

International Journal of Remote Sensing >

Volume 32, 2011 - [Issue 15](#)

12,587 Views | 1,639 CrossRef citations to date | 23 Altmetric

Original Articles


Death to Kappa: birth of quantity disagreement and allocation disagreement for accuracy assessment

Robert Gilmore Pontius Jr  & Marco Millones

Pages 4407-4429 | Received 27 Aug 2010, Accepted 20 Dec 2010, Published online: 17 Aug 2011

 Cite this article  <https://doi.org/10.1080/01431161.2011.552923>

Sample our
Geography
Journals
>> [Sign in here](#) to start your access
to the latest two volumes for 14 days



 Full Article  Figures & data  References  Citations  Metrics

 Reprints & Permissions [Read this article](#) [Share](#)

Abstract

The family of Kappa indices of agreement claim to compare a map's observed classification accuracy relative to the expected accuracy of baseline maps that can have two types of randomness: (1) random distribution of the quantity of each category and (2) random spatial allocation of the categories. Use of the Kappa indices has become part of the culture in remote sensing and other fields. This article examines five different Kappa indices, some of which were derived by the first author in 2000. We expose the indices' properties mathematically and illustrate their limitations graphically, with emphasis on Kappa's use of randomness as a baseline, and the often-ignored conversion from an observed sample matrix to the estimated population matrix. This article concludes that these Kappa indices are useless, misleading and/or

flawed for the practical applications in remote sensing that we have seen. After more than a decade of working with these indices, we recommend that the profession abandon the use of Kappa indices for purposes of accuracy assessment and map comparison, and instead summarize the cross-tabulation matrix with two much simpler summary parameters: quantity disagreement and allocation disagreement. This article shows how to compute these two parameters using examples taken from peer-reviewed literature.

Acknowledgements

The United States' National Science Foundation (NSF) supported this work through its Coupled Natural Human Systems program via grant BCS-0709685. NSF supplied additional funding through its Long Term Ecological Research network via grant OCE-0423565 and a supplemental grant DEB-0620579. Any opinions, findings, conclusions or recommendation expressed in this article are those of the authors and do not necessarily reflect those of the funders. Clark Labs produced the GIS software Idrisi, which computes the two components of disagreement that this article endorses. Anonymous reviewers supplied constructive feedback that helped to improve this article.

Related Research Data

[A review of methods for the assessment of prediction errors in conservation presence/absence models](#)

Source: Environmental Conservation

[Using Geometrical, Textural, and Contextual Information of Land Parcels for Classification of Detailed Urban Land Use](#)

Source: Annals of the Association of American Geographers

[The Map Comparison Kit](#)

Source: Environmental Modelling & Software

[Accuracy Assessment for a Simulation Model of Amazonian Deforestation](#)

Source: Annals of the Association of American Geographers

[Comparing global vegetation maps with the Kappa statistic](#)

Source: Ecological Modelling

Learning Landscape Ecology

Source: Unknown Repository

Related research

People also read

Recommended articles

Cited by
1639

[A call to interpret disagreement components during classification assessment >](#)

Robert Gilmore Pontius Jr et al.

International Journal of Geographical Information Science

Published online: 12 Mar 2025



[Implementation of machine-learning classification in remote sensing: an applied review >](#)

Aaron E. Maxwell et al.

International Journal of Remote Sensing

Published online: 2 Feb 2018



[The use of the Normalized Difference Water Index \(NDWI\) in the delineation of open water features >](#)

S. K. McFEETERS

International Journal of Remote Sensing

Published online: 27 Apr 2007

[View more](#)

Information for

[Authors](#)

[R&D professionals](#)

[Editors](#)

[Librarians](#)

[Societies](#)

Opportunities

[Reprints and e-prints](#)

[Advertising solutions](#)

[Accelerated publication](#)

[Corporate access solutions](#)

Open access

[Overview](#)

[Open journals](#)

[Open Select](#)

[Dove Medical Press](#)

[F1000Research](#)

Help and information

[Help and contact](#)

[Newsroom](#)

[All journals](#)

[Books](#)

Keep up to date

Register to receive personalised research and resources by email



Sign me up



Copyright © 2026 Informa UK Limited [Privacy policy](#)

[Cookies](#) [Terms & conditions](#) [Accessibility](#)

Registered in England & Wales No. 01072954
5 Howick Place | London | SW1P 1WG

 Taylor and Francis
Group