

Analysing the number of train travellers based on mobile telephone data

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Difficulties of obtaining good data on train ridership

There are at least two challenges regarding these data

- Firstly, train operator consider such data as business confidential information, especially in high resolutions
- Secondly, the data that actually is available is of varying quality and coverage.
- We study alternative measures to obtain data about train ridership, and give examples from use of mobile telephone data.

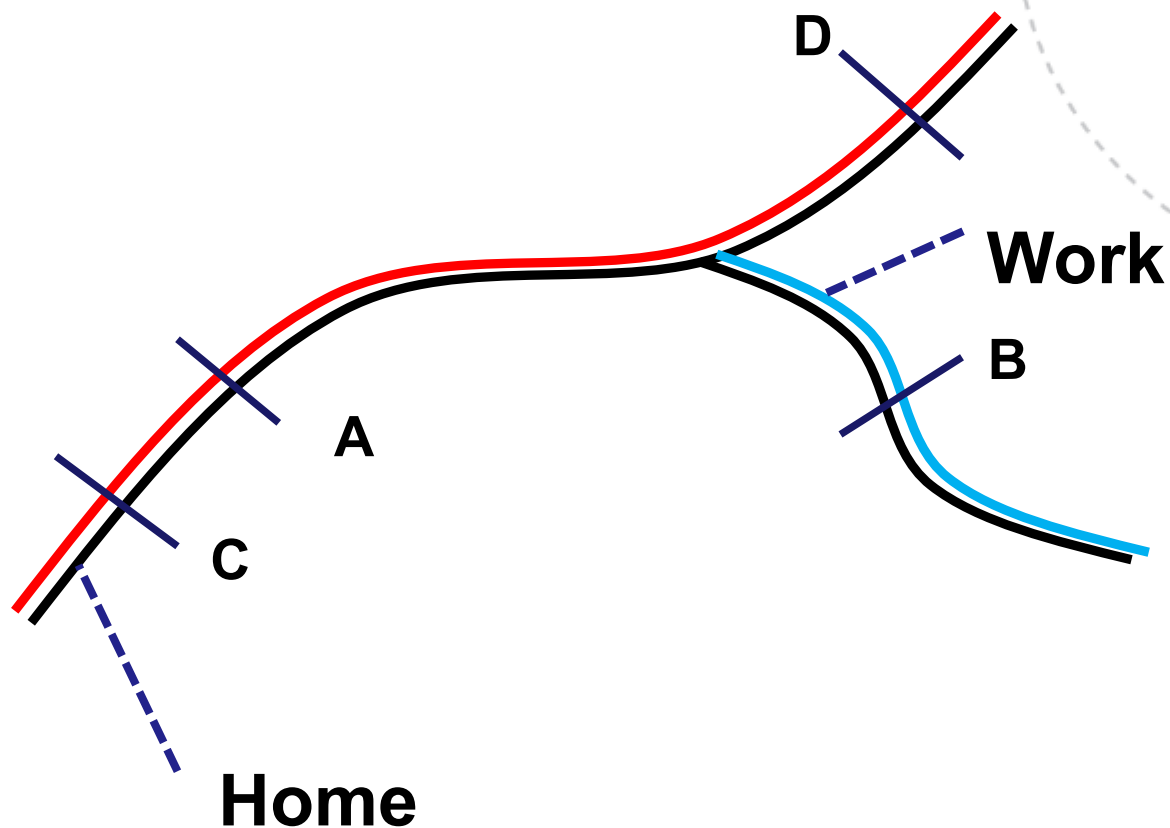
Our research questions are:

- To what extent is the format of available mobile telephone data suitable for measuring the number of mobile units passing close to the railway line
- Is it possible to combine mobile telephone data with railway infrastructure and train traffic data?
- What are suitable formats for presenting and analyzing train rideship based on mobile telephone data?
- What are the conditions for expanded use of mobile telephone data to track travels that include a train leg, in both a long and short perspective?

