DATASAFE: understanding Data Accidents for TrAffic SAFEty Acknowledgments

Aleksandra Malkova, Julyan Arbel, Maria Laura Delle Monache

HAL Id: hal-01950663
https://hal.science/hal-01950663

Submitted on 11 Dec 2018

DATASAFE: understanding Data Accidents for TrAffic SAFEty

Aleksandra Malkova[1], Julyan Arbel[2], Maria Laura Delle Monache[3]

1 Univ. Grenoble Alpes, Inria, CNRS, Grenoble INP, M2SIAM, 38000 Grenoble, France
2 Univ. Grenoble Alpes, Inria, CNRS, Grenoble INP, LJK, 38000 Grenoble, France
3 Univ. Grenoble Alpes, Inria, CNRS, Grenoble INP, GIPSA-LAB, 38000 Grenoble, France
{julyan.arbel, ml.dellemonache, aleksandra.malkova}@inria.fr

Aim and data

Our aim is to understand if there exists a particular link between speed and density of cars at which collisions are more likely to occur. We intend to make use of raw sensor data collected on the Rocade Sud in the framework of the Grenoble Traffic Lab (https://gtl.inrialpes.fr/data_download) using data for different days of the week and different day time. The sensor data consists of these quantities collected every 15 seconds: flow, occupancy and speed.
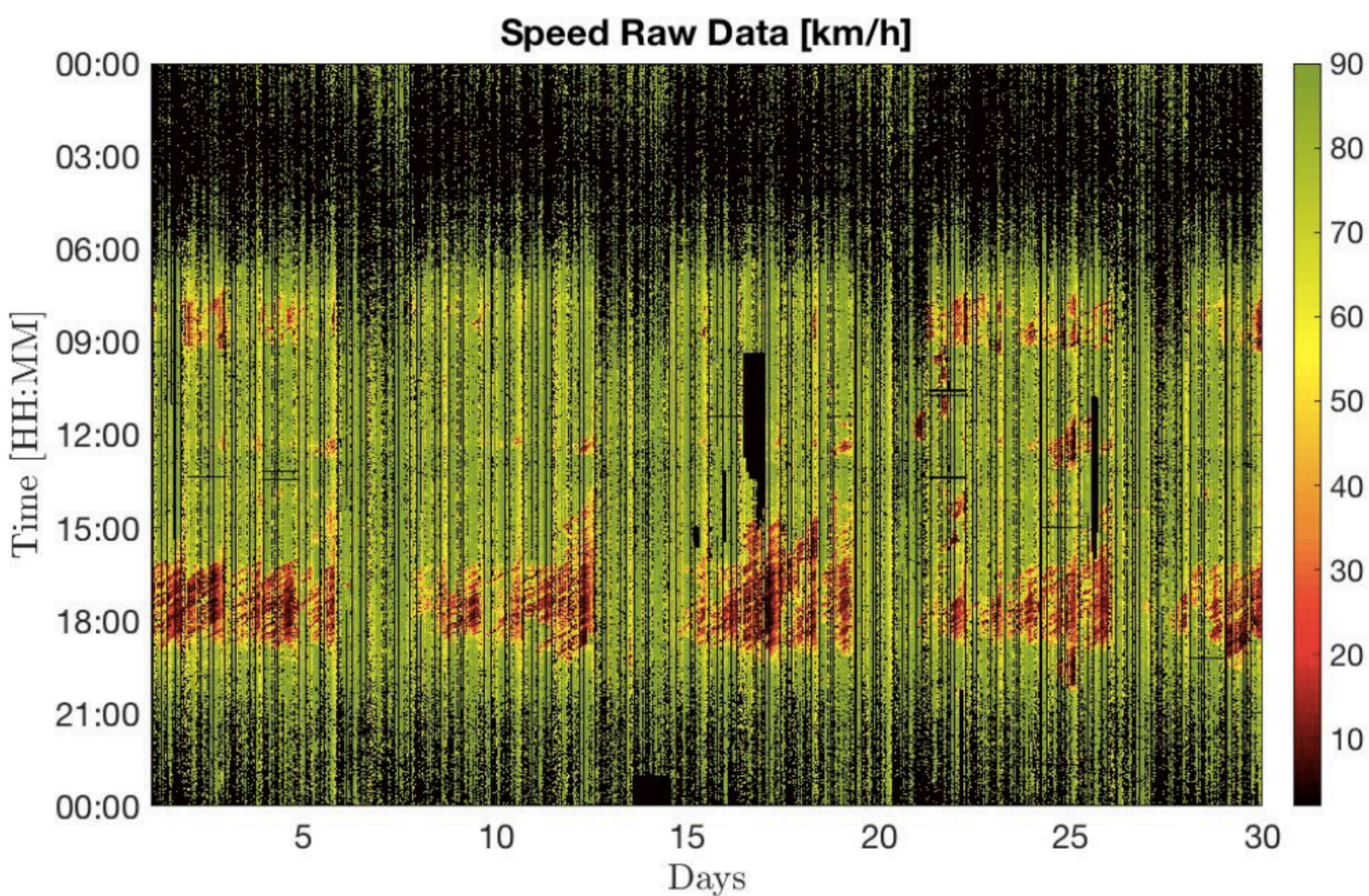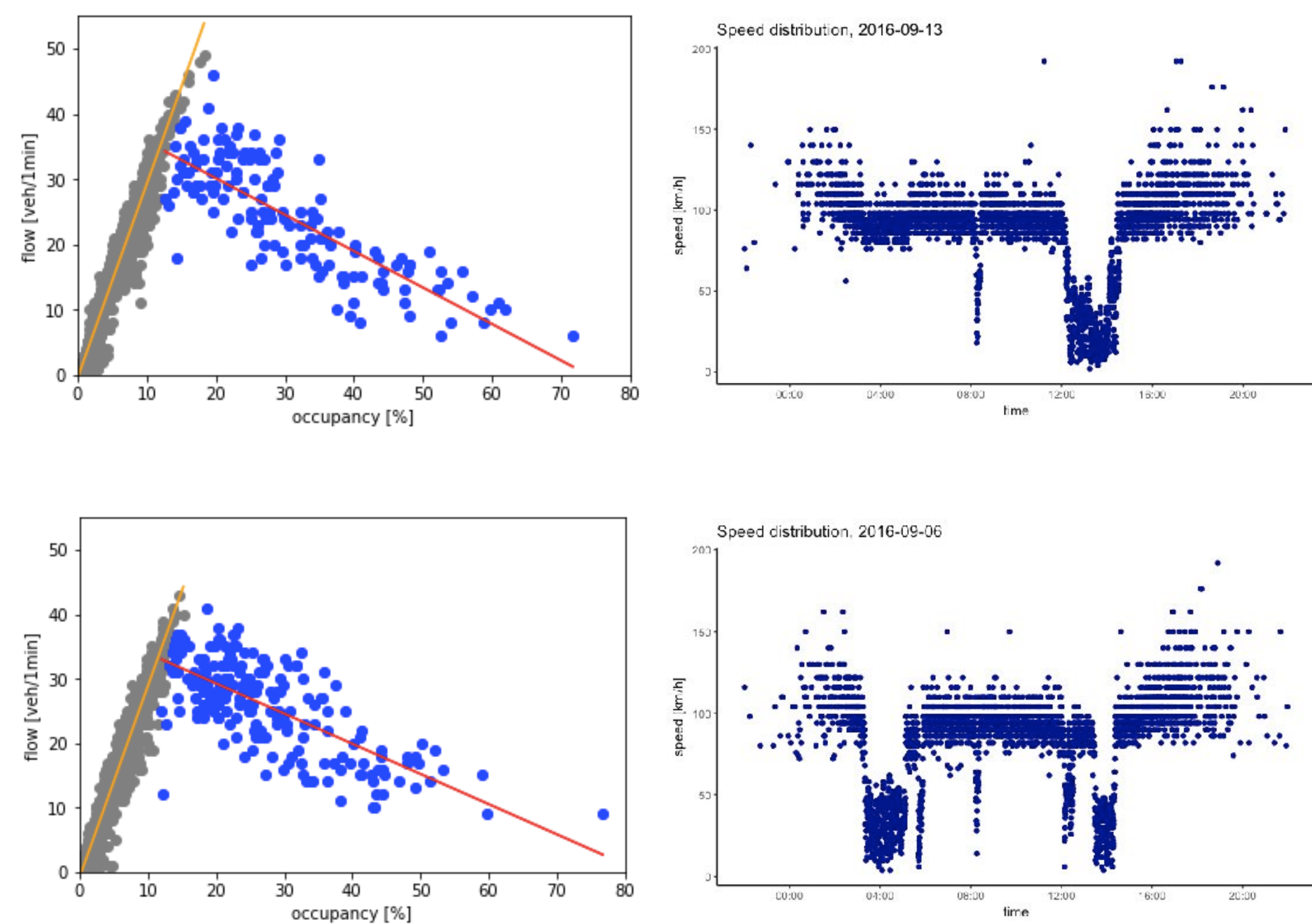

Figure 1. Speed raw data represented according to day of the month VS time of the day, with color code from black-red for low speed to green for high speed.

