

## Nature inspired computation group N meeting minutes

I hereby affirm that, by signing this document, I acknowledge and confirm that the minutes of this meeting are accurate and represent the discussions, decisions, and actions that transpired during each of the meetings recorded below.

YUSUF, Najeeb



12-12-23

WILKINSON, Charlie

W 12-12-23

LIU, Sihang

Sihang Lin 12-12-23

RAHATAL, Ritesh Sunil

 12-12-23

JIN, Hongjin

K/M 12/12/23

WANG, Peitao

Peitao WANG 12-12-23

## **Set of Signed Meetings (Group N)**

Meeting No. 1

Group Number : N

Date: 21st Nov, 2023

Time: 10:30 am to 12pm

Location: Virtual on Microsoft Teams

Attendees:

WILKINSON, Charlie

RAHATAL, Ritesh Sunil

JIN, Hongjin

WANG, Peitao

YUSUF, Najeeb

LIU, Sihang

### **Discussion Topics:**

#### **1. Language discussion: Decided to use Python**

#### **2. Designing fitness functions and algorithms for a problem.**

- Discuss two questions related to the Travelling Thief Problem, including finding the solution and satisfying requirements in different cities.
- Discuss designing a fitness function and algorithm for a problem, with some disagreement on the approach.

#### **3. Using Pythagorean theorem for distance calculation in TSP.**

- Explains how to calculate distances between cities using the Pythagorean Theorem.

#### **4. Solving complex optimization problems using AI.**

- Propose linking two problems (TSP and NP) to find a solution like using Ant Colony Optimisation (ACO) and pheromones to optimise item placement in a city.
- Suggest conducting research and documenting it before starting work on the fitness function.
- Research algorithms for a machine learning problem.
- Give details of algorithm which have researched and why use ACO
- Look at algorithms before deciding on an approach.
- Discuss how to approach research and representation of data to solve a problem.

#### **5. Data for travelling salesmen and knapsack problems.**

- Explain how to parse data for travelling salesman problems and knapsack problems.

## **6. Fitness function for optimization algorithm.**

- Use hyperparameters to balance time and weight in fitness function.

### **Work distribution:**

1. Research ant optimisation algorithms that can be used to solve the problem, highlighting pros and cons for each one. Special focus on the nature of the problem whereby two different types of problems intertwine

- WILKINSON, Charlie
- RAHATAL, Ritesh Sunil

2. Write the function that parses the data into the program, special focus on what data structures to use to represent both the travelling salesman part of the problem and the knapsack problem. A data structure that makes it easy to change which location is visited or what items are picked is preferred

- JIN, Hongjin
  
- WANG, Peitao

3. Write the fitness function that takes in the locations visited, the knapsack at each location and returns the final weight of the bag and the total time taken to finish the tour. Special focus will be on maximising the speed of this function, since it will be executed several times

- YUSUF, Najeeb
  
- LIU, Sihang

Next Meeting:

- Date: 27rd Nov, 2023

Meeting No. 2

Group Number : N

Date: 27th Nov, 2023

Time: 10 am to 12pm

Location: Virtual on Microsoft Teams

Attendees:

WILKINSON, Charlie

RAHATAL, Ritesh Sunil

JIN, Hongjin

WANG, Peitao

YUSUF, Najeeb

LIU, Sihang

### **Discussion Topics:**

#### **1. Optimization Algorithms Discussion:**

- Exploration of Pareto front for challenging problems.
- Discussion of machine learning algorithms, focusing on simplicity for a group project.
- Mention of frustration with a grade-centric approach.
- Introduces hybrid algorithms for the travelling salesman and knapsack problems.

#### **2. Solving Optimization Problems with Different Algorithms:**

- Discuss KNP and TSP problems.
- Emphasis on using diverse algorithms and combining them for the best solution.
- Proposal to align profit and time with the TSP problem.

#### **3. Local Search for Optimization:**

- Suggest using local search for the knapsack problem.
- Importance of a function generating prospective routes.
- Proposal to use local search for the knapsack problem.

#### **4. Different Techniques for Optimization:**

- Discussion on using various search algorithms, including local search and different search for canopy.
- Consideration of a volume indicator for balancing minimum values in optimization.

