Compressive Spatio-Temporal Forecasting of Meteorological Quantities and Photovoltaic Power

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This paper presents a solar power forecasting scheme, which uses spatial and temporal time series data along with a photovoltaic (PV) power conversion model. The PV conversion model uses the forecast of three different variables, namely, irradiance on the tilted plane, ambient temperature, and wind speed, in order to estimate the power produced by a PV plant at the grid connection terminals. The forecast values are obtained using a spatio-temporal method that uses the data recorded from a target meteorological station as well as data of its surrounding stations. The proposed forecasting method exploits the sparsity of correlations between time series data in a collection of stations. The performance of both the PV conversion model and the spatio-temporal algorithm is evaluated using high-resolution real data recorded in various locations in Italy. Comparison with other benchmark methods illustrates that the proposed method significantly improves the solar power forecasts, particularly over short-term horizons.

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