Machine-Assisted Extraction of Formal Semantics from Domain Specific Semi-Formal Diagrams

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Abstract

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1 Introduction

> ”We need to focus more on how information is managed in living systems and how this brings about higherlevel biological phenomena. There should be a concerted programme to investigate this, which will require both the development of the appropriate languages to describe information processing in biological systems and the generation of more effective methods to translate biochemical descriptions into the functioning of the logic circuits that underpin biological phenomena.” ([14] Paul Nurse (2008))

Abstract machines of systems biology [2]

Significance

2 Related Work

Gene gate modeling in the stochastic pi-calculus [1]

State charts [11]

Pi-calculus [20]

Petri-net modeling of biological networks [4]

2.1 Generating Formal Meaning from Informal Diagrams

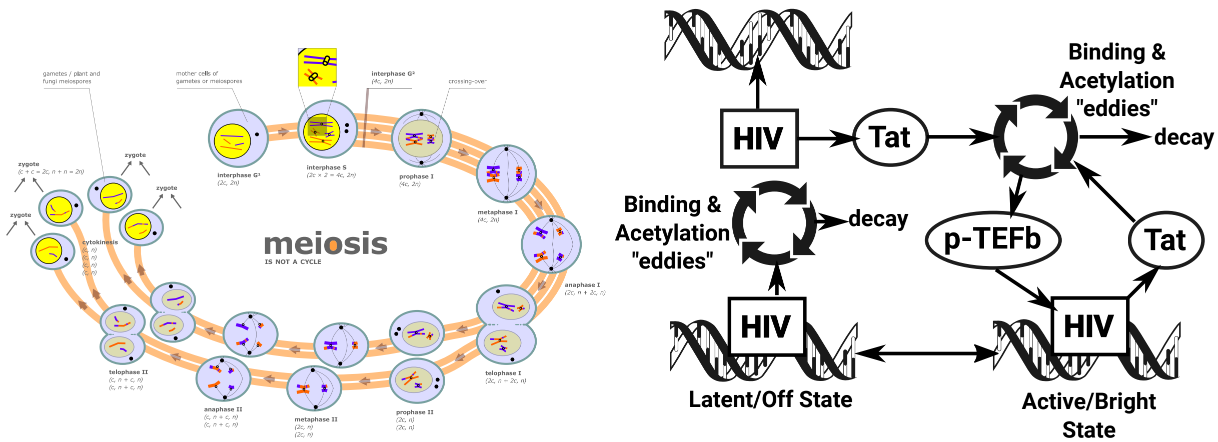
3 AMIDOL

3.1 Visual Domain Specific Languages

Composition [16, 19]

3.2 Intermediate Representation

Markov models [12]



(a) Example of a semi-formal diagram of Meoisis. CC-BY-SA 3.0 Marek Kultys, July 2, 2008.

(b) Example of a semi-formal diagram of the molecular model of the Tat transactivation circuit.

Figure 1: Examples of semi-formal diagrams drawn by domain experts to represent operational semantics and complex system models.

