Analysis of soil at Casa de las Aguilas

Branch: including an effect of the hall

Facundo Muñoz

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Here we compare the outcome of a classical kriging against a cost-based kriging which takes into account the presence of a semi-barrier.

We include a covariate for the *hall*, since the mean values look different among halls. The results make sense, but the effect is only a reduction in the variance of the spatial effect. Not very much on the range nor on the difference between approaches.

Data description

Figures 1 and 2 display the raw data, and an exploratory smoothed surface.

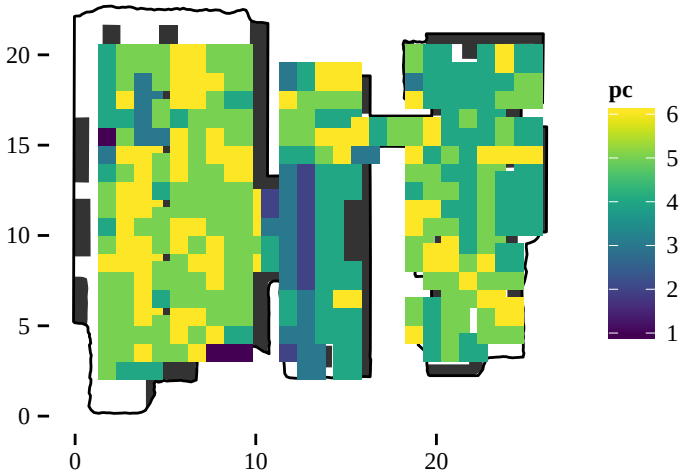

Figure 1: Measurement locations and observed values

Euclidean kriging

The variogram model is Matérn. We choose to estimate the nugget effect, which may account for measurement error, for example.

Cost-based kriging

Watch out! the cost surface can be derived either: - from a SpatialPolygon of the working area - from the SpatialPolygons of the border and of the inner structures

The results from both methods are not the same. In the first case, the cost of non-conductive inner areas is NA, while in the second is 0. This has an effect on one-pixel transitions (? this requires further inverstigation).

Some cost-based maps, for verifications purposes.

