Advanced Multivariate Analysis, MDS. Exam January 2023. THEORY

NAME: .....

(1 point out of 10) *You should not spend more than 20 minutes in this part.*

Are the following sentences TRUE or FALSE? Put `T` or `F` inside the squares.

Right answers score 0.1 points. Wrong answers have a penalty of -0.1 points. Not answered questions score 0 points.

1. [F] In DBSCAN, the estimation of the density of observations around the point $\mathbf{x}_i$ is proportional to the Gaussian kernel density estimation at $\mathbf{x}_i$.

2. [F] In ISOMAP, geodesic distances between points that are widely separated from each other are approximated by a large constant D_∞.

3. [T] In local linear regression, the Mean Square Prediction Error estimated in the training set is an increasing function of the bandwidth.

4. [T] For a given kernel function K and a given bandwdith h, the equivalent number of parameters of the local linear regression is always lower than (or equal to) that of the cubic linear regression.

5. [F] A generalized nonparametric regression model, with binary response Y and only one explanatory variable X, is estimated by maximum local Bernoulli likelihood. Then the logarithm of the estimator of the conditional probability $p(x) = \Pr(Y = 1|X = x)$ is a linear function of x.

6. [F] The functional median is one of the functions in the functional data set, only when you use the Fraiman-Muñiz integrated functional depth measure.

7. [T] The functional mode is one of the functions in the functional data set.

8. [T] The theoretical foundation of Functional Principal Component Analysis is the Karhunen-Loève expansion of a functional random variable.

9. [F] In a linear model with p correlated explanatory variables, the relevance of variable x_j computed by ghost variables is proportional to $\hat{\beta}_j\hat{\sigma}_j$, where $\hat{\beta}_j$ is the estimated coefficient of x_j and $\hat{\sigma}_j^2$ is the estimated variance of x_j.

10. [T] In a generalized additive model with p independent explanatory variables, the estimation of function $g_j(x_j)$ coincides with the partial dependent plot of x_j plus a constant.