Transport Systems in the digital revolution

Inaugural lecture

Francesco Corman

I love travelling

[Ansa; VacationIdea/JFL Photography/Fotolia]

Everybody likes travelling

Google | l l |

i like
i like travelling
i love travelling
i like reading books

Press Enter to search.

- Weather
- (Public) transport
- Politics
- Sport, especially national team
- (slow wifi)
- Food
- Partners
- Neighbors,
- Noise, ...etc etc

[Google; ThoughtCatalog; Telegraph]

Core messages of today

- Time machines do not exist

- Digitalization is innovative

- Transport systems are necessary

- Those three statements are **false**.

Transport systems are not necessary

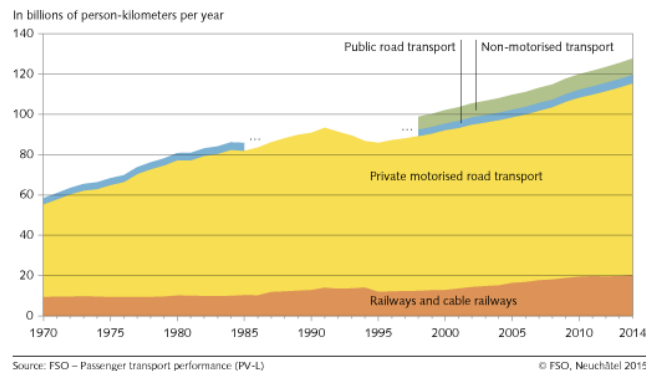# Transport systems have been very useful so far

- The seats
- The screen
- Your clothes
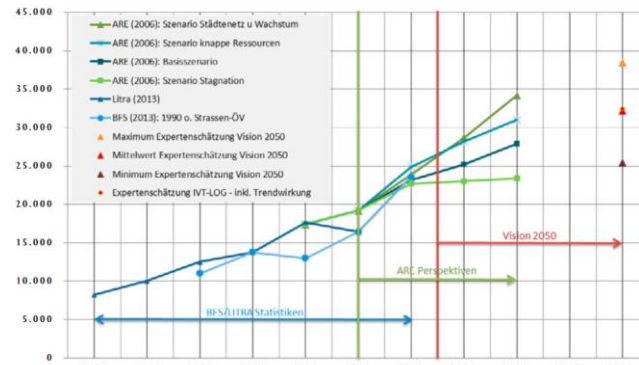- The food waiting outside, including the coffee and the sweets

- You

Economic impact of transport systems

- Total annual turnover ≥120 bn. CHF (~20 % of CH GDP)
- Total Estimated number of jobs > 250'000 (≥5% of Swiss employment)
- Public transport ≥12 bn CHF turnover, 33'000 jobs
- Share of final energy demand of the country: 34%; of CO_2: 46%

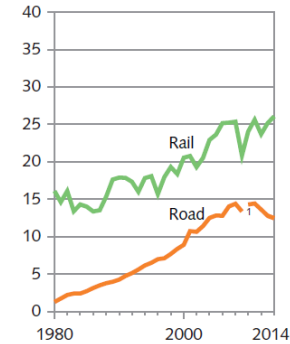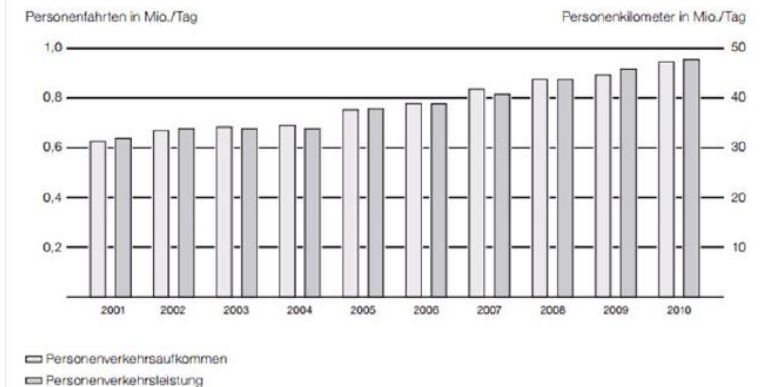[Boulouchos, 2018; BAFU 2017; VademecumStrasseschweiz, 2018; Automotive Industry Switzerland, Swiss CAR, Vision Mobilität Schweiz 2025; ETH Zurich, 2008; BFS Aktuell, 2017]

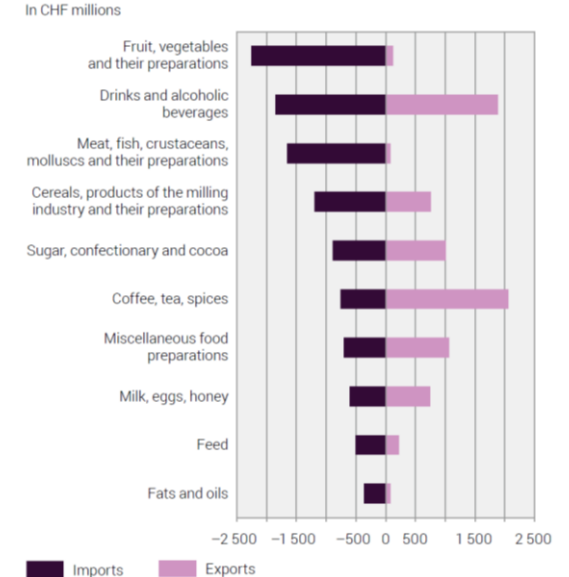# Transport systems are not necessary,

- ..But they are very useful,
  if we want to keep our lifestyle

In that case,

- Infrastructure is necessary
- Organization is necessary
- Funding/economic support is necessary
- Public acceptance is necessary

