**PR**

**Title:** Decomposition of Raman Spectra of Martian soil Analog Mixture using Convolutional Neural Network.

**Subtitle:** RamanSpec announces a Raman Spectra Convolution Neural Network that enables researchers and their respective labs to analyze the components of Martian soil samples.

**Intro Paragraph:** Knoxville, TN – May, 2024

Raman spectroscopy is a technique used by scientists and researchers to determine the chemical structure of materials. By incorporating a deep learning approach, more specifically using a Convolutional Neural Network (CNN), this process can be automated, improving the accuracy and speed of research in this area. This tool will allow researchers to better understand material found on Martian soil.

**Customer Problems:** The customer needs to identify the individual components of Martian soil from Raman spectra. Traditional methods for spectral decomposition require manual examination. The customer wishes to automate the task and increase the accuracy and reliability compared to traditional methods.

**Solution**:

The product will utilize a Convolutional Neural Network framework that allows the customer to input a path to a directory of Raman Spectra files and then outputs spectra of individual components to solution files. Instead of manually examining each compound Raman spectra, the customer will be able to place the experimentally collected Raman Spectra files in a directory, from which the model will iterate through and create the respective component labelings/solutions. This labeling scheme will save the customer hours of manual inspection time that can then be directed to other aspects of experimentation and analysis.

**Leader’s Quote:** A very common challenge customers encounter in spectral analysis is the identification of individual components from spectra of complex mixtures. For better qualitative and quantitative measurement of mixture components, there is a need to develop systems that can decompose complex spectra into spectra of pure components with precision and high accuarcy. Our mission is to develop Convolutional Neural Networks that can effectively address this challenge. The aim of our neural network architecture is to extract the overlapping signals from spectra data, enabling the identification of mixture;s constituents.

**Customer’s Job-to-be-Done:** To utilize the spectral decomposition neural network for analyzing Martian soil, the customer needs to collect and preprocess data. The customer needs to collect Raman Spectra data of pure compounds and mixtures of the compounds at various concentrations. They must preprocess the spectra, which includes baseline corrections, cosmic ray removal, smoothing, and truncating redundant portions of the spectra. Our product model will take in the preprocessed data as input to output pure component spectra. Customers may evaluate the performance of the model using evaluation metrics like RMSE.

**Customer Quote:**

“This product has saved me countless hours. Previously, I had to go through each file individually and determine the spectra components, but now I can simply organize the files into a directory and the model takes care of the rest! This has allowed me direct more of my time to other aspects of my research and efficiently iterate across experiments” - Customer X

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