Automatic determination of Upper Hybrid Resonance Frequencies by Convolutional Neural Network.

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Electron number density is a key parameter for discussions of plasma wave generation/propagation, and wave-particle interaction in the inner magnetosphere. The High Frequency Analyzer (HFA) is a subsystem of Plasma Wave Experiment (PWE) aboard Arase [Kasahara et al. (2018), Kumamoto et al. (2018), Miyoshi et al. (2018)]. The HFA measures electric field spectra in a frequency range from 10 kHz to 10 MHz, which covers a typical frequency range of Upper Hybrid Resonance (UHR) frequency in the inner magnetosphere. Kumamoto et al. (2018) proposed the semiautomatic method for the identification of UHR frequency by computer and a human operator. However, it takes a enormous effort of a human operator.
We propose an automatic determination system of UHR frequency by machine learning. Machine learning is a technique in the field of artificial intelligence to give computers the ability to learn with data. In this study, we defined a task of UHR frequency determination as supervised regression that a computer estimates UHR frequencies using the dataset composed of electric field dynamic spectra with correct UHR frequency labels. We adopted Convolutional Neural Network (CNN) as a machine learning algorithm. In this study, we introduce our machine learning approach and initial results for determining UHR frequency from electric field spectra observed by PWE/HFA.

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