



Universitat de Girona

Departament d'Informàtica
i Matemàtica Aplicada

**Referee's report on the Habilitation Thesis submitted
by Karel Hron, PhD, entitled
"Classical and robust statistical methods for a comprehensive
statistical treatment of compositional data".**

The statistical analysis of compositional data is an old problem in statistics, which dates back to 1897, and the log-ratio approach presently used is a relatively new field of research, initiated in the 1980s by John Aitchison. There are many issues pendent to be explored with this new methodology, and robust methods were an important part. The habilitation thesis submitted by Karel Hron, PhD, represents an excellent state-of-the-art of classical and robust methods for a statistical treatment of compositional data. It comprises a summary of this relatively new field of knowledge and of the candidates contributions to the research in this area, followed by a collection of sixteen (16) scientific, peer reviewed, papers of which the candidate is a co-author. It reflects clearly the many recent contributions to this line of research, line in which the candidate is a very active and valuable member, in particular concerning robust methods. Robust methods were a pendent topic in compositional data analysis, a hole that has been successfully filled by the candidate and his co-authors. Particularly valuable are the applications of the new methodology, altogether five (5), which are a reflection of its need in many applied fields, and of the potential they have for a rapid expansion and impact. Also, the fact that the candidate has many diverse collaborations with scientists of different institutions is highly relevant, as it reflects his will to participate actively in an international context.

The only point I disagree with his approach is not related to the mathematical tools used, but to the formulation. From my point of view, the insistence on an—in some sense—*univariate* interpretation in certain cases, like in the case of Eq. (2) in page 8 of the thesis, can be misleading. Compositional information, being relative, always involves at least two parts, and I think it is more important to insist on the relative character of the information, than on capturing all the information contained in one part. Nevertheless, this discussion is very important, as it is frequent among applied and theoretical scientists and, therefore, there is a need to better understand how the compositional information can be extracted and interpreted.

I consider that the submitted habilitation thesis is of a comparable standard to other habilitation thesis successfully presented in other European countries, like Germany or Spain. Furthermore, I consider the candidates contributions outstanding. The fact that the high number of publications covers not only applications, but also methodological and theoretical issues, as well as issues related to preprocessing of compositional data, and the fact

that they have seen the light in recent years (from 2008 to 2012) and have been published in very divers statistical journals, indicates the potential of the initiated research line and of the candidate himself. For these reasons the candidate is, from my point of view, excellent and deserves recognition and approval.

In conclusion, this thesis meets the habilitation thesis requirements in Mathematics-Applied Mathematics at Masaryk University.

Barcelona, January 21, 2013.

Prof. Dr. Vera Pawlowsky-Glahn
Department of Computer Science,
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Prof. Dr. Ivana Horova
Department of Mathematics and Statistics
Masaryk University
Kotlarska 2
61137 Brno
Czech Republic

Dear Prof. Horova,

Please, find attached my report on the Habilitation Thesis submitted by Karel Hron, PhD, entitled "Classical and robust statistical methods for a comprehensive statistical treatment of compositional data".

With best regards,

Prof. Dr. Vera Pawlowsky-Glahn
Department of Computer Science,
Applied Mathematics, and Statistics
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