

Hyperspectral Imaging For Precision Agriculture

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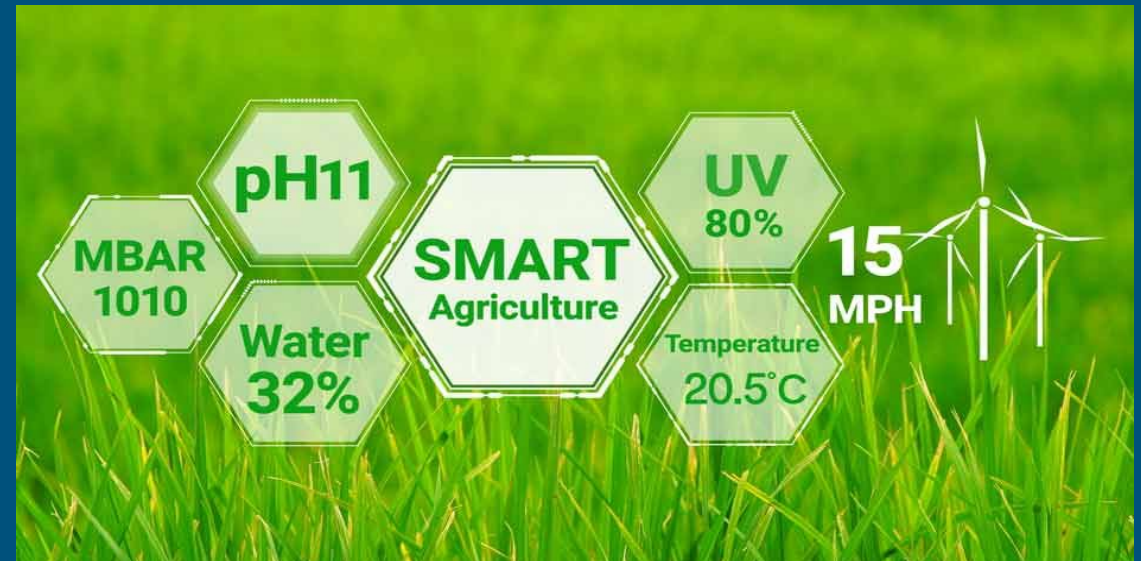


What is Sustainability?

In 1987, the United Nations Brundtland Commission defined sustainability as “meeting the needs of the present without compromising the ability of future generations to meet their own needs.

UN goals addressed by the project:

- 1) Climate change Action -(Goal 13)
- 2) Life on Water -(Goal 15)
- 3) No Hunger -(Goal 2)



Literature review

Group	Existing solution	key problem to be addressed
Bing Lu, Phuong D. Dao, Jiangui Liu, Yuhong He ,and Jiali Shang	Remote sensing techniques like LiDAR,Ultrasonic sensing,active light camera and other techniques.	Very small and inadequate data set with no intricate details about the agricultural fields.
Ang and sen	Machine learning frameworks or architectures, information processing and analytics with hyperspectral and multispectral data.	Hyperspectral cube containing a large volume of spatial and spectral information.This results in Big data challenges.Thus ensemble machine learning framework is applied to Big data for features extraction and classification .
Firouz Abdullah Al-Wassai, N.V. Kalyankar, Ali A. Al-Zuky	machine learning models with suitable pre-processing algorithms.	Trade-off between spectral and spatial resolution of the images.
Te-Ming Tu, Shun-Chi Su, Hsuen-Chyun Shyu, Ping S. Huang	Pansharpening Algorithms <ul style="list-style-type: none"> Primitive Image Fusion Techniques Hyperspectral Imaging in Precision Agriculture	Spectral Distortion in fused images

Problem Statement:

To compensate for the trade-off between spatial and spectral resolution of hyperspectral images.

