

# Package ‘iccTraj’

May 8, 2026

**Type** Package

**Title** Estimates the Intraclass Correlation Coefficient for Trajectory Data

**Version** 1.1.0

**Depends** R (>= 4.0)

**Imports** dplyr, magic, trajectories, sp, spacetime, purrr, utils, furr, progressr, parallel, parallelly, future

**Description** Estimates the intraclass correlation coefficient for trajectory data using a matrix of distances between trajectories. The distances implemented are the extended Hausdorff distances (Min et al. 2007) <doi:10.1080/13658810601073315> and the discrete Fréchet distance (Magdy et al. 2015) <doi:10.1109/IntelCIS.2015.7397286>.

**License** GPL (>= 2)

**Encoding** UTF-8

**LazyData** true

**RoxygenNote** 7.3.2

**NeedsCompilation** no

**Author** Josep L. Carrasco [aut, cre]

**Maintainer** Josep L. Carrasco <jlcarrasco@ub.edu>

**Repository** CRAN

**Date/Publication** 2025-05-08 10:50:01 UTC

## Contents

gull_data	2
HD	2
ICC	3
iccTraj	4
interval	6

<b>Index</b>	<b>7</b>
--------------	----------

---

 gull\_data

*Gull data*


---

**Description**

A data frame with sample of 90 gull trajectories.

**Usage**

gull\_data

**Format**

A data frame containing 90 trajectories

**ID** Subject identifier

**trip** Trip identifier

**LONG** Longitude

**LAT** Latitude

**triptime** Time in seconds when the locations were obtained

---

 HD

*Computes extended Hausdorff distance between two trajectories.*


---

**Description**

Computes extended Hausdorff distance between two trajectories.

**Usage**

HD(pp1, pp2, q = 1)

**Arguments**

pp1 Set of spatial points for the first trajectory. It can be a matrix of 2D points, first column x/longitude, second column y/latitude, or a SpatialPoints or SpatialPointsDataFrame object.

pp2 Set of spatial points for the second trajectory. It can be a matrix of 2D points, first column x/longitude, second column y/latitude, or a SpatialPoints or SpatialPointsDataFrame object.

q Quantile for the extended Hausdorff distance. Default value q=1 uses the maximum that leads to classical Hausdorff distance.

**Value**

A numerical value with the distance.

**References**

Magdy, N., Sakr, M., Abdelkader, T., Elbahnasy, K. (2015). Review on trajectory similarity measures. 10.1109/IntelCIS.2015.7397286.

Min, D., Zhilin, L., Xiaoyong, C. (2007) Extended Hausdorff distance for spatial objects in GIS. International Journal of Geographical Information Science, 21:4, 459–475

**Examples**

```
# Take two trajectories
library(dplyr)
library(sp)
sample_data<-gull_data %>% filter(ID %in% c(5107912,5107913), trip %in% c("V02", "V01"))
tr1<-gull_data %>% filter((ID == 5107912) & (trip=="V02"))
tr2<-gull_data %>% filter((ID == 5107913) & (trip=="V01"))
pts1 = SpatialPoints(tr1[c("LONG", "LAT")], proj4string=CRS("+proj=longlat"))
pts2 = SpatialPoints(tr2[c("LONG", "LAT")], proj4string=CRS("+proj=longlat"))
# Hausdorff distance
HD(pts1,pts2,q=1)
# Median Hausdorff distance
HD(pts1,pts2,q=0.5)
```

---

 ICC

*Computes the intraclass correlation coefficient (ICC) using a matrix of distances.*

---

**Description**

Computes the intraclass correlation coefficient (ICC) using a matrix of distances.

**Usage**

```
ICC(X, nt)
```

**Arguments**

X                      Matrix with the pairwise distances.  
 nt                     Data frame with the number of trips by subject

**Details**

The intraclass correlation coefficient is estimated using the distance matrix among trajectories.

**Value**

Data frame with the estimates of the ICC ( $r$ ), the subjects' mean sum-of-squares (MSA), the between-subjects variance (sb), the total variance (st), and the within-subjects variance (se).

---

iccTraj	<i>Estimates the intraclass correlation coefficient (ICC) for trajectory data</i>
---------	---

---

**Description**

Estimates the intraclass correlation coefficient (ICC) for trajectory data

**Usage**

```
iccTraj(
  data,
  ID,
  trip,
  LON,
  LAT,
  time,
  projection = CRS("+proj=longlat"),
  origin = "1970-01-01 UTC",
  parallel = TRUE,
  individual = TRUE,
  distance = c("H", "F"),
  bootCI = TRUE,
  nBoot = 100,
  q = 0.5,
  future_seed = 123
)
```

**Arguments**

data	A data frame with the locations and times of trajectories. It is assumed the time between locations is uniform. It must contain at least five columns: subject identifier, trip identifier, latitude, longitude, and time of the reading.
ID	Character string indicating the name of the subjects column in the dataset.
trip	Character string indicating the trip column in the dataset.
LON	Numeric. Longitude readings.
LAT	Numeric. Latitude readings.
time	Numeric. Time of the readings.
projection	Projection string of class CRS-class.
origin	Optional. Origin of the date-time. Only needed in the internal process to create an object of type POSIXct.

