Bicycling 2004

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1 Cycling Data

1.1 Initialization

Initialization is performed with the following R commands

```
> source("bike.R")
> source("Simple.R")
> library(xtable)
> par(mfrow = c(1, 1), mar = c(5, 4, 4, 3) + 0.1)
```

which load the necessary R source files and libraries. The last command ensures, that some essential drawing parameters are set correctly.

1.2 Data input

The data are read from a CSV[1] file called "`bike2004.csv`" (in the current directory),

```
> csv.file <- paste("bike", thisyear, ".csv", sep = "")
> bike <- getcsv(csv.file)
> bike.colors <- c("grey70", "blue", "black", "orange")
```

and put into the data frame `bike`. The columns are

```
 [1] "Count"      "Date"       "HR"         "Kg"         "Day1"
 [6] "Total1"     "Min1"       "Sec1"       "Avg1"       "Day2"
[11] "Total2"     "Min2"       "Sec2"       "Avg2"       "Day3"
[16] "Total3"     "Min3"       "Sec3"       "Avg3"       "Day"
[21] "Total"      "Avg10Days"  "Avg20Days"  "AvgYear"    "Target"
[26] "Diff"       "MinutesDay" "SecondsDay" "AvgDay"     "CumTime"
[31] "CumAvg"
```

It contains data for 3 bicycles I used this year. The variable `bike.colors` is set so that the individual bicycles can be indicated by their respective color in subsequent plots.

[1] Comma Separated Values, output format from OpenOffice/Excel/Spreadsheet programs, in this case actually TAB-separated.

1.3 Overview

The first graph[2] gives an overview of the bike usage this year. It tries to mimic the graph from the spreadsheet program by also showing the following information:

- the red line indicates the *total distance traveled* this year, 6316.612 km so far.
- the orange circle show *daily distance*
- while the other lines show *averages* over
  - 10 days (light purple)
  - 20 days (dark purple)
  - the whole year so far (grey), currently 21.055 km/day.

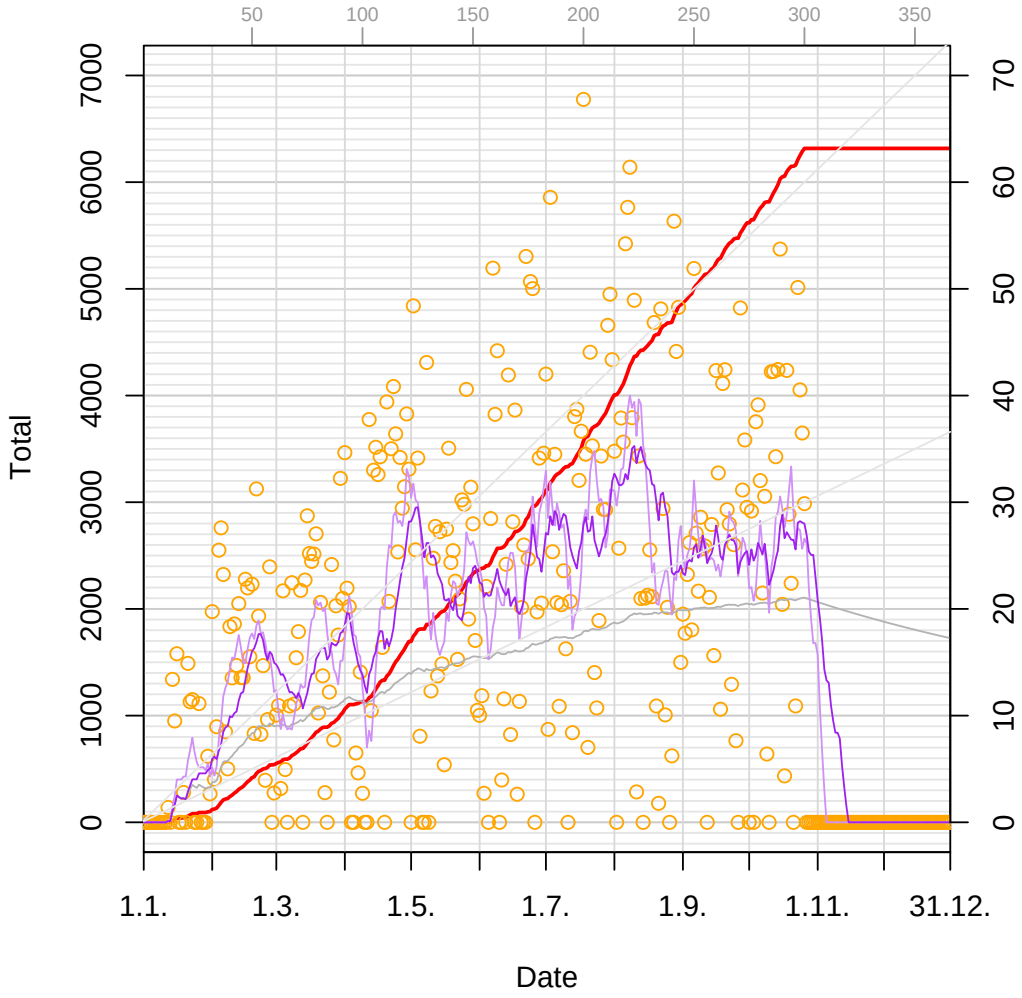

Figure 1: Daily (circles) and overall (red line) distance traveled. The purple line indicates an average (light over 10 days, dark over 20 days), the dark grey line the daily average for the year so far. The light grey lines correspond to an average daily distance of 10 and 20 km. The scale for the daily parameters is shown on the right y-axis.