Possible sources of info on number of passengers

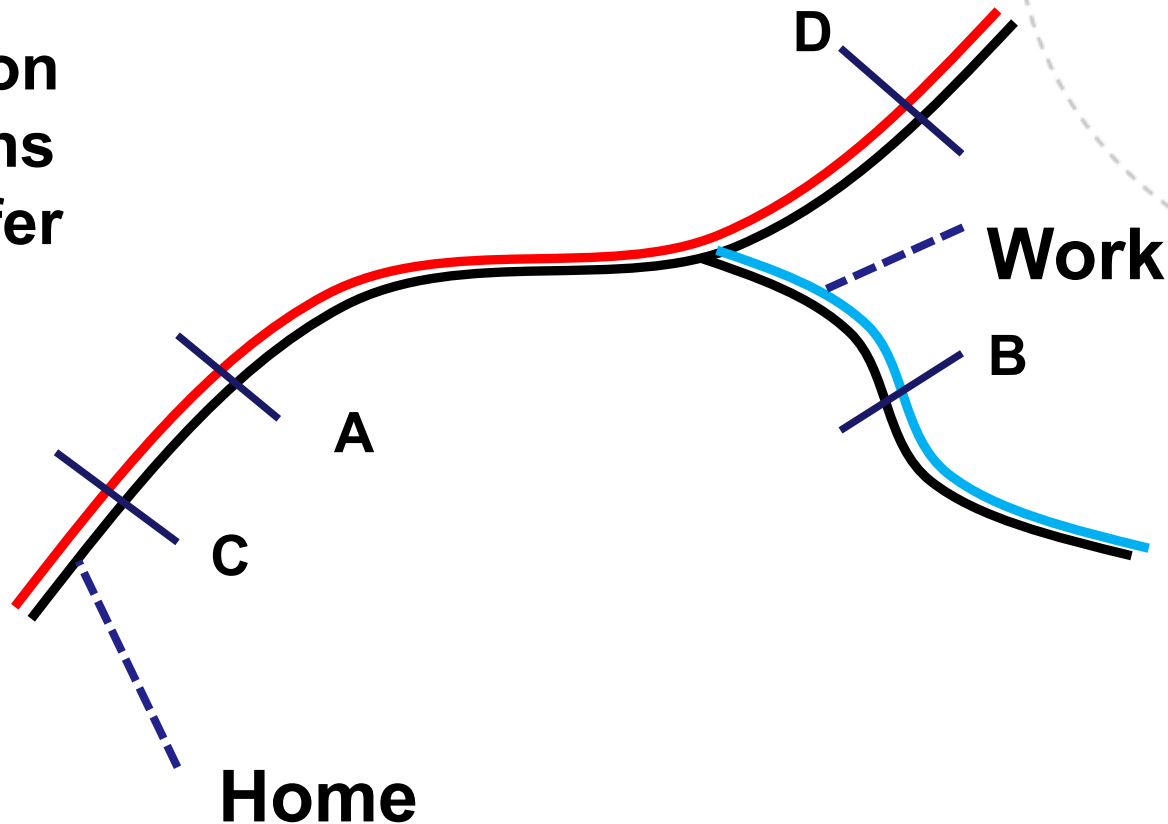
| Indicator on rideship | Source |
|-------------------------------|--------------------------------------|
| Manual counts | On board personnel |
| Passing of doors | Automatic logging of door passings |
| Ticket sales | Sales data |
| Ticket use | Ticket validation equipment |
| Vehicle weight | Rolling stock control system |
| WiFi use | No. of units logged on to train wifi |
| Train operator smartphone app | Travel detection (GPS, wifi etc.) |
| Mobile base station data | Mobile network operator |
| Surveys | Questionnaires |
| More? | |

How can we use mobile telephone data?



How can we use mobile telephone data?

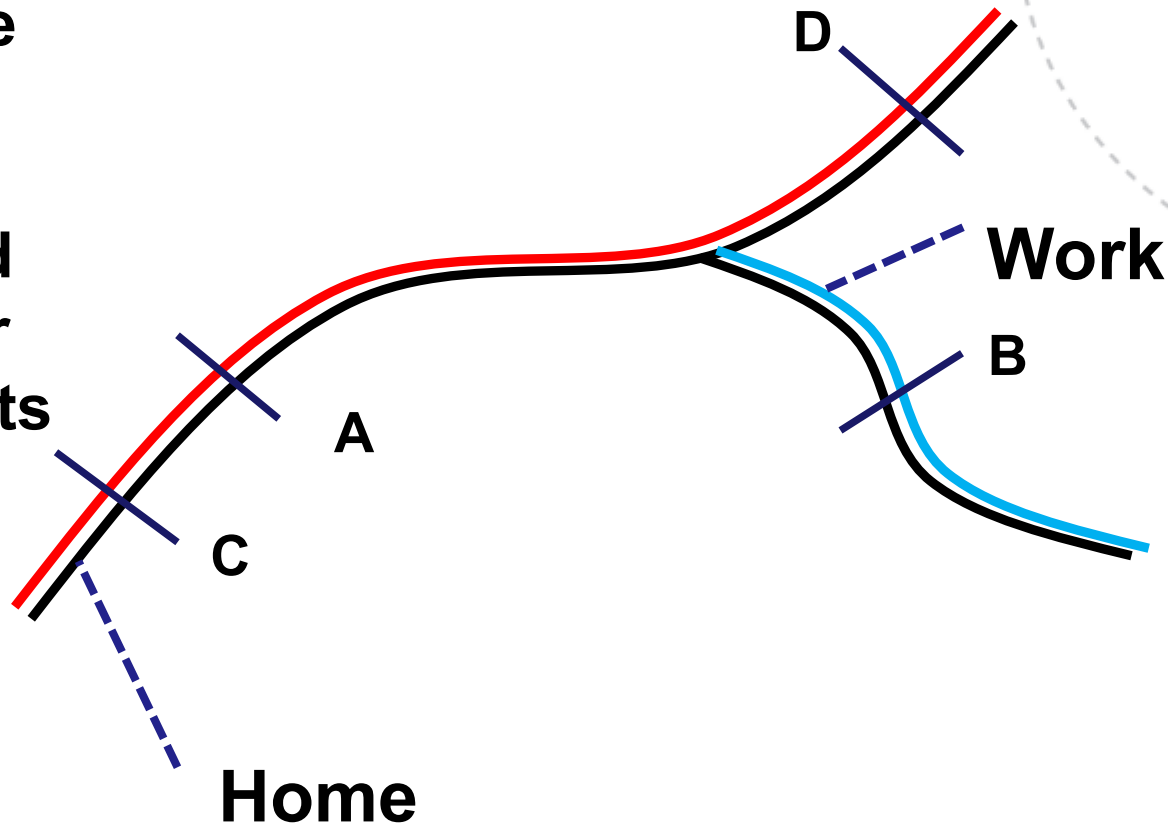
Number of travellers on connections with transfer A-B



How can we use mobile telephone data?

