



Aalto-yliopisto  
Perustieteiden  
korkeakoulu

# Scheduling in a ride-sharing scenario (topic presentation)

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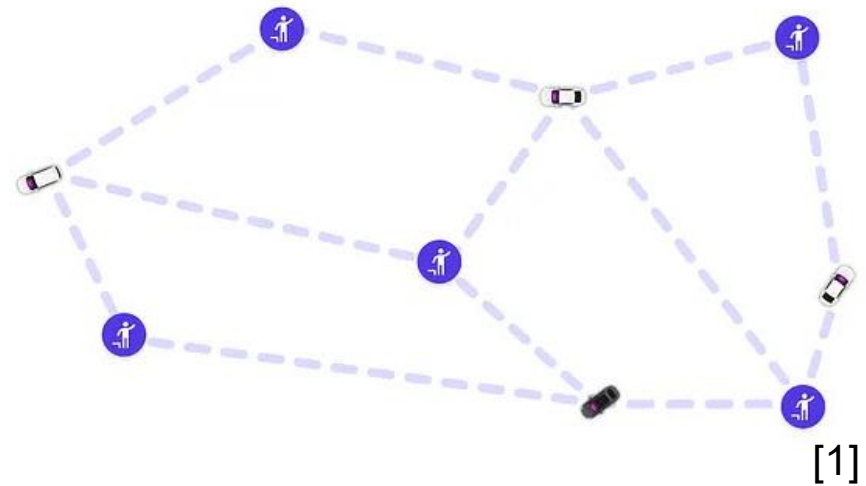
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Työn saa tallentaa ja julkistaa Aalto-yliopiston avoimilla verkkosivuilla. Muilta osin kaikki oikeudet pidätetään.

# Background 1/3

- The **ride-sharing problem**: match ride requests to a fleet of vehicles
  - Inputs: customer requests, driver capacity
  - Decisions: who serves whom, in what order, at what times
- A typical **objective** is to minimize customer travel time and/or wait time
- Common **constraints** include driver working hours, travel distance conditions etc
- Real ride-sharing platforms (Uber, Lyft) solve this continuously at scale

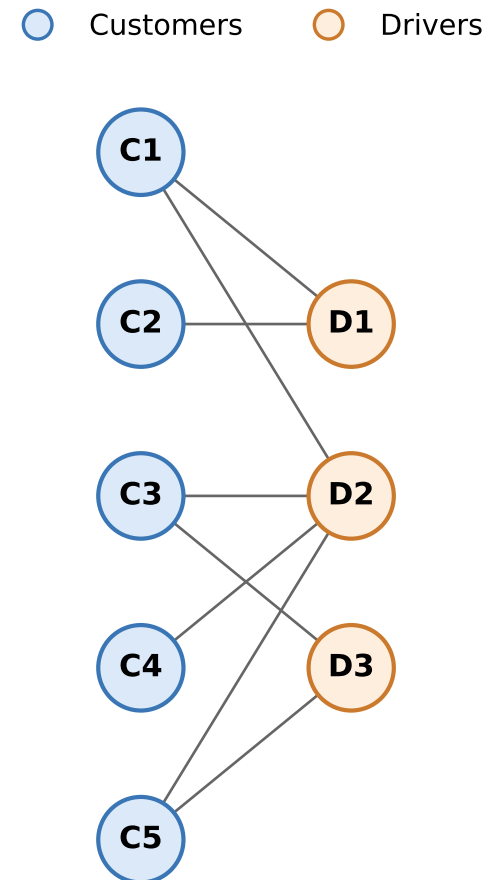


# Background 2/3

- A **scheduling problem** is a combinatorial optimization problem
  - Inputs:  $n$  jobs,  $m$  machines
  - Objective: obtain a schedule for each of the machines
- Scheduling problems became **NP-hard** quickly
  - Exact methods scale poorly
  - Additional business specific constraints increase the difficulty even more
  - Solving a single machine scheduling problem is much easier