- how to do that? Research might help

Imports and exports of the most important foodstuffs, 2014

In CHF millions

Fruit, vegetables and their preparations
Drinks and alcoholic beverages
Meat, fish, crustaceans, molluscs and their preparations
Cereals, products of the milling industry and their preparations
Sugar, confectionary and cocoa
Coffee, tea, spices
Miscellaneous food preparations
Milk, eggs, honey
Feed
Fats and oils

−2 500 −1 500 −500 0 500 1 500 2 500

■ Imports ■ Exports

Source: SCA – Swiss foreign trade statistics   © FSO 2016

[ZüriBieter; Proaktiva.eu; BFS/FSO]

Digitalization is not something innovative

F. Corma [Wikimedia]

How would you describe this weather?

[Ansa; VacationIdea/JFL Photography/Fotolia]

What digitalization entails

- Store data
- Retrieve data
- Communicate data (without significant loss)
- Analyse, visualize
- Replay situations as described by the available data – replicate
- Determine how situation might occur again in the future - predict
- Find alternative ways to deal with a replayed situation - improve

Sky/Weather has been a first key thing to measure and compute

Bone sticks from Africa and Europe, possibly as long ago as 35,000 BC are marked in ways that tracked the **moon's phases.**

Golden Hats (Bronze Age, 1000 BC) are a kind of calendar used to calibrate between the **lunar and solar calendars**, including summer and winter solstices.

Su Song (1010-1020 AD) .. created a **celestial atlas** in five maps, which had the hour circles between the xiu forming the astronomical meridians, with stars marked.
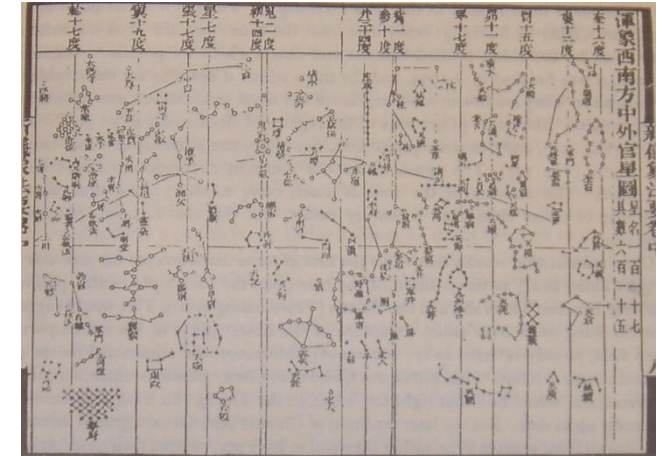
During the 1940s and 1950s, JPL used the word "**computer**" to refer to a person rather than a machine The all-female computer team, many of the members recruited right out of high school, were responsible for doing all the math by hand required to plot **satellite trajectories** and more.

F Cormar [Wikimedia]

