

tempR: Temporal sensory data analysis

John C. Castura¹

¹Compusense Inc., 255 Speedvale Ave. W., Guelph, Ontario N1H 1C5, Canada E-mail : jcastura@compusense.com



Abstract

This forthcoming package includes several functions for analyzing data arising temporal sensory methods. Functions are currently provided for analyzing Temporal Check-All-That-Apply (TCATA) and Temporal Dominance of Sensations (TDS) data.

Keywords: tempR; Temporal Check-All-That-Apply; TCATA; Temporal Dominance of Sensations; TDS; TCATA curves; TCATA trajectories; R package

Introduction

Historically temporal sensory evaluation has focused on how the intensity of a single sensory attribute changes over time. The approach is manageable but appropriate only for model systems and simple applications. Various researchers have proposed alternative temporal sensory methods that better capture the real-world complexity associated with many foods and beverages, which have complex changes in multiple sensory attributes over time. Amongst temporal sensory methods that have been proposed recently are Temporal Dominance of Sensations (TDS; Pineau et al., 2009) and Temporal Check-All-That-Apply (TCATA; Castura et al., 2016) methods. These methods do not attempt to measure attribute intensities directly. A TDS evaluation provides a sequence of dominant attributes, where each dominant attribute has a start time and a duration, and the duration of a dominant attribute ends with the selection of the next dominant attribute. A TCATA evaluation provides a multivariate binary time series, where attributes are either selected or not selected at each time slice. Both univariate and multivariate approaches are used to investigate data arising from studies involving TCATA and TDS methods. The forthcoming package tempR is introduced to enable exploratory data analyses of data arising from each of these methods. Only selected methods are discussed in the sections that follow.

If there is an interest in contrasting a product of interest with other products, then attributes can be highlighted at time segments when its citation proportions differs from the other products. Average citation proportions for the other products can be shown at the corresponding time slices using a reference line, as shown by Castura et al. (2016; Figs. 3 & 4). Highlighting appears according to the data frame referenced by the (optional) highlight parameter. Reference lines appear according to the data frame referenced by the (optional) reflines parameter. Reference lines can be suppressed according to the data frame referenced by the (optional) declutter parameter. Any corresponding data frames would have the same dimensions as the data frame containing the data. Details for using these files are given in the help file. Graphical parameters are available to adjust the line type, width, and colour of the highlight and reference lines. Parameters not mentioned here are available to further customize plots.

Data

Selected data from the study described by Baker et al. (2015; 2016) are in included in the package. After loading the package tempR, data can be loaded.

library(tempR)

data(syrah)

Citation proportions for the panel are available from syrah\$data.

TCATA Curves

TCATA curves show changes in citation proportions for attributes (y axis) over time (x axis). Such a visualization can be obtained using the function tcata.line. plot. For illustrative purposes we show TCATA curves for the first sip of the low ethanol wine.

```
low1 <- t(syrah$data[seq(3, 1026, by = 6), ])
colnames(low1) <- 10:180</pre>
```

The data are now arranged with attributes in rows and time slices in columns, and provides citation proportions. Data can be plotted (not shown) using the following command.

Other Univariate Methods

Various other univariate methods are available. For example, pairwise differences in citation proportions can be obtained from the function tcata.diff.plot. TDS curves and difference curves can be obtained from functions tds.plot and tds.diff.plot. Chance and significance lines can obtained via functions get.chance and get.significance, then plotting using tds.plot. Several methods discussed in the paper by Castura and Li (2016) are also provided.

TCATA Trajectories

Castura et al. (2016, Figs. 6 & 7) obtain trajectories for products evaluated using TCATA using correspondence analysis. As discussed by Castura et al. (submitted), TCATA citation proportions can also be submitted to principal component analysis on the covariance matrix. A data frame of proportions should be structured such that each row is a Product*Time (sorted by Time, then Product) and each column is an Attribute. Analysis using prcomp gives a list of class prcomp that can be used as input to the function plot_pca.trajectories, which displays the trajectories.

tcata.line.plot(low1)

Smoothing is applied to avoid overfitting the data. The function get.smooth can be applied either to a data frame or to a vector for the purpose of smoothing. TCATA curves are shown in Fig. 1.

tcata.line.plot(get.smooth(low1))



The tcata.line.plot function has default settings that are appropriate for citation proportion data. If data submitted to tcata.line.plot are based on counts, then the number of observations can be set using the parameter n. The get.smooth function constrains smoothed values to between the values set by low.bound and up.bound, which are by default 0 and 1. If counts are used, then set up.bound to the number of evaluations in the study. Other parameters are also available to ensure that smoothing is appropriate.



Help, Citation, and Download

on CRAN at the time of the AgroStat conference.

Various additional graphical parameters are provided. For details see the help files
associated with the particular functions. Help for the package can be accessed
using the command.
 help(package = "tempR")
It is requested that the package be cited where appropriate. Citation details can
be obtained for this package in the usual manner.
 citation(package = "tempR")
A link will be provided at the poster if the package is unavailable on for download

References

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