

# Automatic Magnetite identification at Placer Deposit Using Multi-Spectral Camera Mounted on UAV and Machine Learning

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## ABSTRACT

As safety, accuracy and overall system optimization requirements evolve, we see the world rapidly moving into a computer age where equipment automation makes the most sense in every industry. The use of drones in mining environments is one way in which data pertaining to the state of the site can be remotely collected. Though capable of visualizing what a miner would be able to see without the need for their physical presence, most production drones are incapable of classifying rocks or minerals with their traditional visible light camera sensors. To counter this, our paper proposes the employment of a multispectral image capturing camera mounted on a drone. Through this Unmanned Automatic Vehicle (UAV) drone with multispectral image gathering capabilities, our integrated system is able to capture depth possessing imagery data from within the visible near-infrared range (VNIR). Aerial imagery data was captured at a placer deposit in an attempt to remotely identify magnetite iron ore via the UAV drone specialized in collecting 5 band spectral information at an accuracy of +/- 16nm. Having accumulated the data, we fed the visual imagery into a machine learning algorithm specialized in classifying spectral imagery data. This algorithm is trained, validated and tested in order to classify the magnetite deposits, hence deducing the amount of iron ore present from within each image corresponding with the site capture point. With our algorithm, we were able to attain a global classification accuracy of 78%, deeming our system highly viable in mining environments that are constantly aiming for risk potential elimination, by increasing the physical distance between miners and the site. This paper, therefore, confirms our initial hypothesis aimed at achieving overall system optimization within a mine site by means of our integrated system composed of a UAV drone, multispectral imaging, and machine learning.