What a transport system is

- Demand
- → stop planning,
- → line planning,
- → to timetabling,

- Measuring/Computing
  a network structure,
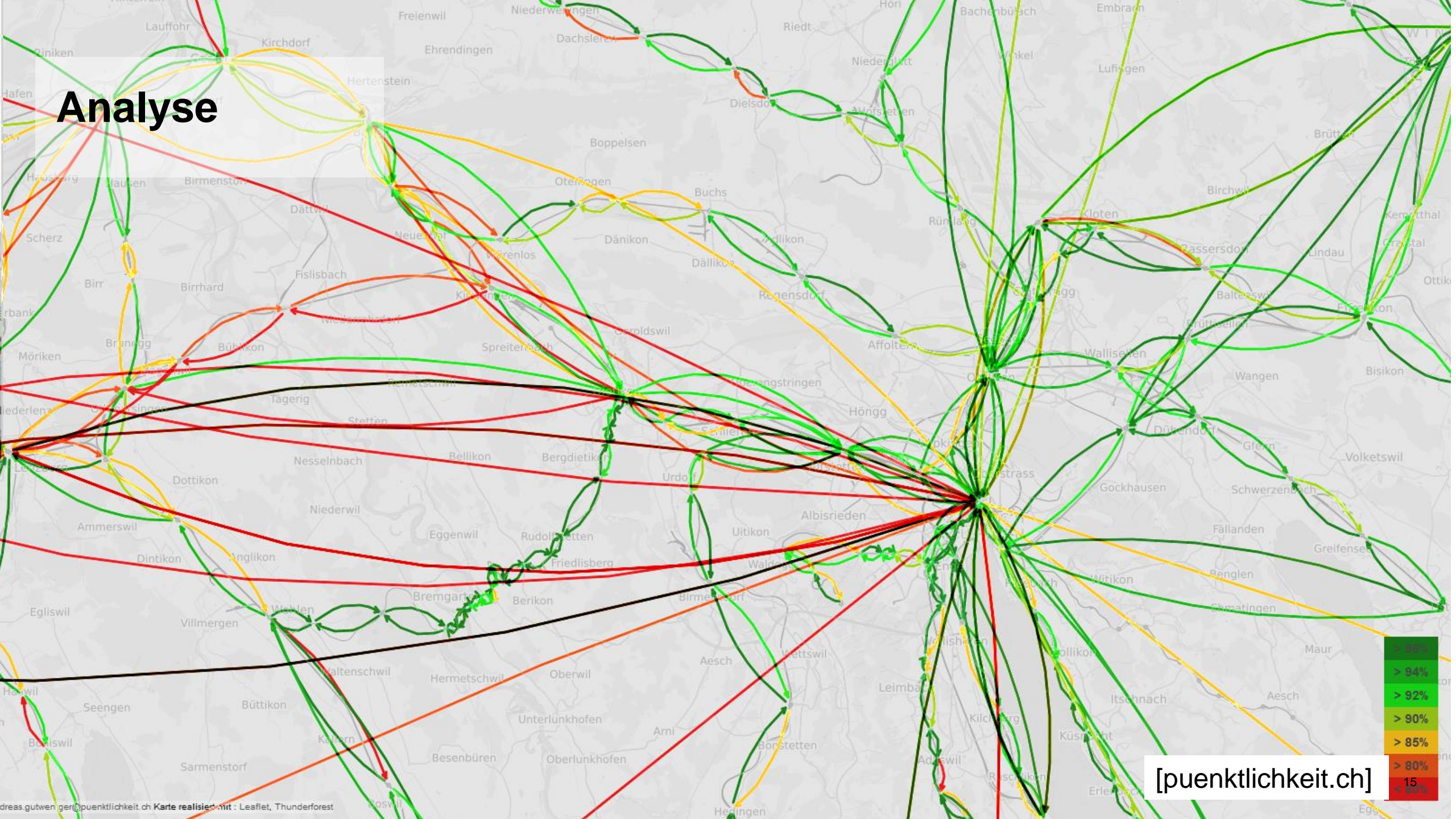 