1158-78-291 **Omar DeGuchy*** (odeguchy@ucmerced.edu), **Arnold D Kim**, **Roummel F Marcia** and **Chrysoula Tsogka**. *Forward and Inverse Scattering In Synthetic Aperture Radar Using Machine Learning.*

In this work we consider machine learning for solving the forward and inverse scattering problems associated with the remote sensing application of synthetic aperture radar (SAR). Our approach consists of formulating the inverse problem as a linear system of the form $A\rho = d$ where d is the measured data, ρ the unknown reflectivity and A is the sensing matrix that depends on the characteristics of the imaging system. In all generality the sensing matrix is typically unknown and the reflectivity is reconstructed using an approximation of the sensing matrix. The quality of the reconstruction is critically dependent on the accuracy of the sensing matrix model. The idea that we pursue in this work, uses machine learning so as to recover the sensing matrix A or its inverse from a set of data corresponding to known reflectivities. To keep the algorithm simple and interpretable, we use a single, fully connected layer where the weights of the network correspond to the matrix A or its recovered inverse. We show with numerical simulations that the learned version of the sensing matrix is close to the actual sensing matrix while its learned inverse leads to improved reflectivity reconstructions. We provide evidence that the performance is robust over a range of SNR values. (Received March 03, 2020)