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Angiogenesis, the formation of new blood vessels from pre-existing vasculature is one of the main processes that helps in the growth and spread of tumors connecting the benign avascular phase and the prospectively harmful vascular stage of the tumor. Angiogenesis is a process that involves a well organised sequence of events including tumor angiogenic factor signaling; endothelial cell migration and proliferation; degradation of extra-cellular matrix and directed blood flow. The use of Mathematical and Computational approach to investigating cancer growth and spread has been identified as a complementary approach to scientific investigation. Experimentalist and medical practitioners can depend on the results obtained from mathematical and computational models to redefine their hypotheses, focus experiments, and enable more accurate predictions. It is in this light that we propose a multiscale continuum model that describes the effect of hypoxia on pathological angiogenesis in conjunction with a discrete model to capture vascular structure of the blood vessels growing towards the tumor. (Received February 02, 2015)