vehicles movement
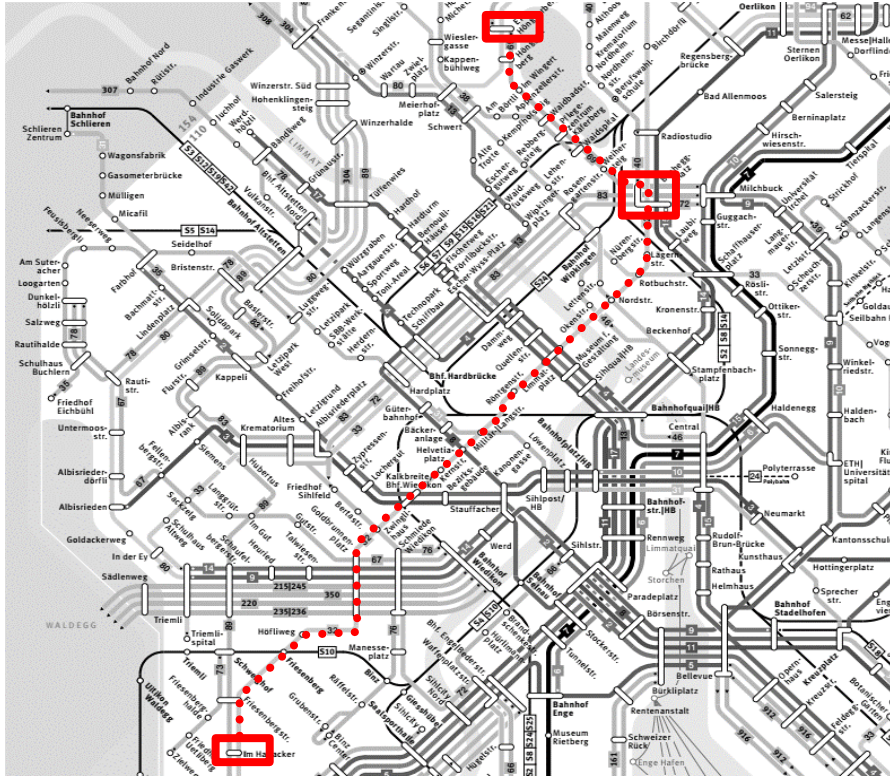 object of movement (people or goods)
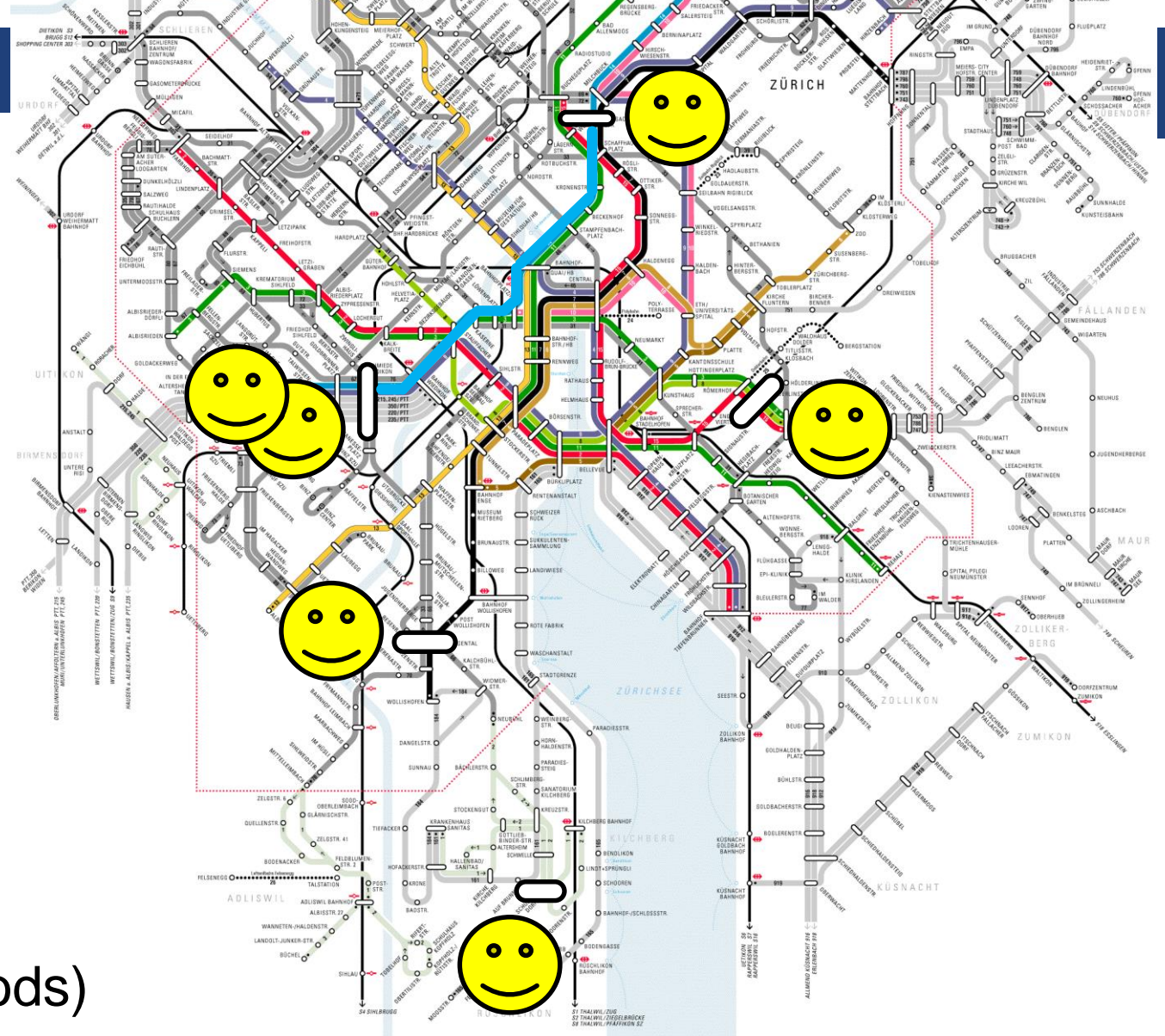
