Galileo Ferraris

Galileo Ferraris' Contest
Ranking procedure

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Evaluation of **Teams** results

the content of these slides is detailed in the **Ranking** document that will be available on the `GitHub` page

The evaluation will be performed:

- in a *quantitative* way: ranking will be provided using extensively the concept of *Pareto optimality* criterion and considering:
  - *interpolation*: how the surrogate model is able to reconstruct the input-output relationship on a given motor type data-set (Motor A);
  - *extrapolation*: how the surrogate model trained on two data-sets is able to extrapolate its prediction on a new size of motor of the same typology of the surrogate algorithm (Motor A+B $\rightarrow$ C).
- *novelty* content: how the approach is able to provide useful design insights on motor design

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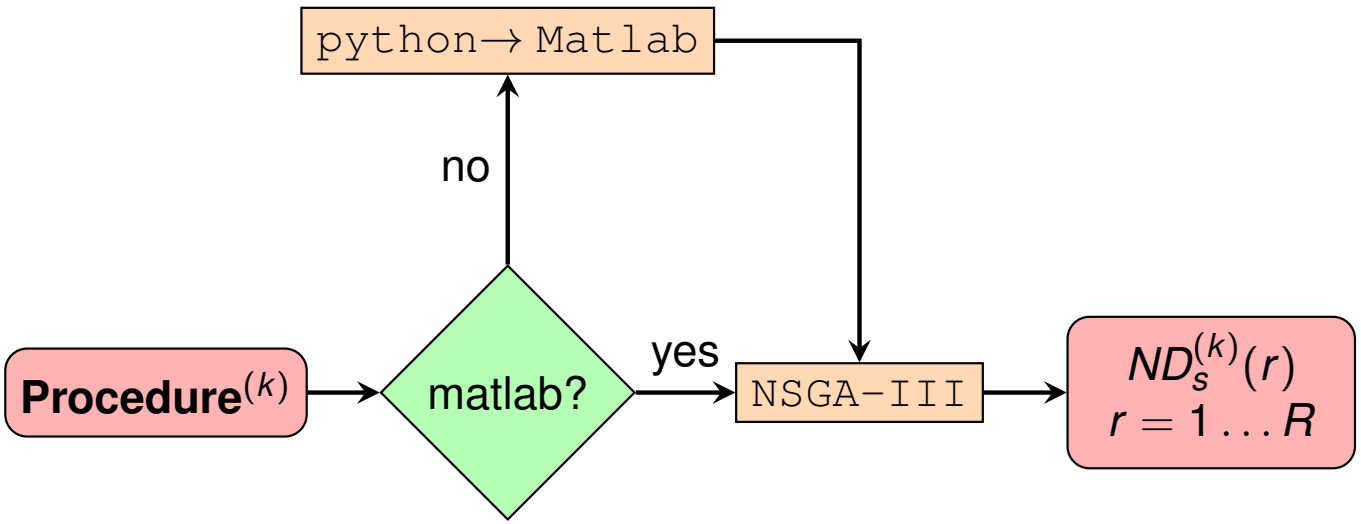
Each **Team** will provide a **Procedure** and organizers will run the multi-objective optimization algorithm