Travel time
from Home
to Work.

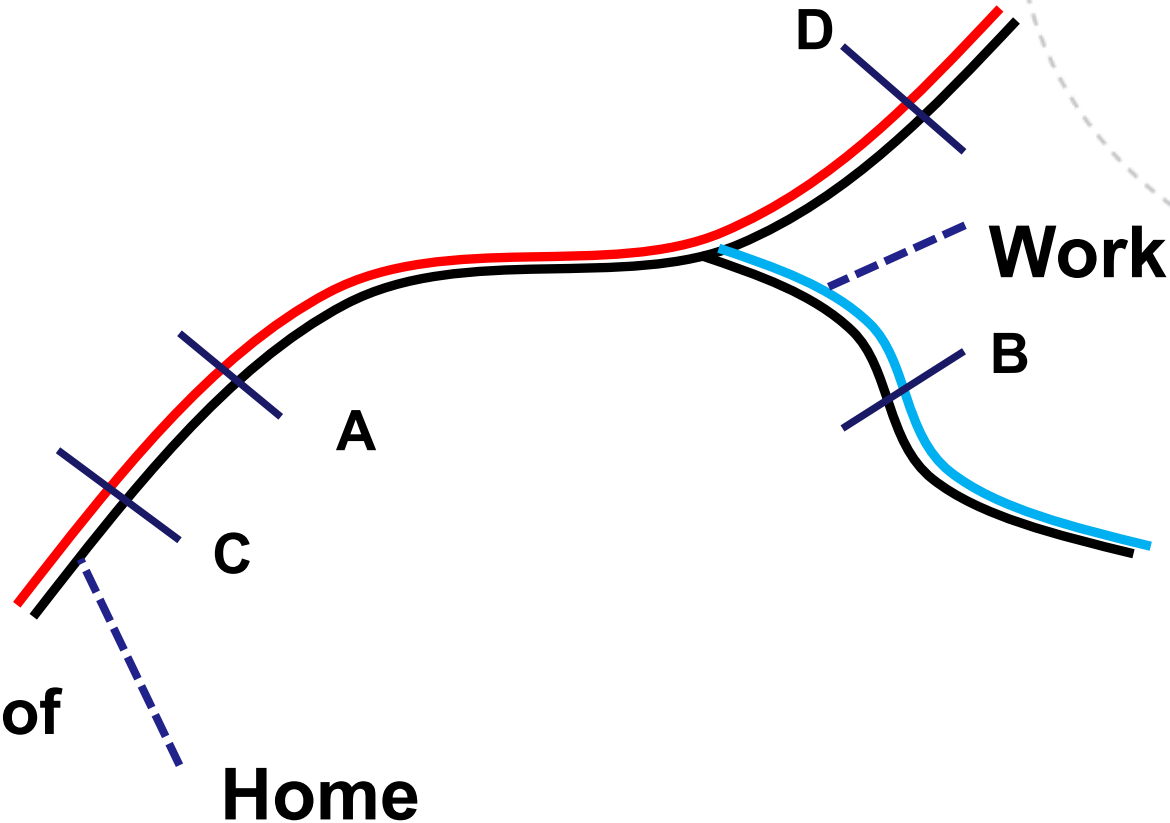
Before and
after major
investments



How can we use mobile telephone data?

Counting events logged by base stations close to railway.

Indication of number of travellers



The first dataset is number of units that are connected to the different base stations. These are pure counts by cell by time unit, which is anonymous data.

The initial step was to select the base stations in close proximity to the railway tracks.

The first data set is counts every 5 minute, for 7 days in 2016.