parallel	TRUE/FALSE value. Use parallel computation? Default value is TRUE.
individual	TRUE/FALSE value. Compute individual within-subjects variances? Default value is TRUE.
distance	Metric used to compute the distances between trajectories. Options are "H" for median Hausdorff distance, and "F" for discrete Fréchet distance.
bootCI	TRUE/FALSE value. If TRUE it will generate bootstrap resamples. Default value is TRUE.
nBoot	Numeric. Number of bootstrap resamples. Ignored if bootCI is FALSE. Default value is 100.
q	Quantile for the extended Hausdorff distance. Default value q=0.5 leads to median Hausdorff distance.
future_seed	Logical/Integer. The seed to be used for parallelization. Further details in <a href="#">furr_options</a> .

### Details

The intraclass correlation coefficient is estimated using the distance matrix among trajectories.

Bootstrap resamples are obtained using balanced randomized cluster bootstrap approach (Davison and Hinkley, 1997; Field and Welsh, 2007)

### Value

An object of class `iccTraj`. The output is a list with the following components:

- `est`. Data frame with the following estimates: the ICC ( $r$ ), the subjects' mean sum-of-squares (MSA), the between-subjects variance ( $sb$ ), the total variance ( $st$ ), and the within-subjects variance ( $se$ ).
- `boot`. If `bootCI` argument is set to TRUE, data frame with the bootstrap estimates.
- `D`. Data frame with the pairwise distances among trajectories.
- `indW`. Data frame with the following columns: the subject's identifier (ID), the individual within-subjects variances ( $w$ ), the individual ICC ( $r$ ), and the number of trips ( $n$ ).

### References

Davison A.C., Hinkley D.V. (1997). *Bootstrap Methods and Their Application*. Cambridge: Cambridge University Press.

Field, C.A., Welsh, A.H. (2007). Bootstrapping Clustered Data. *Journal of the Royal Statistical Society. Series B (Statistical Methodology)*. 69(3), 369-390.

### Examples

```
# Using median Hausdorff distance.
Hd<-iccTraj(gull_data,"ID","trip","LONG","LAT","triptime")
Hd$est
# Using discrete Fréchet distance.
Fd<-iccTraj(gull_data,"ID","trip","LONG","LAT","triptime", distance="F")
Fd$est
```

---

interval	<i>Computes the confidence interval for the ICC</i>
----------	---

---

**Description**

Computes the confidence interval for the ICC

**Usage**

```
interval(x, conf = 0.95, method = c("BCa", "Perc", "EB", "AN", "ZT"))
```

**Arguments**

x	An object of class <code>iccTraj</code>
conf	Numeric. Level of confidence. Default is set to 0.95.
method	String. Method used to estimate the confidence interval. Accepted values are: "BCa" for bias-corrected and accelerated bootstrap, "EB" for empirical bootstrap, "Perc" for percentile bootstrap, "AN" for asymptotic Normal, and "ZT" for asymptotic Normal using the Z-transformation.

**Details**

Let  $\hat{\theta}$  denote the ICC sample estimate and  $\theta_i^B$  denote the ICC bootstrap estimates with  $i = 1, \dots, B$ . Let  $\delta_{\alpha/2}^B$  and  $\delta_{1-\alpha/2}^B$  be the  $\frac{\alpha}{2}$  and  $1 - \frac{\alpha}{2}$  percentiles of  $\delta_i^B = \theta_i^B - \hat{\theta}$ .

The percentile bootstrap confidence interval is computed as  $\hat{\theta} + \delta_{\alpha/2}^B, \hat{\theta} + \delta_{1-\alpha/2}^B$ .

The empirical bootstrap confidence interval is estimated as  $\hat{\theta} - \delta_{1-\alpha/2}^B, \hat{\theta} - \delta_{\alpha/2}^B$

Asymptotic Normal (AN) interval is obtained as  $\hat{\theta} \pm Z_{1-\alpha/2} * SE_B$  where  $SE_B$  denotes the standard deviation of  $\theta_i^B$ , and  $Z_{1-\alpha/2}$  stands for the  $1 - \alpha/2$  quantile of the standard Normal distribution.

In the ZT approach, the ICC is transformed using Fisher's Z-transformation. Then, the AN approach is applied to the transformed ICC.

**Value**

A vector with the two boundaries of the confidence interval.

**Examples**

```
# Using median Hausdorff distance
Hd<-iccTraj(gull_data,"ID","trip","LONG","LAT","triptime", parallel=FALSE, distance="H")
Hd$est
interval(Hd)
```

# Index

\* **datasets**

gull\_data, [2](#)

furr\_options, [5](#)

gull\_data, [2](#)

HD, [2](#)

ICC, [3](#)

iccTraj, [4](#)

interval, [6](#)