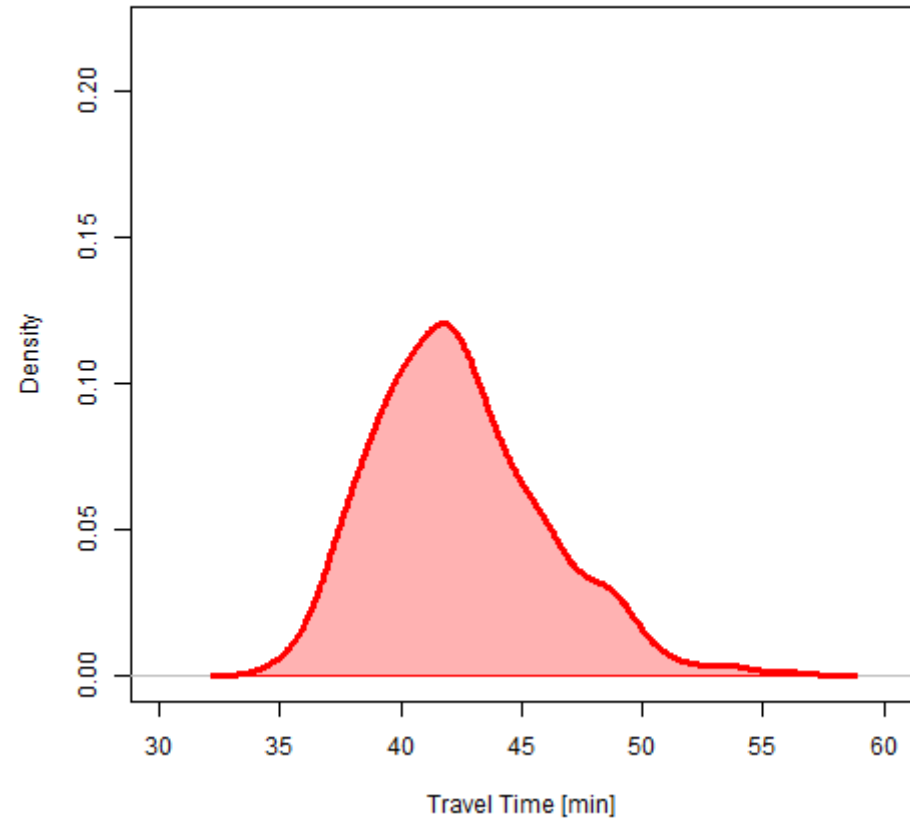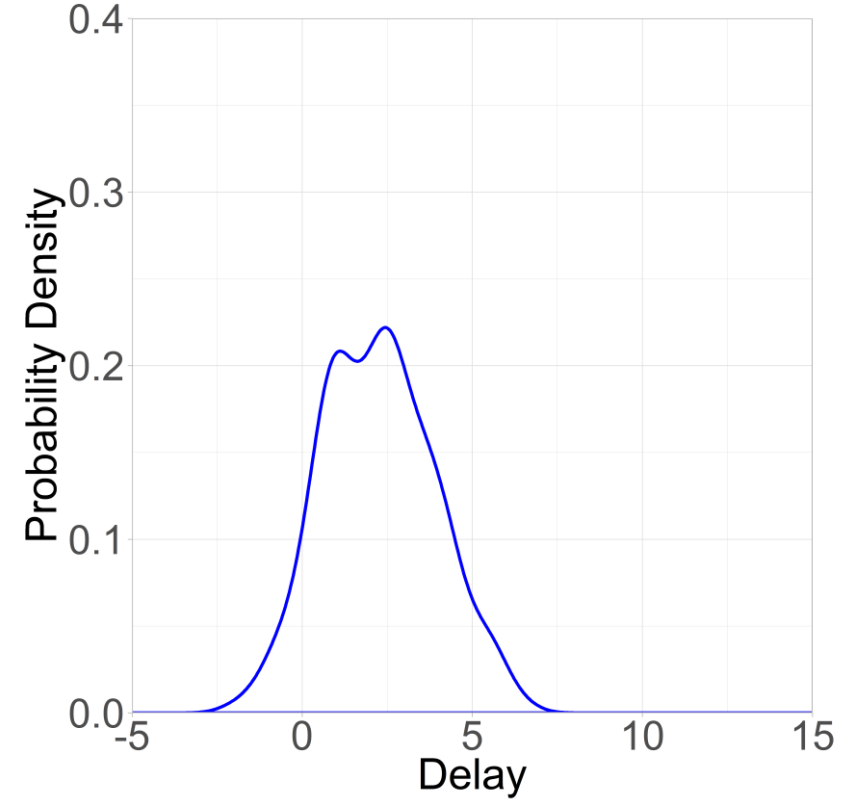**Measure**
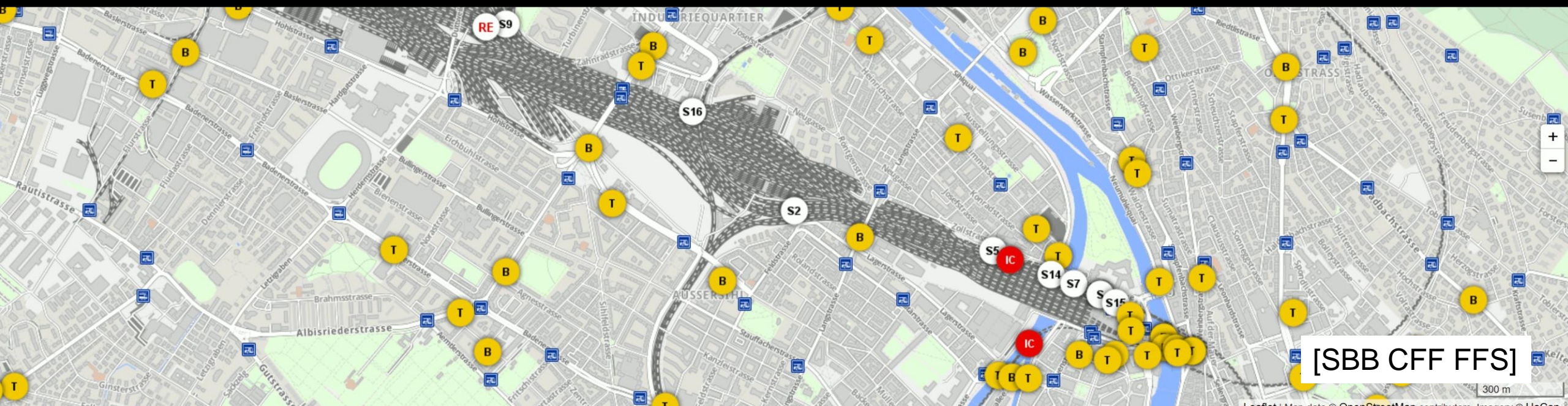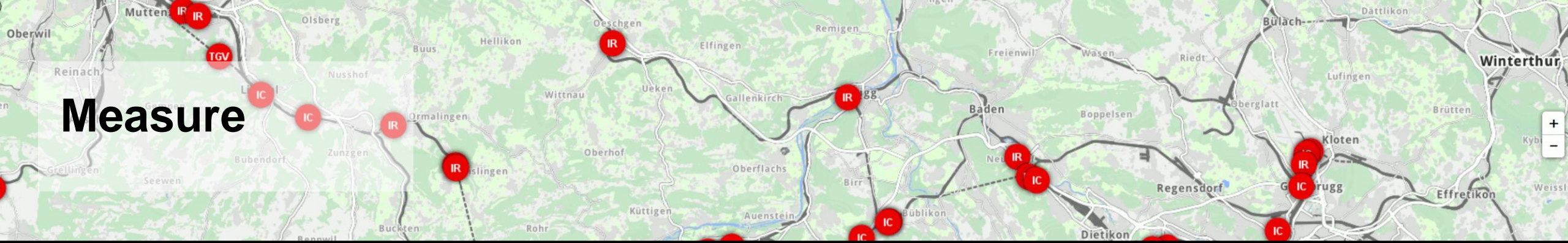
[SBB CFF FFS]

