Introduction

This platform enables the exploration and comparison of magnetic materials reported in the scientific literature through a transparent, user-driven evaluation framework. Magnetic performance, data reliability, and sustainability are treated as distinct and adjustable criteria, allowing users to tailor material rankings to specific application needs.

The platform is designed as a decision-support tool for identifying promising magnetic materials and exploring trends across different material classes.

Performance Filters

The first step of the analysis consists of applying performance-based filters defined by the user.

Temperature threshold:
The user is required to specify a temperature threshold $T \geq 350$ K. This value is compared against the available Curie temperature and, when applicable, the Néel temperature of each material.

Magnetization threshold:
The user must define a magnetization threshold expressed in Tesla (≥ 0.4 T). This threshold is compared primarily with the remanent magnetization and, if unavailable, with the saturation magnetization. When both values are available, both are considered in the filtering process.

Coercivity threshold:
The user must specify a coercivity-related threshold in Tesla (≥ 0.4 T). This value is compared, in order of priority, with the coercivity measured at room temperature, the coercivity measured at non-room temperature, and the magnetic anisotropy constants. When all of these quantities are available, all are applied as filtering criteria.

Those values will filter the database based on performances required by user.

Performance Score Configuration

Each category for each material, carries, based on the next table, a reliability score for each category:

Reliability Coefficients Table

Category	Property Used	Reliability Coefficient
C1 (Temperature)	Curie temperature	1.0
C1 (Temperature)	Néel temperature	0.5

C2 (Magnetization)	Remanence	1.0
C2 (Magnetization)	Saturation magnetization	0.5
C3 (Stability)	Coercivity at room temperature	1.0
C3 (Stability)	Coercivity at non-room temperature	0.6
C3 (Stability)	Anisotropy constant	0.3

Filters applied are compared in ierarchical way to the values of each category.

Ex. If 700K is set this valure will be compared first to Curie T(if present the material will be given 1 as R.C.) then, if the first is not present, wil be compared to Neel T(in this case 0.5 as R.C. will be assigned).

Reliability Score Weights

After collecting every score from every material the overall reliability score will be calculated for each material as:

$$C_1^x \, C_2^y \, C_3^z = O.R.S.$$

[O.R.S.= overall reliability score. This value will be assigned to every material based on user's arbitrary]

x, y, z are the values required from user in this section and will determine how much each category should be aligned with the ierarchy set up.

Performance Score Weights

User can also have an overall performance score(O.P.S.).

User can decide in how many subcategories every category is divided and each threshold related to the score of each subcategory.

Ex. If user inputs:
-SF_T=3, the table of T will be divided in 3 parts, so the scores will be 1, 0.66, 0.33. User will set also the thresholds for each point(n-1 inputs) as 700 K and 500K. It means that materials with T≥700k will get performance score 1 for that category, materials with 700K>T≥500K will get 0.66 and materials with T<500K will get 0.33 as score.
The scores will always be divided equally: once set SF_T or SF_M or SF_C(inputting a value n for example), scores will follow the grid 1/n(avoiding 0 as coefficient).

This example applies logically on all 3 performance categories.

The last part of this paragraph is dedicated to the O.P.S. calculation.

$$C_1^x\, C_2^y\, C_3^z = O.P.S.$$

Applying the same logic of the R.S. and relative weights, user can calculate the O.P.S. based on his needings.
Again x, y, z are inserted by user.

Sustainability Score Configuration

The sustainability scores come out from 9 categories, which thresholds are already set after conducted studies:

S2: CO2 footprint
S3: Energy footprint
S4: Water usage
S5: Recycling CO2 footprint
S6: Recycling energy footprint
S7: HHI
S8: ESG
S9: Supply risk
S10: World reserve
S11: Companionality

The user must insert 9 inputs: a, b, c, d, e, f, g, h, I which are the exponents of each category in the calculus of the O.S.S.(overall sustainability score), as follows:

$$S_1^a\, S_2^b \cdots\, C_9^i = O.S.S.$$

Overall Score Configuration

After the collecting of O.R.S., O.P.S. and O.S.S. for each material, based on user needings, last step is to calculate the O.S.(overall score) which will display the final list of materials. The calculation is with the same logic as before:

$$O.R.S.^x\, O.P.S.^y\, O.S.S.^z = O.S.$$

with x, y, z weight coefficients chosen by user(again sum should be 1).

Global Prevalence filter

O.S. will be used to calculate the prevalence(normalized) of elements in the list displayed after user's filtring process. Based on needings the top materials in the list will change, so it will be for the prevalence. User can modulate the window of elements wanted to do forecasting by selecting minimum and maximum of prevalence to have for materials to be extracted from the list.

In the "Template" section, a list of templates(most used on industry level) will be dispalyed. Every template has "variable site(s)"(expressed as A and/or B) in which is possible to fit different elements(in decrescent order from prevalence window selected). It's possible to do it by selecting a valure in "Top-K". Finally, by pressing "Generate material", a material will be generated based on window of prevalence, template and top-K elements selected.

Conclusion

Results will be a list of the best materials for all the user's inputs + a forecast of possible choices to try to test in laboratory.