[2]Using the command `bike.graph()`

An alternative plot[3] shows bike specific contributions and averages as well as the overall data presented in the previous plot. Here a `loess()`-based fit is used rather than sliding averages.

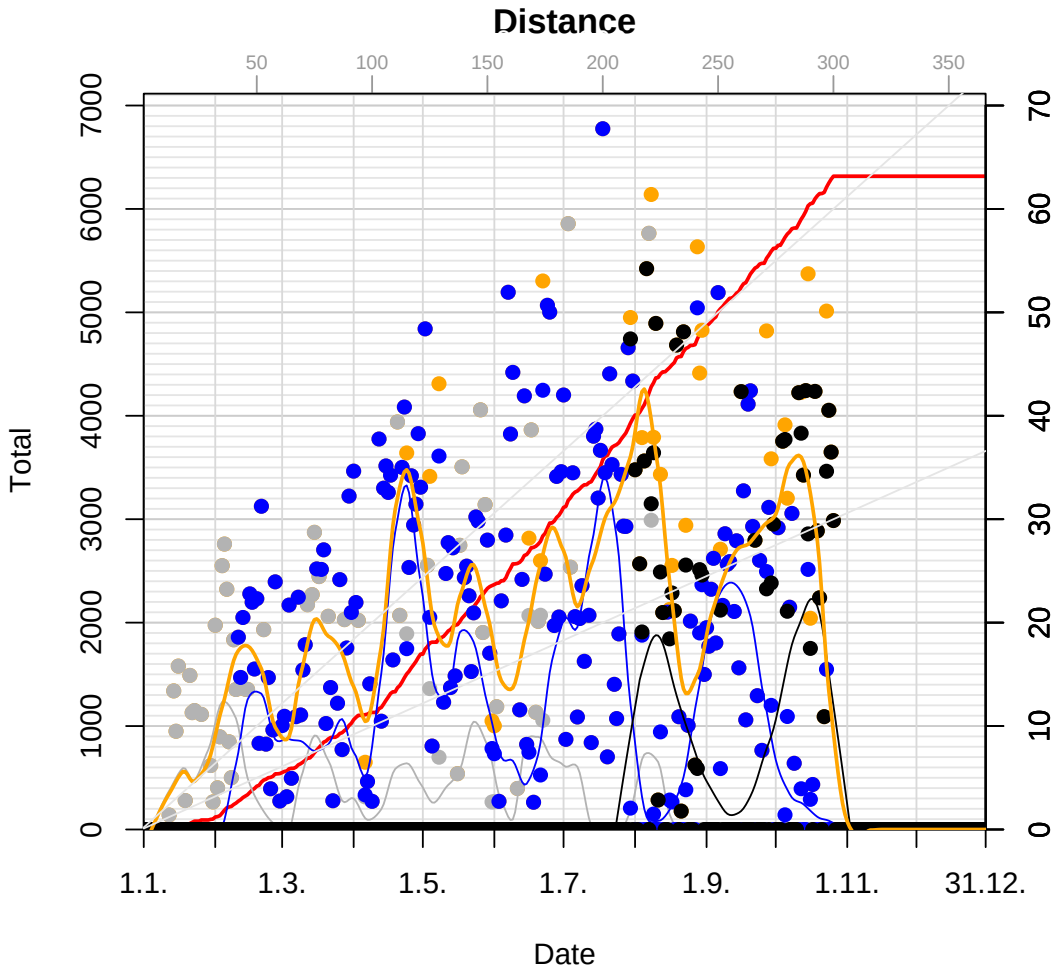

Figure 2: Daily (dots) and overall (red line) distance traveled. The dot color indicates the bicycle used: grey70—bike1, blue—bike2, and black—bike3. Orange dots indicate the total daily distance when more than one bike was used that day as well as the overall daily average. The light grey lines correspond to an average daily distance of 10 and 20 km.

Interestingly, looking at the denity curves of the usage graph, during the first half of 2004, the usage of bike1 and bike2 show rather synchronous peaking, indicating good weather for cycling. In the second half, however, bike2 and bike3 show an almost alternating pattern with the dip in bike3 (early September) corresponding to the hand injury.

[3]Using the command `bg2()`

1.4 Scatter Plot of Time vs. Distance

This plot shows a dot for each day a bicycle was used as well as circles for daily overall time and distance.