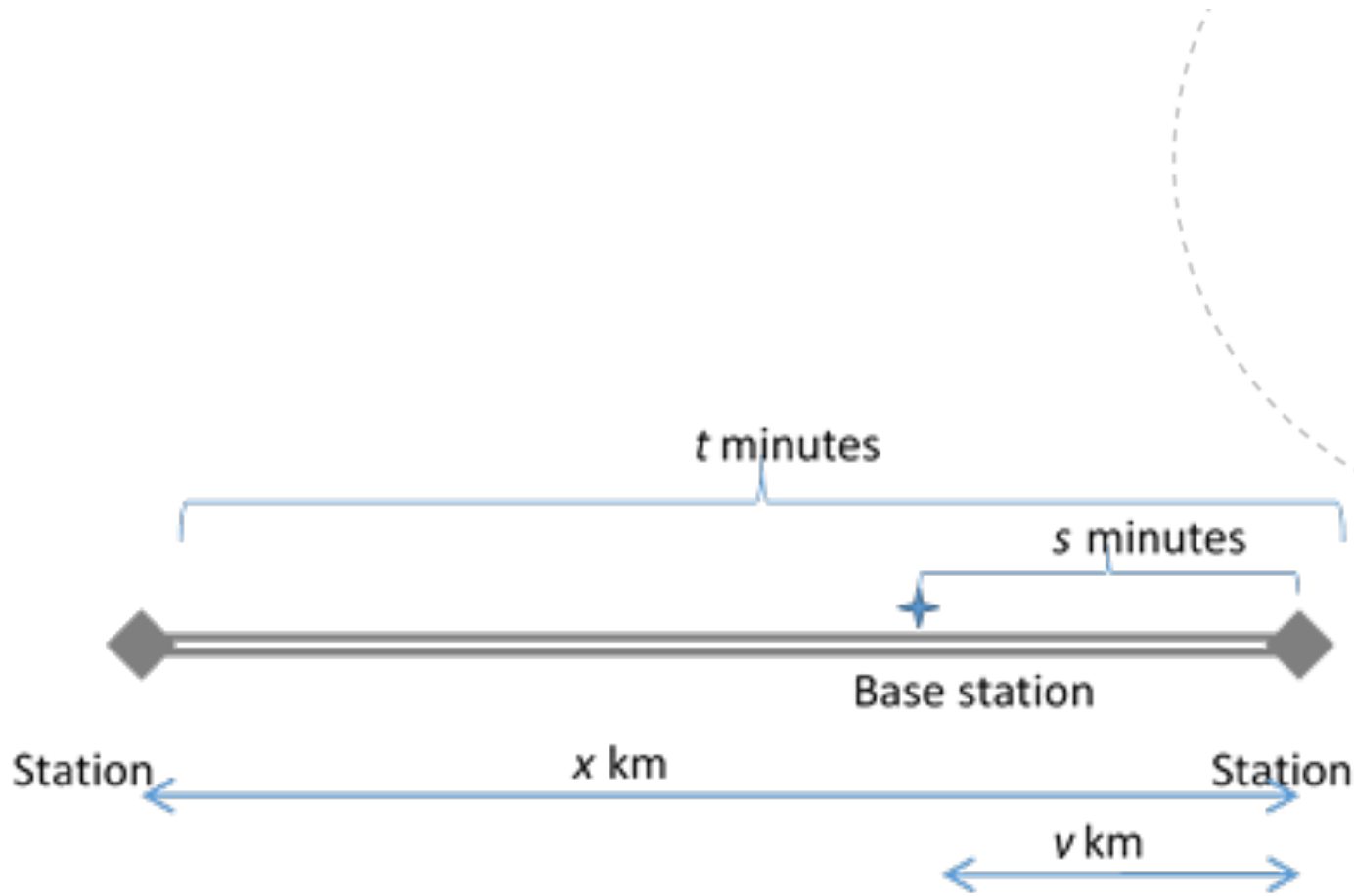
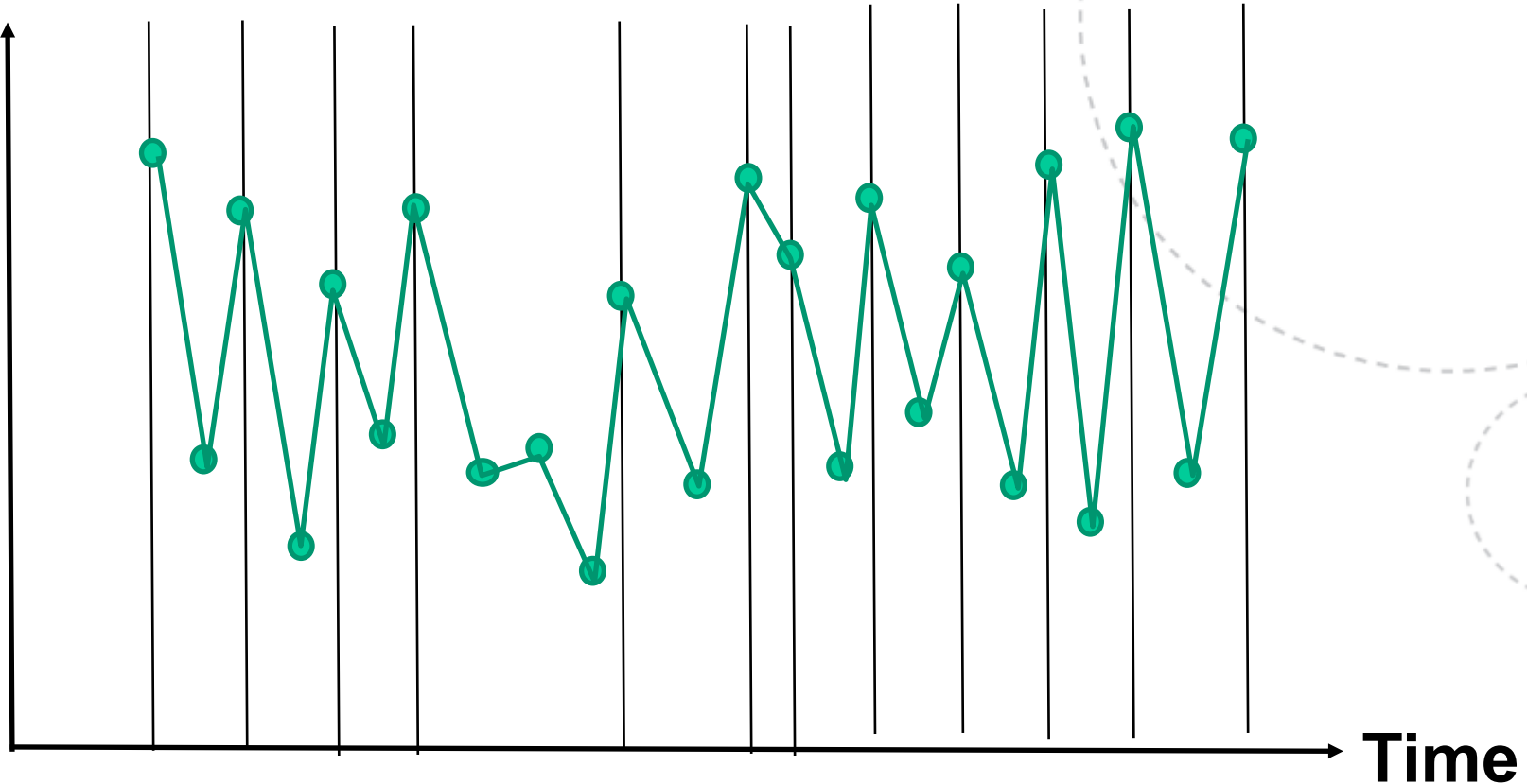
