

## **Annex 7: Habilitation thesis reviewer's report**

### **Masaryk University**

**Faculty** Faculty of Science  
**Habilitation field** Mathematics - Applied Mathematics

**Applicant** Mgr. Jan Koláček, Ph.D.  
**Unit** Faculty of Science, Masaryk University, Brno  
**Habilitation thesis** Theory and Practice of Kernel Smoothing

**Reviewer** A/Prof José E. Chacón, Ph.D.  
**Unit** Department of Mathematics, University of Extremadura, Spain

### **Reviewer's report**

This habilitation thesis by Mgr. Jan Koláček is thoroughly praiseworthy. This work comprises ten publications, including not only nine papers in international journals of long-standing and renowned prestige, but also a full monographic book of considerable length. Hence, the author presents quite a substantial and important amount of research work.

There are two further circumstances that I would like to highlight from this work. First, the fact that the research papers included in this thesis cover a wide range of topics. All of them regard the field of Kernel Smoothing, but within this field the author treats a large number of different nonparametric problems: univariate and multivariate density estimation, density derivative estimation, kernel regression, bandwidth selection, boundary correction, distribution function estimation, hazard function estimation and kernel estimation of ROC curves.

In addition, it is to be remarked that the hard theory work is also complemented by very interesting applied methodologies. On one hand, some of the publications included in the thesis are of interdisciplinary nature, by studying regression models for environmental problems or by proposing innovative tools in Finance. But also, on the other hand, the researchers from other areas will certainly appreciate the development of a very useful and quite exhaustive library for performing Kernel Smoothing in MATLAB. This is, undoubtedly, a tool that will be employed by many scientists from different research areas in the near future.

### **Reviewer's questions for the habilitation thesis defence (number of questions up to the reviewer)**

1. One of the most remarkable methodologies introduced in this habilitation thesis is, surely, the iterative method for bandwidth selection. The versatility of its rationale makes it suitable to be adapted to a great deal of situations. For the moment, the author has developed this method mainly for fixed bandwidth selection, but in some situations it is well known that it can be quite beneficial to use a variable bandwidth, either depending on the point where the density is to be estimated (balloon kernel density estimators), or using a different bandwidth for each sample point (sample smoothing estimator). Could the iterative method for bandwidth selection be adapted to perform variable bandwidth selection?

2. All the papers included in this thesis about regression deal with the univariate case; that is, a single covariate is taken as the regression. It would be interesting to extend the proposed methods of bandwidth selection for univariate regression to the case of multivariate regression, where several explanatory variables are used to predict the outcome of a response variable. It would be most interesting to use full (i.e., unconstrained) bandwidth matrices in this case. Has the author considered exploring this possibility in the near future?

### **Conclusion**

The habilitation thesis submitted by Jan Kolářek entitled "Theory and Practice of Kernel Smoothing" **meets** the requirements applicable to habilitation theses in the field of Mathematics - Applied Mathematics.

In Badajoz, on January 27, 2015

José E. Chacón