



Galileo
Ferraris

Galileo Ferraris' Contest

comparing *data-driven* methodologies
for the *multi-physics* simulation of traction electrical machines

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April 17, 2024



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IEEE Milestone "Rotating Fields and Early Induction Motors, 1885-1888": Galileo Ferraris, professor at the Italian Industrial Museum (now Polytechnic) of Turin, conceived and demonstrated the principle of the rotating magnetic field. Ferraris' field, produced by two stationary coils with perpendicular axes, was driven by alternating currents phase-shifted by 90 degrees. Ferraris also constructed prototypes of two-phase AC motors. Rotating fields, polyphase currents, and their application to induction motors had a fundamental role in the electrification of the world.



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- *Galileo Ferraris* was an Italian scientist willing to apply new technologies to the world
- one of the leading characters at the *International Electrical Congress* in Chicago, 1893, where cooperation and competition among researchers brought advancements and solved technical dilemmas
- after more than 130 years, *COMPUMAG* conference will again feed the scientific debate on computation, simulation and modelling of electrical devices
- a *contest* among several research groups on a common *test problem* could bring advancement in comparing different approaches

why a contest in data-driven models?



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- *new requests* are made to designers and, at the same time, *new methodologies* based on *learning from data* are appearing
- but how measuring the *effectiveness* of different *data-driven* procedures?
- a *sandbox* problem where different approaches can be compared would enable measuring advantages and drawbacks of methods and procedures
- the COMPUMAG community has a long tradition in *experimenting* new numerical approaches on analysis and optimization

why a contest in data-driven models?



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- *surrogate* or *meta* modelling of electromagnetic devices can exploit new methodologies
- up to now surrogate modelling had dealt mainly with *interpolation*:
 - reconstruction of problem landscape starting from samplings
 - good behaviour on *existing data*
- data-driven Machine Learning procedures are more focused on *extrapolation*:
 - learning from data
 - pattern recognition in *large dimensional* datasets
 - good behaviour on *new data*
- *Galfer contest*: train the *data-driven* model on some existing datasets and then assess its *predictive modeling* performance on new similar cases