Abstract

Due to the concerns raised by global warming and given the recent technological advances made, the need to utilize clean and sustainable energy and to harness the potentials of renewable energy sources, have become increasingly popular.

Every year, more industrial shops and households are switching to generating their power from solar panels. Governments are also investing more in research and development of better hybrid systems, such as wind and solar-generated electricity to satisfy the ever-increasing need for energy.

However, one of the challenges that push us back from fully utilizing and implementing hybrid power systems is the inconsistency in the generated power. For example, it can vary based on season, weather, and the time of the day. Partly due to the better and more efficient solar panels, some of these power-generating houses or farms can at times have excess energy that they will not be using. With the number of such cases growing one ideal option for them would be to sell their excess energy by injecting it into the power grid.

However, in implementing this idea, there is a need for an accurate and effective mechanism to measure the amount of power added to each line, especially when it is being sold.

Previously, there have been some works done with an attempt to address this issue by a centralized approach, assuming that they have access to the information of the entire network, which in many cases may not be possible or secure.

In our study, our focus will be on a decentralized approach, meaning that we tackle the problem by just having access to the information of only a few nodes (buses) of the network.

By using Data-driven methods, then we try to solve the problem of measuring the exact amount of electricity added to the grid from “private electricity suppliers”.

We tested and assessed the results of different learning models, such as fully connected neural networks, convolutional neural networks and the mixture density networks. The results are promising on small-sized grids. By the end of this project, we hope to expand our work to larger-scale power grids.

This project can help the pace at which the old power generators are changed and upgraded with green ones and at the same time enhancing the security of the network and creating financial incentives for both government and citizens.