Speaker Abstract

Wednesday, September 10
1:00pm-2:30pm

Winning half the battle: starting from human biology

Luiz Ladeira
Postdoctoral researcher, University of Liege, Belgium

This presentation will focus on human biology mapping at the molecular level, linking (patho)physiological pathways to biological functions and phenotypes. It will introduce the concepts and showcase the advancements of physiological maps, disease maps, and adverse outcome pathways (AOPs) as frameworks for collecting and storing relevant knowledge. These tools are designed and curated to represent specific organ systems, focusing on detailing molecular interactions that streamline signals leading to undisturbed and disturbed ontological biological functions. They are built using a systems biology toolbox, which we will explore, to deliver not only a human-readable diagram but also a machine-readable resource that can be explored using analytical and dynamic modeling tools to unveil valuable insights about the mechanisms of hazards. We will show and explore the Brain Development physiological map from the ONTOX project in order to understand how the molecular interplay among signaling pathways controls cellular fate during development. From the Parkinson's Disease Map, we will visualize how the Systems Biology community contributed to building a state-of-the-art knowledge repository throughout the last decade and how this is supporting researchers in understanding better chemical-induced Parkinson's. The AOP network will provide a higher-level view of toxicological mechanisms, summarizing molecular interactions leading to specific endpoints. We will show how these tools are being used to establishing both in vitro and in silico test batteries to assess specific toxicity endpoints and assist in describing hazards in a mechanistic and probabilistic way. Furthermore, we will show how to use these tools to enable the retrieval of information from external formal ontologies such as ChEMBL, DrugBank, and CTD, visualizing data on biological interactions to facilitate a comprehensive understanding of pathway disturbance. We will explore how these new approaches to collecting and processing data, crowdsourcing data curation, and constructing previous knowledge diagrams, can be leveraged for hazard characterization, showcasing successful examples from the toxicology and systems biology communities.