Analyse

[puenktlichkeit.ch]

15

Understand

8:00 - 9:00

Predict

Origin Station ————————————————— Destination Station

[Marra, TrafikVerket Data]

Improve

Vehicles
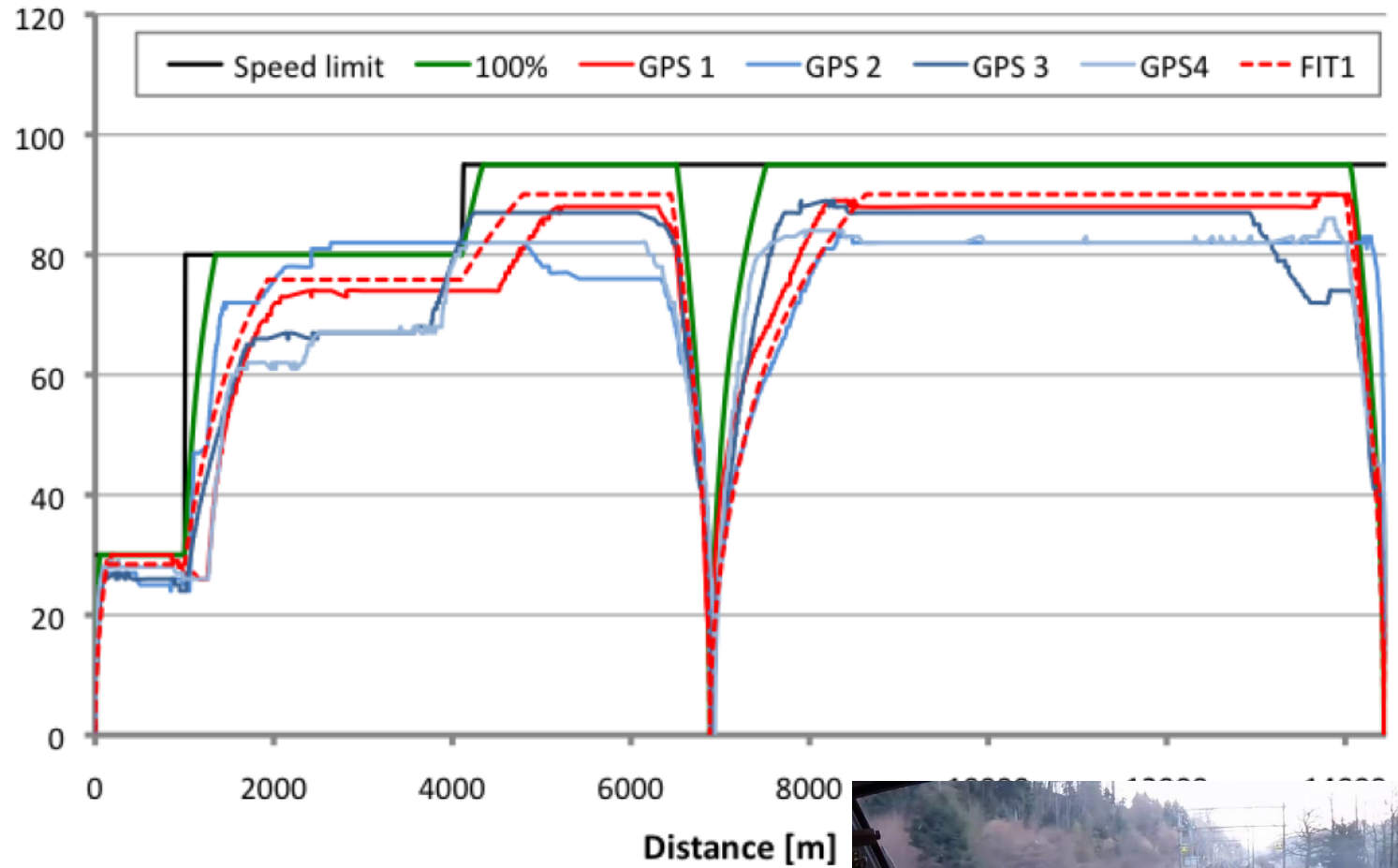
▪ Speed, trajectory planning

[Sessa, SBB, De Fabris, @AtraverslaSuisse]

Improve

Vehicles

- Speed, trajectory planning
- Interaction, Traffic control

[Corman et al, Wikimedia]

