

## ▶ BACKGROUND

In recent years, due to computational advances, different methods of predicting weather states have begun to emerge, increasing the forecast extent and its accuracy. The Analog Ensembles method (AnEn), introduced by Luca Delle Monache in 2011 [1], is a post-processing tool that has shown good results to improve whether predictions or perform hindcasting (reconstruction of missing meteorological data).

## ▶ OBJECTIVES

The objective of this study is to use the AnEn method to perform hindcasting to reconstruct past weather conditions at stations in the villages of Edroso, Soutelo and Valongo (see Figure 1) in Portugal, and verify their similarity with the actual forecast.

 Edroso Valongo Soutelo

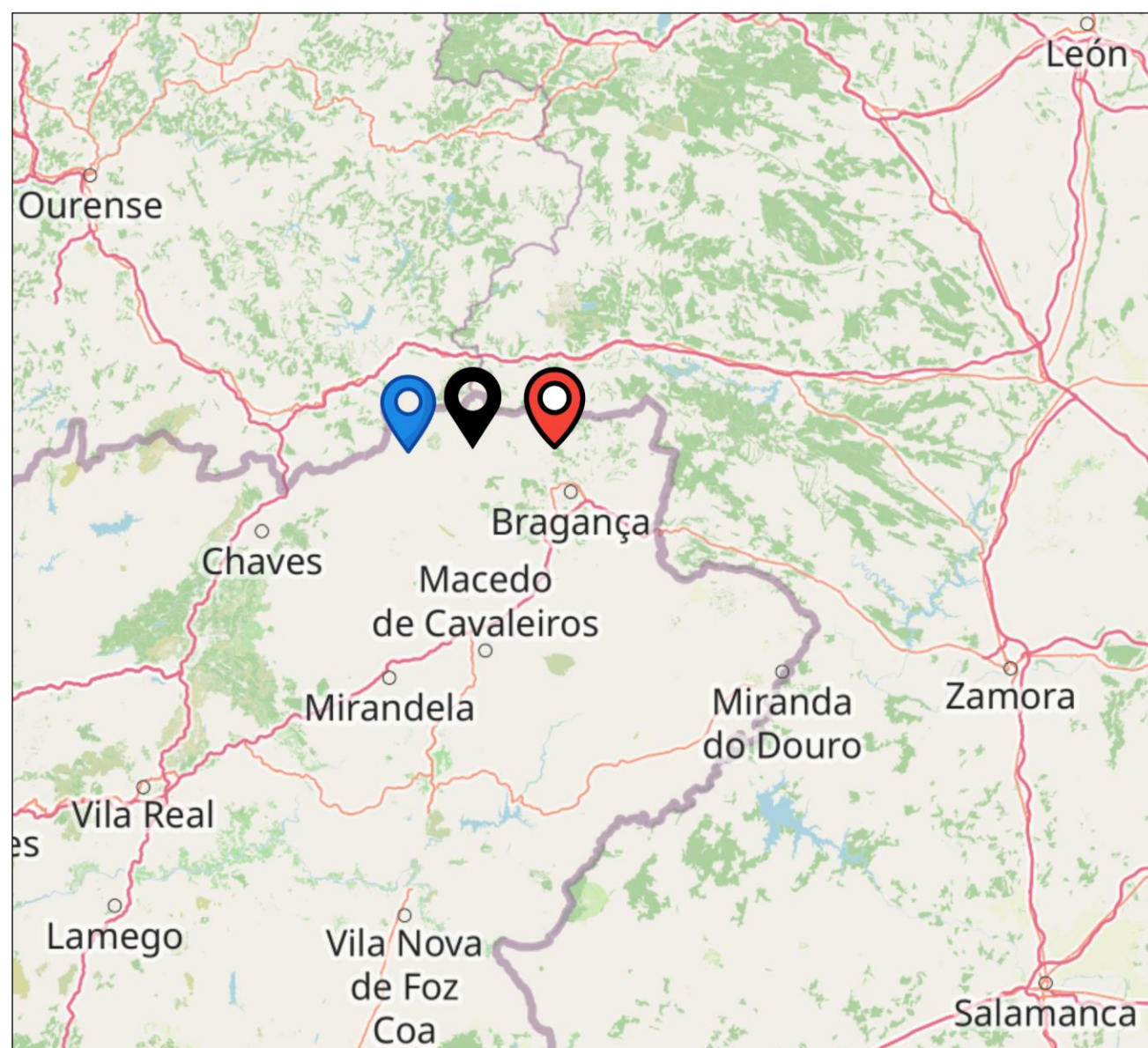


Figure 1: Geolocation of the meteorological stations.

## ▶ METHODOLOGY

The AnEn method uses two different time series: one with historical data (from a predictor station) and another with observed data (from a predicted station). In Figure 2 a number of analogs are selected from the historical data set, according to their similarity to a predictor value (step 1).

At the same time instant, but at the predicted station, the corresponding observed data is selected and is used to produce a predicted value (step 3). This process is performed successively until the end of the prediction period data, and thereby it is possible to reconstruct the full predicted data from station 2.