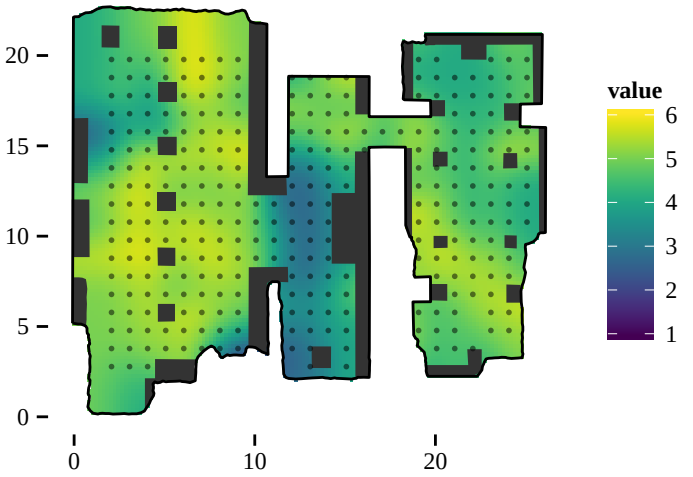

Figure 2: Exploratory kernel smoothing of the measurements

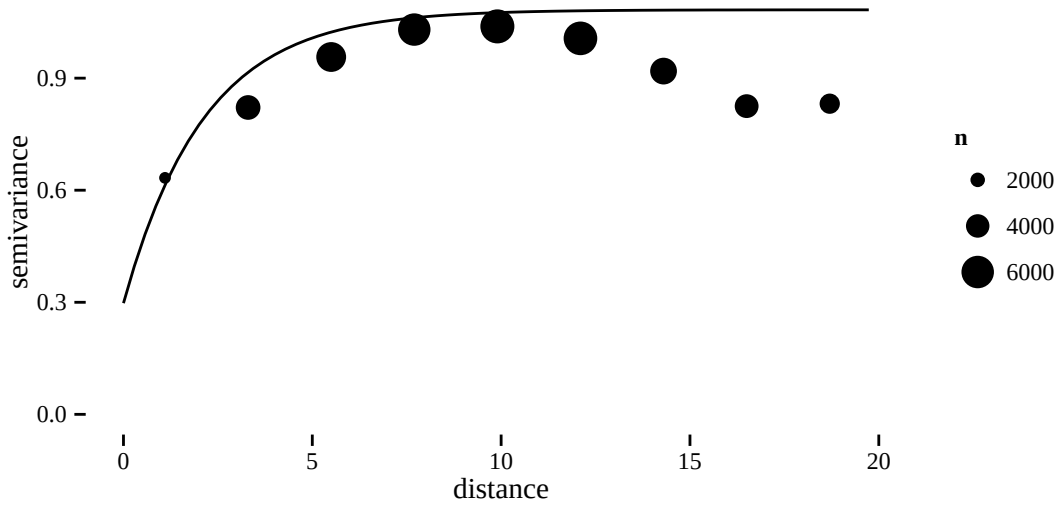

Figure 3: Empirical variogram and fitted model.