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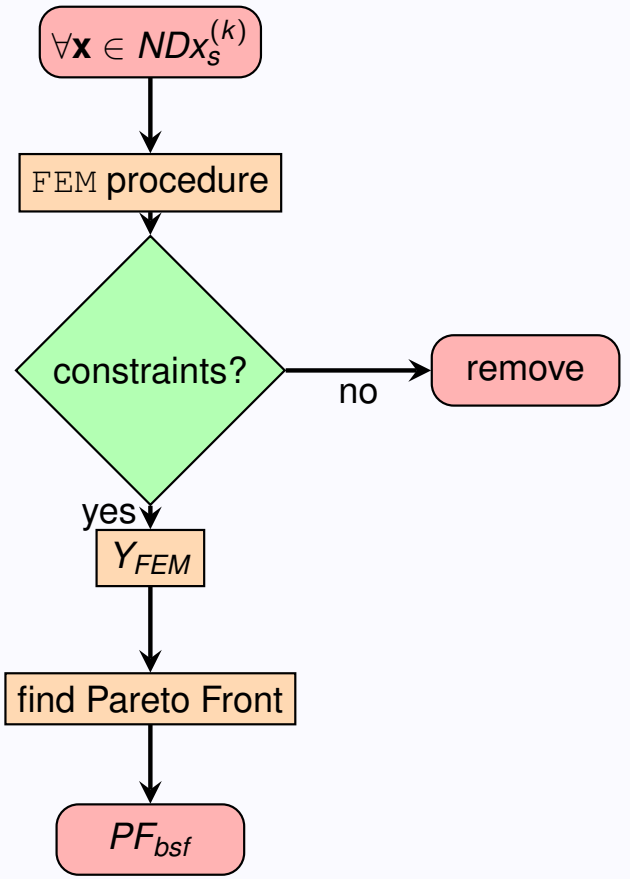
Validation by FEM

- union of all *non dominated* results

$$ND_s = \bigcup_{\substack{k=1\ldots N_{teams} \\ r=1\ldots R}} ND_s^{(k)}(r)$$

- run the FEM analysis $NDx_s \rightarrow Y_{FEM}$, *true values*;
- remove configurations that violate the constraints on *VM* and *Temp*;
- get the *Pareto Front best so far* PF_{bsf} and Pareto set NDx_s.



