



# An ANOVA Test for Parameter Estimability using Data Cloning with Application to Statistical Inference for Dynamic Systems

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(Submitted on 14 May 2013)

Models for complex systems are often built with more parameters than can be uniquely identified by available data. Because of the variety of causes, identifying a lack of parameter identifiability typically requires mathematical manipulation of models, monte carlo simulations, and examination of the Fisher Information Matrix. A simple test for parameter estimability is introduced, using Data Cloning, a Markov Chain Monte Carlo based algorithm. Together, Data cloning and the ANOVA based test determine if the model parameters are estimable and if so, determine their maximum likelihood estimates and provide asymptotic standard errors. When not all model parameters are estimable, the Data Cloning results and the ANOVA test can be used to determine estimable parameter combinations or infer identifiability problems in the model structure. The method is illustrated using three different real data systems that are known to be difficult to analyze.

Comments: 30 double spaced pages

Subjects: **Methodology (stat.ME)**

Cite as: **arXiv:1305.3299 [stat.ME]**

(or **arXiv:1305.3299v1 [stat.ME]** for this version)

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