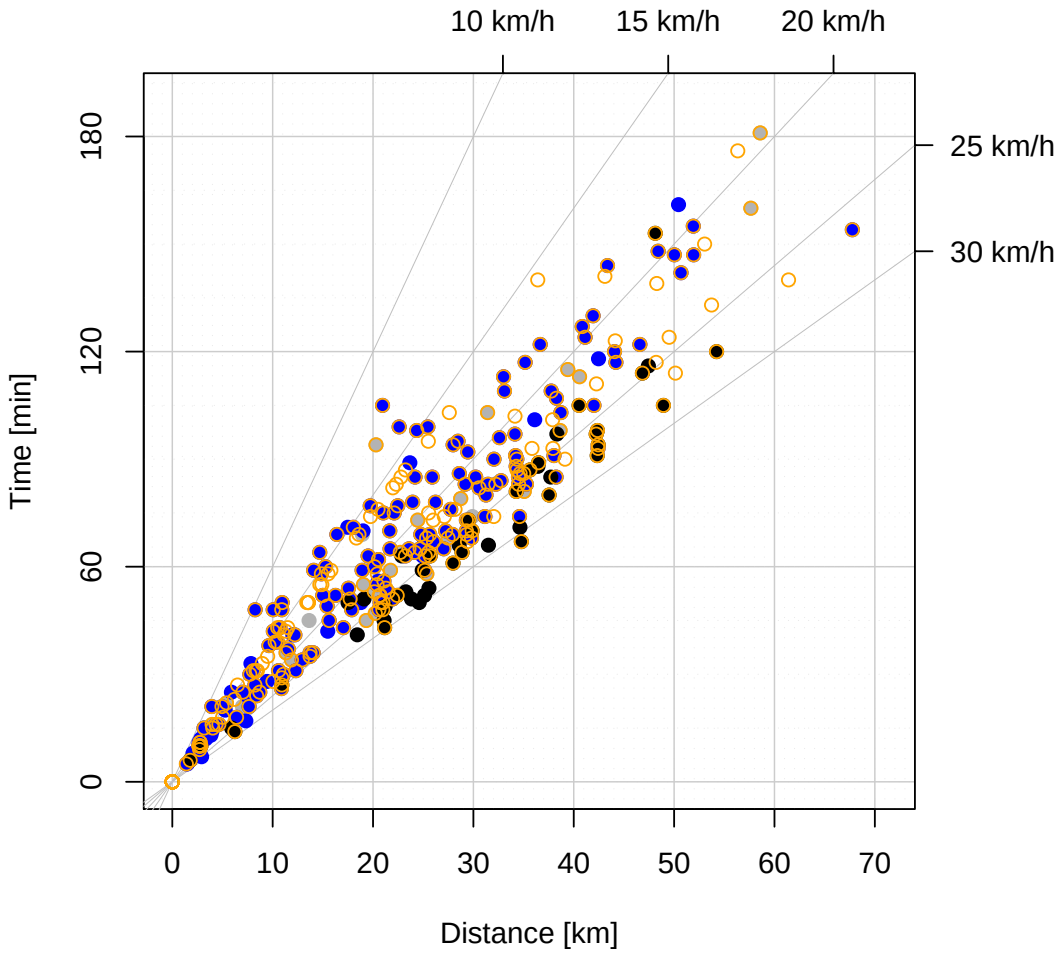

Figure 3: Grey—bike1, blue—bike2, black—bike3, orange—overall per day

1.5 Cumulative bike usage

The following plots show the contributions from each bike to the overall distance evolving over the year.

