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My project here at NCCT involves designing chemical space classifiers for ToxCast compounds. I am excited to work on this project because it is challenging and gives me an opportunity to apply and advance my Cheminformatics skills. It is also an honor to work and collaborate with the NCCT scientists who are passionate about the work and have unique ways of approaching research. I look forward to working with them to move this project forward.

Chemical Structure Classifiers and Approaches for Toxicity Prediction in ToxCast™

ToxCast™ is generating high-throughput screening (HTS) data for 1,000 chemicals in over 500 biochemical, cell-based, and model organism assays. Tox21 is a collaboration between EPA, NTP (National Toxicology Program) and NCGC (NIH Chemical Genomics Center) that is generating HTS data for a larger set of upwards of 10,000 compounds of environmental interest in an expansion of the ToxCast™ paradigm. This project will apply cheminformatics concepts to develop novel methods for chemical classification and toxicity prediction in association with the ToxCast™ and Tox21 research projects. The project will also work on developing and applying these methods to both the ToxCast™ and larger Tox21 chemical sets in an effort to refine toxicity predictions for chemicals and chemical classes to support chemical prioritization for more extensive toxicity testing. Initial modeling efforts have focused on developing predictive toxicity signatures relating HTS results to reference in vivo toxicity endpoints. A key requirement to the success of such efforts will be the integration of chemical clustering concepts based on chemical properties, reactivity and metabolism, with biologically-informed clustering derived from toxicity, mechanistic and HTS data. A key difference in this approach from traditional structure-activity relationship (SAR) approaches is the explicit incorporation of HTS biological data in guiding selection of chemical classes, and refinement of traditional chemistry-based classes based on biological data. The vision is a layered approach where chemical classifications are flexible and tailored to the compound and biological activity space under consideration. This research will take advantage of data mining approaches and informatics methods being developed within and outside the NCCT.