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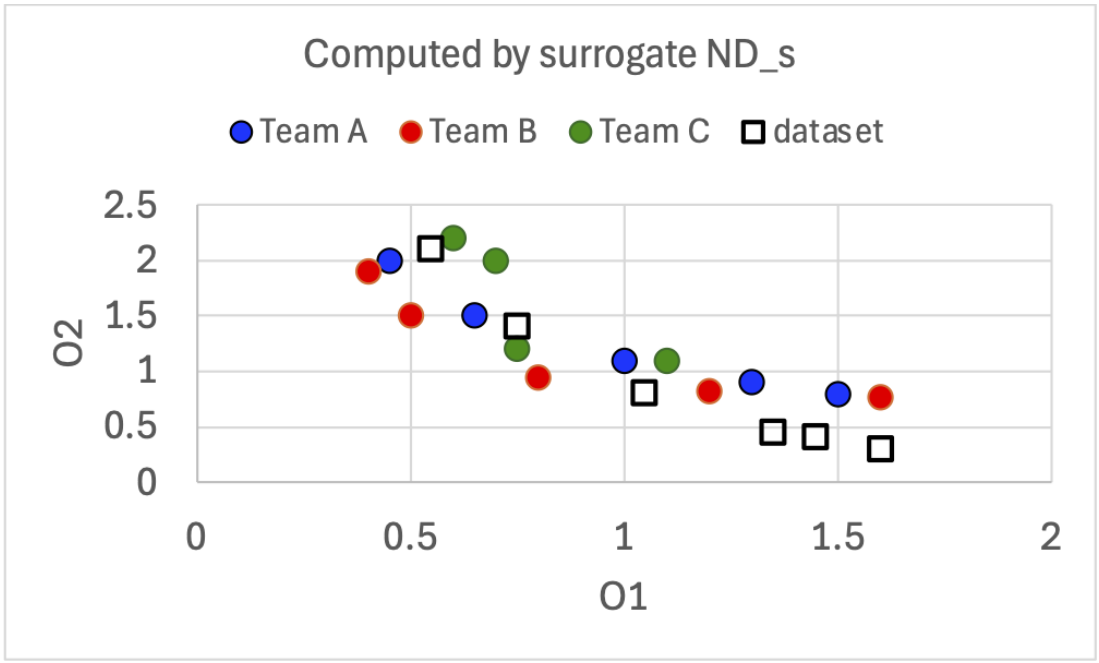
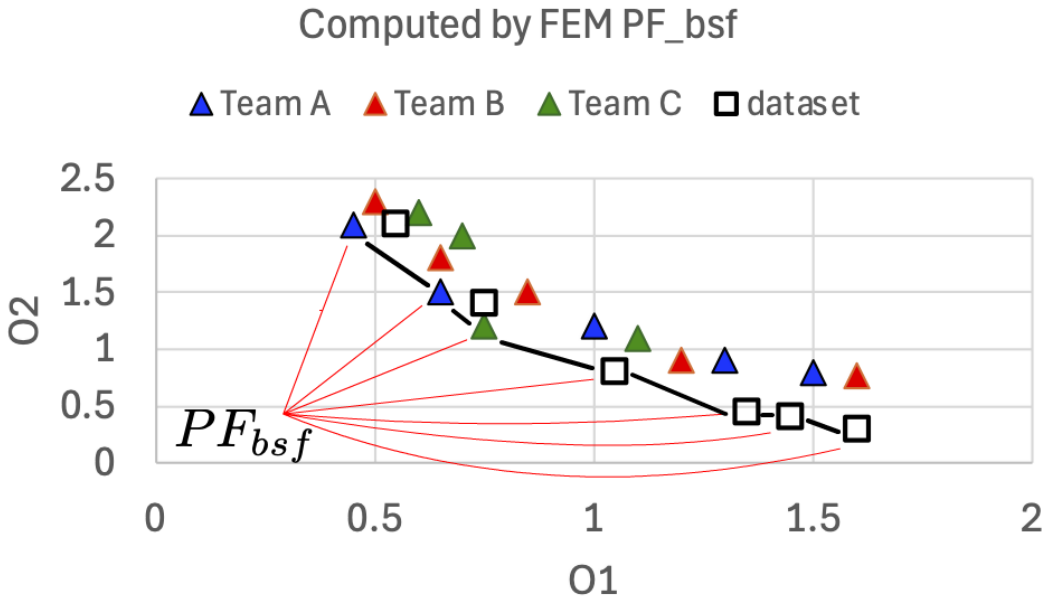
Interpolation





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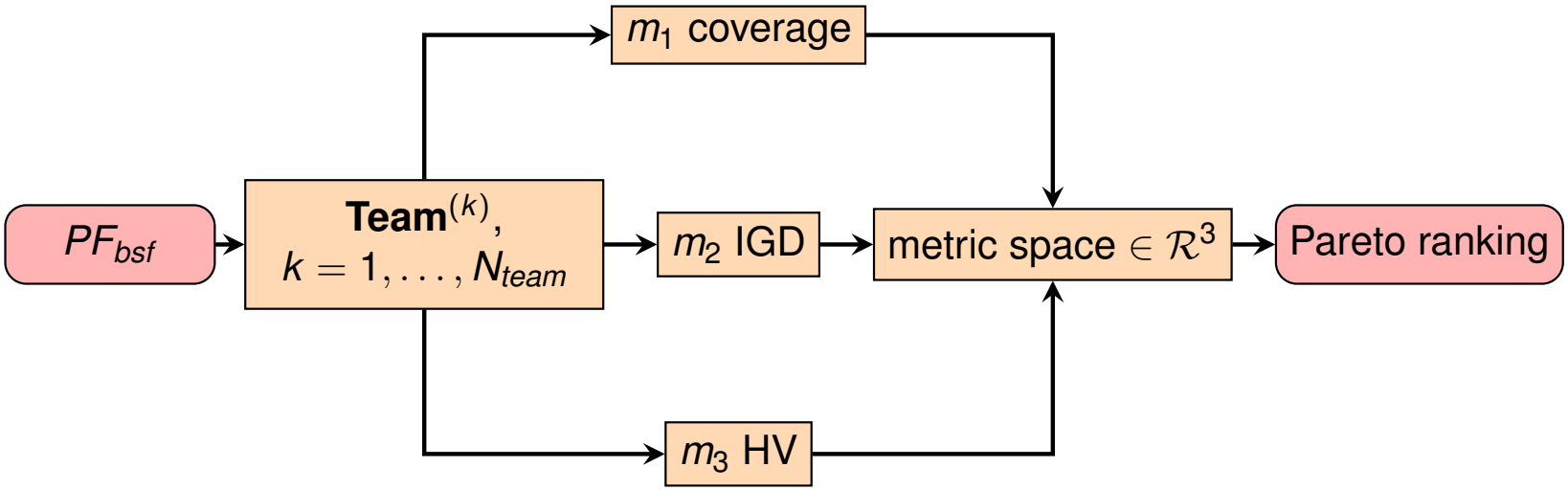