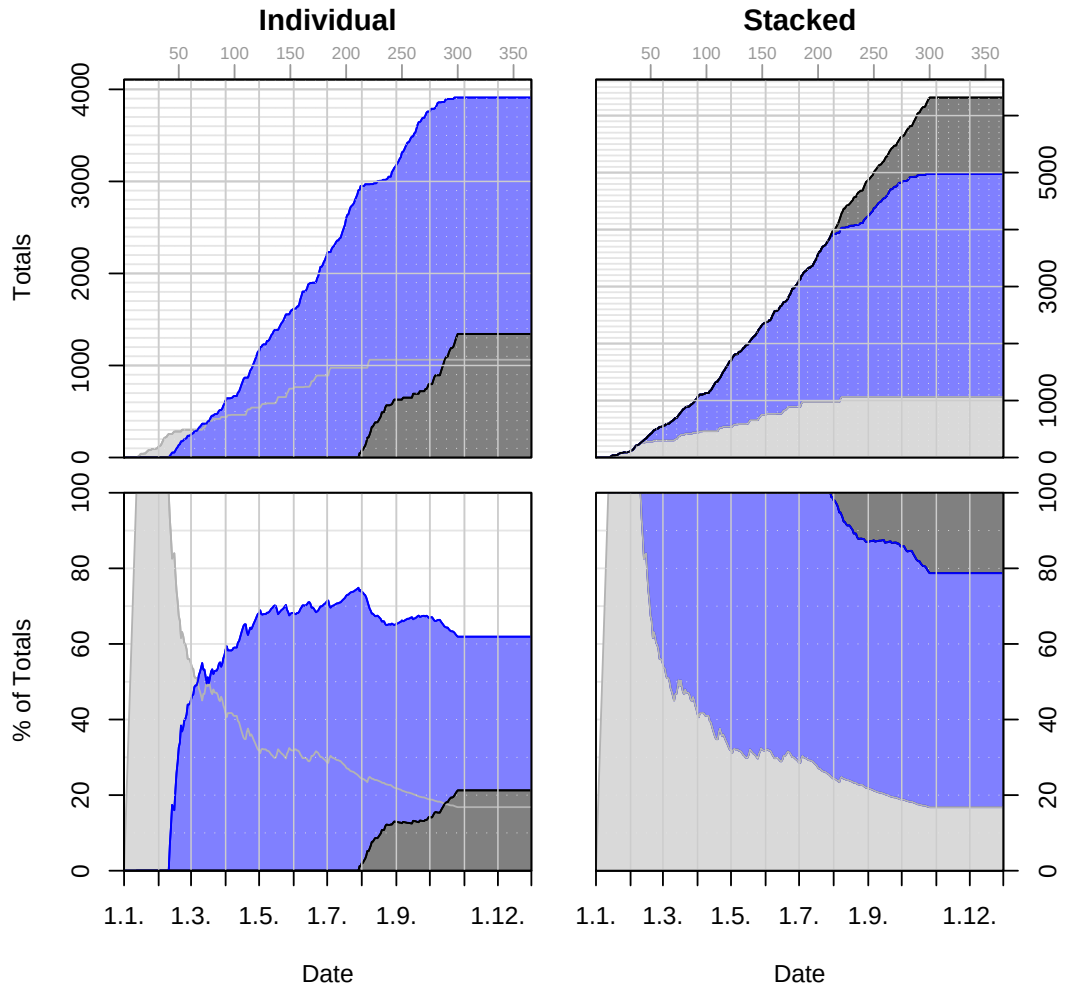

Figure 4: Individual (left) and stacked (right) plots of the bike's usage in km (top) and as percentage (bottom). Grey—bike1, blue—bike2, black—bike3.

1.6 Bike specific distributions

As the data are recorded separately for each of the three bikes, these can be analyzed per bike.[4]

