

Machine Learning Applied to Large Area Perovskite Photovoltaic Modules

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Artificial Intelligence and Machine Learning (ML) are becoming fundamental computational tools in many different research areas, from more “standard” applications (image recognition, text translation) to more “exotic” ones (medicine, drug discovery). Material science and device development is no different. In the last few years a research field has been emerging aimed to apply ML methods for the discovery and classification of novel materials for many different applications (photovoltaics, electronics, thermoelectricity, energy storage, etc.).

In the present PhD project we aim to apply ML methods to help the synthesis and fabrication of Photovoltaic modules using an innovative material: perovskite. The project is in collaboration with the experimental group of Prof. Aldo Di Carlo at the University of Rome “Tor Vergata”. He has been working since several years on perovskite photovoltaic technology. The activity of Prof. Di Carlo is about the upscaling of these new devices from small prototype cells with an area of few square centimeters to real PV-panels of larger dimension.

The upscaling involves an enormous challenge as many fabrication techniques used for small size prototype devices do not apply for large areas. Moreover, one of the main foreseen application for perovskite PV-panels is to integrate them with current silicon technology in order to improve silicon light absorption. Thus, any fabrication protocol that wants to be integrated with silicon technology must not interfere with the silicon components, a further constrain in the perovskite fabrication.

Thus the aim of the PhD project is to collaborate in strict contact with Prof. Di Carlo’s group in order to transfer their experience into an automatized ML approach to identify the best way to produce large area perovskite PV-devices.

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Required skills: programming, Machine learning, material science.