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## **Formalizing Metabolic-Regulatory Networks by Hybrid Automata**

### **Abstract:**

Computational approaches in systems biology have become a powerful tool for understanding the fundamental mechanisms of cellular metabolism and regulation. However, the interplay between the regulatory and the metabolic system is still poorly understood. In particular, there is a need for formal mathematical frameworks that allow analyzing metabolism together with dynamic enzyme resources and regulatory events.

Here, we introduce a metabolic-regulatory network model (MRN) that allows integrating metabolism with transcriptional regulation, macromolecule production and enzyme resources. Using this model, we show that the dynamic interplay between these different cellular processes can be formalized by a hybrid automaton, combining continuous dynamics and discrete control.