



Stony Brook University

Biomedical Informatics Grand Rounds



Michal Sofka, PhD; Team Leader, Hyperfine Research

Deep Learning and Medical Imaging for Streamlining MRI Exams

Wednesday, February 27, 2019 3pm—4pm

BMI Conference Room HSC-L3 Room 045

Abstract: MRI may produce more informative diagnostic images than CT in patients presenting with focal stroke symptoms and soft tissue brain injuries. The severity of the injury can be measured by the shift of the brain past its midline and the lesions can be automatically detected and volumetrically quantified. Despite these clinical advantages, it has been a common practice to perform CT rather than MRI in the emergency setting since it is generally faster. As a consequence, MRI image reconstruction is often accelerated by undersampling the k-space to maximize the clinical value. Various methods have been developed to recover image blurring and eliminate artifacts from undersampling, among which Compressed Sensing (CS) gained a lot of popularity. However, CS relies on intensive iterative computation, requires empirical parameter tuning, and often results in loss of image details. We propose two new deep learning architectures that reconstruct MR images with undersampled k-space and incorporate subnetworks specific to k-space and image-domain data to jointly improve the performance compared to state-of-the-art techniques. Furthermore, we show that the design of the second model makes it possible to reconstruct non-Cartesian acquisitions. We also analyze how the networks learn to conduct adaptive local as well as non-local interpolation to construct the k-space. Results on the common MRI sequences demonstrate that the two proposed models preserve image details and suppress artifacts.

Bio: Michal Sofka is currently leading the deep learning team at Hyperfine Research in New York with a mission to solve challenging research and development problems and launch new products in healthcare. Hyperfine (currently in stealth) is a member of 4Catalyzer, a group of technological startups focused on developing new types of sensors and pairing them with deep learning to get a new window into biology and medicine. Before joining 4Catalyzer, Michal was a senior technical leader in the Cisco's Cognitive Threat Analytics team in Prague, Czech Republic. Prior to Cisco, Michal worked as a senior scientist and project leader at Siemens Corporate Research, top healthcare industrial R&D lab in Princeton, New Jersey. He received the MS degree in Electrical Engineering from Union College and MS and PhD degrees in Computer Science from the Rensselaer Polytechnic Institute (RPI).

****CME Credit Available****

Disclosure Policy: All those in control of CME content are expected to disclose any relevant financial relationship with a commercial interest (defined as any entity producing, marketing, reselling, or distributing health care goods or services consumed by, or used on, patients) that relates to the content that will be discussed in the educational presentation. All commercial relationships that create a conflict with the planners, speakers, authors' control of content must be resolved before the educational activity occurs.

Questions? Please call the Biomedical Informatics Department at 631-638-2590.