Mitral regurgitation is a common heart valve disease. Current approaches for mitral valve repair include open heart surgery (which carries the risk of post-operative complications) and transcatheter mitral valve repair (TMVR). TMVR is a relatively new approach that is performed on a beating heart using a catheter that is guided to the target location to implant the device to reduce or eliminate mitral regurgitation. Given the tortuosity of the path that needs to be taken to reach the mitral valve, TMVR is a clinically challenging procedure. The first part of the talk will focus on our work in developing a highly articulated, intravascular meso-scale robot that can be guided to deploy the mitral valve implant under image guidance.

The second part of the talk will focus on the area of micro-scale robotic systems involving steerable guidewires. One of the primary requirements of an endovascular robotic system is to be able to successfully steer the guidewire towards the target location with minimal or no harm to the vessel. Chronic total occlusions (CTOs) remain the riskiest, most challenging, and least successful vascular lesions to treat with traditional endovascular devices. Peripheral artery disease (PAD) in particular, is one of the most common causes of cardiovascular deaths worldwide. Procedural complexity in treating CTOs are attributed to multiple causes. The second part of the talk will present our work on the development of 400 microns (~0.016") robotically steerable guidewire as a potential solution to this challenging clinical problem.