CIVIL-557
Decision Aid Methodologies
In Transportation

Lab 1:
Practice examples

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Decision Aid Methodologies **in Transportation**

Focus on the Transport & Logistics industry

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Cargo loading problem

How to optimally load a set of containers/pallets (ULDs) into a cargo aircraft that has to serve multiple destinations under some safety, structural, economical, environmental and maneuverability constraints?

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Rolling stock allocation problem

How to optimally assign physical train units to timetable schedules?

Number of unit-kilometers

Passenger travel time

Number of composition changes

Shortage of seats

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Railway cargo network design problem

What is the optimal number and location of marshaling and shunting yards in a railway network in order to reduce freight transport and shunting costs?

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Passenger centric train timetabling problem

How to optimally design a timetable?

Cyclicity?

Profit

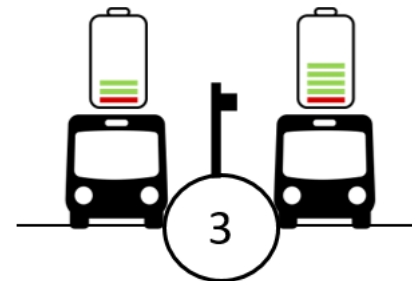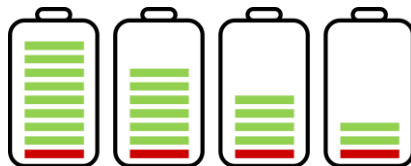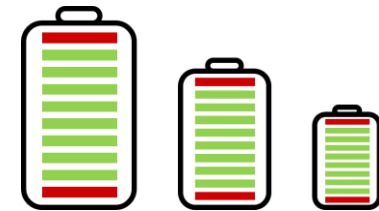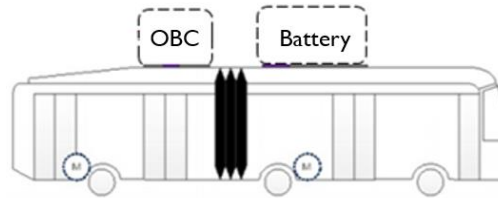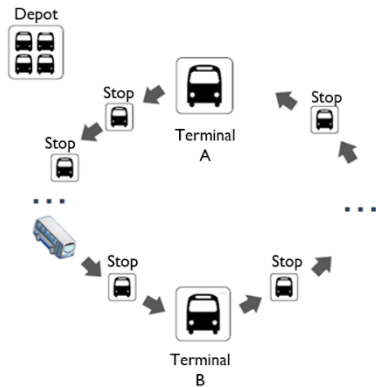Passenger travel time

Network design problem for battery electric bus

At which stations should we install a feeding station, which type of feeding station should be installed at these stations and with which battery should we equip the buses in order to minimize the total cost of the system ?

Assignment 1:
UPS case

UPS

UPS is the world's largest package and delivery company and a leading global provider of specialized transportation and logistics services.

UPS optimizes delivery routes with an advanced planning system.

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UPS

1. Read the paper entitled "*UPS optimizes delivery routes*" that describes the UPS planning system ORION.

UPS

2. Answer the following questions:

a) What are the two main groups of the small-package business segment? Define briefly the purpose of each group.

b) How many days does it take to deliver a package? What does it depend on?

c) Is the number of package delivered and picked up every day constant? Why?

d) Explain the controlled dispatch process used in 1970s. What were the decisions to be made ? What input data were needed? Was the solution optimal? Why?

e) What were the main advantages of the package-flow technologies?

f) What were the main reasons to adopt a new planning process?

g) What were the two initial principal problems to solve in the ORION project?

UPS

h) What are the reasons why the round 1 of the first phase failed?

i) What happened next? Describe briefly how they changed the formulation of the problem in the second round.

j) Explain briefly why the solution provided by ORION was better than the driver's solution.

k) What were the main challenges linked to the implementation of ORION? Explain briebly these challenges and how UPS has dealt with them.

l) What were the main impacts of Orion? List them and explain briefly.

m) As a modeling exercise, look at the model in Appendix. Try to understand each constraint, what it does and how. How many variables and how many constraints are contained in this formulation?

Assignment #1

- Write a short report containing your answers
- Individual work or in group (max 3 students)
- Send your reports to virginie.lurkin(at)epfl.ch
- Send your reports by 8:00PM Monday 26th of February

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Reference

- Holland, Chuck, et al. "UPS optimizes delivery routes." *Interfaces* 47.1 (2017): 8-23.