The behavioral approach to systems and control, put forward in the late 70s by Jan C. Willems, has a number of advantages. Among these are the ability to treat all of the system variables on an equal footing, separate the system from its (numerous) representations, and define system's properties/problems in terms of the behavior rather than its representations. These advantages have been used in solving identification, signal processing, and control problems.

In this project, we use the behavioral approach to derive models from incomplete data sets. A practical motivation for this research problem is malfunctioning of measurement devices. Modeling from incomplete data occurs also in compressive sensing and data-driven control. In these applications there is no prior knowledge about the missing data apart from the basic assumption that the missing data is consistent with an underlying model. We adopt a generic approach without restrictive assumptions about the pattern and nature of the missing data.

Our strategy for solving the missing data identification problem is motivated by advances in the behavioral system theory and effective machine learning methods for estimation of missing data in static estimation problems. In the case of dynamic models, the problem can be posed and solved as a structured low-rank matrix approximation and completion. The project will provide a unified setting for dealing with missing data in system identification problems as well as computationally robust and efficient methods that implement the theory in practice.

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