

## Design and Implementation of an Abductive Reasoning System for Gene Network Completion

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### **Abstract**

Signaling pathways are essential for understanding complex biological processes. This paper presents an automated framework for synthesizing signaling pathways from biological knowledge bases. The proposed approach combines formal knowledge representation with rule-based logical reasoning to identify, organize, and infer relevant facts related to intracellular communication. We describe the system architecture and its implementation, including the reasoning engine and pathway reconstruction module. Experimental results demonstrate the effectiveness of the approach in extracting and reconstructing metabolic and signaling pathways from structured biological data.