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Using Convolutional Neural Networks for the Classification of Radio Signals from Cosmic-Ray Air Showers.[1] ABDUL REHMAN, FRANK SCHROEDER, ALAN COLEMAN, Bartol Research Institute, Department of Physics and Astronomy, University of Delaware. — In the past two decades, radio experiments around the world have shown that radio detection of cosmic-ray air showers is an effective and inexpensive technique for measuring the properties of primary cosmic rays: properties like the energy, direction, and composition of primary particles which can help us understand the exotic processes going on in the galactic and extragalactic objects. The irreducible Galactic and thermal backgrounds pose a significant challenge for radio detection of air showers. In an effort to improve the detection threshold, we want to mitigate the background by using machine learning techniques, namely convolutional neural networks. Inspired by previous work at Tunka-Rex, we test two different networks: a Classifier which would enable us to distinguish the radio signal traces from the pure background, and a Denoiser which will help us to recover the underlying cosmic-ray signal from the background. For training and testing of the network, we use simulations to generate radio signals from air showers in addition to modeled and measured background. These networks, once trained, will enable us to lower the detection threshold of radio experiments at Antarctica and to better reconstruct the properties of primary cosmic rays.

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