27 December, 2022

Dear Editor of Scientific Reports, please find enclosed the revised manuscript entitled:

"Enhancing diagnostic of stochastic mortality models leveraging contrast trees. An application on Italian data",

co-authored by S.Levantesi, M.Lizzi, and A. Nigri, that we would like to submit for consideration for publication in *Scientific Reports*.

We would like to thank the anonymous reviewer and the Editor for their helpful comments and valuable suggestions that contributed to improving our paper. We have revised the paper accordingly.
Specifically, following the main Reviewer's comment:

We thank the reviewer for opening the floor to an interesting discussion on traditional diagnostic methods in mortality modeling. This is a crucial issue useful to mention but with any doubt too wide to address in our work and thus beyond the scope of this paper. Nevertheless, we take this chance to mention the canonical tools, such as the residual diagnosis, and the main difference with respect to the proposed method.
The following text has been included in the final manuscript:

"In mortality modeling, the objective of diagnostic checking is to ascertain whether the model fits the historical data by obeying an underlying probabilistic hypothesis. This procedure is carried out using residuals diagnosis checking with a Gaussian or more often a Poisson assumption (see, e.g., Renshaw, S. Haberman; Insurance: Mathematics and Economics 38 (2006) 556–570).
Leveraging Friedman (2020), who introduces contrast trees to estimate the full conditional probability distribution without any parametric assumptions, we propose a prominent alternative, with particular regard to the intersection of Machine Learning and Mortality modeling fields. In this sense, our proposal fills the gap between mortality modeling and model diagnostics, particularly for nontraditional modeling as a machine learning framework."

We sincerely hope that you will find our work suitable for publication at the current stage.

Thank you for your consideration.
Sincerely,

Andrea Nigri
(on behalf of all co-authors)