We envision a future where robots are integrated seamlessly into our factories, hospitals, and homes as autonomous agents that interact with the physical world as fluently and efficiently as humans do. While a great deal of work has investigated the manipulation of rigid objects in these settings, manipulation of deformable objects like cables, muscle tissue, and cloth remains extremely underexplored. The problem is indeed challenging, as these objects are not straightforward to model and have infinite-dimensional configuration spaces, making it difficult to apply established motion planning approaches. Our approach seeks to bypass these difficulties by representing deformable objects using simplified geometric models at both the global and local planning levels. Though we cannot predict the state of the object precisely, we can nevertheless perform tasks such as cable-routing, cloth folding, and surgical probe insertion in geometrically-complex environments. Building on this work, our new projects in this area aim to blend exploration of the model space with goal-directed manipulation of deformable objects and to generalize the methods we have developed to motion planning for soft robot arms, where we can exploit contact to mitigate the actuation uncertainty inherent in these systems.

Bio:

Dmitry Berenson received a BS in Electrical Engineering from Cornell University in 2005 and received his Ph.D. degree from the Robotics Institute at Carnegie Mellon University in 2011, where he was supported by an Intel PhD Fellowship. He completed a post-doc at UC Berkeley and started as an Assistant Professor in Robotics Engineering and Computer Science at WPI in 2012. He founded and directs the Autonomous Robotic Collaboration (ARC) Lab at WPI, which focuses on motion planning, manipulation, and human-robot collaboration. He received the IEEE RAS Early Career award in 2016.