Skoltech
Skolkovo Institute of Science and Technology

# Jury Member Report – Doctor of Philosophy thesis.

**Name of Candidate:** Mile Mitrovic

**PhD Program:** Engineering Systems

**Title of Thesis:** Data-driven stochastic AC-OPF using Gaussian processes

**Supervisor**: Assistant Professor Elena Gryazina
**Co-supervisor:** Assistant Professor Petr Vorobev

**Name of the Reviewer:**

| | |
|---|---|
| I confirm the absence of any conflict of interest<br><br>(Alternatively, Reviewer can formulate a possible conflict) | **Date 10-10-2023** |

*The purpose of this report is to obtain an independent review from the members of PhD defense Jury before the thesis defense. The members of PhD defense Jury are asked to submit signed copy of the report at least 30 days prior the thesis defense. The Reviewers are asked to bring a copy of the completed report to the thesis defense and to discuss the contents of each report with each other before the thesis defense.*

*If the reviewers have any queries about the thesis which they wish to raise in advance, please contact the Chair of the Jury.*

**Reviewer's Report**

Reviewers report should contain the following items:

- Brief evaluation of the thesis quality and overall structure of the dissertation.
- The relevance of the topic of dissertation work to its actual content
- The relevance of the methods used in the dissertation
- The scientific significance of the results obtained and their compliance with the international level and current state of the art
- The relevance of the obtained results to applications (if applicable)
- The quality of publications

The summary of issues to be addressed before/during the thesis defense

The thesis considers a problem of optimal power flow for electric grids under conditions of high penetration of uncertain energy sources. Instead of considering multiple scenarios – a regular approach for dealing with uncertainty – the thesis uses the chance-constraint optimization approach. Since this approach is computationally challenging for non-linear problem of power flow, the thesis proposes to use Gaussian process regression to approximate these non-linear equations. Thus, the method "learns" the power flow problem solution from measurements, rather than solving a set of non-linear equations. The approach allows to incorporate the probabilistic constraints into the general OPF problem formulation.

A few questions and comments can be posed:

- On p 73 RMSE as a metrics is proposed. What is the rationale behind this choice?
- User guide in Chapter 6 is quite brief yet clear for the reader.
- Conclusions could have been a bit more detailed to explain the impact of this work.

Overall this is good work that apparently meets requirements to PhD theses.

**Provisional Recommendation**

***YES**, I recommend that the candidate should defend the thesis by means of a formal thesis defense*

☐ *I recommend that the candidate should defend the thesis by means of a formal thesis defense only after appropriate changes would be introduced in candidate's thesis according to the recommendations of the present report*

☐ *The thesis is not acceptable and I recommend that the candidate be exempt from the formal thesis defense*