MSc AI Lab: Second Assignement

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Homework 4 Monte Carlo Tree Search for Orienteering Problem

Grade

The project grade, corresponding to 30% of your final grade, is given by a weighted average of your performance in the homeworks (10%, 25%, 30% and **35%**).

Deadline

This assignment must be submitted by **23:59** (Lugano's time) on **22th December 2023**.

Instructions

Your assignment is to address the Orienteering Problem with Time Windows (OPTW) using Monte Carlo Tree Search (MCTS). For more in-depth implementation guidance, refer to the paper "MCTS survey". The implementation will be based on a provided notebook and should be tested following the rules below. Implement the following MCTS:

1. **Starting Point**: Use the notebook available at `MCTS_for_the_OPTW.ipynb` as your base.
2. **Target Problems**: Implement the MCTS to search for the global minimum of the OPTW random generated instances: 0, 1, 2 (small size problems).
3. **Core Functions**: Develop the following key MCTS functions:
   - Tree policy
   - Select best child
   - Backup
4. **Evaluation Strategy**:
   - Employ at least three distinct seeds for evaluation.
   - Test your solution on three random instances from the notebook.
   - Limit each MCTS step to a maximum duration of 5 seconds.
5. **Variant Implementation**:
   - Propose and implement your version of MCTS.
   - Elaborate on the changes made and their impact in comparison to the baseline.

Submission

1. **Format**: Your submission should be in the form of a Python Jupyter notebook file.
2. **Content**: Provide a brief yet informative discussion of your results, with evidence supporting the completion of the listed tasks. Avoid including images of plots or files from the `AI_USI_MA` directory.
3. **File Naming**:
    - For a single file submission, name your file as <Name Surname>_MSCAI23_hw4.ipynb.
    - For multiple files, compress them into a single folder <Name Surname>_MSCAI23_hw4.zip.

Evaluation Criteria

Your work will be evaluated on the basis of:

1. **Correctness**: The precision in applying MCTS to the OPTW.
2. **Analysis**: Your capability to analyze and interpret the outcomes.
3. **Clarity**: The clarity and organization of your code and documentation.
4. **Presentation**: The effectiveness of your graphical representations and tables in communicating the results.

Additional Notes

- Ensure your code is well-commented and follows best programming practices.
- Additional credit may be given for novel enhancements or particularly insightful analysis.
- This assignment is designed to test both your technical abilities and your skill in presenting research in a clear, concise manner.