11/09/2021

Dear George Christakos,

We hereby submit the manuscript entitled "Ranking earthquake forecasts using proper scoring rules: Binary events in a low probability environment" to be considered for publication in the Stochastic Environmental Research and Risk Assessment (SERRA) journal.

We confirm that we have removed any identifying content that could compromise a blind review. This is an original submission that has not been published before (it is present only in pre-print on arxiv) and that is not currently under review at any other publication outlet.

The submission builds on the following papers: Gambling scores for earthquake predictions and forecasts (Jiancang Zhuang, 2010), A parimutuel gambling perspective to compare probabilistic seismicity forecasts (J. Douglas Zechar, Jiancang Zhuang 2014) and Prospective CSEP Evaluation of 1-Day, 3-Month, and 5-Yr Earthquake Forecasts for Italy (Matteo Taroni et al. 2018). The present work investigate the properties of the parimutuel gambling score (defined in the first two papers and used as metric in the third one) and compares its performance with two alternatives. We prove that the parimutuel gambling score is generally not proper and we explore the consequences of using this score to rank earthquake forecasts using simulated data. It turns out that depending on the forecasts to be ranked the parimutuel gambling score favours forecasts over/underestimating the seismicity of the area.

We would like to submit this as an environmental theoretical work of immediate current interest, as described in the instructions for authors, which we have read and believe to have understood. Although we realise that other people may be selected, we would like to nominate the following reviewers Jiancang Zhuang, Frederic R. Paik Schoenberg and Thordis L. Thorarinsdottir to examine our work and with which we have no conflict of interest.

On behalf of the co-authors,

Best regards,

Francesco Serafini

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