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Ranking in *metric* space: worked example

- A set of 10 teams is simulated
- The metric values for *IGD* and *HV* are computed by using the PF_{bsf} and comparing it with the final Pareto Front produced by each team.

team	m_1	m_2	m_3
1	0.1600	0.1092	1.0687
2	0.0000	0.2279	0.7309
3	0.1600	0.1451	1.3697
4	0.0000	0.2439	0.6365
5	0.0800	0.1660	0.8119
6	0.0800	0.1468	0.8404
7	0.1200	0.1410	0.7911
8	0.2000	0.1175	0.8876
9	0.0800	0.1453	1.0467
10	0.1200	0.1101	0.9770

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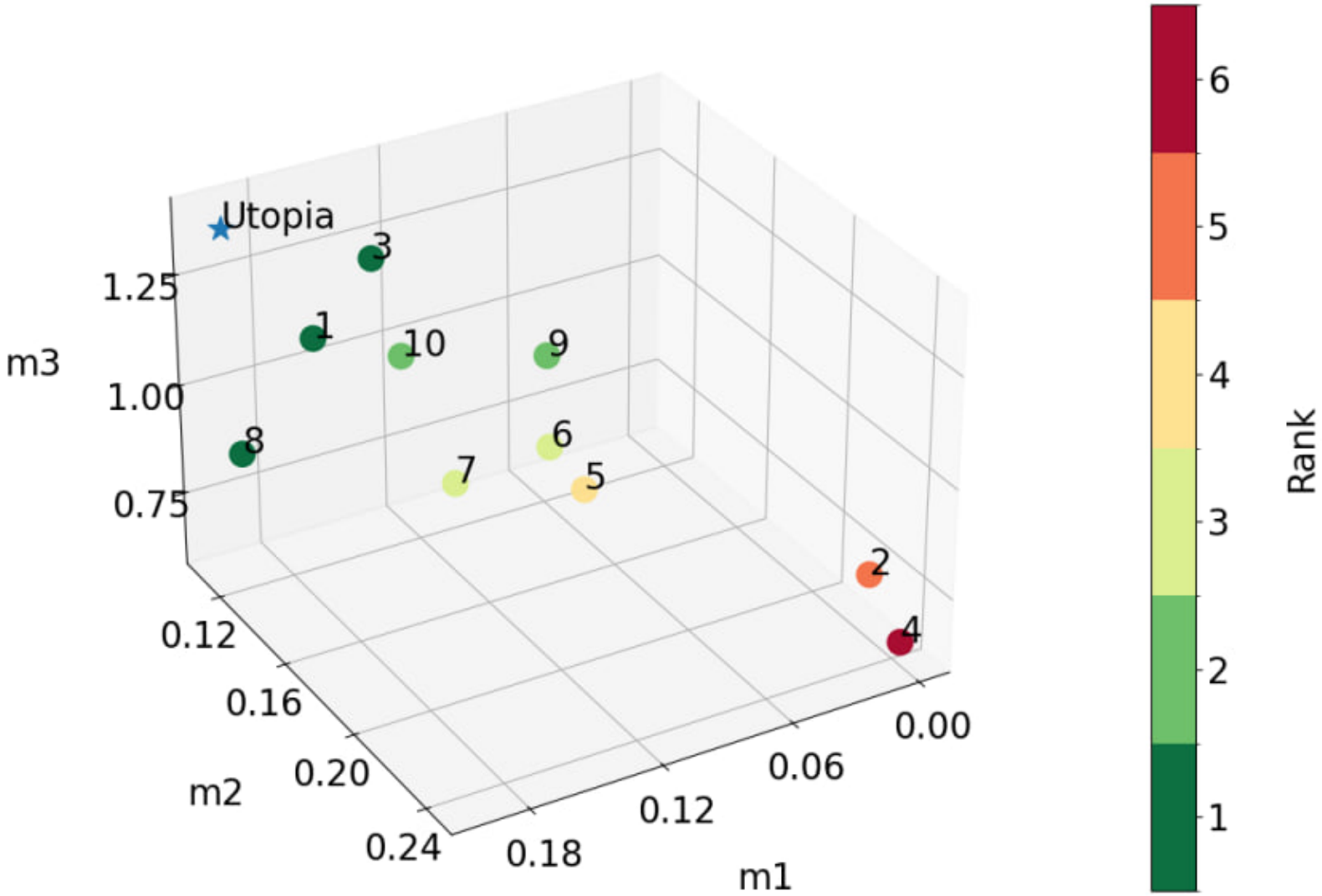
Ranking in *metric* space: worked example