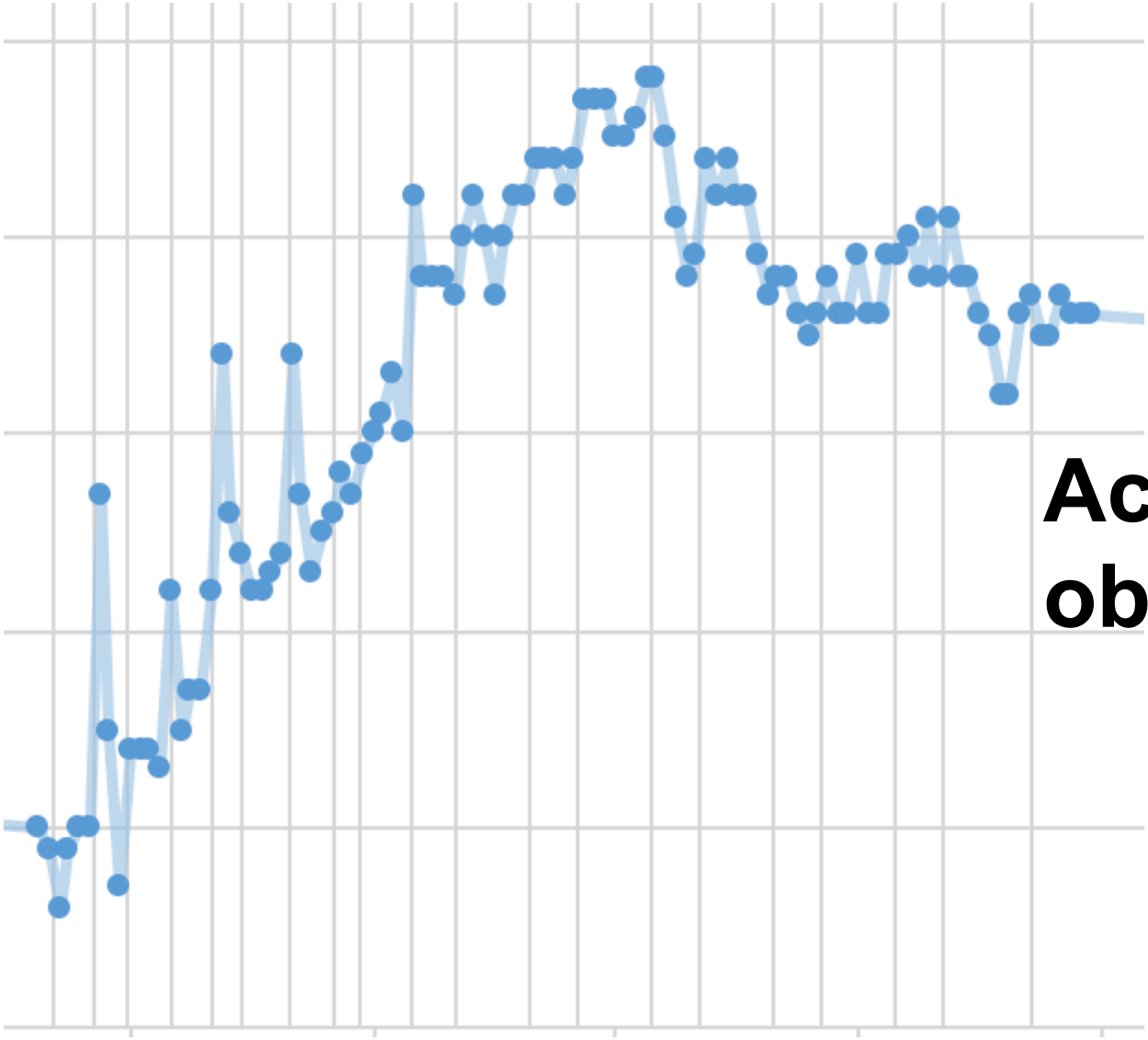


