Chapter 1

Search Engines and Search Strings

1.1 ACM Digital Library

Notes: ACM Digital Library did not support a mix of ANDs and ORs in its initial input field, but this was possible in advanced search. The search string was not modified, and the first search gave a satisfactory number of results.

Queries:

- (Train OR plane OR bus OR delivery) AND ("path optimization" OR "scheduling optimization" OR "route optimization" OR planning OR multimodal) AND ("bee colony optimization" OR "particle swarm optimization" OR "swarm intelligence" OR "ant colony optimization" OR bco OR pso OR aco) AND (transit OR transportation OR traffic OR vehicle) AND ("artificial intelligence" OR ai OR "machine learning") AND "multi agent" AND routing

  Date of search: 2014-11-10
  Results: 19

- (Train OR plane OR bus OR delivery) AND ("path optimization" OR "scheduling optimization" OR "route optimization" OR planning OR multimodal) AND ("bee colony optimization" OR "particle swarm optimization" OR "swarm intelligence" OR "ant colony optimization" OR bco OR pso OR aco) AND (transit OR transportation OR traffic OR vehicle) AND ("artificial intelligence" OR ai OR "machine learning") AND "multi agent" AND routing AND ("graph database" OR neo4j)

  Date of search: 2014-11-10
  Results: 0

1.2 ScienceDirect

Notes: In ScienceDirect it was only possible to perform a full text search. The first search was within "all sciences" and this retrieved 100 results. The next search was therefore just within "Computer Science", which gave less, but a lot more relevant papers. In addition to this books were excluded from the results.

Queries:

- (Train OR plane OR bus OR delivery) AND ("path optimization" OR "scheduling optimization" OR "route optimization" OR planning OR multimodal) AND ("bee colony optimization" OR "particle swarm optimization" OR "swarm intelligence" OR "ant colony optimization" OR bco OR pso OR aco) AND (transit OR transportation OR traffic OR vehicle) AND ("artificial intelligence" OR ai OR "machine learning") AND "multi agent" AND routing

  Date of search: 2014-11-10
  Results: 60

- (Train OR plane OR bus OR delivery) AND ("path optimization" OR "scheduling optimization" OR "route optimization" OR planning OR multimodal) AND ("bee colony optimization" OR "particle swarm optimization" OR "swarm intelligence" OR "ant colony optimization" OR bco OR pso OR aco) AND (transit OR transportation OR traffic OR vehicle) AND ("artificial intelligence" OR ai OR "machine learning") AND "multi agent" AND routing AND ("graph database" OR neo4j)

  Date of search: 2014-11-10
  Results: 0

1.3 CiteSeer

Notes: In CiteSeer you cannot perform a search within title, abstract and keywords at the same time. It was therefore conducted a full text search by adding the element text:() to the query. Some of the retrieved papers had an unknown title with unknown authors, so theese were excluded from the results.

Queries:

- text:((Train OR plane OR bus OR delivery) AND ("path optimization" OR "scheduling optimization" OR "route optimization" OR planning OR multimodal) AND ("bee colony optimization" OR "particle swarm optimization" OR "swarm intelligence" OR "ant colony optimization" OR bco OR pso OR aco) AND (transit OR transportation OR traffic OR vehicle) AND ("artificial intelligence" OR ai OR "machine learning") AND "multi agent" AND routing)

Date of search: 2014-11-10
Results: 27

- text:((Train OR plane OR bus OR delivery) AND ("path optimization" OR "scheduling optimization" OR "route optimization" OR planning OR multimodal) AND ("bee colony optimization" OR "particle swarm optimization" OR "swarm intelligence" OR "ant colony optimization" OR bco OR pso OR aco) AND (transit OR transportation OR traffic OR vehicle) AND ("artificial intelligence" OR ai OR "machine learning") AND "multi agent" AND routing) AND ("graph database" OR neo4j)

Date of search: 2014-11-10
Results: 0

1.4 SpringerLink

Notes: In SpringerLinks advanced search it was only possible to find articles with either all the words, the exact phrase or at least one of the words in the search string. For this reason the whole boolean search string was used in the initial input field. The first search gave 200 results, so the next search was only conducted within "computer science" and "engineering". In addition to this results within "book chapters" were removed.

