

SUMMER 2020 – SC EPSCOR /INBRE RET PROJECT DESCRIPTION FORM

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Research Subject Area	Mechanistic computational modeling of cancer cell drug responses

- A. Briefly describe overall research program at your laboratory.** The Birtwistle Lab combines computational and experimental methods to understand how cancer cells make decisions. We aim to use this understanding to better predict drug and drug combination responses. We give particular focus to brain tumors, although the approaches we take are quite flexible and can be applied to a multitude of cell and cancer types. Our goal is to build simulation models that can guide patient-specific therapies by accounting for mechanisms of drug action within the unique complexity of an individual's tumor. This goal brings with it both basic and applied science projects.
- B. Briefly describe specific project(s) for your teacher:** There are a variety of modeling activities along the lines above being done in the lab, so there is reasonable flexibility in defining a project. That being said, a particular project of interest here involves using natural language processing algorithms to automatically generate computational models of signal transduction pathways of relevance to cancer. Specifically, we are using the INDRA tool (Gyori et al., MSB, 2017) along with our recent pan-cancer signaling model (Bouhaddou et al., Plos Comp Biol, 2018) to build a “paragraph form” version of a detailed differential equation-based chemical kinetics model. All the software we use in our work is freely available and thus, the participant will be able to use these techniques for teaching and research beyond the project period if they choose to. We look forward to hosting you!
- C. Will any other people (post docs, grad students, undergraduate students, colleagues, etc.) be involved directly with your teacher?** There will be one postdoc and potentially some undergraduates that will work directly with the teacher, in addition to myself.
- D. Will you require any advanced reading/preparation for the teacher? If yes, please briefly describe.** Some brief reading will be required. Experience with some software will be beneficial, particularly python (but we can train quickly to get started).