CSE 151B Deep Learning
UCSD, Spring 2022

Project Milestone

Due 11:59 p.m, May 22th, 2022

Please submit your report as a single PDF file using the NeurIPS 2022 template on Overleaf by clicking on "Open as Template". Edit the template as follows:

- Comment out `\usepackage{neurips_2022}`(Line 10) and Abstract (Line 87-93)
- Uncomment `\usepackage[preprint]{neurips_2022}` (Line 15)
- Change title to **CSE 151B Project Milestone Report** (Line 37)
- Change author name and email to your team members' names and emails (Line 49)
- Follow the format instructions to write your report, especially Figures and Tables

You report will contain the following components with a minimum 2 pages (not including references). Please copy the section titles and write the details under each section title. Your report will be judged by (1) how well it is following the format (2) how much detail it contains about your project (3) how creative/innovative/thoughtful your solution is. Include a **github** repository link for your solution and grant access to TAs/Prof.

1 Task Description and Exploratory Analysis

Problem A [1 points]: Describe in your own words what the task is and why it is important. Define the input and output in mathematical language and formulate your prediction task. Refer to week 1 lectures if you need help.

Problem B [1 points]: Run the provided Jupyter notebook for loading the data. Provide exploratory analysis on the data and report your findings with texts and figures. Your report should answer the following questions at a minimum:

- what is the train/test data size, how many dimensions of inputs/outputs
- what is the distribution of input positions for all agents (hint: use heatmap)
- what is the distribution of output positions for all agents (hint: use heatmap)
- what are the distributions of positions for different cities?

If you include more exploratory analysis beyond the above questions that provides insights into the data, you will receive bonus points.

2 Deep Learning Model and Experiment Design

Problem A [1 points]: Describe how you set up the training and testing design for deep learning. Answer the following questions:

- What computational platform/GPU did you use for training/testing?
- What is your optimizer? How did you tune your learning rate, learning rate decay, momentum and other parameters?
- How did you make multistep (30 step) prediction for each target agent?
- How did you utilize the city information?
- How many epoch did you use? What is your batch-size? How long does it take to train your model for one epoch (going through the entire training data set once)?

Explain why you made these design choices. Was it motivated by your past experience? Or was it due to the limitation from your computational platform? You are welcome to use screenshots or provide code snippets to explain your design.

Problem B [1 points]: Describe the models you have tried to make predictions. You should always start with simple models (such as Linear Regression) and gradually increase the complexity of your model. Include pictures/sketch of your model architecture if that helps. You can also use mathematical equations to explain your prediction logic.

3 Experiment Results and Future Work

Problem A [1 points]: Play with different designs of your model and experiments and report the following for your best-performing design:

- Visualize the training loss (RMSE) value over training steps (You should expect to see an exponential decay).
- Randomly sample a few training samples after the training has finished. Visualize the ground truth and your predictions on a 2D plane.
- Your current ranking on the leaderboard and your test RMSE .

Summarize your current experiment results. If you have tried more than one experiment design, compare all of them in a table/figure.

Analyze the results and identify the lessons/issues that you have learned so far. Briefly discuss what you plan to do to improve the performance in the following weeks.