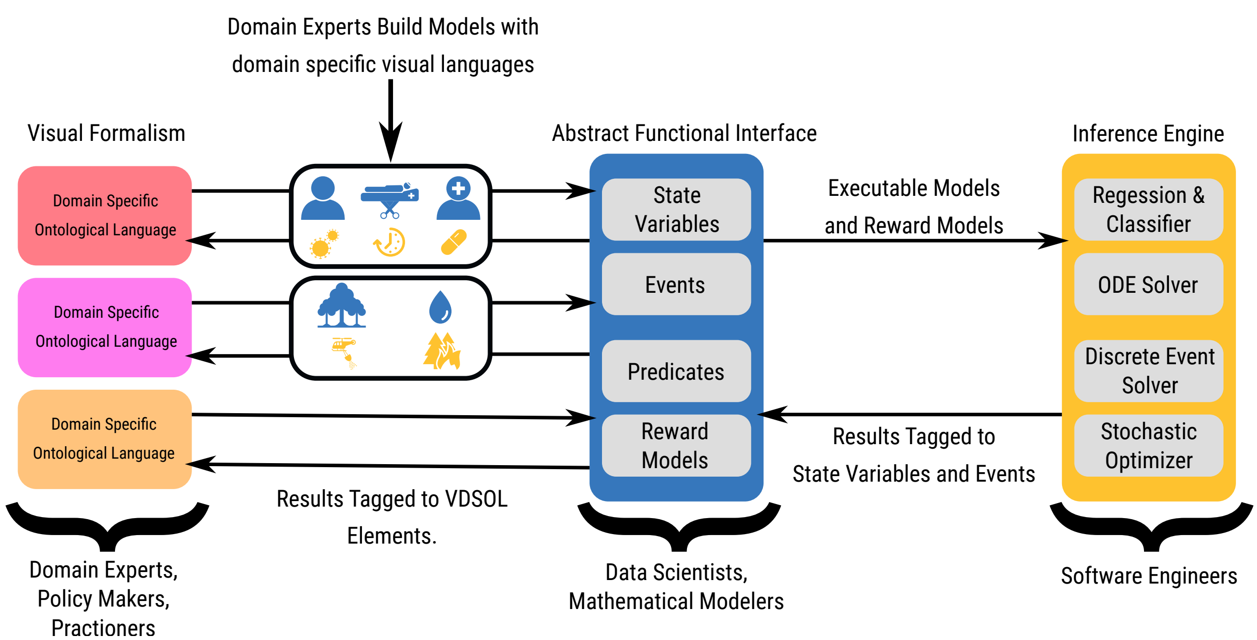


Figure 2: AMIDOL Architecture

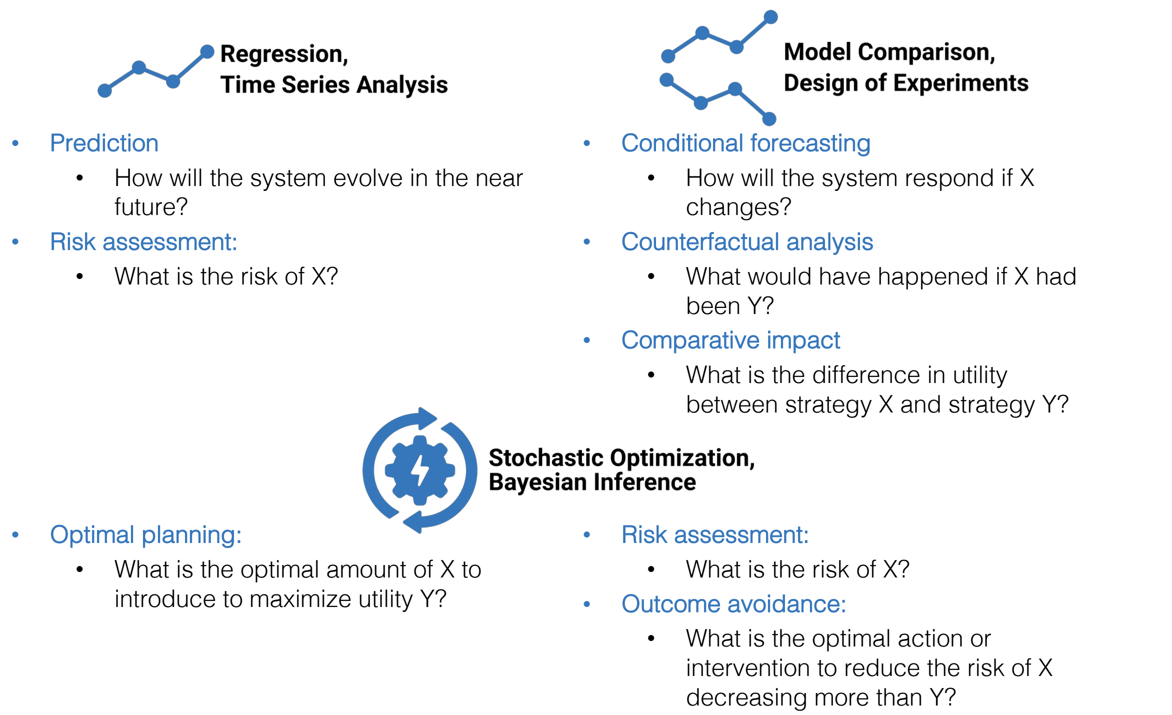


Figure 3

Petri-nets with inhibitor arcs [5]

Stochastic activity networks [13, 18]

State and reward variables Reward structures [15, 7, 6, 17]

Instant of time... [10]

Events

Input and output predicates

3.3 Inference Engine

4 Compartmental Model for Epidemiology

4.1 SIRS Model

H1N1 R_0 importance [9].

Ebola R_0 importance [8]

CDC Data [3]

4.2 Vital Dynamics

5 Conclusions

6 Future Work

7 Acknowledgments

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8 Resources, web sites, etc.

MWS seeks to build a community and share resources, so feel free to have a section in your paper that points readers to web sites, github pages, etc.

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