The focus of pancreatic cancer research has been shifted from pancreatic cancer cells towards their microenvironment, involving pancreatic stellate cells that interact with cancer cells and influence tumor progression.

To quantitatively understand the pancreatic cancer microenvironment, in this work, we construct a computational model for intracellular signaling networks of cancer cells and stellate cells as well as their intercellular communication. We extend the rule-based BioNetGen language to depict intra- and inter-cellular dynamics using discrete and continuous variables respectively. Our framework also enables a statistical model checking procedure for analyzing the system behavior in response to various perturbations.

The results demonstrate the predictive power of our model by identifying important system properties that are consistent with existing experimental observations. We also obtain interesting insights into the development of novel therapeutic strategies for pancreatic cancer.