

Report on the outcomes of a Short-Term Scientific Mission¹

Action number: CA16228

Grantee name: Aitazaz Ali Raja

Details of the STSM

Title: Data markets for energy systems

Start and end date: 15/11/2021 to 31/01/2022

Description of the work carried out during the STSM

Forecasting is central to planning and decision making problems thus, has been receiving a considerable attention from researchers. Specially, the data boom in the last few decades has made forecasting an exciting field for the experts from various disciplines, resulting in rapid progress. This improvement in forecasting is fueled by several factors like the availability of large amounts of heterogeneous data along with the development of data pooling platforms. Furthermore, theoretical development of methods in machine learning and advancement in the computing resources enabled sophisticated data analysis for improved forecasts. During STSM, we focused on the development of market based data or forecast pooling platforms.

Often, the data and information is collected and held by different owners at different locations. The data of one owner can be of an additional value for other owners as well as for data consumers. One way of aggregating data is by designing market places that encourage data owners for posting their data in return for monetary compensation. However, the determination of the value of a particular data set, requires solution of a combinatorial problem. Computation requirements for such a problem grow exponentially with increase in number of providers. Furthermore, for personal data providers the market setup causes depressed prices with increased participation or because of the presence of externality that consequently will diminish the value of individual contribution making it non-attractive for the participants.

Considering these limitations of data markets we focused on developing forecasting markets where, group of forecasters (experts) post their predictions in response to a request by an agent on a market platform. Platform then evaluates an aggregate forecast and delivers it to the agent. Furthermore, it evaluates a compensation for each forecaster according to her forecast “quality”. The compensation must satisfy some *desirable* economic properties.

¹ This report is submitted by the grantee to the Action MC for approval and for claiming payment of the awarded grant. The Grant Awarding Coordinator coordinates the evaluation of this report on behalf of the Action MC and instructs the GH for payment of the Grant.

Description of the STSM main achievements and planned follow-up activities

- During the STSM we had extensive discussions on the idea of data markets with an application to energy systems.
- We reviewed an interesting area of literature on competitive forecasting and scoring rules.
- We designed an initial model of forecasting market platform and payoff mechanism with desirable economic properties. Results are to be compared with the coalitional game theoretic solutions (Shapley value).
- I presented our design internally in a seminar arranged by The Energy Analytics & Markets (ELMA) group at Center for Electric Power and Energy (CEE), Denmark Technical University.
- We are currently refining the model and working on a draft with a plan to be submitted initially in a relevant conference and finally at International Journal of Forecasting.
- As a future work, we plan to set the model in the form of a game to analyse best response strategy of forecasters and resulting market equilibrium.