# Background 3/3

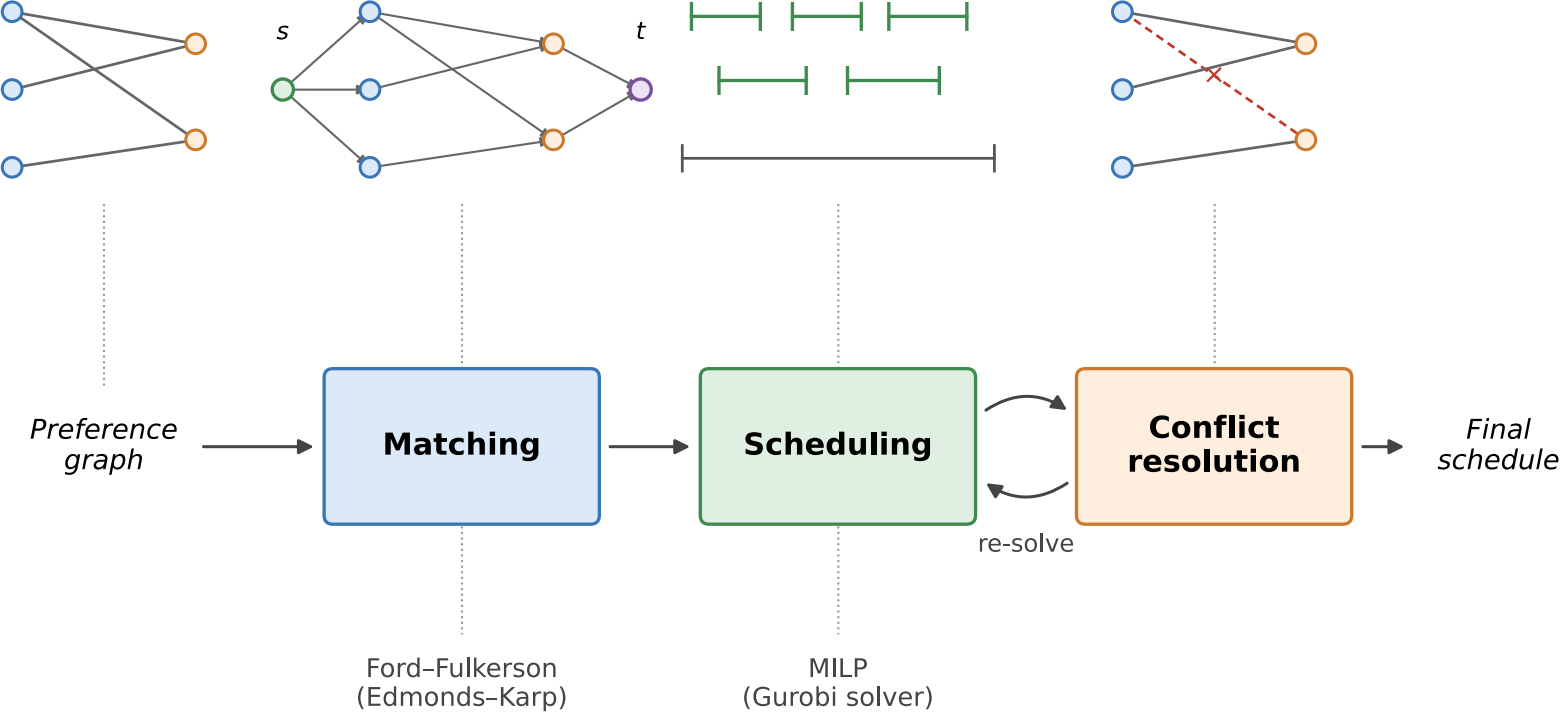
- The previously defined ride-sharing scheduling problem can be modelled as a bipartite graph
- A graph is **bipartite** if and only if
  - The graph is two-colorable
  - Does not contain an odd cycles
- One set of nodes in the graph is the customers and the other is the drivers
- Preferences of the customers can be modelled as the edges between customer and the drivers



# Objective

- **Create** an alternate way for solving a scheduling problem
  - In the context of this thesis, we consider a **ride sharing scheduling problem**
  - **Approach** the problem as multiple single machine scheduling problems
- The end result of the research of thesis is a pipeline that:
  - **Matches** the given customer set to the driver set based on the customer preferences
  - **Schedules** the matched customer sets of each driver so that the assignments are on average the best possible

# Methods



# Scope

- **Focus** on optimizing the time and coverage dimensions of the scheduling problem
  - **Minimizing** customer pickup delays, driver total idle time and unassigned customers
- Distance traveled by the drivers will not be modelled nor optimized
- Real customer request or preference data will not be used
  - Both will be generated from some probability distribution

# References

- Fielbaum, A., & Tirachini, A. (2021). The sharing economy and the job market: the case of ride-hailing drivers in Chile. *Transportation*, 48(5), 2235–2261.
- Lai, K., Chen, T., & Natarajan, B. (2020). Optimal scheduling of electric vehicles car-sharing service with multi-temporal and multi-task operation. *Energy*, 204, Article 117929.
- Wang, L., & Zheng, D.-Z. (2001). An effective hybrid optimization strategy for job-shop scheduling problems. *Computers & Operations Research*, 28(6), 585–596.

# Schedule

- Literature review 03-04/2026
- Working on the matching problem 04/2026
- Working on the scheduling model 04-05/2026
- Constructing the scheduling pipeline 04-06/2026
- Presentation of the topic 15.6.2026
- Writing 05-07/2026
- Presentation of the thesis 08/2026

*Thank you!*  
*Questions?*