

## A5 - Presentation Outline

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Title	Bus-Route Optimization
Audience	non-experts
Relevance	Saving money, better for environment, better public transportation
Purpose	Describe existing concept
Thesis/Claim	Inform regulators about the usefulness of bus-route optimization
Pattern	Explain the benefits of bus-route optimization and the working principles

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# Introduction

**Capture attention:** Transportation accounts for 5% of the GDP of Europe (“Transport Sector Economic Analysis - European Commission”). Transportation also accounts for an estimated 30 percent of national greenhouse gases. This means that optimizing the routes for vehicles, such as buses, can have large impact for saving time, money and the environment.

**Establish credibility:** My name is Jaan Tollander de Balsch and I’m an student at Aalto University majoring in applied mathematics.

**State your topic and purpose:** Today, I would like to talk you about how the use of mathematical optimization can be used in creation of efficient bus routings for bus networks. I will tell you about how problem of this kind are formulated and how they can be solved.

**Preview main points:** This talk is divided into three part. First, we’ll talk why bus-route optimization is useful and important. Then we’ll move on to the how the optimization works and what

# Formulation

1. In order to formulate the bus-routing problem we need to define ... (“Route Optimization Algorithm..”), (“Vehicle Routing Problem - Wikipedia”),
  - ▶ Objective, minimize the cost function
  - ▶ Constraints, what are the features we want to avoid
  - ▶ Real life data, numerical estimates for the parameters for the formula

# Data and Methods

2. Now that we have looked at the the data required to formulate the bus-routing problem, I am going to explain how is the actual optimization is performed. We are going to look at optimization methods and existing solvers ... (“Genetic Algorithm - Wikipedia”), (“Gurobi Optimization - the State-of-the-Art Mathematical Programming Solver”)
  - ▶ Example of genetic optimization algorithm
  - ▶ Existing solvers, software that can solve optimization problems

# Conclusion

**Summarize the main points:** Now that we understand what bus-route optimization consists of and how it can be solved and we have looked at the benefits for saving time and money as well as the positive environmental impact we can conclude that bus-route optimization is investment that is well worth it.

# References

“Genetic Algorithm - Wikipedia.”

[https://en.wikipedia.org/wiki/Genetic\\_algorithm](https://en.wikipedia.org/wiki/Genetic_algorithm).

“Gurobi Optimization - the State-of-the-Art Mathematical Programming Solver.” <http://www.gurobi.com/>.

“Route Optimization Algorithm..” [https://www.slideshare.net/Mazhar\\_Nazik/route-optimization-algorithm-57634160](https://www.slideshare.net/Mazhar_Nazik/route-optimization-algorithm-57634160).

“Transport Sector Economic Analysis - European Commission.” <https://ec.europa.eu/jrc/en/research-topic/transport-sector-economic-analysis>.

“Vehicle Routing Problem - Wikipedia.”

[https://en.wikipedia.org/wiki/Vehicle\\_routing\\_problem](https://en.wikipedia.org/wiki/Vehicle_routing_problem).