Guidelines for Student Reports

An innovative tools for the energy forecast of photovoltaic plants by means of SVM technique.

A. Pedrolli

Abstract

The increasing demand of energy worldwide, together with the new have led to the convergence of political, scientific and technological interests focused on the enhancement of all the production, distribution and management processes of the electrical energy. This new way to "think the energy" following a distributed approach, in which every single component of the grid plays an active role, it is usually called: "Smart Grid". The implementation of this new kind of grid consider the application of the information and communication technologies in all that devices that produce, distribute and manage taking into account a bi-directional flux of energy and information inside the grid, different and more complex in comparison with the traditional one in which there is a simpler energy flux that moves uni-directionaly from big energy plants to the users.

In a Smart Grid the renewable energy plants as photovoltaic and eolic plants play a fundamental role. Unfortunately, the energy producted by such kind of plants is only partially exploited because it is strongly influenced by the weather conditions. Moreover, the energy peaks due by a sunny or a windy day could create overvoltage on the grid, and in those situations the manager of the grid preferes to isolate the plants not allowing to put the energy in the grid.

The objective of this master thesis is the development of an algorithm able to predict the energy profile production in a photovoltaic plants. More in detail, once the weather forecast are known, the algorithm will be able to compute the energy profile with a precision of at least the 10% in respect to the real one. The performance of the algorithm have been choosen in order to achieve the constraints described in the "Quarto Conto Energia" published by the "Ministero dello Sviluppo Economico". The performance have been considered sufficient to allow a perfect integration between the photovoltaic plants and the existing grid. The algorithm is based on a Learnig By Example (LBE) technique developed by means of a Support Vector Machine (SVM) classifier. The SVM will exploit the weather forecast and the energy production measurement of a photovoltaic plants with nominal power of 0.996 [MW].

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Supervisors: Prof. Andrea Massa, Dr. Luca Manica, Dr. Federico Viani.