Other Dissertation participants

LDR934 Sophia Natasha Wilson

Activity	Type of exam	Fixed subjects	Administrative office	ECTS points
NFYK10020E	Thesis		Niels Bohr Institutet	60

Contract No.	147359
Contract status	Under oprettelse
Dissertation start	08.20.2024
Language	engelsk
Open to public	Ja
Annex open to public	Ja
Externaly prepared	Nej
External partners	
Residence abroad (months). Check local guidance	0
Hand in deadline	
Hand in date	

Title	Quantifying the reduction in carbon footprint of physics-informed machine learning in the pursuit of greener artificial intelligence practices
Other information - Cf. local guidance	Frequency of meetings: - Weekly, 30-45 minutes if needed. In person if possible. (Raghavendra and Sophia) - Bi-monthly meetings with both supervisors. - Sophia can join weekly group meetings in both research groups. Expectations for meetings: - A designated time/day, with flexibility as needed. Sophia gives status of what she has done since last meeting, asks questions and Sophia and Raghavendra agree on what Sophia will work on until next meeting. Expectation of your coorperation - Communication through teams channel. Raghavendra has access to an overleaf document where Sophia writes continuously throughout the project.
Statement of dissertation	This thesis aims to investigate the potential reduction in the carbon footprints of machine learning (ML) models by incorporating physical constraints into their design. Traditionally, ML models have relied on vast amounts of data and model parameters, which contribute significantly to computational time and energy consumption, and subsequently to carbon dioxide (CO2) emissions. However, by adopting a physics-informed approach, it may be possible to achieve substantial improvements in carbon footprint during development and deployment. In this work we will strive to provide concrete evidence of the CO2 emission advantages of physics-informed ML. By comparing the carbon footprint of traditional ML models with those that incorporate physical constraints, the research will seek to quantify the potential reduction in CO2 emissions achievable through this approach. The study will analyse the trade-offs between additional key metrics such as size of data set, model performance, computational efficiency, and environmental impact. Ultimately, this thesis strives to contribute to the emerging field of sustainable artificial intelligence by providing insight into how integrating physical constraints can lead to more environmentally friendly ML models. The findings of this

research have the potential to inform future developments in ML design and promote the adoption of environmentally conscious practices within the ML community.

Supervisor name	Administrative office	Priority
Raghavendra Selvan, examiner, raghav@di.ku.dk, external co-supervisor, 50%		1
Jens Hesselbjerg Christensen, hesselbjerg@nbi.ku.dk, primary supervisor, 50%		1

Faculty / institution

Supervisor