



Galileo
Ferraris

Galileo Ferraris' Contest preliminary results

August 29, 2024



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- the first part of the workflow (steps 1 \rightarrow 4) is fully operative
- thermal and structural modules are now under testing to hone their accuracy
- first datasets on electromagnetic problem have been generated on one motor size (characteristic of a BEV) and the reliability of results has been assessed
- a share of the results KPIs are currently been used to train the *surrogate*:
 - torque
 - torque ripple
 - copper volume
 - permanent magnet volume

first two KPIs are related to motor performance, the remaining two to its cost-effectiveness



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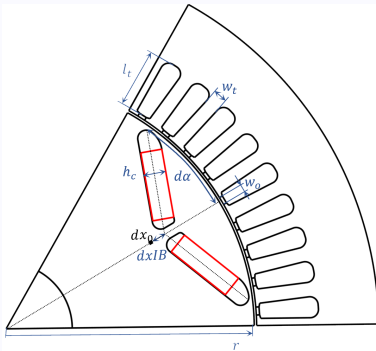
- a dataset containing about 5000 records has been created sampling a 8 dimensional degrees of freedom space
- CPU time needed to create the dataset on a HPC cluster is of about 12 *hours*
- surrogate models based on different approaches (statistical, support vector machines, neural networks) have been applied

Surrogate modelling (preliminary)



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Parametric geometry



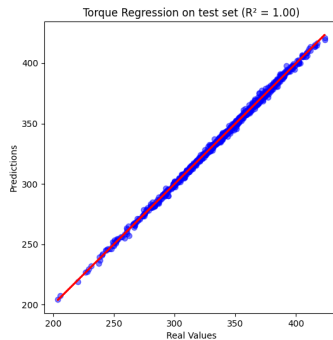
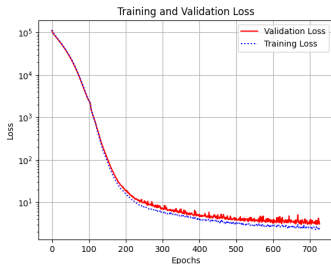
Pearson correlation

	T	dT	Wcu	Wm	PF
hc d_alpha	0.13	-0.066	-0.085	-0.16	0.041
hc	-0.16	-0.014	0.13	0.56	-0.0028
r	0.56	0.19	0.55	0.64	0.15
wt	-0.28	-0.27	-0.71	-0.13	-0.23
lt	0.14	-0.097	0.53	-0.14	0.51
wo	-0.1	0.19	-0.056	-0.15	0.084
gamma dx_lB	-0.38	-0.02	-0.069	-0.43	0.2
gamma	0.18	0.25	-0.064	-0.13	-0.66

Artificial Neural Network



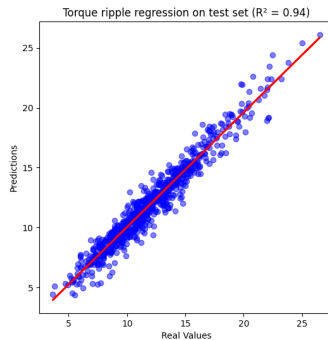
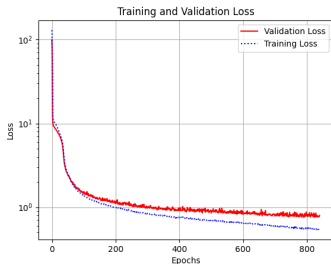
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Artificial Neural Network



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Support Vector Regression



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