

AlgaeMAp: Algae Bloom Monitoring Application for Inland Waters in Latin America

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Abstract

Due to increasing algae bloom occurrence and water degradation on a global scale, there is a demand for water quality monitoring systems based on remote sensing imagery. This paper describes the scientific, theoretical, and methodological background for creating a cloud-computing interface on Google Earth Engine (GEE) which allows end-users to access algae bloom related products with high spatial (30 m) and temporal (~5 day) resolution. The proposed methodology uses Sentinel-2 images corrected for atmospheric and sun-glint effects to generate an image collection of the Normalized Difference Chlorophyll-a Index (NDCI) for the entire time-series. NDCI is used to estimate both Chl-a concentration, based on a non-linear fitting model, and Trophic State Index (TSI), based on a tree-decision model classification into five classes. Once the Chl-a and TSI algorithms had been calibrated and validated they were implemented in GEE as an Earth Engine App, entitled Algae Bloom Monitoring Application (AlgaeMAp). AlgaeMAp is the first online platform built within the GEE platform that offers high spatial resolution of water quality parameters. The App benefits from the huge processing capability of GEE that allows any user with internet access to easily extract detailed spatial (30 m) and long temporal Chl-a and TSI information.

Keywords: Google Earth Engine, Sentinel-2, water quality, chlorophyll-a, Trophic State Index, Earth Engine App

*CNPq, Capes, INPE

1 Introduction

Body of paper. Margins in this document are roughly 0.75 inches all around, letter size paper.

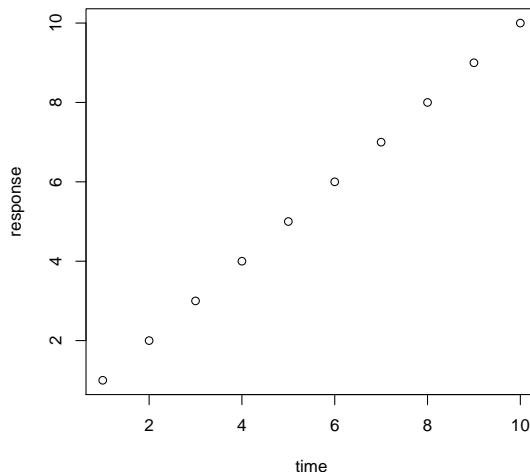


Figure 1: Consistency comparison in fitting surrogate model in the tidal power example.

Table 1: D-optimality values for design X under five different scenarios.

one	two	three	four	five
1.23	3.45	5.00	1.21	3.41
1.23	3.45	5.00	1.21	3.42
1.23	3.45	5.00	1.21	3.43

- Note that figures and tables (such as Figure 1 and Table 1) should appear in the paper, not at the end or in separate files.
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in the text. That is, don't say "In Smith et. al. (2009) we showed that ...". Instead, say "Smith et. al. (2009) showed that ...".

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- If you have supplementary material (e.g., software, data, technical proofs), identify them in the section below. In early stages of the submission process, you may be unsure what to include as supplementary material. Don't worry—this is something that can be worked out at later stages.

2 Methods

Don't take any of these section titles seriously. They're just for illustration.

3 Verifications

This section will be just long enough to illustrate what a full page of text looks like, for margins and spacing.

[Gelman & Vehtari \(2021\)](#) offer some guidance about key ideas about statistical ideas. On an unrelated note, spreadsheets are important to use correctly ([Broman & Woo 2018](#)). Log-linear models are an attractive way to model categorical data ([Bishop et al. 1975](#)).

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4 Conclusion

5 Disclosure statement

The authors have the following conflicts of interest to declare (or replace with a statement that no conflicts of interest exist).

6 Data Availability Statement

Deidentified data have been made available at the following URL: XX.

SUPPLEMENTARY MATERIAL

Title: Brief description. (file type)

R-package for MYNEW routine: R-package MYNEW containing code to perform the diagnostic methods described in the article. The package also contains all datasets used as examples in the article. (GNU zipped tar file)

HIV data set: Data set used in the illustration of MYNEW method in Section 3 (.txt file).

7 BibTeX

We encourage you to use BibTeX. If you have, please feel free to use the package natbib with any bibliography style you're comfortable with. The .bst file agsm has been included here for your convenience.

References

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