#### **5. Optimising Search Algorithms:**

- Discussion on local and different search methods.
- Suggestion to use past data to determine the best solution.
- Exploration of connecting ACO and external solutions for improved fitness function.

#### **6. Dynamic Programming and Local Search:**

- Team discusses local search.
- Focus on completing functions and updating GitHub.

Next Meeting:

- Date : 8th Dec, 2023

Meeting No. 3

Group Number : N

Date: 8th Dec, 2023

Time: 10 am to 12pm

Location: Virtual on Microsoft Teams

Attendees:

WILKINSON, Charlie

RAHATAL, Ritesh Sunil

JIN, Hongjin

WANG, Peitao

YUSUF, Najeeb

LIU, Sihang

### **Review of Previous Minutes:**

YUSUF, Najeeb presented his local search.

WILKINSON, Charlie and RAHATAL, Ritesh Sunil presented the ACO optimizer.

### **Discussion on adapting ACO for the Travelling Thief Problem:**

- Identified ACO being more suited for the Travelling Salesman Problem.
- Agreed upon adapting the probabilities calculator to incorporate fitness of routes rather than distance.
- Decision to update pheromones to favour routes based on fitness.

### **Testing:**

- Plan to test different sections of the algorithm developed so far to assess performance.
- Includes testing of local search, ACO, and others.

### **Work Distribution:**

1. Research ant optimization algorithms for solving the problem using ACO on the Burma14 database.

WILKINSON, Charlie

RAHATAL, Ritesh Sunil

2. Adapt the ACO to use overall fitness in probability calculations instead of distance.

YUSUF, Najeeb

3. Develop the fitness function, add notes, and improve clarity.

LIU, Sihang

JIN, Hongjin

4. Begin working on the report, understand the deliverables.

WANG, Peitao

Next Meeting:

- Date: 11th Dec, 2023

Meeting No. 4  
Group Number : N  
Date: 11th Dec, 2023  
Time: 3 pm to 5 pm  
Location: Virtual on Microsoft Teams

Attendees:

WILKINSON, Charlie  
RAHATAL, Ritesh Sunil  
JIN, Hongjin  
WANG, Peitao  
YUSUF, Najeeb  
LIU, Sihang

### **Discussion Topics:**

#### **1. Discuss Testing Results:**

- Review the outcomes of the recent testing phase.
- Identify any issues, bugs, or unexpected results.
- Discuss potential solutions and improvements.

#### **2. Compile ACO and Knapsack Code:**

- Ensure that all team members have successfully compiled the ACO (Ant Colony Optimization) and Knapsack code.
- Address any compilation errors or issues encountered.
- Verify the integration of ACO and Knapsack components.

#### **3. Task Assignment for Runner.py:**

- Divide tasks related to running the Runner.py file to avoid overlapping and reduce running time.
- Clarify responsibilities for each team member.
- Ensure that everyone is clear on their tasks and deadlines.

#### **4. Plotting Result Data:**

- Discuss the requirements and specifications for plotting result data.
- Determine the type of plots (e.g., graphs, charts) needed.
- Assign responsibilities for implementing the plotting functionality.

Next Meeting:  
- Date: 12th Dec, 2023



Meeting No. 5  
Group Number : N  
Date: 12th Dec, 2023  
Time: 3 pm to 5 pm  
Location: Virtual on Microsoft Teams

Attendees:

WILKINSON, Charlie  
RAHATAL, Ritesh Sunil  
JIN, Hongjin  
WANG, Peitao  
YUSUF, Najeeb  
LIU, Sihang

### **Discussion Topics:**

#### **1. Comparison of Results:**

- Discussed and compared the results obtained from individual team members.

#### **2. Report Content Discussion:**

- Discussed the structure and content to include in the final project report.

#### **3. Plotting and Visualization:**

- Reviewed the plots and visualisations created by team members.
- Discussed regarding how well each visualisation displayed the intended message.

#### **4. Closing Remarks:**

- Expressed gratitude for active participation and contributions.
- Demonstrated how important working together and co-operation play in the successful completion of a project.