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Global Characterization of Model Parameter Space Using Information Topology MARK TRANSTRUM, Brigham Young University — A generic parameterized model is a mapping between parameters and data and is naturally interpreted as a prediction manifold embedded in data space. In this interpretation, known as Information Geometry, the Fisher Information Matrix (FIM) is a Riemannian metric that measures the identifiability of the model parameters. Varying the experimental conditions (e.g., times at which measurements are made) alters both the FIM and the geometric properties of the model. However, several global features of the model manifold (e.g., edges and corners) are invariant to changes in experimental conditions as long as the FIM is not singular. Invariance of these features to changing experimental conditions generates an "Information Topology" that globally characterizes a model's parameter space and reflects the underlying physical principles from which the model was derived. Understanding a model's information topology can give insights into the emergent physics that controls a system's collective behavior, identify reduced models and describe the relationship among them, and determine which parameter combinations will be difficult to identify for various experimental conditions.

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