Illustration of expectations

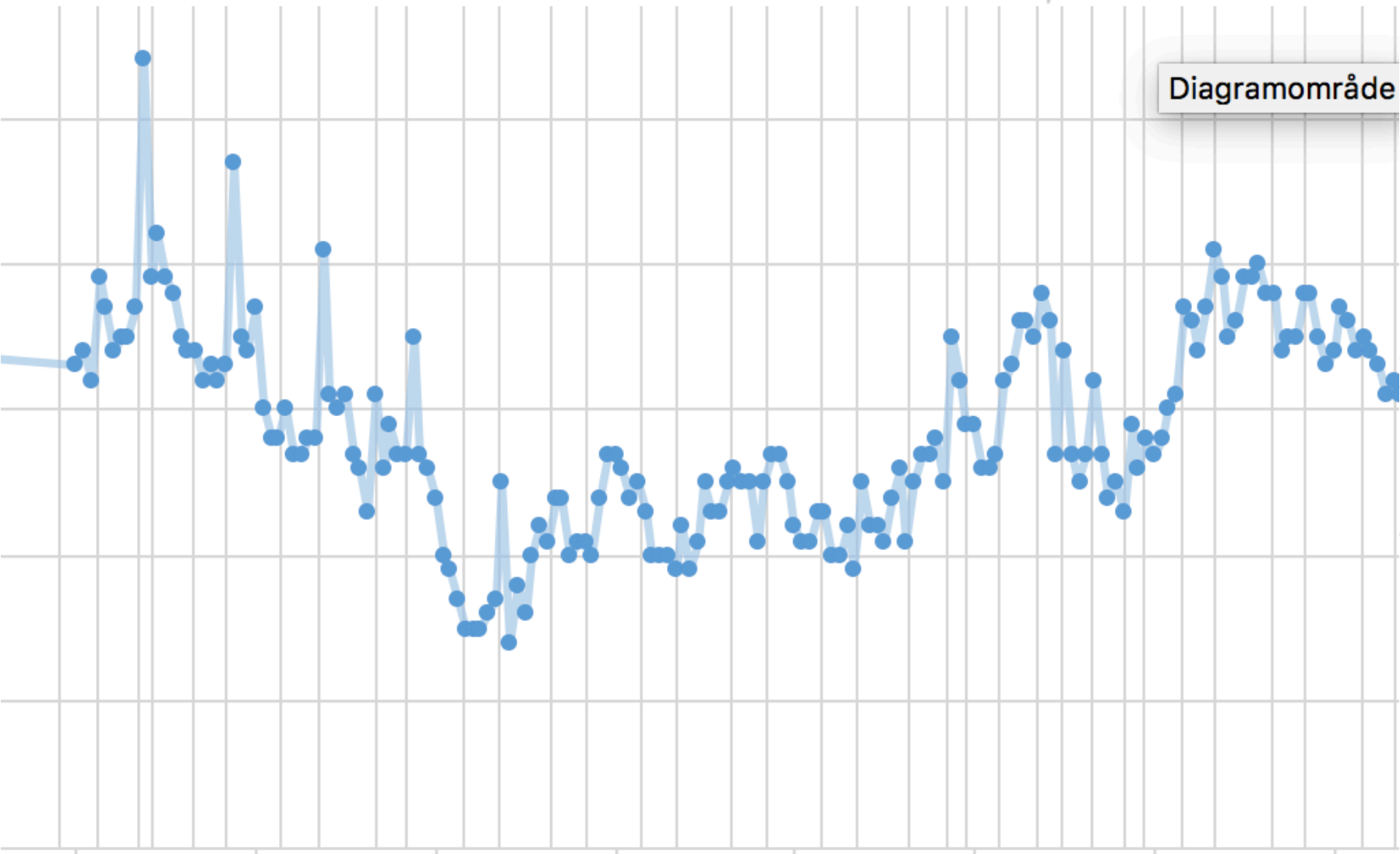
Number of events



Line= train passes

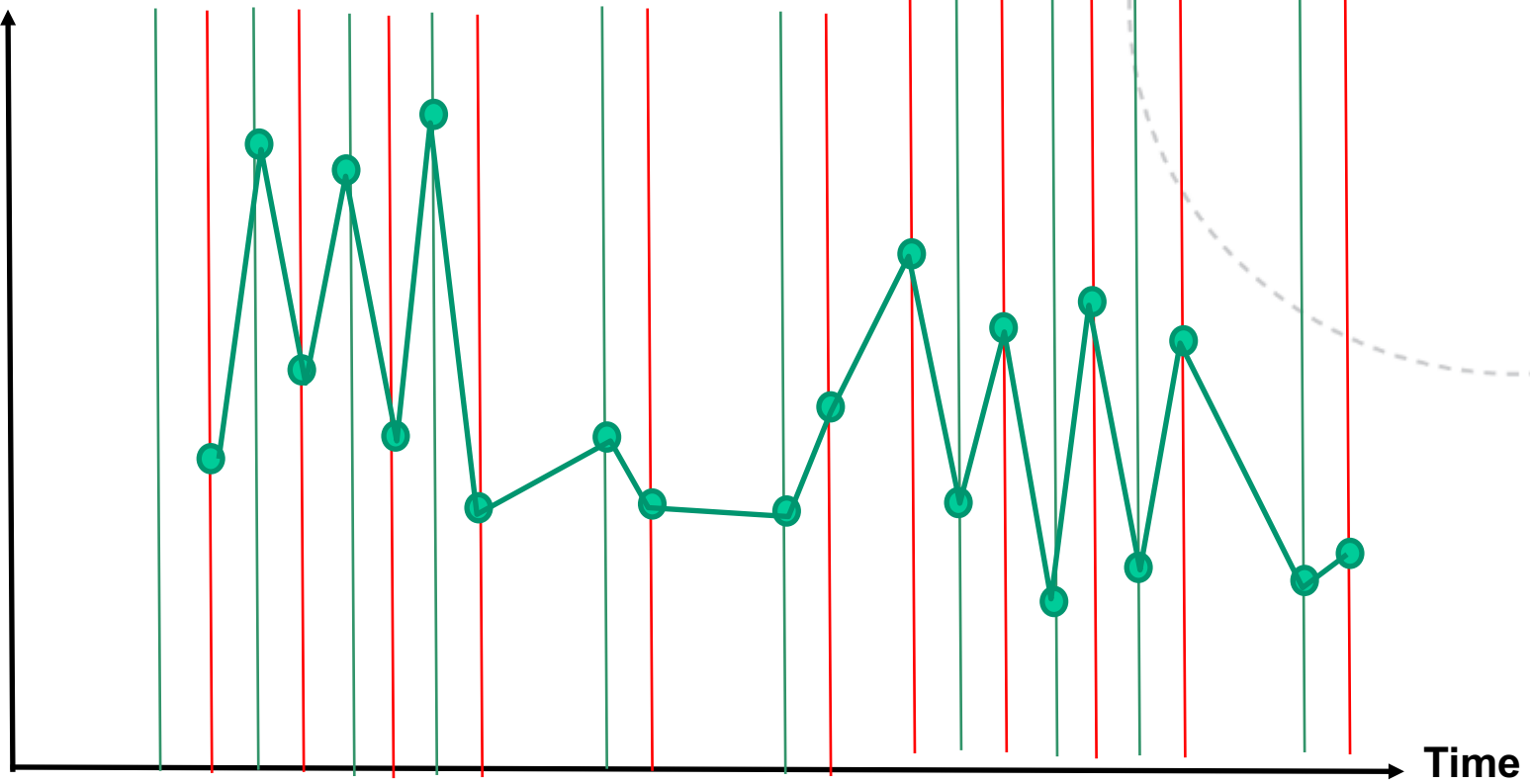


**Actual
observations**



Diagramområde

