Synopsis - Implementing GraphHopper in C++

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This document describes the purpose and basic plans for our bachelor's thesis titled *Implementing GraphHopper in C++*.

1 Problem

The GraphHopper kernel for graph classification is implemented only in MATLAB. We wish to implement the kernel with a different approach using the strengths of C++ and compare the efficiency to the existing implementation.

2 Motivation

The quality of a kernel is measured in its accuracy as well as its efficiency. An efficient implementation lowering the running time of the kernel is therefore essential to its success. By implementing the kernel in a low-level language such as C++ we hope to achieve shorter running time and thereby faster classifications than the existing implementation.

3 Tasks

- Read and understand the GraphHopper kernel as described in [1].
- Rewrite the GraphHopper kernel for loop-based implementation.
- Design data structure.
- Implement translation of MAT-files (MATLAB data files).
- Implement reading formatted data into in-memory data structure.

- Implement one-source shortest path algorithm.
- Implement GraphHopper kernel.
- Implement export functionality.
- Test solution by comparing accuracy of results with results from existing MATLAB implementation.
- Compare running time of implementations.
- Document project.

4 Schedule

4.1 Week 16

- Project contract.
- Scheduling.
- Study GraphHopper kernel.

4.2 Week 17

- Rewrite GraphHopper kernel.
- Hand in synopsis.
- Design data structure.

4.3 Week 18

- Implement translation of MAT-files (MATLAB data files).
- Implement reading formatted data into in-memory data structure.
- Implement single-source shortest path algorithm.

4.4 Week 19

- Implement GraphHopper kernel.

4.5 Week 20

- Implement GraphHopper kernel.
- Implement export functionality.

4.6 Week 21

- Test solution by comparing accuracy of results with results from existing MATLAB implementation.
- Compare running time of implementations.

4.7 Week 22

- Write report

4.8 Week 23

- Write report

4.9 Week 24

- Hand in report Monday (June 13th).

References

[1] Aasa Feragen, Niklas Kasenburg, Jens Petersen, Marleen de Bruijne, Karsten M. Borgwardt. *Scalable kernels for graphs with continuos attributes.* In Advances in Neural Information Processing Systems, pages 216-224, 2013.