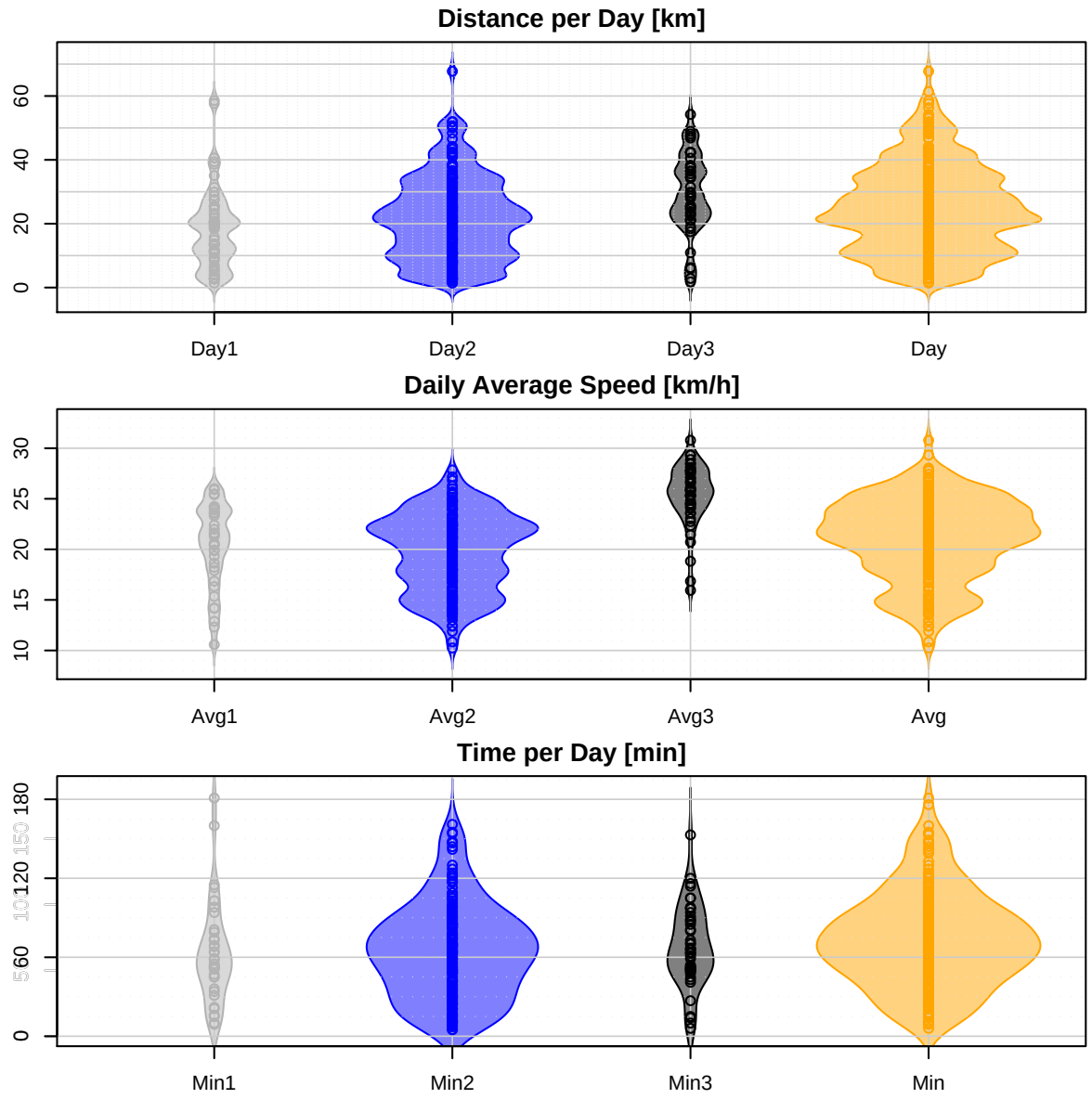

Figure 5: The densities are scaled to the overall count of non-zero values in each plot. The right-most "violin" shows to the overall distribution.

[4]For this figure the function `simple.violinplot()` from the package `Simple` has been adapted.
The package has been updated for R 2.0.0 on Oct. 4, 2004, but there still seem to be some problems. To install the official version, try
> `install.packages("Simple",contriburl="http://www.math.csi.cuny.edu/Statistics/R/simpleR/")`
at the R prompt.

1.7 Average Speed over whole year

Note that the average speed was only available after February 21, before an estimate of 16 km/h is assumed.

The overall average speed (*) was 20.9 km/h.

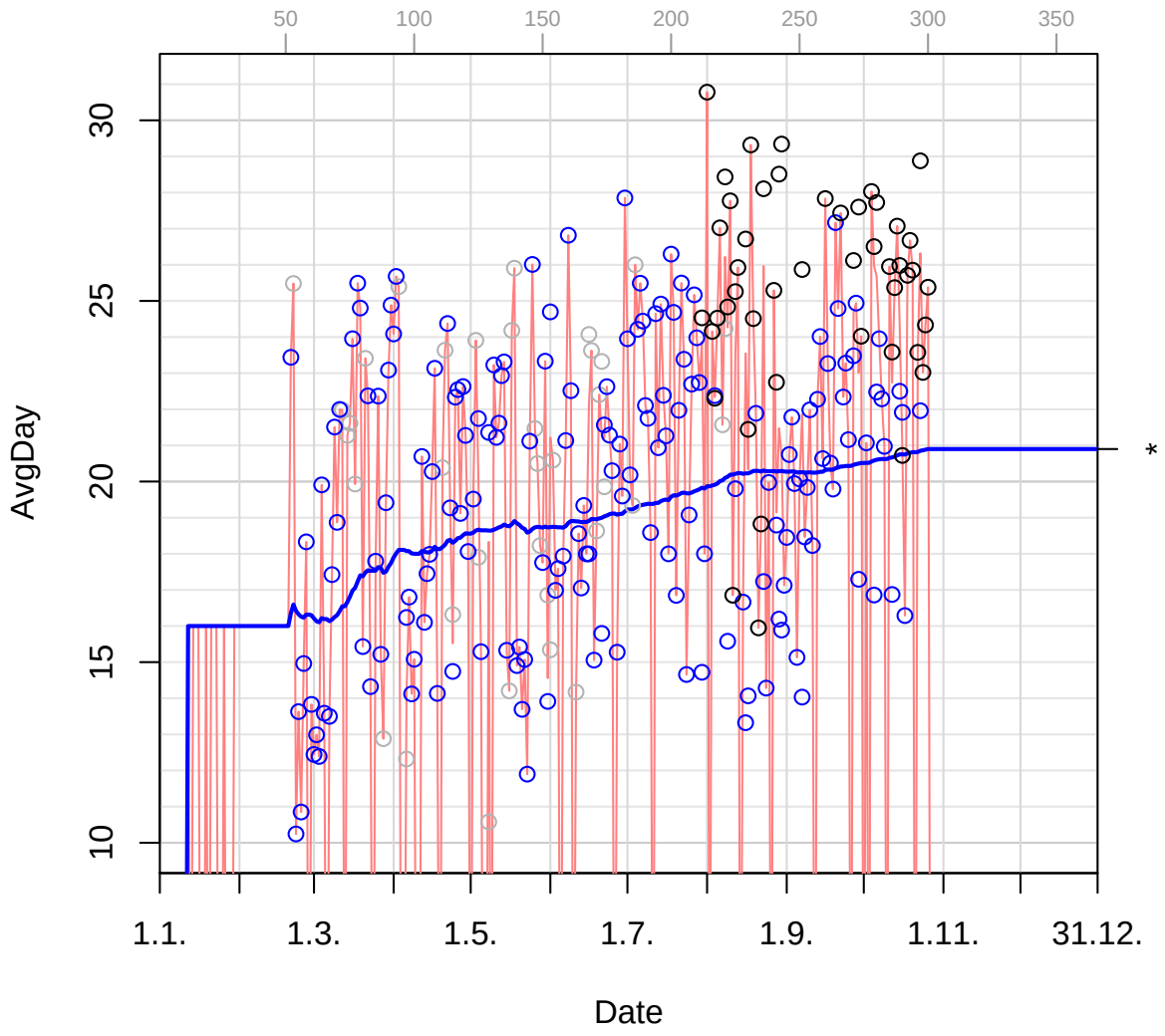

Figure 6: The circles indicate the daily average speeds per bike, where grey70—bike1, blue—bike2, and black—bike3. The thin red line shows the daily average, the thick blue line indicates the overall average speed over the whole year.

