

RATIONAL APPROXIMATION FOR DATA-DRIVEN MODELING AND
COMPLEXITY REDUCTION OF LINEAR AND NONLINEAR
~~REFERENCES DYNAMICAL SYSTEMS (MS - ID 69) REFERENCES~~
**Comparison of greedy-type approaches involving the
Loewner matrix for rational modeling**

Sanda Lefteriu

IMT Lille Douai

sanda.lefteriu@imt-lille-douai.fr

The Loewner framework has established itself as a popular choice for building rational approximations in barycentric form. The Loewner together with the shifted Loewner matrices are built from measurements and, together with the data matrices, yield a high-order rational model for a potentially non-rational function. To eliminate the redundancy in the data, an SVD step of the Loewner matrix pencil is involved. However, as the size of these matrices is equal to half of the number of measurements, this step is rather costly for large data sets when the traditional SVD is employed.

This talk compares several greedy-type approaches which use the same principle: starting from an order 1 approximant, points from the available data set are added in a greedy fashion by minimizing the error measure of choice. These approaches considered in the comparison are: AAA [1], the CUR decomposition [2], DEIM-CUR decomposition [3], as well as the adaptive and recursive approaches [4].

References

- [1] Y. Nakatsukasa, O. Sète, L. N. Trefethen. *The AAA algorithm for rational approximation*. SIAM Journal on Scientific Computing, 40(3):A1494–A1522, Jan. 2018.
- [2] D. S. Karachalios, I. V. Gosea, A. C. Antoulas. *Data-driven approximation methods applied to non-rational functions*. Proc. Appl. Math. Mech., 18(1), 2018.
- [3] D. C. Sorensen, M. Embree. *A DEIM induced CUR factorization*, SIAM Journal on Scientific Computing, 38(3): A1454–A1482, 2016.
- [4] S. Lefteriu, A. C. Antoulas. *A New Approach to Modeling Multiport Systems From Frequency-Domain Data*, IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems, 29(1):14-27, Jan. 2010.