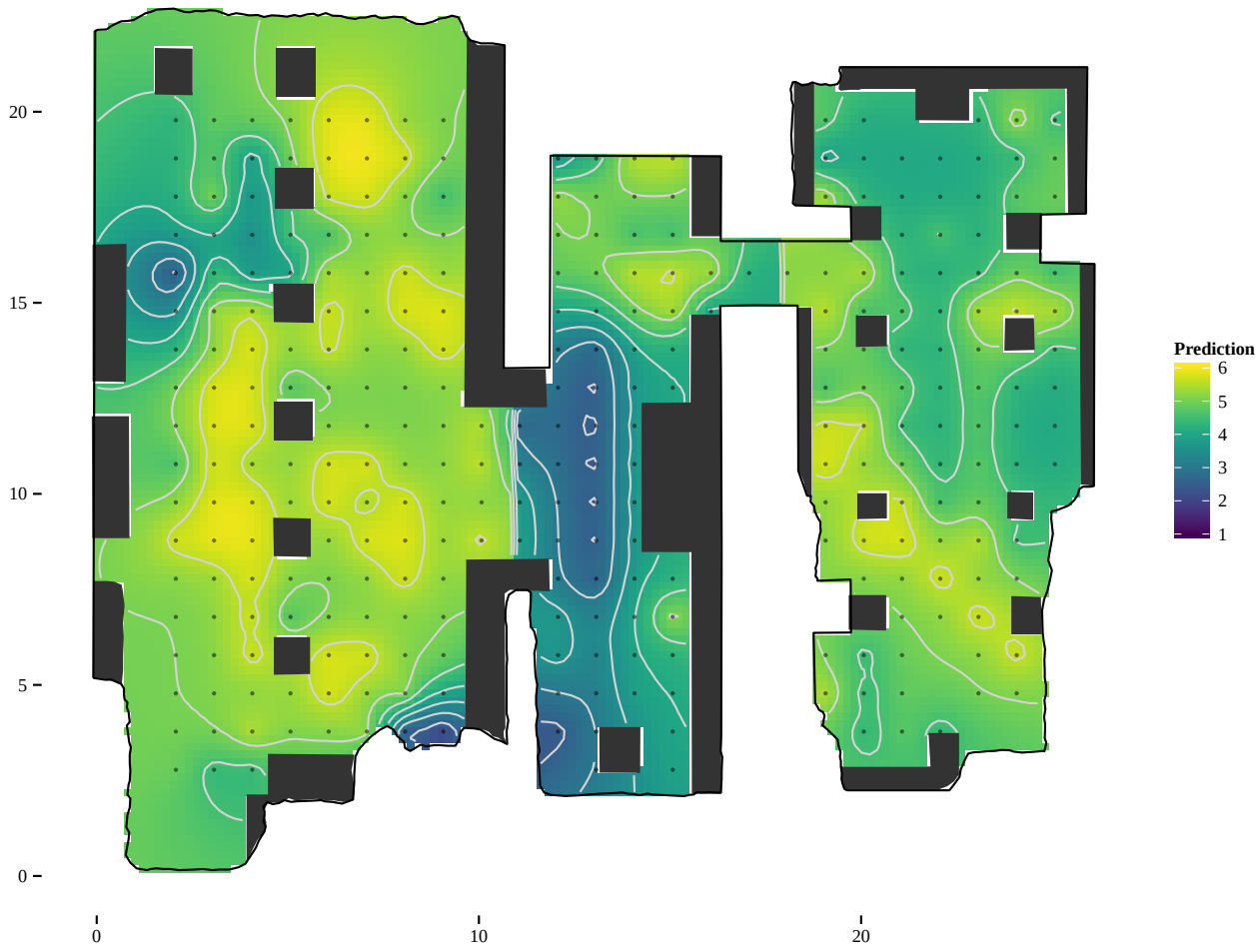

Figure 4: Euclidean kriging prediction

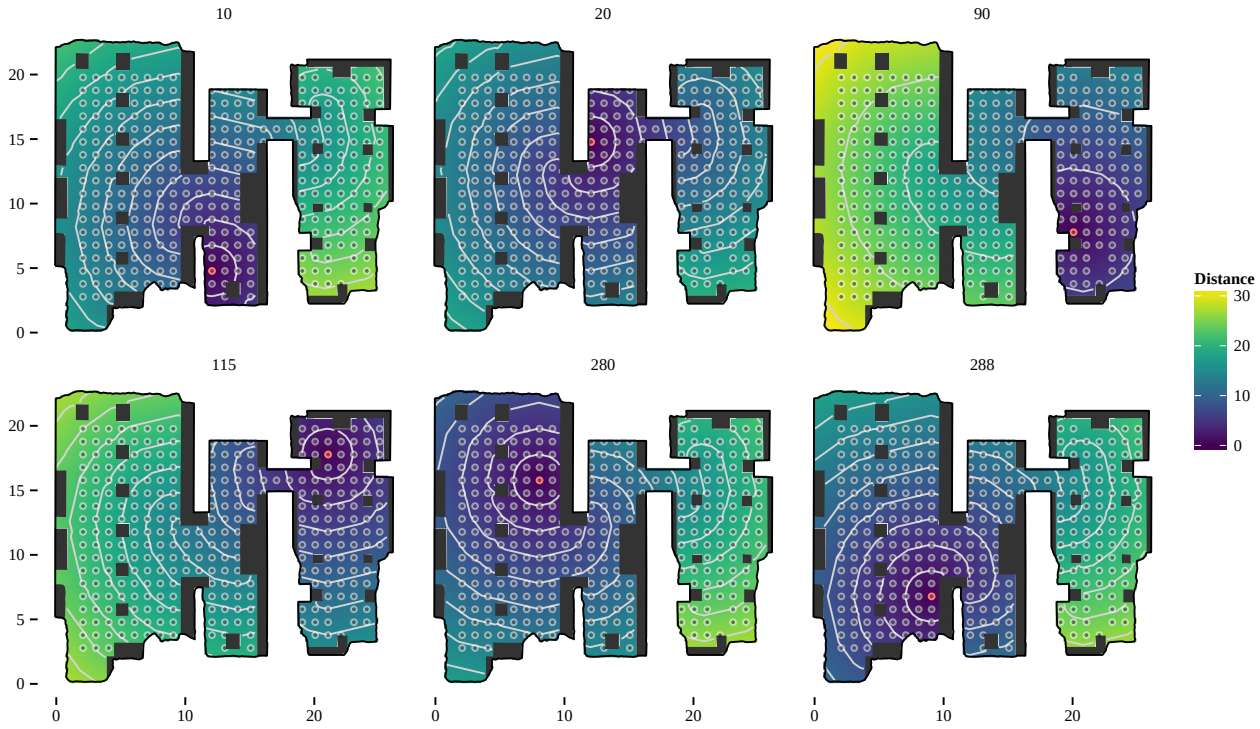

Figure 5:

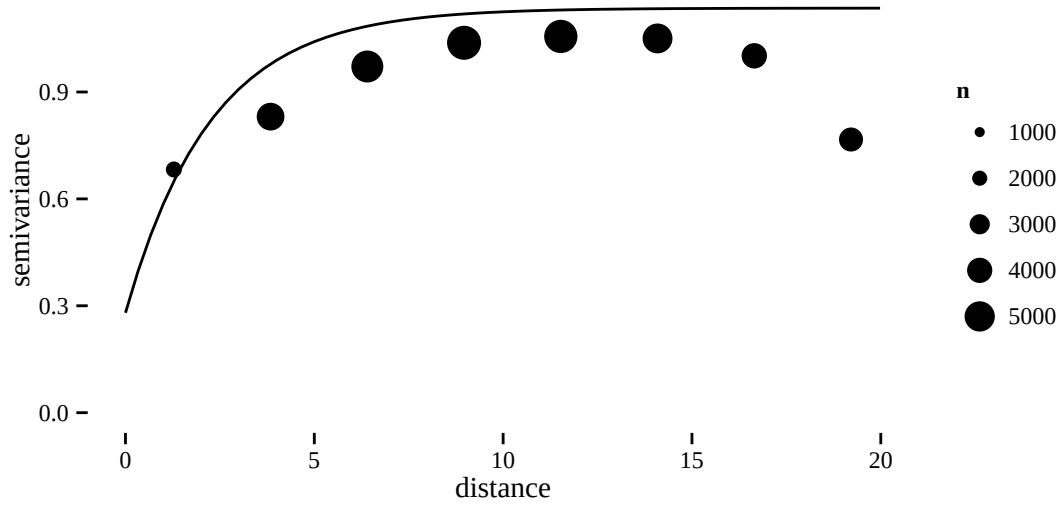

Figure 6: Empirical variogram and fitted model.