1.8 Time Spent

Overall a total of 302 hours and 14 min was spent cycling during the year so far (300 days). This corresponds to approx. 60 min and 26.8 sec per day.

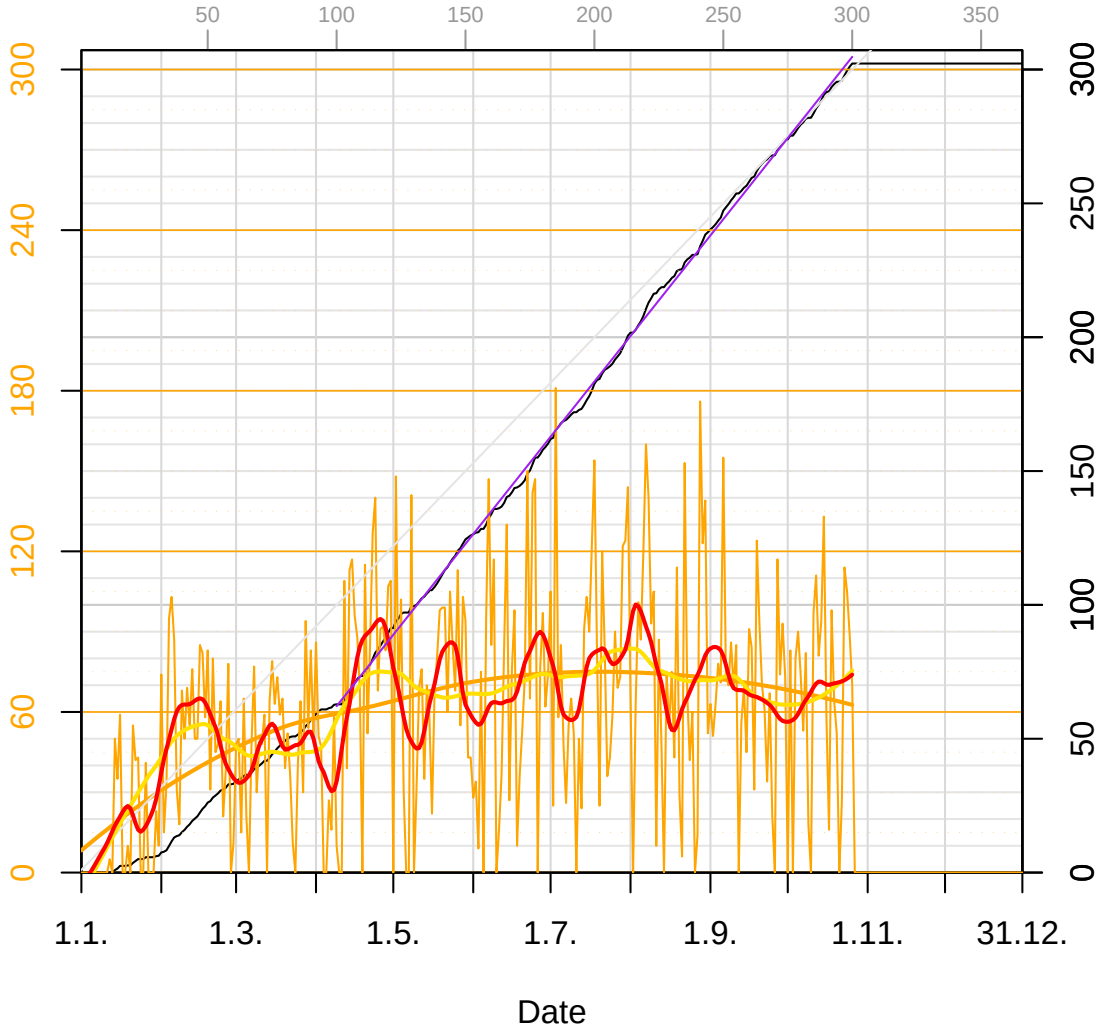

Figure 7: The overall time spent cycling (black, [h]) and the time per day (orange, [min]). The yellow and red lines indicated fine averages of the time cycled per day.

From April on the time spent per day stayed relatively constant at about 1 hours and 13 min (1.21 h). This is indicated by the purple line showing a linear fit to the data in that time range.