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Ranking in *metric* space: worked example

partial position P, considering only one metric at a time

team	P_1	P_2	P_3	rank average s
1	2	1	2	1.6667
3	2	3	1	2.0000
8	1	2	3	2.0000

proceed on all fronts

ranking	team	front	rank average s
1	1	1	1.6667
2	3	1	2.0000
2	8	1	2.0000
4	10	2	1.3333
5	9	2	1.6667
6	7	3	1.3333
7	6	3	1.6667
8	5	4	1.0000
9	2	5	1.0000
10	4	6	1.0000

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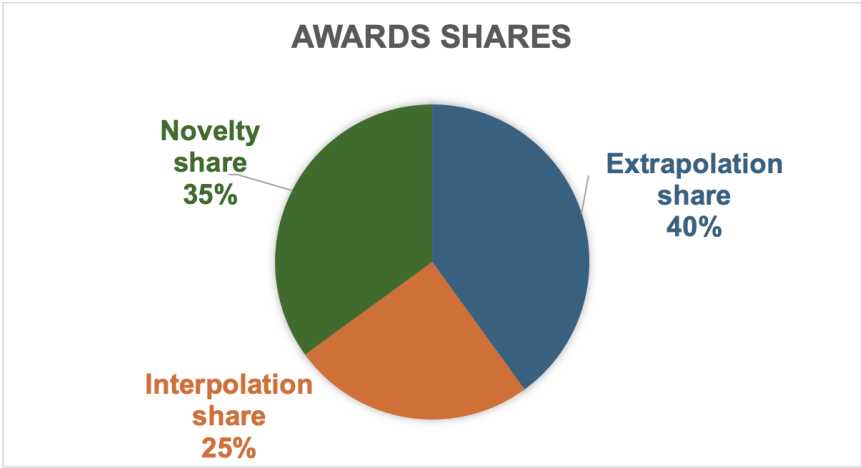
Awards

As of today, a *reasonable* budget for prizes is of 9000 €



	Extrapolation	Interpolation	Novelty
total for cat.	3600	2250	3150
1st	2057	1286	1800
2nd	1029	643	900
3rd	514	321	450

An official procedure will be set on the `PoliTO` website where **Teams** will have to enrol