Efficacy of Machine Learning Techniques in Analyzing Amino Acids & Minerals Using Fourier Transform Infrared Spectroscopy. C. J. Walker[1], C. I. Weatherspoon[2], and Y. Markushin[3] [1] Delaware State University cjwalker18@students.desu.edu, [2] Delaware State University ciweatherspoon17@students.desu.edu, [3] Delaware State University ymarkushin@desu.edu.

Introduction: Infrared spectroscopy provides chemical information pertinent to several Mars biological questions. Life as we know it is composed of carbon-containing building blocks, organic molecules. This study was conducted to classify and predict varying concentrations of amino acids and rock using machine learning techniques. The selection of instruments for landing on Mars poses particular challenges. Instruments must withstand launch, vacuum space conditions and landing in the extreme environment. Fourier-transform infrared spectroscopy (FTIR), an analytical technique, meets the challenges and is broadly used to identify organic materials.

In this study, several concentrations of L-stereoisomer serine and rock were pulverized and measured using FTIR to obtain a spectrum of absorption. Each sample was measured in 5 sets then averaged to exclude errors. Using the R software environment, we performed Principal Component Analysis (PCA), a machine learning method for dimensionality reduction, to better visualize the story or data told. Preliminary results of our investigation indicate a separation of amino acid/rock mixture and pure rock at our sample concentrations 0.001g, 0.0001g, and 0.00001g.

Further study includes measuring the separation of amino acid/rock mixture and pure rock at the parts per million level, improving on our analysis techniques and developing a method that can be used to detect signatures of life in Martian rocks.

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