1.9 Development per Month

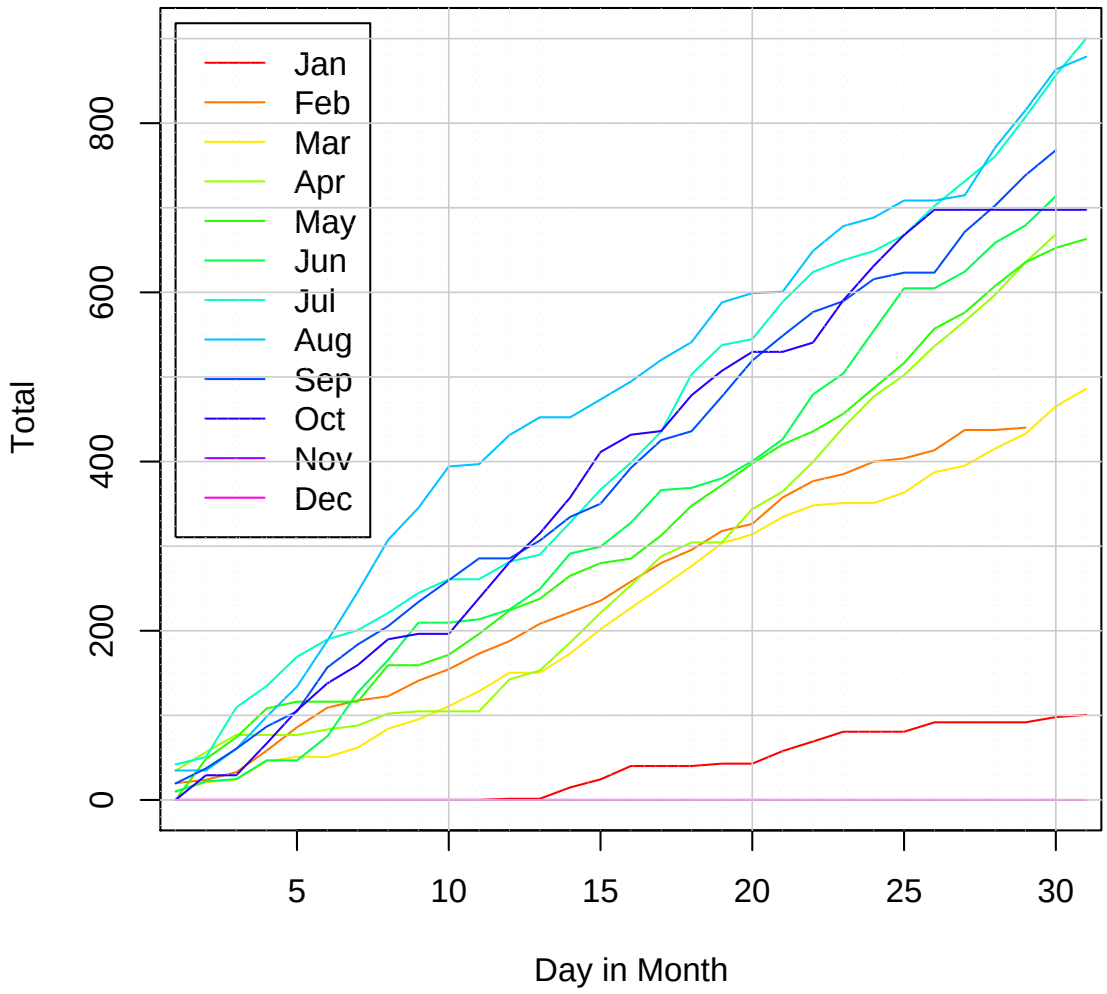

Figure 8: Each line represents the distance traveled in the corresponding month.

1.10 Monthly Statistics

Data can be factored by month which can also be plotted

	Cycled	Paused	Distance	Average	corrected
Jan	11.00	20.00	100.59	3.24	9.14
Feb	28.00	1.00	440.07	15.17	15.72
Mar	28.00	3.00	486.13	15.68	17.36
Apr	25.00	5.00	668.61	22.29	26.74
May	27.00	4.00	663.07	21.39	24.56
Jun	27.00	3.00	713.80	23.79	26.44
Jul	30.00	1.00	900.15	29.04	30.00
Aug	28.00	3.00	878.54	28.34	31.38
Sep	28.00	2.00	768.03	25.60	27.43
Oct	22.00	4.00	697.62	26.83	31.71
Nov	0.00	0.00	0.00		
Dec	0.00	0.00	0.00		

