applying or not applying mutation) on the performance of the genetic algorithm. In your comparison discuss the run time and the fitness of the final solution. Use figures and tables to illustrate your answer

Run your test with a knapsack that has the following settings

- Number of item is **500** items, the knapsack **capacity is 5000**
- The total number of available items are **20,000 items**. The item profit and weights are in the enclosed csv file **"items_set.csv"**

QUESTION 4) Write your own Final Exam|Quiz

Write or design one question in one of the following topics

- Similarity and Distance Measure in AI
- Computational Intelligence

The group with the best or the most interesting question will be awarded **20 bonus points** limited to the assignments (any of the three assignments).

Finally, one of the top (best) suggested questions by all the groups will be **included** in the final quiz|exam