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Coarse-graining systems biology models with Information Geometry DANE BJORK, MARK TRANSTRUM, Brigham Young University — Microscopically, biological signaling pathways can be very complex, involving a large number of bio-chemical reactions organized to perform specific cellular functions. In spite of the immense complexity of these systems when modeled at the bio-chemical level, systems often have an elegant simplicity when modeled at a more abstract, coarse-grained level. For example, numerous chemical reactions may coordinate to form an effective feedback loop. Understanding and modeling the relationship between the microscopic components and the macroscopic function is an important, challenging problem that is central to systems biology. Using information geometry, we systematically coarsen models from the bio-chemical level into effective models of the emergent biology. The coarse-grained models remain written in terms of the the microscopic parameters but vividly illustrate the emergent control mechanisms, such as feedback loops, that control the system.

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