



Environmental factors, cancer drivers, and cancer development. Mutation patterns are often indicative of a gene's function as either tumor promoting or tumor suppressing. The qCancerDr model will quantify the uncertainty of the loss and gain functions of a cancer driver. The extDEGBOE model will show the connection of environmental factors and cancer drivers for carcinogenesis.

I will first develop a quantitative deterministic mathematical model (qCancerDr) that describes the dual role of cancer drivers in regulating aspects of cellular metabolism: a) activating and promoting a cancer phenotype and b) inhibiting tumor suppressor capacity. The qCancerDr will help elucidate the molecular mechanisms that govern the dynamics of regulatory behavior of cancer drivers. I will base the model on the properties of regulatory structures, which I studied in systems biology work during my doctoral PhD studies. Second, I will connect epigenetics and genetics mechanisms to study carcinogenesis and cancer progression by linking qCancerDr with extDEGBOE to create a mixed model that identifies cancer drivers in the dynamics of tumor heterogeneity. The mixed model will exploit deterministic information on environmental factors to assess their roles in carcinogenesis.