

RATIONAL APPROXIMATION FOR DATA-DRIVEN MODELING AND
COMPLEXITY REDUCTION OF LINEAR AND NONLINEAR
DYNAMICAL SYSTEMS (MS - ID 69)
~~Input-tailored moment matching – a system-theoretic
model reduction method for nonlinear systems~~

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We suggest a new moment matching method for quadratic-bilinear dynamical systems. Most system-theoretic model order reduction methods for nonlinear systems rely on multivariate frequency representations derived from the Volterra series expansion of the solution. Similarly, our approach relies on variational expansions, but we consider instead univariate frequency representations tailored towards user-pre-defined families of inputs. Then moment matching corresponds to a one-dimensional interpolation problem, not to multi-dimensional interpolation as for the multivariate approaches, i.e., it also involves fewer interpolation frequencies to be chosen. The resulting moment matching problems are approached exploiting the inherent low-rank tensor structure.

In addition, our approach allows for the incorporation of more general input relations in the state equations – not only affine-linear ones as in existing system-theoretic methods – in an elegant way.