

Classifying Human Behaviour



Chris Campbell, PhD

Humans have many behaviours



Record of behaviour can be valuable

- sports performance
 - team brand
 - athlete health/career
 - political - international representation
- lifestyle and health
 - heart conditions
 - sleep problems

But accurate records can be hard to acquire



... unobtrusively



Technology has a solution



GENEActiv

Activinsights

GENEActiv wrist-worn accelerometer



- 24 h wear
- acceleration in 3 axes
- ambient light
- temperature
- 100 Hz measurements

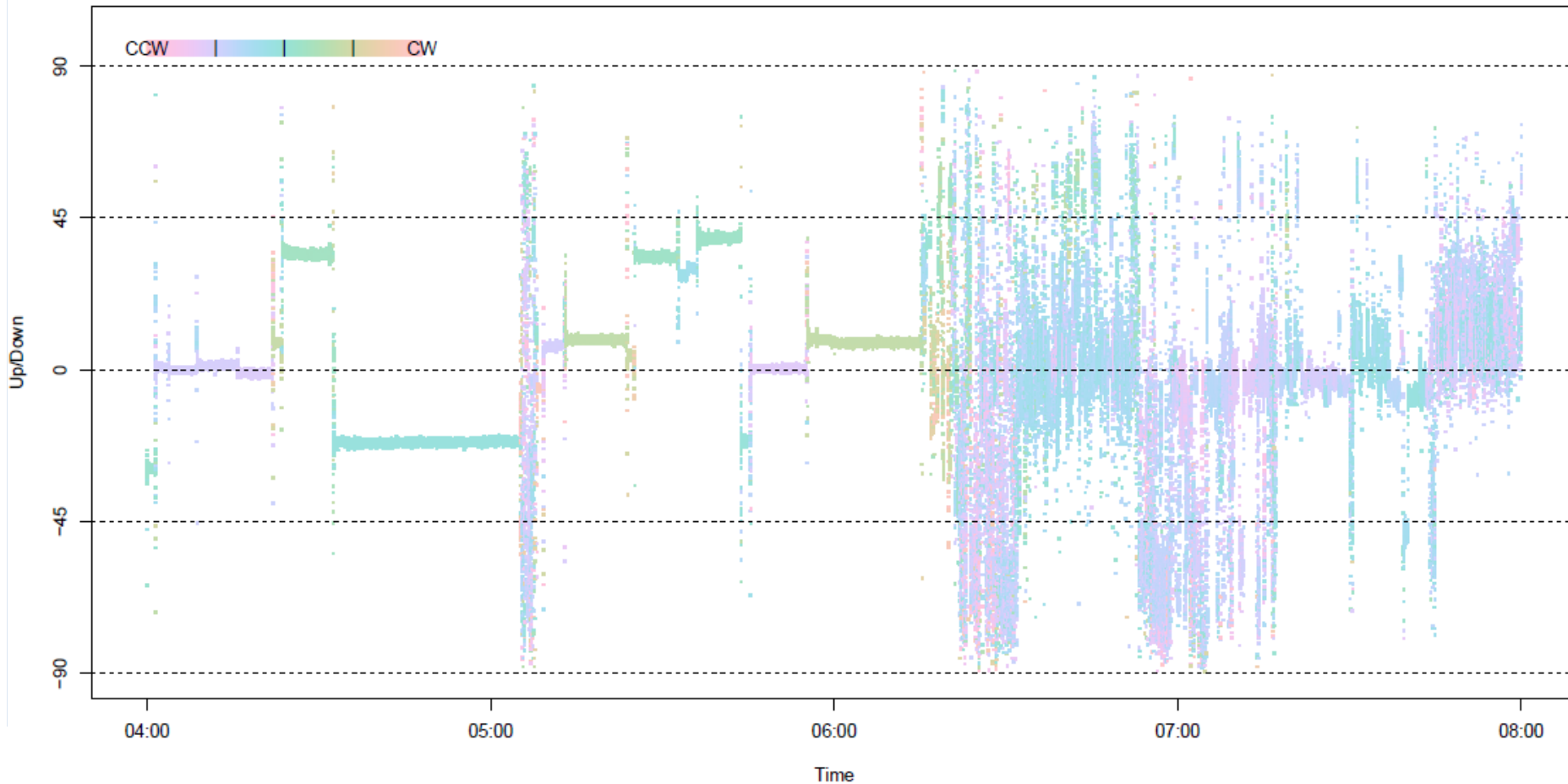
Activinsights

large numbers of users, high frequency data

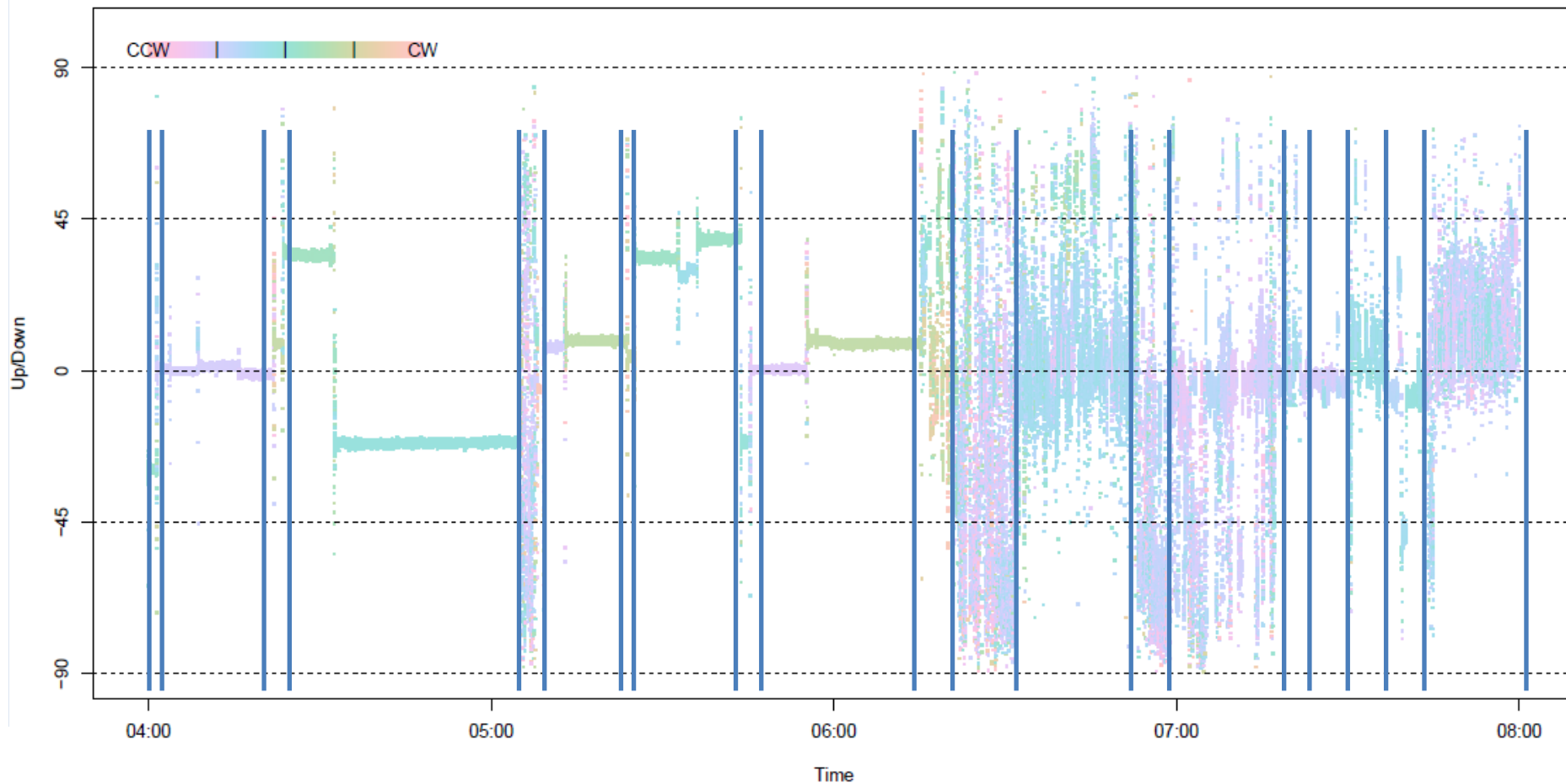
- too much data to manually classify
- R tools to simplify analysis for researchers
- supervised learning using rpart



Wrist moves up/down and rotates



Time series must be segmented

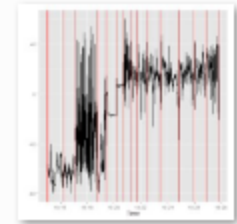


Segment GENEActiv output

```
> library(GENEAcclassify)
> seg <- getSegmentedData(testfile =
+     "geneactiv_right_wrist_2015-01-12_04-15-03.bin",
+     outputdir = "segdata")
```



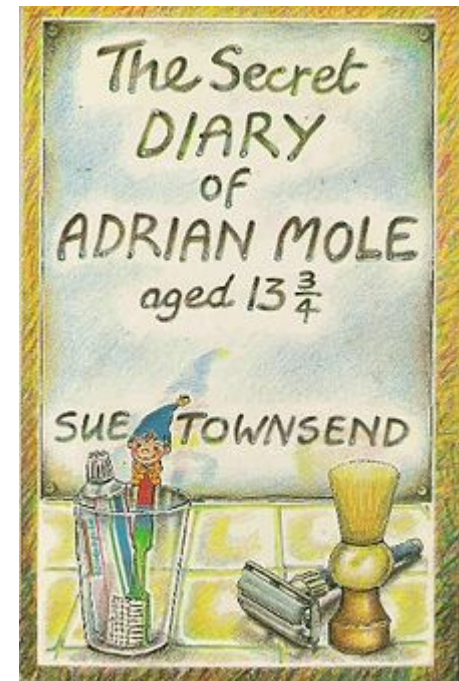
geneactiv_right_wrist_2015-01-12_04-15-03_segmented.csv



geneactiv_right_wrist_2015-01-12_04-15-03_segmented.png

Add segment class with diary

```
> seg$Activity <- c(  
+   rep("Walking", times = 5),  
+   rep("Running", times = 9))
```



Train rpart fit

```
> sfit <- createTrainingFit(data = seg)
> levels(sfit)
[1] "Running" "Walking"
> features(sfit)
[1] "Degrees.sd"
[2] "Segment.Duration"
[3] "Principal.Frequency.mad"
[4] "UpDown.sd"
```



Identify behaviours from data

```
> sclass <- classifyGENEA(testfile =  
+   "geneactiv_right_wrist_2015-02-03_07-01-53.bin",  
+   trainingfit = sfit)  
> table(sclass$Class)
```

Running	Walking
41	30



Limitations

- only previously observed behaviours classified
- multiple simultaneous activities may be tricky to classify and/or disambiguate

Advantages

- extended time series can be classified with minimal investigator input
- training fit can be optimized to focus on behaviours of interest in the study

Next Steps

- Release to CRAN
- Promote awareness of GENEActiv to researchers

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