Appendix I: MagNet Challenge Final Evaluation Rules – 08/31/2023

This document presents the key principles of the final evaluation rules for the 2023 MagNet Challenge. These rules should be interpreted as general guidelines with potential updates. Please check https://github.com/minjiechen/magnetchallenge for most updated explanation of the rules.

The final evaluation of the 2023 MagNet Challenge is a two-step process. In the first step (due 11/01/2023), student teams will self-report the pre-evaluation results of their pre-trained models for the 10 already known materials with abundant data. They will also receive new data for the final evaluation which will determine the results of the competition.

The purpose of the first step is not to evaluate or compare teams or algorithms, but to (1) ensure all teams are familiar with the final evaluation rule; and (2) to provide useful feedback to the team and keep everyone engaged. Teams will only report results and will not release their code or algorithms in this round.

The second step is the final submission (due 12/24/2023), student teams will (1) submit their prediction results based on the new given data, and (2) submit the codes and supporting documents. The top-ranked teams will be invited for a final presentation followed by a code review.

November 1st, 2023 – Pre-Evaluation

1) Download the pre-evaluation data from the following link for the 10 existing materials:
   https://www.dropbox.com/sh/4ppuzu7z4ky3m6l/AAApqXcxr_Fnr5x9f5qDr8j8a?dl=0
   This pre-evaluation dataset contains 5,000 data points for each of the 10 materials.
2) Evaluate the data with your already trained algorithm and predict the core losses.
3) Evaluate the error for each prediction as $\frac{|measured-predict|}{measured} \times 100\%$. The measured results come from the dataset, and the predicted results come from your models.
4) Plot the error histograms of the core losses for each material and create a single page PDF to summarize the results. Label the average error, 95th percentile error, maximum error. An example template is shown in Appendix II. Example codes and models are available in: https://github.com/minjiechen/magnetchallenge/tree/main/pretest.
5) Feel free to submit any explanatory document with your self-evaluation results to pelsmagnet@gmail.com.

November 1st, 2023 – Data released for final evaluation.

1) New training data and testing data available for final evaluation. The training data will include a small amount of excitation and core loss data for a few new materials. The testing data will include a large amount of excitation data for the new materials. Core loss data is not included in the testing data. Student teams will predict the core loss for evaluation and testing.

December 25th, 2023 – Final submission.

1) Prediction results for the testing data due as CSV files.
2) A 5-page IEEE TPEL format document due as a PDF file. Please briefly explain the key concepts.
3) Full executable model due as a ZIP file for a potential code review with winning teams.

January to March 2024 – Model Performance Evaluation, Code Review, Final Winner Selection

Appendix II: MagNet Challenge Pretest Results – Team Name – Date

Error Distribution for 3C90
Avg=5.822%, 95-Prct=18.2%, 99-Prct=31.7%, Max=63.63%

Avg=5.822%
95-Prct=18.23%
Max=63.63%

Ratio of Data Points
Relative Error of Sequence [%]

Error Distribution for 3C94
Avg=4.25%, 95-Prct=13.2%, 99-Prct=20.4%, Max=50.12%

Avg=4.25%
95-Prct=13.18%
Max=50.12%

Ratio of Data Points
Relative Error of Sequence [%]

Error Distribution for 3E6
Avg=2.099%, 95-Prct=6.73%, 99-Prct=11.4%, Max=64.35%

Avg=2.099%
95-Prct=6.733%
Max=64.35%

Ratio of Data Points
Relative Error of Sequence [%]

Error Distribution for 3F4
Avg=16.17%, 95-Prct=48.4%, 99-Prct=77.5%, Max=180.8%

Avg=16.17%
95-Prct=48.38%
Max=180.8%

Ratio of Data Points
Relative Error of Sequence [%]

Error Distribution for 77
Avg=4.608%, 95-Prct=13.7%, 99-Prct=24.1%, Max=111.1%

Avg=4.608%
95-Prct=13.67%
Max=111.1%

Ratio of Data Points
Relative Error of Sequence [%]

Error Distribution for 78
Avg=6.137%, 95-Prct=19.1%, 99-Prct=30.7%, Max=65.55%

Avg=6.137%
95-Prct=19.12%
Max=65.55%

Ratio of Data Points
Relative Error of Sequence [%]

Error Distribution for N27
Avg=4.305%, 95-Prct=13.5%, 99-Prct=22.7%, Max=50.49%

Avg=4.305%
95-Prct=13.45%
Max=50.49%

Ratio of Data Points
Relative Error of Sequence [%]

Error Distribution for N30
Avg=1.603%, 95-Prct=4.71%, 99-Prct=7.87%, Max=13.24%

Avg=1.603%
95-Prct=4.709%
Max=13.24%

Ratio of Data Points
Relative Error of Sequence [%]

Error Distribution for N49
Avg=13.88%, 95-Prct=41.9%, 99-Prct=59%, Max=184.2%

Avg=13.88%
95-Prct=41.87%
Max=184.2%

Ratio of Data Points
Relative Error of Sequence [%]

Error Distribution for N87
Avg=5.221%, 95-Prct=15.6%, 99-Prct=26.6%, Max=46.1%

Avg=5.221%
95-Prct=15.6%
Max=46.1%

Ratio of Data Points
Relative Error of Sequence [%]