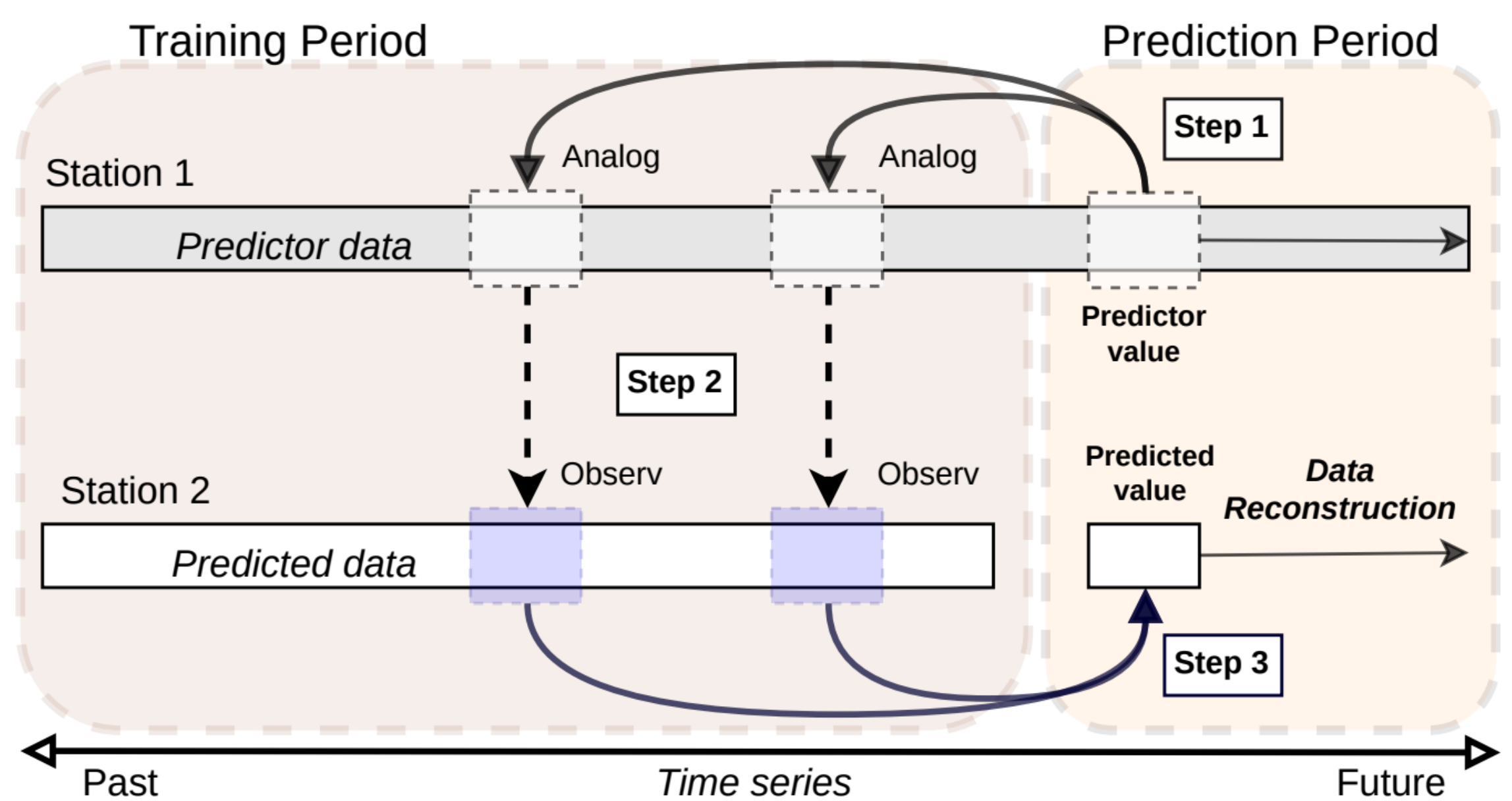


Figure 2: Hindcasting with the Analog Ensembles method.

## ▶ RESULTS AND CONCLUSIONS

The simulations were done with a R-based [2] implementation of the AnEn method and compared with previous results of other stations [3]. Soutelo and Edroso showed lower error rates in the WSPD and GST variables, while *Dom* and *Ykr* [3] showed superior performance in PRES and ATMP variables (see Table 1).

In overall, using two stations simultaneously showed better results.

Therefore, the prediction results obtained in the selected Portuguese villages were similar to those observed at the stations of *Dom* and *Ykr*, showing the effectiveness of the Monache method.

Variable	Dependency	Soutelo		Edroso		Soutelo/Edroso		Dom/Ykr	
		BIAS	RMSE	BIAS	RMSE	BIAS	RMSE	BIAS	RMSE
WSPD	Yes	-0.064	0.707	<b>-0.032</b>	0.851	-0.049	<b>0.670</b>	-0.206	2.075
	No					-0.061	0.725	-0.166	1.572
GST	Yes	-0.219	1.646	<b>-0.037</b>	1.870	-0.125	<b>1.467</b>	-0.530	2.197
	No					-0.141	1.644	-0.421	1.733
PRES	Yes	0.657	1.323	-0.832	2.008	-0.137	1.520	0.278	<b>0.497</b>
	No					<b>-0.061</b>	1.216	0.579	0.853
ATMP	Yes	-0.077	2.667	-0.142	2.690	-0.037	2.308	<b>0.001</b>	<b>1.071</b>
	No					-0.133	2.498	0.208	1.437

Table 1: Valongo variables predicted by Soutelo and Edroso. The results were compared to [3] (*Dom* and *Ykr*).

## ▶ BIBLIOGRAPHY

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[2] R Core Team. R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing, Vienna, Austria, 2017.

[3] Leonardo Araújo, Carlos Balsa, C. Veiga Rodrigues, and José Rufino. Parametric study of the analog ensembles algorithm with clustering methods for hindcasting with multistations. In *Trends and Applications in Information Systems and Technologies*, pages 544–559, Cham, 2021. Springer International Publishing.