Galileo Ferraris

Galileo Ferraris' Contest

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

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about Galileo Ferraris

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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about Galileo Ferraris

- Galileo Ferraris was a researchers willing to apply new technologies to the world
- he was one of the main characters on the scene of the *International Electrical Congress* in Chicago, 1893, where cooperation and competition among researchers brought advancement and solved technical dilemmas
- after more than 130 years `COMPUMAG` conference is the place where questions at the leading edge of research in computation, simulation and modelling of electrical devices are discussed
- a *contest* among several research groups on a common *test problem* could bring advancement in comparing different *methodologies* and *numerical approaches*

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why a contest in data-driven models?

- 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? often works are presenting results on particular problems but data are seldom available
- 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

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why a contest in data-driven models?

- *surrogate* or *meta* modelling of electromagnetic devices can exploit new methodolgies
- up to now surrogate modelling had dealt mainly with *interpolation*:
  - it exploits reconstruction of problem landscape starting from some samplings
  - it shows *good behaviour on existing data*
- data-driven Machine Learning procedures are more focused on *extrapolation*:
  - they can learn from data
  - they look for patterns in *large dimensional* datasets
  - they have *good behaviour on new data*
- the challenge is: *train the data-driven model on some existing datasets and then assess its predictive modeling performance on new similar cases*