Data scientist position at Météo-France

Scientists in charge: Laure Raynaud, Lucie Rottner, Bruno Joly

Subject: Towards the production of an extreme weather warning indicators dashboard for forecasters based on ensemble predictions.

Applicants are invited for an 18 month post-doctoral or civil engineer position starting on
 1 st January 2019 [possibly renewable once]
The deadline for application is 25th November 2018.

Context:

At Météo France, the forecasters in charge of issuing warnings to the civil security, media and general public altogether have to analyse a huge amount of data from a growing number of numerical models to synthesize a comprehensive information accounting for model uncertainty. When a severe weather situation is likely to occur, forecasters have to assess the level of possible anomalies with respect to a reference or "climate" of key selected parameters values from the model outputs.   For that purpose, several experimental products have been recently developed based on comparisons of current day parameters values with those extracted from large model archives. There is now an opportunity to generalise this approach and develop a dashboard of benchmark extreme weather warnings indicators (EWWI) to assist national forecast centres in the production of enhanced and reliable warnings for severe weather situations.

Scientific Objectives:

Experimental maps for extreme forecast diagnostic are produced from the two ensemble forecasting systems operational at Météo-France, called PEARO for the limited-area convective-scale forecast and PEARP for the global domain. First, these diagnostics must be integrated in the operational suite and be produced for a wider range of parameters and lead times in order to cover the forecasters needs. Some technical aspects will be discussed, for instance how to handle the large amount of input data involved in the EWWI computation is a key point. For new meteorological variables, some sensitivity experiments of the EWWI computation to some parameters of the method will be performed to determine for instance an optimal length for the climatological sample or the setup of the spatialisation processing. More general concerns about sustaining a model archive up to date will also have to be considered.
In a second step, the ability of the EWWI to provide a reliable information for extreme weather will be examined. At Météo-France, the forecasters issue twice a day a "vigilance" watch map, that defines for the next 24h the level of high-impact weather at the scale of the French department. It is to be extended to the next 48h. The consistency between EWWI values and the "vigilance" events will be first evaluated based on past events. Then, the opportunity to translate EWWI into an early warning product will be addressed   based on machine learning and deep learning techniques.

Required skills

- PhD or Master Science or Engineer degree in atmospheric sciences, applied mathematics or any related fields.
- Excellent knowledge in atmospheric numerical modelling.
- Excellent skills in scientific computer langages, python, R, scilab, and linux environnement.
- 3+ years experience in using statistical tools and methods for processing weather data , knowledge of machine learning and deep learning approaches is desirable.
- Experience in ensemble modelling techniques
- Aptitude for scientific work, written and oral communication in English, meetings abroad

Expected Results
S1 : Development of a complete EWWI operational production (including higher frequency and new parameters)
S2 : Sensitivity studies for the setup of EWWI computation (for instance, impact of the model climate)
S3 : Verification scores of EWWI performance on *vigilance* past events and development of a calibration procedure

Practical information:
The successful applicant will be based at the Météopole in Toulouse, in the Centre National de Recherche Météorologique. The position will start preferentially on the 1st January 2019 for 18 months .
The gross monthly indicative salary before taxes will range:
• between 2552 and 3280 euros for an engineer, depending upon experience.
• 3280 for a junior researcher.

For full consideration, an application letter shall include a detailed statement of research interest, along with a curriculum vitae (including research experience, publications and conferences, computing skills and different language practice) and the names, telephone and email address of 2 referees.
The package should be sent by email before November 25th 2018 to
bruno.joly@meteo.fr , laure.raynaud@meteo.fr and alain.gradot@meteo.fr. Due to
spam filters applied in Météo-France, without rapid acknowledgement of receipt by email from one of the three addressees, it is recommended to verify the correct receipt of the candidate's email with a phone call (Bruno Joly: +33 (0)5 61 07 99 09).

For scientific questions, please contact:
Bruno Joly
Météo-France CNRM
42 avenue G. Coriolis
31057 Toulouse Cedex 1
France
Tel: +33 (0)5 61 07 99 09
Email: bruno.joly@meteo.fr

For more information, please contact :
Alain GRADOT
Météo-France DCT/GFE
42 avenue G. Coriolis
31057 Toulouse Cedex 1
France
Tel.: +33 (0)5 61 07 80 24
Email: alain.gradot@meteo.fr

References :
  • Boisserie M., L. Descamps, P. Arbogast 2015, Calibrated forecasts of extreme wind-storms using EFI and SOT , *Weather and Forecasting, doi: http://dx.doi.org/10.1175/WAF-D-15-0027.1*
  • Raynaud L., B. Touzé and P. Arbogast 2018 : Detection of Severe Weather Events in a High-Resolution Ensemble Prediction System Using the Extreme Forecast Index (EFI) and Shift of Tails (SOT), *Weather and Forecasting, https://doi.org/10.1175/WAF-D-17-0183.1*