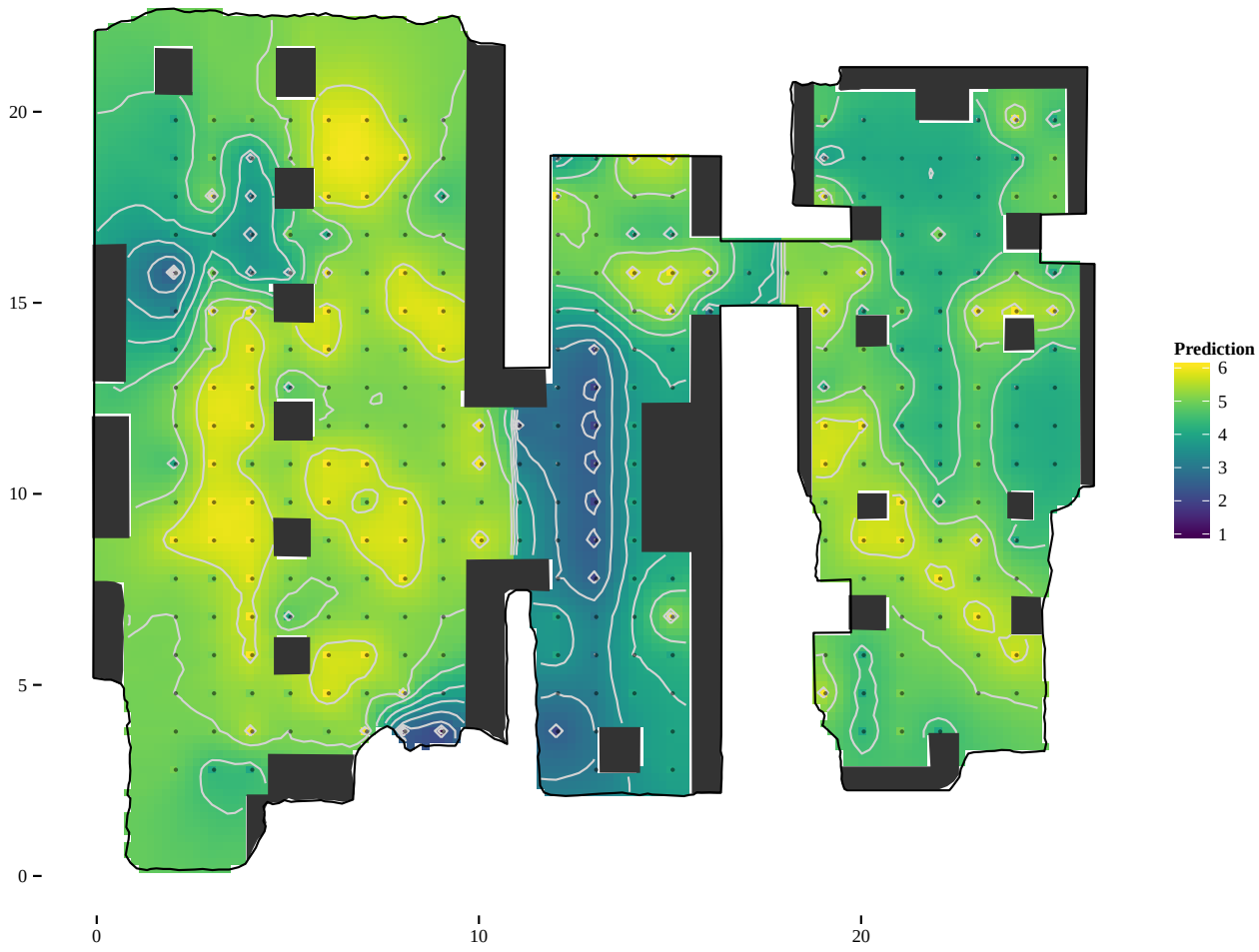

Figure 7: Cost-based kriging prediction

Comparison of method outcomes

	Euclidean	Cost-based
Mean hall 1	4.93	4.94
Mean hall 2 - hall 1	-1.22	-1.32
Mean hall 3 - hall 1	-0.24	-0.17
Nugget	0.30	0.28
Partial sill	0.79	0.86
kappa	0.50	0.50
phi	2.13	2.27
Pract. range	6.39	6.79

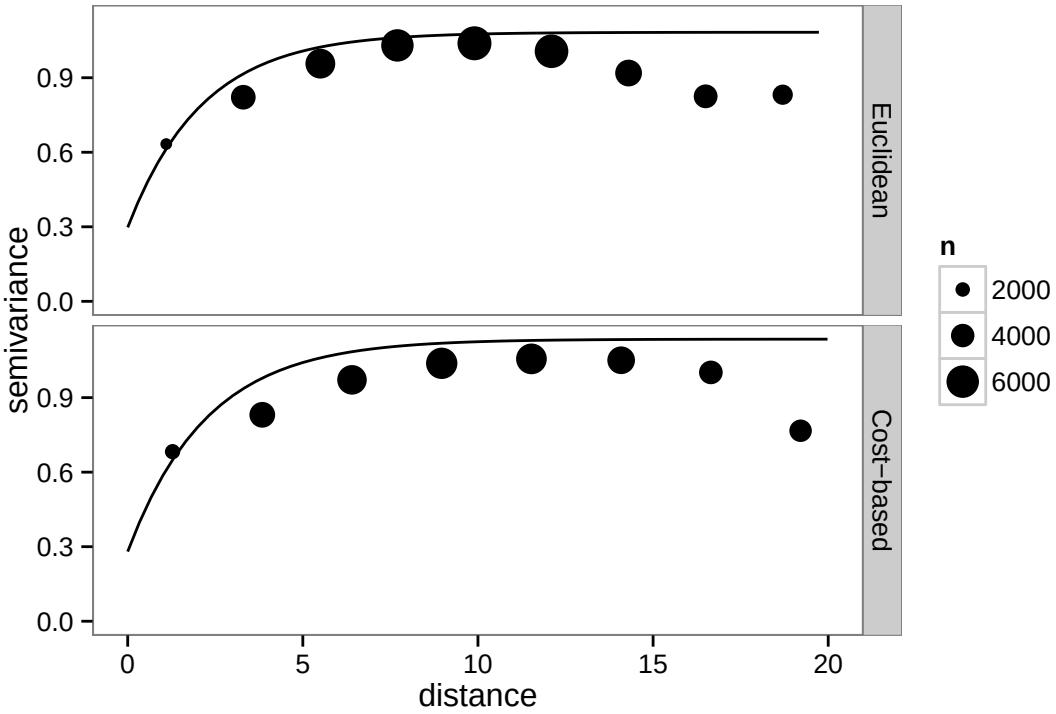

Figure 8: Empirical variogram and fitted models by method.

The estimated variogram models are very similar in this case, with log-likelihoods of -376.7070588 and -376.5023032 respectively. This yields very similar kriging predictions as well.

In the scatter plot, the horizontal patterns correspond to predictions on observed values. Otherwise, the differences are negligeable.