Number of events

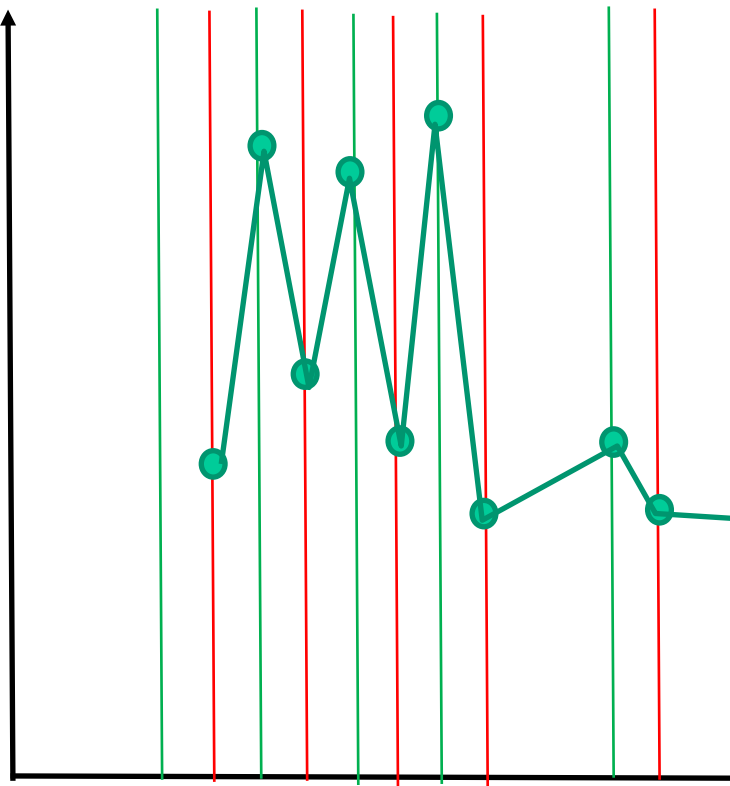


Morning rush hour
Expected peaks on green trains

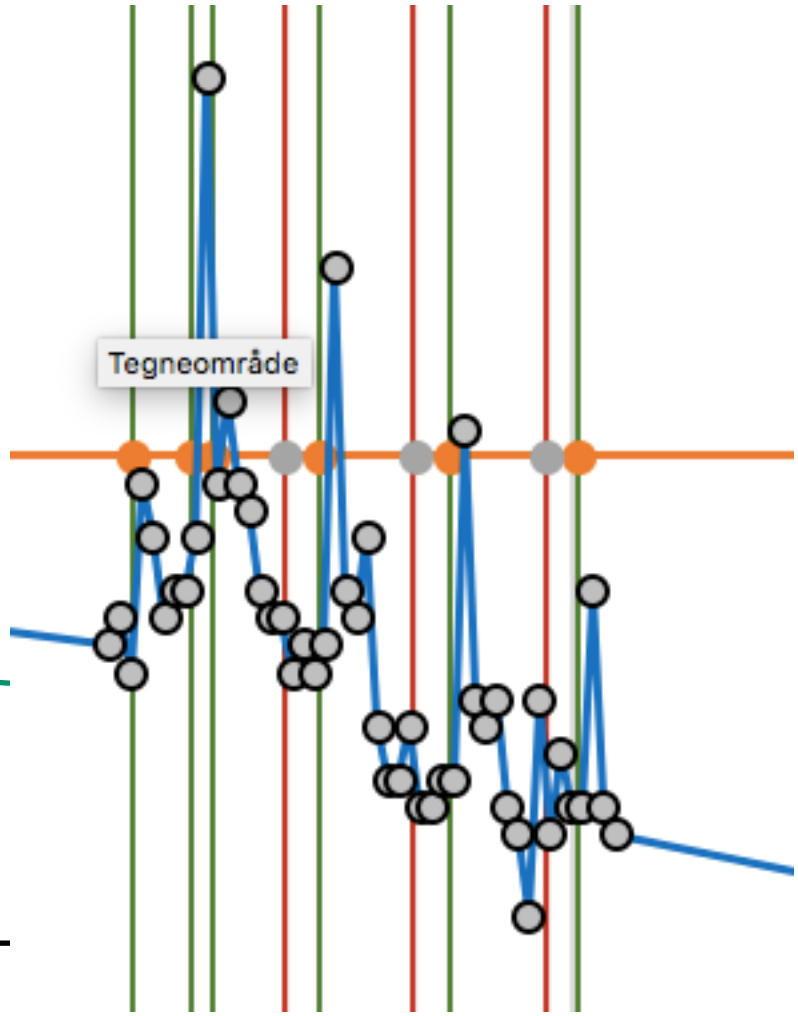
Afternoon rush hour
Expected peaks on red trains

