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| **Design-based assessment of the accuracy of land use/land cover maps based on remote sensing information** |
| **Introduction:** Land use/land cover (LULC) maps are usually obtained through the classification of satellite images. To assess the accuracy of these satellite maps, the magnitude of misclassification errors is measured comparing the map labels to the reference class labels, i.e. the best assessment of ground truth recorded for a probabilistic sample of reference locations. However, misclassifications are likely to be spatially clustered and their presence may vary in different parts of the survey area, determining the necessity of accompanying the satellite map with an accuracy map that shows the spatial distribution of the quality of satellite-based predictions.  **Aim**: To this end, the estimation of error maps is performed for the first time in a design-based inference perspective, considering that both the true (unknown) map and the satellite map are fixed. Indeed, the true map is fixed because, in a design-based approach, uncertainty only stems from the sampling scheme, while the satellite map is fixed as it is derived from samples of non-probabilistic nature. Consequently, also the matching between true and satellite maps gives rise to a fixed error/non-error surface.  **Methods:** In this way, the error map can be estimated using the nearest neighbour interpolator (NN) to assign to any unsampled location in the survey area the error/non-error value observed at the nearest reference location.  **Results:** Under sampling schemes of wide use in environmental surveys, the resulting error maps are asymptotically design-unbiased and consistent, i.e., as the effort in collecting reference samples increases, the interpolated maps approach the true error map. The error map design-consistency has also been checked through a simulation study. The U.S. land cover map and the Italian forest/non forest map are considered as case studies.  **Conclusion:** Our proposal allows LULC map users to operate fully in a design-based mode when assessing the quality of satellite maps. |