Department of Electrical Engineering
Technion—Israel Institute of Technology
Signal Acquisition Modeling and Processing Lab - המעבדה לחישה מידול ועיבוד אותות

Sparse 3D Imaging using Deep Learning

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Diagnostic sonography allows visualization of body tissues, by radiating them with acoustic energy pulses. As the pulse propagates, echoes are scattered by density and propagation-velocity perturbations in the tissue, and detected by the transducer elements. Averaging the detected signals, after their alignment with appropriate time-varying delays, allows localization of the scattering structures, while improving the signal-to-noise ratio (SNR). The latter process is referred to as beamforming.

In 3D ultrasound imaging, 2D transducer arrays rather than 1D arrays are used, and more scan-lines are needed for volumetric imaging. This implies that the amount of sampled data is vastly increased with respect to 2D imaging, making it difficult to perform 3D imaging in real time.

In this project, we aim to reduce the number of transducer elements while preserving the image quality. The project will include the study of the basics ultrasound imaging and designing CNNs for real-time imaging from sparse measurements.

Required background:
Introduction to Digital Signal Processing (044198)
Learning System (046195)
Tensor Flow – Advantage

סרקו ?Beamforming