Magnetic resonance imaging provides several contrast mechanisms to examine changes to white matter during neurodegenerative disease or even healthy aging. Diffusion tensor imaging provides information about the integrity of axons and axonal membranes by looking at restrictions experienced by water that is mainly within axons. In contrast, magnetic resonance elastography provides information about the structural organization of axons, along with the integrity of the extracellular matrix. During healthy aging or neural degeneration, each of these measures provides complementary information about the status of white matter networks. Both of these techniques are traditionally low signal-to-noise techniques that typically are acquired with low spatial resolution to obtain high signal. However, both techniques would benefit significantly from improvements in the imaging spatial resolution to separate fine white matter structures and achieve a more homogeneous signal within a voxel. In this talk, I will describe our improvements in the imaging resolution of these two techniques, bringing diffusion tensor imaging to sub-mm voxels and providing localized measures of mechanical properties of white matter structures.

Speaker Bio:

Brad Sutton received his undergraduate education from the University of Illinois at Urbana-Champaign in General Engineering (1998). Along with MS degrees in Biomedical Engineering and Electrical Engineering, he received his Ph.D. in Biomedical Engineering from the University of Michigan in 2003. He then returned to the University of Illinois to serve as a research scientist at the Biomedical Imaging Center of Beckman Institute. He joined the Department of Bioengineering at the University of Illinois at Urbana-Champaign in 2006. Since 2012, he has been an Associate Professor and Associate Head for Undergraduate Studies of the Bioengineering Department. He also has affiliations in Electrical and Computer Engineering, Speech and Hearing Sciences, Neuroscience Program, and the Beckman Institute. Dr. Sutton’s research is in development of magnetic resonance imaging acquisition and reconstruction methods to improve the accuracy, speed, and information content of neuroimaging methods.