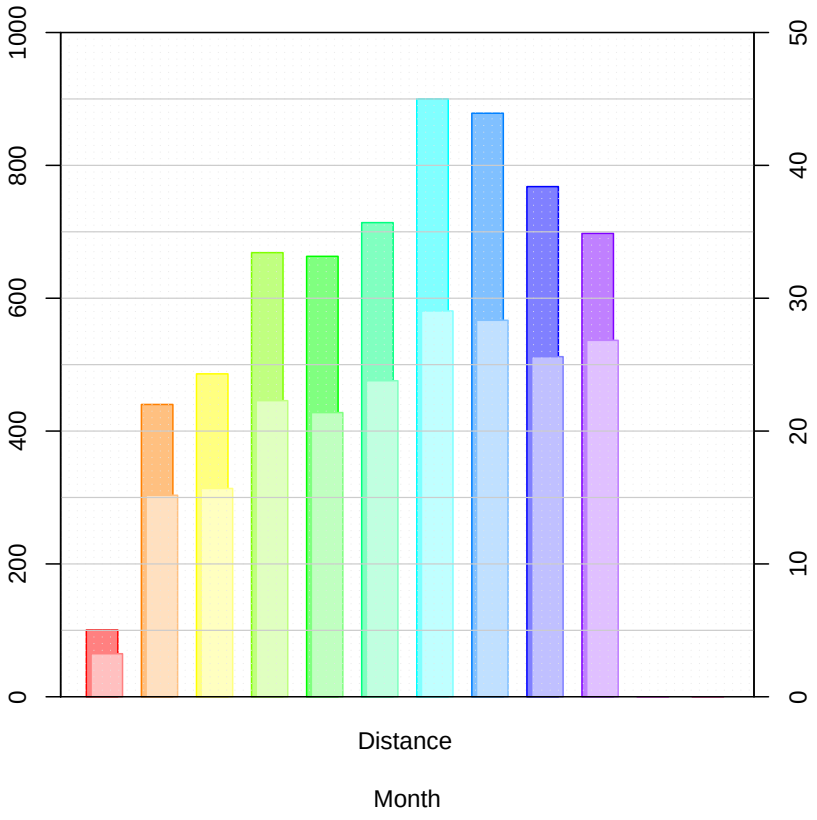

Figure 9: Monthly kilometers (darker bars, left axis) and monthly average (lighter bars, right axis).

2 Biometric Data

From May on weight and resting heart rate were acquired almost daily.

2.1 Weight

Weight was measured usually before breakfast. The scale used offers a resolution of 0.5 kg.

2.2 Resting heart rate

The heart rate is taken either before going to sleep or after waking up in the morning. Initially the pulse was counted over over intervals of 10, 15, 20, 30, or even 60 sec and extrapolated to one minute.

Later a program was written for the HP 48 which times the duration of 10 heart beats. The average of 6 such measurements is taken, yielding fractional HR values from Aug. 21.

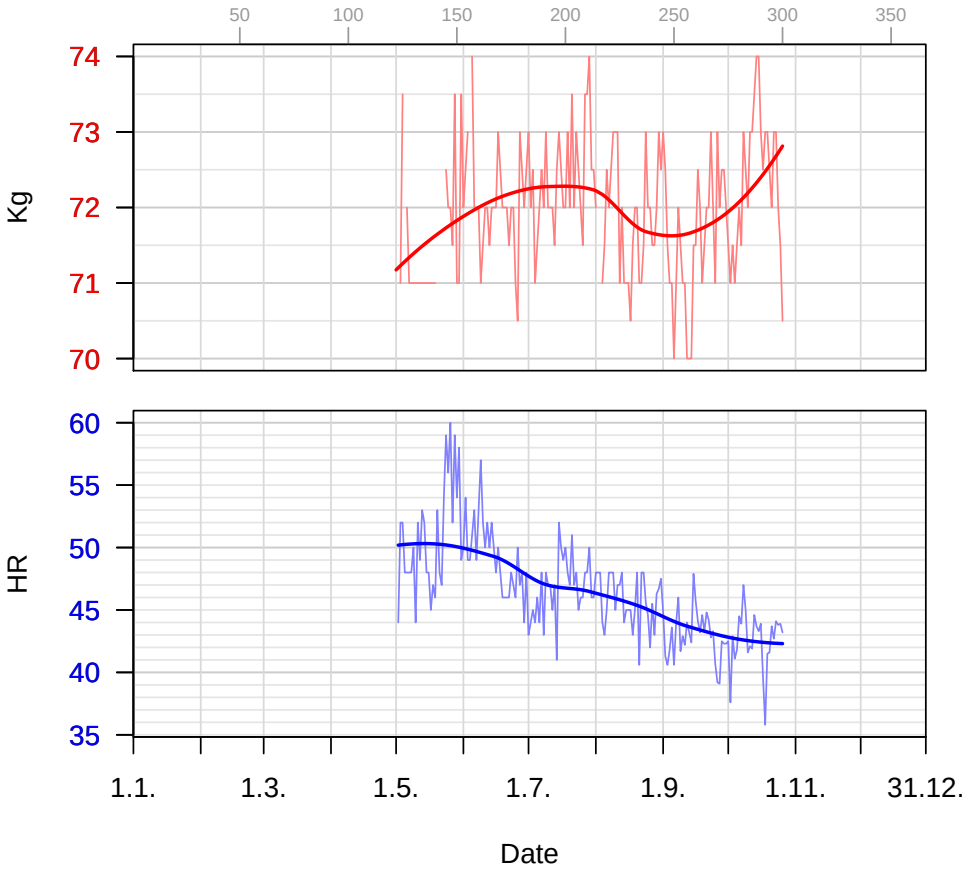

Figure 10: Weight [kg] (red) and resting heart rate [bpm] (blue) with corresponding `loess` fit lines.