This happens because of the discretization implicit in the calculation of cost-based distances. When prediction locations are very close to observations, both falling in the same discretization cell, the cost-based distance becomes zero and thus the prediction equals the observation.

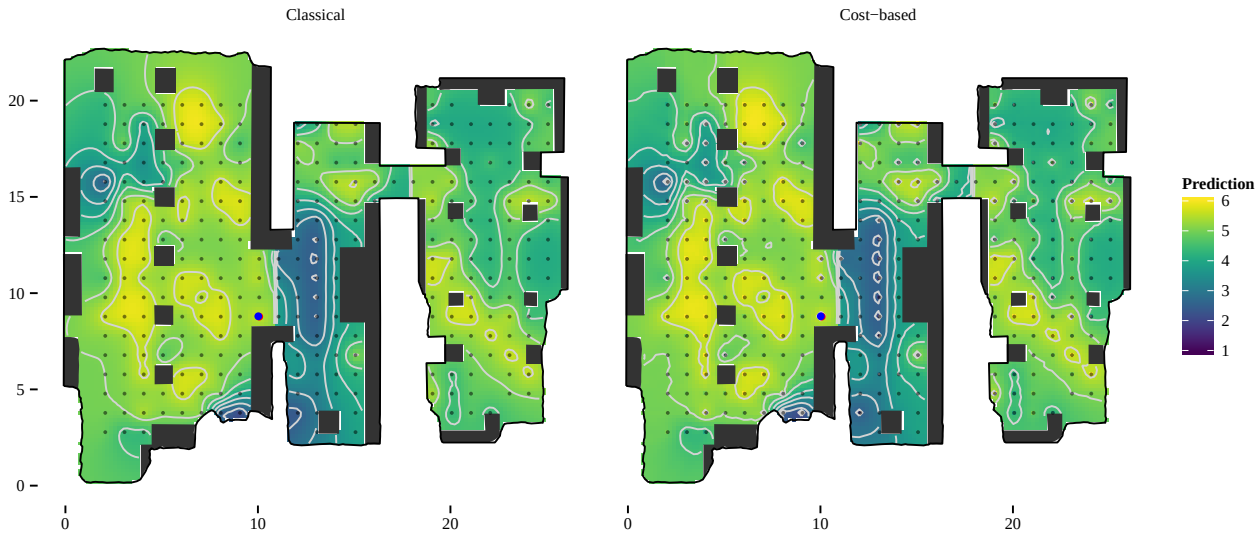

Figure 9: Comparison of Kriging estimates.

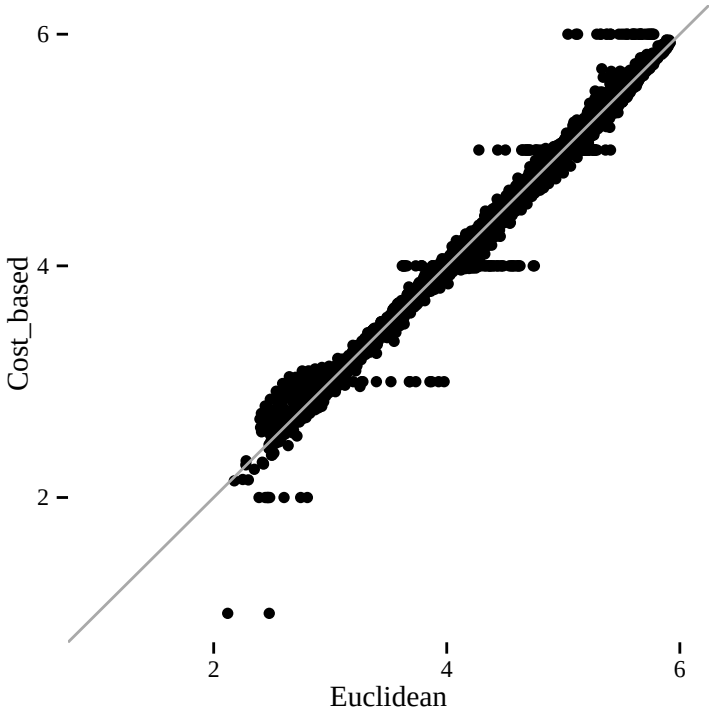

Figure 10:

Figure 11: Difference between the cost-based prediction and the Euclidean prediction