



Contribution ID: 51

Type: **not specified**

## Constructing nonparametric control charts for correlated and independent data using resampling techniques

*Tuesday, 14 September 2021 17:05 (20 minutes)*

Non-parametric control charts based on data depth and resampling techniques are designed to monitor multivariate independent and dependent data.

### Phase I

Dependent and independent case

1. The depths  $D_F(X_i)$  ordered in ascending order are obtained.
2. The lower control limit ( $LCI$ ) is calculated as the quantile at the  $\alpha$  level of the observations under null hypothesis such that the percentage of false alarms are approximately equal to  $\alpha$ .
3. If  $D(X_i) \leq LCI$  then the process is out of control.

For the estimation of the quantile, smoothing bootstrap, stationary bootstrap have been applied for independent and dependent case.

### Phase II

1. From the reference sample  $\{X_1, \dots, X_n\}$  the depth of the data  $D(X_i)$  is calculated with  $i = 1, \dots, n$  and based on this the depths of the monitoring sample  $D(Y_j)$  are obtained with  $j = n+1, \dots, m$  based on the calibration sample
2. Monitor the process, if you have observations  $D(Y_j) \leq LCL$  then the process is out of control.
3. Calculate the percentage of rejection as the average of observations under the lower control limit.

The simplicial depth in general has a better performance for all sample sizes. It is noted that as the sample size increases, the Tukey and Simplicial measures yield better results.

### Keywords

Control Chart Depth Bootstrap

### Special/invited session

**Primary author:** Dr FLORES, Miguel (MODES,SIGTIG, Dep. de Matemática, Escuela Politécnica Nacional)

**Co-authors:** Ms GUAYASAMÍN, Priscila (Dep. de Matemática, Escuela Politécnica Nacional); Dr FERNÁNDEZ-CASAL, Rubén (Dep. de Matemáticas, Universidade da Coruña, Spain); Dr NAYA, Salvador (MODES, CITIC,

ITMATI, Universidade da Coruña, Escola Politécnica Superior); TARRÍO-SAAVEDRA, Javier (MODES, CITIC, Universidade da Coruña, Escola Politécnica Superior)

**Presenter:** Ms GUAYASAMÍN, Priscila (Dep. de Matemática, Escuela Politécnica Nacional)

**Session Classification:** Quality 3

**Track Classification:** Quality