Green trains going towards Oslo
Red trains going from Oslo

Number of events



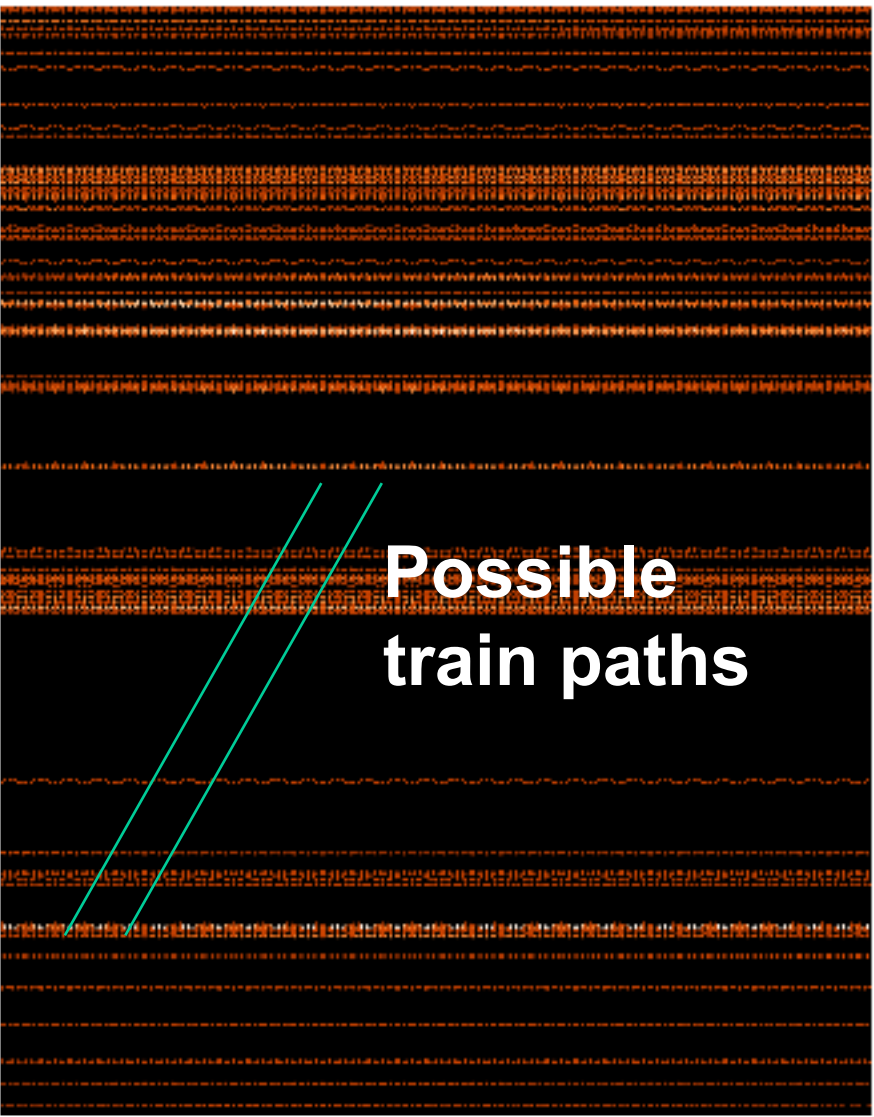
Morning rush hour
Expected peaks on green trains



Green trains going towards Oslo
Red trains going from Oslo

Heatchart

Distance



Many events

Few events

One line = one base station

Time

To what extent is the format of available mobile telephone data suitable for measuring the number of mobile units passing close to the railway line

- Looks promising, but we need higher resolution
- Would be good with base stations in rail tunnels

Is it possible to combine mobile telephone data with railway infrastructure and train traffic data?

- Basically, yes, but rail data have higher resolution

What are suitable formats for presenting and analyzing train rideship based on mobile telephone data?

- We have two alternatives, may not be final

What are the conditions for expanded use of mobile telephone data to track travels that include a train leg, in both a long and short perspective?

- A->B data. Identification of flows, not just events