Queries:

- (Train OR plane OR bus OR delivery) AND ("path optimization" OR "scheduling optimization" OR "route optimization" OR planning OR multimodal) AND ("bee colony optimization" OR "particle swarm optimization" OR "swarm intelligence" OR "ant colony optimization" OR bco OR pso OR aco) AND (transit OR transportation OR traffic OR vehicle) AND ("artificial intelligence" OR ai OR "machine learning") AND "multi agent" AND routing

Date of search: 2014-11-10
Results: 28

- (Train OR plane OR bus OR delivery) AND ("path optimization" OR "scheduling optimization" OR "route optimization" OR planning OR multimodal) AND ("bee colony optimization" OR "particle swarm optimization" OR "swarm intelligence" OR "ant colony optimization" OR bco OR pso OR aco) AND (transit OR transportation OR traffic OR vehicle) AND ("artificial intelligence" OR ai OR "machine learning") AND "multi agent" AND routing AND ("graph database" OR neo4j)

Date of search: 2014-11-10
Results: 0

1.5 IEEE Xplore

Notes: The search is done in full text, including metadata. The search string had to be changed to fulfill IEEE's criteria that the string only should contain 15 search terms.

Queries:

- ("public transportation" AND ("path optimization" OR "route optimization" OR planning OR multimodal) AND (transit OR traffic) AND ("artificial intelligence" OR ai OR "machine learning") AND routing AND ("bee colony optimization" OR "particle swarm optimization" OR "swarm intelligence" OR "ant colony optimization")

  Results: 45
  Date of search: 2014-11-10

- ("public transportation" AND ("path optimization" OR "route optimization" OR planning OR multimodal) AND (transit OR traffic) AND ("artificial intelligence" OR ai OR "machine learning") AND routing AND ("bee colony optimization" OR "particle swarm optimization" OR "swarm intelligence" OR "ant colony optimization") AND neo4j)

  Results: 0
  Date of search: 2014-11-10

- ("public transportation" AND ("path optimization" OR "route optimization" OR planning OR multimodal) AND (transit OR traffic) AND ("artificial intelligence" OR ai OR "machine learning") AND routing AND ("bee colony optimization" OR "particle swarm optimization" OR "swarm intelligence" OR "ant colony optimization") AND "graph database")

  Results: 0
  Date of search: 2014-11-10

1.6 ISI Web of Knowledge

Notes: In Web of Knowledge you cannot perform at full text search, and must choose to search in "Topic", "Title", "Author", "Author Identifiers", "Editor", "Group Author", "Publication Name", "DOI" or "Year Published". We decided to use "Topic", "Title" and "Publication Name" because it seemed the most relevant to our search terms. The search was done in "All databases", but only in the "COMPUTER SCIENCE" research area. The original search string (see table 2) had to be modified, because it gave no results in Web Of Knowledge. A few terms were therefor excluded, and a few AND's were switched with OR's.

Queries:

- ("public transportation" OR traffic OR transportation OR transit OR "scheduling optimization" OR "path optimization" OR "route optimization" OR planning OR multimodal OR routing) AND ("bee colony optimization" OR "particle swarm optimization" OR "swarm intelligence" OR "ant colony optimization" OR pso OR aco OR bco) AND ("artificial intelligence" OR ai OR "machine learning")

Results: 47 (Topic) + 0 (Title) + 0 (Publication Name)
Date of search: 2014-11-11

- ("public transportation" OR traffic OR transportation OR transit OR "scheduling optimization" OR "path optimization" OR "route optimization" OR planning OR multimodal OR routing) AND ("bee colony optimization" OR "particle swarm optimization" OR "swarm intelligence" OR "ant colony optimization" OR pso OR aco OR bco) AND ("artificial intelligence" OR ai OR "machine learning") AND (neo4j OR "graph database")

Results: 0 (Topic) + 0 (Title) + 0 (Publication Name)
Date of search: 2014-11-11

1.7 Google Scholar

Notes: Google Scholar only allows very short search strings, and we were therefor forced to split the query into smaller pieces and do mulitple search, for so to add the results togheter. The original search string had to be modified for making the splitting tolerable and effective.

Queries:

- "public transportation" AND ("path optimization" OR "route optimization" OR planning OR multimodal) AND (transit OR traffic) AND ("artificial intelligence" OR ai OR "machine learning") AND routing AND "bee colony optimization"

Results: 21
Date of search: 2014-11-10

- "public transportation" AND ("path optimization" OR "route optimization" OR planning OR multimodal) AND (transit OR traffic) AND ("artificial intelligence" OR ai OR "machine learning") AND routing AND "bee colony optimization" AND neo4j

Results: 0
Date of search: 2014-11-10

- "public transportation" AND ("path optimization" OR "route optimization" OR planning OR multimodal) AND (transit OR traffic) AND ("artificial intelligence" OR ai OR "machine learning") AND routing AND "bee colony optimization" AND "graph database"

