Neural Ensemble Bayesian Nowcasting of Geostationary Multispectral Imagery for Hydro-Meteorological Applications

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The modern Numerical Weather Prediction (NWP) models, used to predict the weather conditions, work on large scales both in time and in space. On the other hand, meteorological events, like the thunderstorms, develop on small scales because they last from a few minutes to a few hours and they develop from a few hundred meters to some kilometers. For these reasons, it is clear that the NWP models are insufficient in order to achieve a good prediction of the extreme meteorological events and it is necessary to use other kind of models, which are able to give high resolution (in space and in time) predictions with a given degree of confidence. The objective of this work is to propose, develop and validate a new predictive model, based upon satellite observation. In this work the Meteosat Second Generation (MSG) satellite is the source. Its high resolution both in time and space gives the possibility to satisfy some of the requirements needed to nowcast the development of extreme events and, in a more wide view, gives the possibility to monitor the environment in an efficient way and to plan actions in the case of dangerous events. This work discusses a new kind of model and it shows some possible applications: one of those is the rain rate nowcasting. The prediction model is based on the ensemble framework, which uses a set of simpler cooperating models, while the rain field estimator is based on the neural networks framework. Some results are presented and discussed about a near real time working system together with its software architecture.