Improve

Vehicles

- Speed, trajectory planning
- Interaction, traffic control

Commodity
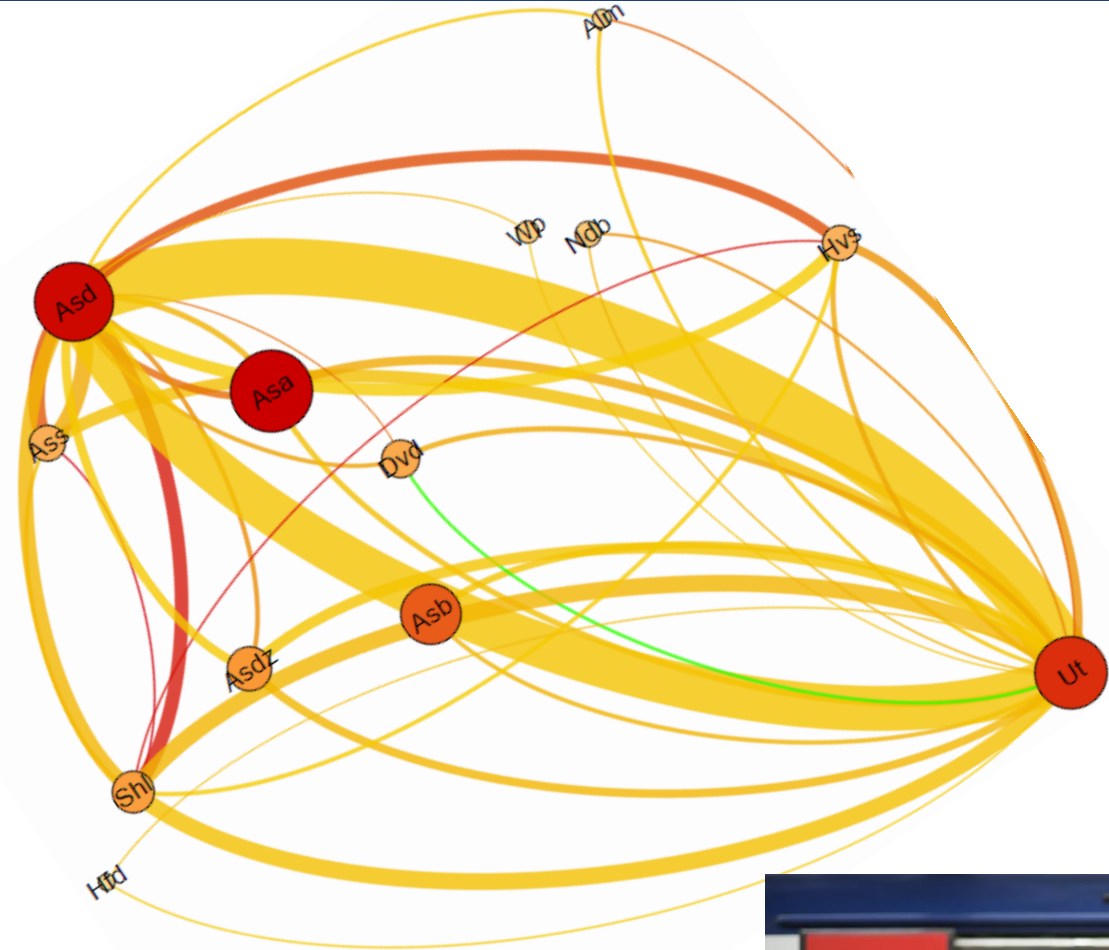
- Multi commodity, capacity

[Corman et al, Keystone/Swissinfo]
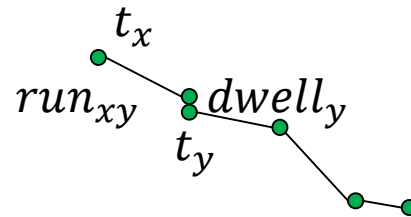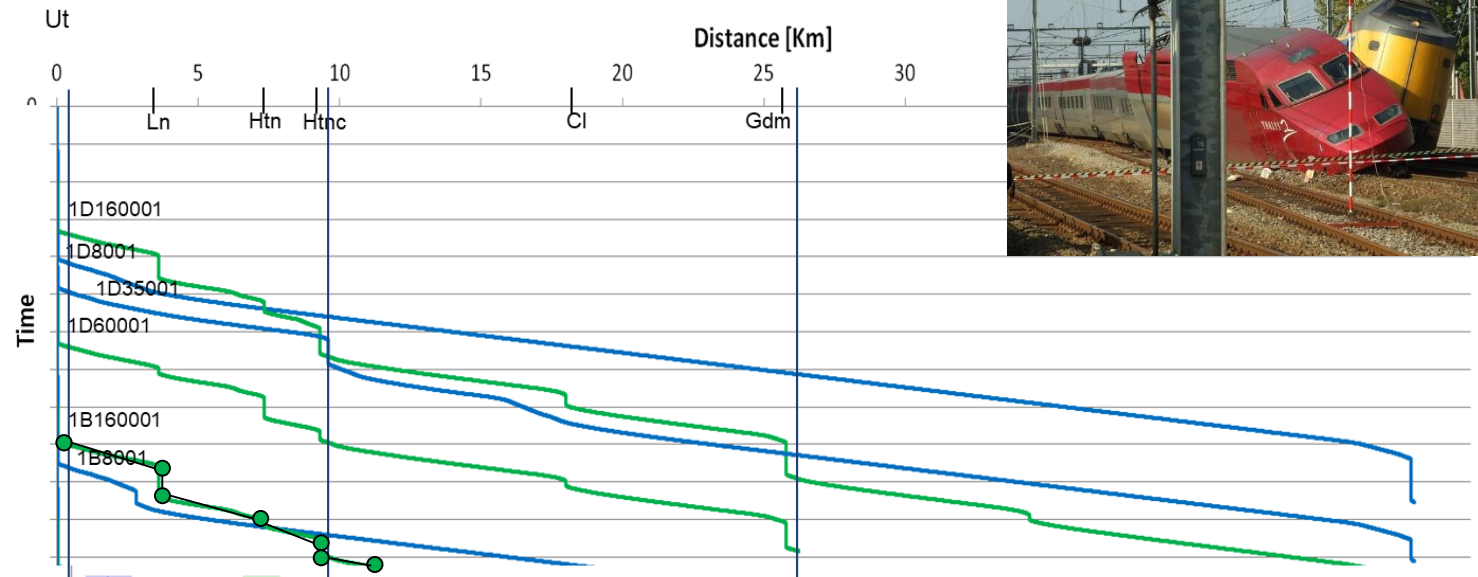
Improve