Data summaries

To understand the data firstly we analyzed the distribution of the main parameters of traffic flow. In Figures (2-3) there are distributions of the speed, occupancy and flow for each day of the week.
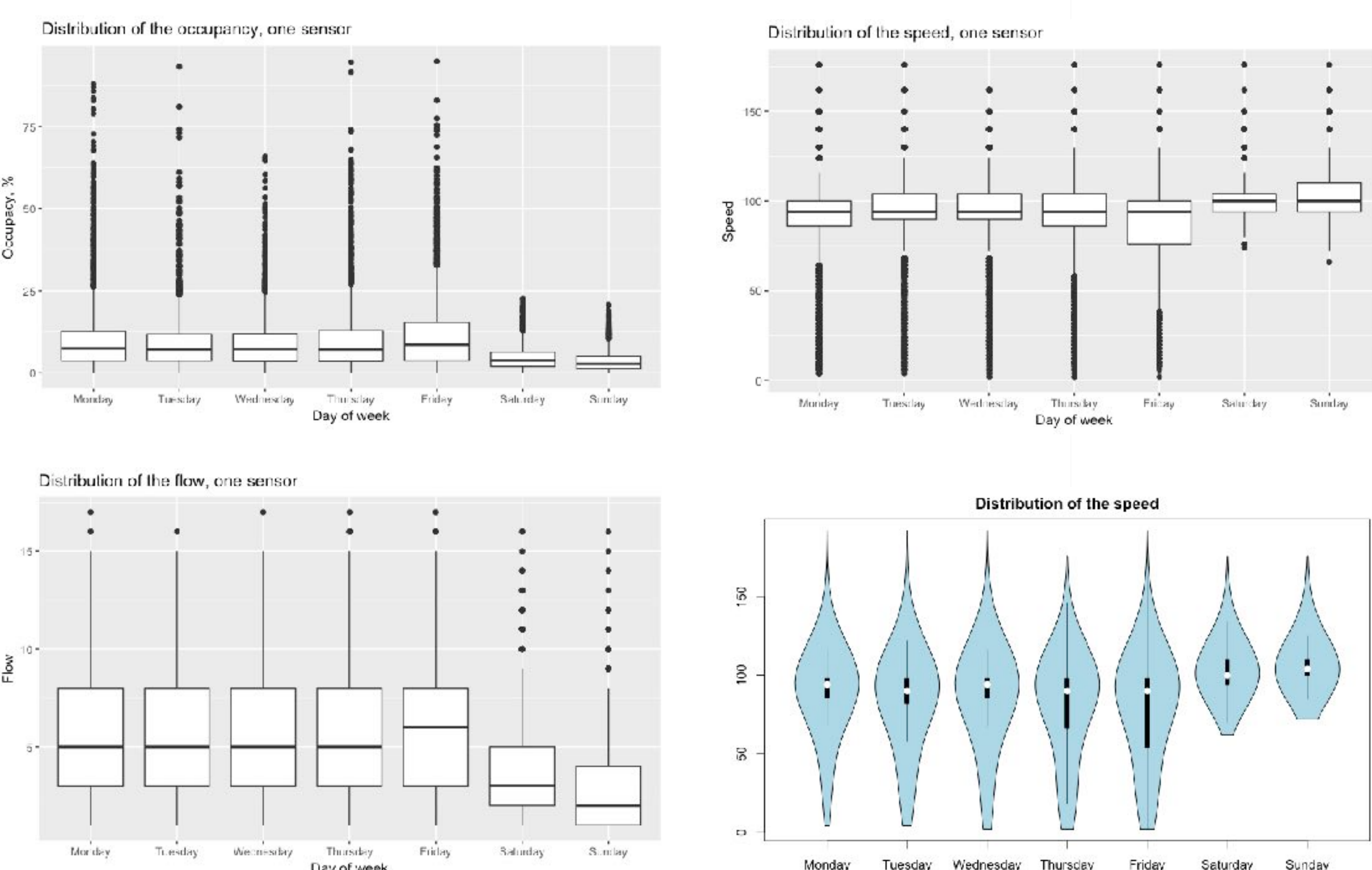

Figure 2. Distribution of the occupancy, speed and flow for one sensor.

Fundamental diagram

The **fundamental diagram** is the main tool used in traffic flow to understand traffic characteristics. It is the graph that links the flow and the density. In this project, we study how the fundamental diagram depends on time and day of the week, weather conditions, characteristics of the road and local traffic rules. In particular, we are interested in understanding if certain particular road conditions can be linked to the generation of accidents.

Days with and without accident

Left: Fundamental diagrams. *Right*: Speed VS time.
First row: Normal day without accident. *Second row*: Day with accident.
They are different days, but same week day.

Note that the two fundamental diagrams above are not radically different. In contrast, the accident is quite visible on the morning of the speed VS time plot.

Future work

We will derive traffic density and flow rate from the sensor data by first reducing the data dimensionality (PCA). Then using state of the art Bayesian statistical learning, building upon [1], and clustering techniques we will analyze traffic behavior during periods of time that precede the accidents from which we will derive traffic patterns.

Acknowledgments

References

1. N. Polson, V. Sokolov, "Bayesian analysis of traffic flow on interstate I-55: The LWR model", *Ann. Appl. Statist.*, vol. 9, no. 4, pp. 1864-1888, 2014.