1176-45-344 **Min-Jhe Lu*** (mlu19@hawk.iit.edu). *Nonlinear simulation of vascular tumor growth with chemotaxis and the control of necrosis.* Preliminary report.

In this work, we develop a sharp interface tumor growth model to study the effect of both the intratumoral structure using a controlled necrotic core and the extratumoral nutrient supply from vasculature on tumor morphology. We first show that our model extends the benchmark results in the literature using linear stability analysis. Then we solve this generalized model numerically using a spectrally accurate boundary integral method in an evolving annular domain, not only with a Robin boundary condition on the outer boundary for the nutrient field which models tumor vasculature, but also with a static boundary condition on the inner boundary for pressure field which models the control of tumor necrosis. Our nonlinear simulations reveal the stabilizing effects of angiogenesis and the destabilizing ones of chemotaxis and necrosis in the development of tumor morphological instabilities. Finally, the values of the nutrient concentration with its fluxes and the pressure level with its normal derivatives, which are solved accurately at the boundaries, help us to characterize the corresponding tumor morphology and the level of the biophysical quantities on interfaces required in keeping various shapes of the necrotic region of the tumor. (Received January 25, 2022)