Vehicles
- Speed, trajectory planning
- Interaction, traffic control

Commodity
- Multi commodity, capacity
- Lines/network, routing, slow modes


[SBB]
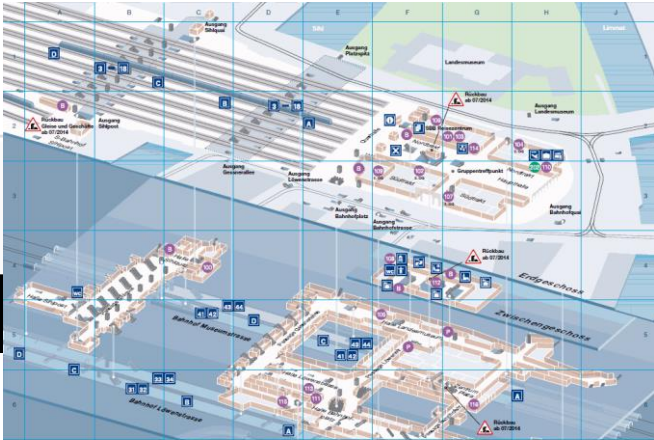
Digitalization is not innovative…

- We use digitalization since forever
- Digital information is much easier to store access and communicate
- But what we can do know is that is even easier to analyse, compare correlate, predict and optimize

- This trend of increasing digitalization, and increasing expectations on performance from it, is getting faster and faster
- Transport systems can benefit a lot of it
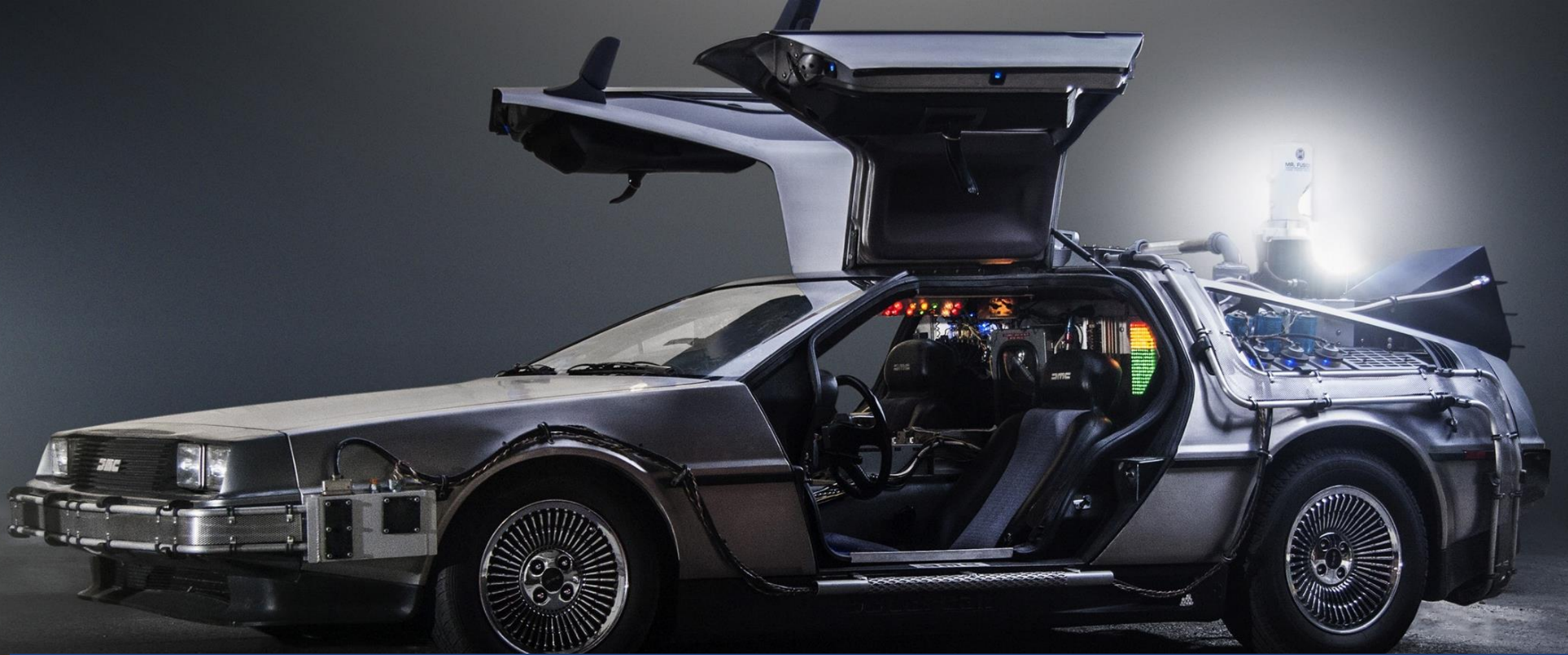
Time machines exist

Time, movement, time machines, teleportation

- Type-A time machines: they can go in the future
- Type-B time machines: they can go in the past

- Ready?

Zeno

Augustine

Time machines exist…

- But of a very sloppy type

- What is needed is not to transfer your current self in the future; is to exploit them little time we have in our lives to act.
- So a time machine is not what you want to use.

- Mix research and industry, deliver scientific and practical value

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