Results: 0
Date of search: 2014-11-10

- "public transportation" AND ("path optimization" OR "route optimization" OR planning OR multimodal)AND(transit OR traffic)AND("artificial intelligence" OR ai OR "machine learning")AND routing AND "particle swarm optimization"

Results: 78
Date of search: 2014-11-10

- "public transportation" AND ("path optimization" OR "route optimization" OR planning OR multimodal)AND(transit OR traffic)AND("artificial intelligence" OR ai OR "machine learning")AND routing AND "particle swarm optimization" AND neo4j

Results: 0
Date of search: 2014-11-10

- "public transportation" AND ("path optimization" OR "route optimization" OR planning OR multimodal)AND(transit OR traffic)AND("artificial intelligence" OR ai OR "machine learning")AND routing AND "particle swarm optimization" AND "graph database"

Results: 0
Date of search: 2014-11-10

- "public transportation" AND ("path optimization" OR "route optimization" OR planning OR multimodal) AND (transit OR traffic) AND ("artificial intelligence" OR ai OR "machine learning") AND routing AND "swarm intelligence"

Results: 76
Date of search: 2014-11-10

- "public transportation" AND ("path optimization" OR "route optimization" OR planning OR multimodal) AND (transit OR traffic) AND ("artificial intelligence" OR ai OR "machine learning") AND routing AND "swarm intelligence" AND neo4j

Results: 0
Date of search: 2014-11-10

- "public transportation" AND ("path optimization" OR "route optimization" OR planning OR multimodal) AND (transit OR traffic) AND ("artificial intelligence" OR ai OR "machine learning") AND routing AND "swarm intelligence" AND "graph database"

Results: 0
Date of search: 2014-11-10

- “public transportation” AND (“path optimization” OR “route optimization” OR planning OR multimodal) AND (transit OR traffic) AND (“artificial intelligence” OR ai OR “machine learning”) AND routing AND “ant colony optimization”

Results: 119
Date of search: 2014-11-10

- “public transportation” AND (“path optimization” OR “route optimization” OR planning OR multimodal) AND (transit OR traffic) AND (“artificial intelligence” OR ai OR “machine learning”) AND routing AND “ant colony optimization” AND neo4j

Results: 0
Date of search: 2014-11-10

- “public transportation” AND (“path optimization” OR “route optimization” OR planning OR multimodal) AND (transit OR traffic) AND (“artificial intelligence” OR ai OR “machine learning”) AND routing AND “ant colony optimization” AND “graph database”

Results: 0
Date of search: 2014-11-10

Chapter 2

Protocol

	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Group 8
Term1	Train	Path optimization	Bee colony optimization	Transit	Artificial intelligence	Multi agent	Routing	Neo4j
Term2	Plane	Scheduling optimization	Particle swarm optimization	Transportation	AI			Graph database
Term3	Bus	Route optimization	Swarm intelligence	Traffic	Machine Learning			
Term4	Delivery	Planning	Ant colony optimization	Vehicle				
Term5		Multimodal	BCO					
Term6			PSO					
Term7			ACO					

Table 2.1: Matrix of search terms

2.1 Search Terms

- Group 1: Train, plane, bus, delivery
- Group 2: Path optimization, Scheduling Optimization, Route Optimization, Planning, Multimodal

- Group 3: Bee colony optimization, Particle swarm optimization, Swarm intelligence, Ant colony optimization, BCO, PSO, ACO
- Group 4: Transit, Transportation, Traffic, Vehicle
- Group 5: Artificial Intelligence, ai, Machine Learning
- Group 6: Multi-agent
- Group 7: Routing
- Group 8: Neo4j, Graph database

2.2 Complete Search Term

(train OR plane OR bus OR delivery) AND ("path optimization" OR "scheduling optimization" OR "route optimization" OR planning OR multimodal) AND ("bee colony optimization" OR "particle swarm optimization" OR "swarm intelligence" OR "ant colony optimization" OR bco OR pso OR aco) AND (transit OR transportation OR traffic OR vehicle) AND ("artificial intelligence" OR ai OR "machine learning") AND "multi-agent" AND routing)

2.3 Research Questions

LALALALALALAL and This gave us ?? main research questions:

1. LALALALALALALALALA
2. Which of the selected AI-methods is best suited for optimizing?
3. Does this solution help optimizing the bus routes?

2.4 Scoring Criteria

2.4.1 Inclusion Criteria

2.4.2 Quality Criteria

List of Tables