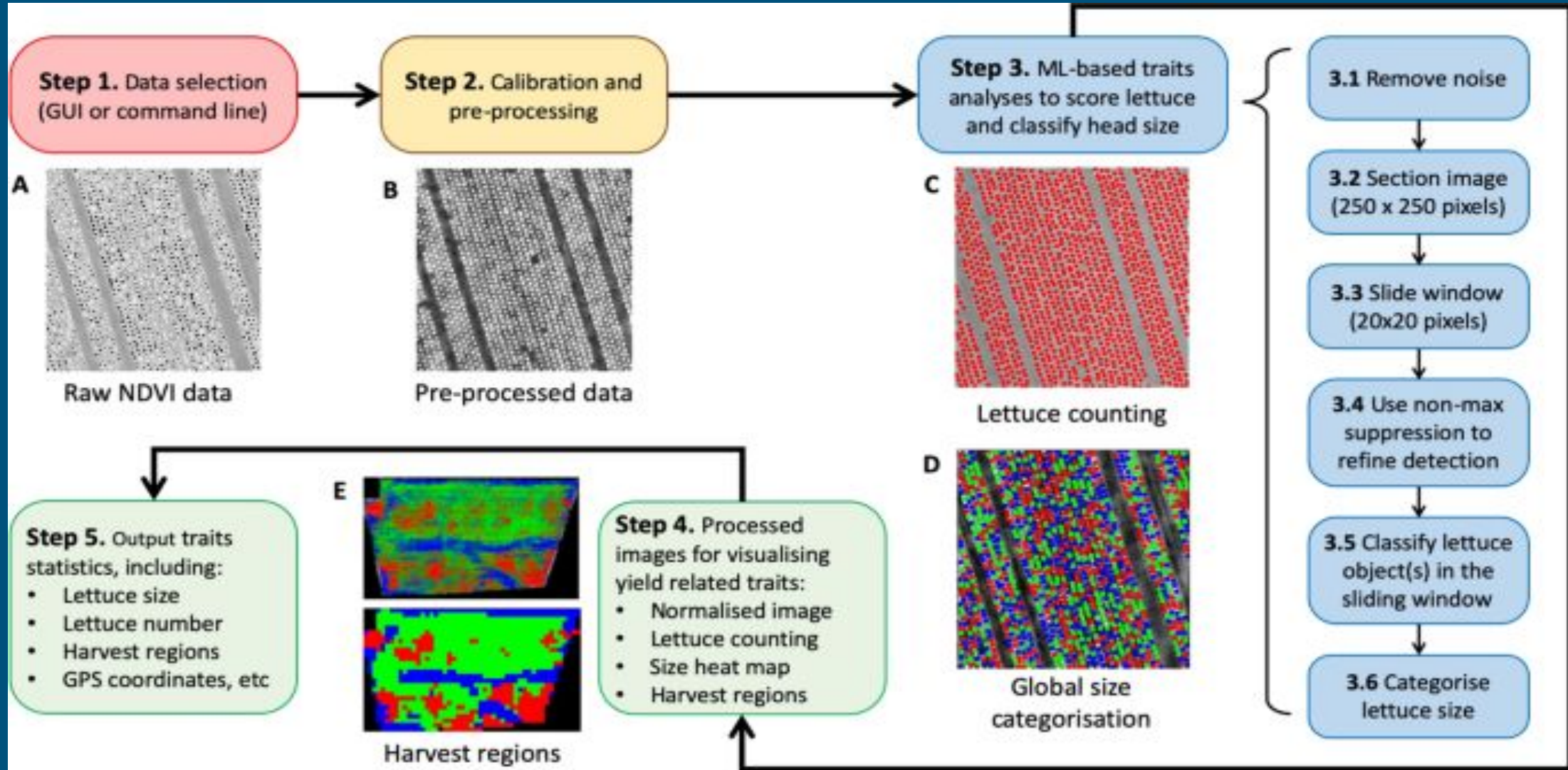
In countries like India, most of the agricultural land-holdings are small to medium scale. Hence, high resolution images have to be obtained for data analysis. But there is always a trade-off between spatial and spectral resolution.

Problem Solution:

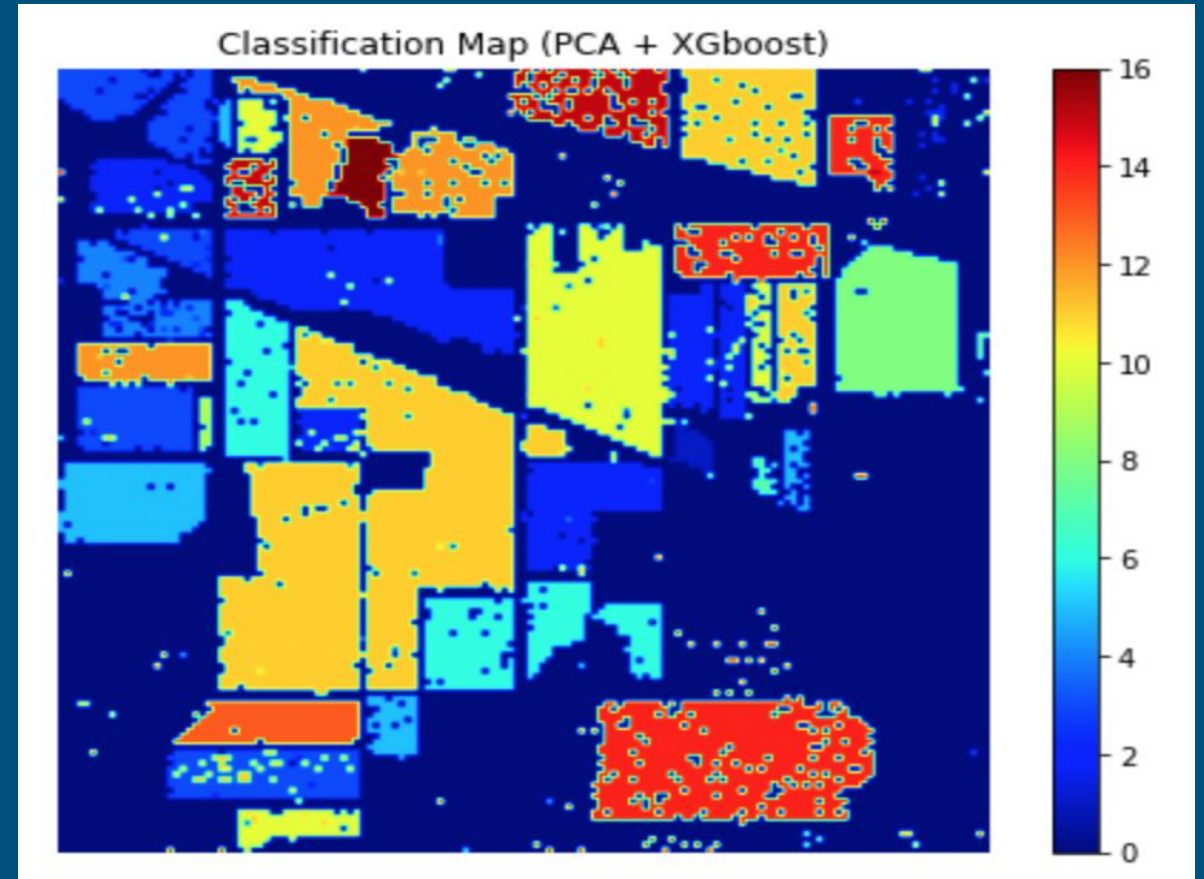
This problem is addressed by developing machine learning model with adopting suitable pre-processing algorithms.



Analysis of Hyperspectral Images with ML

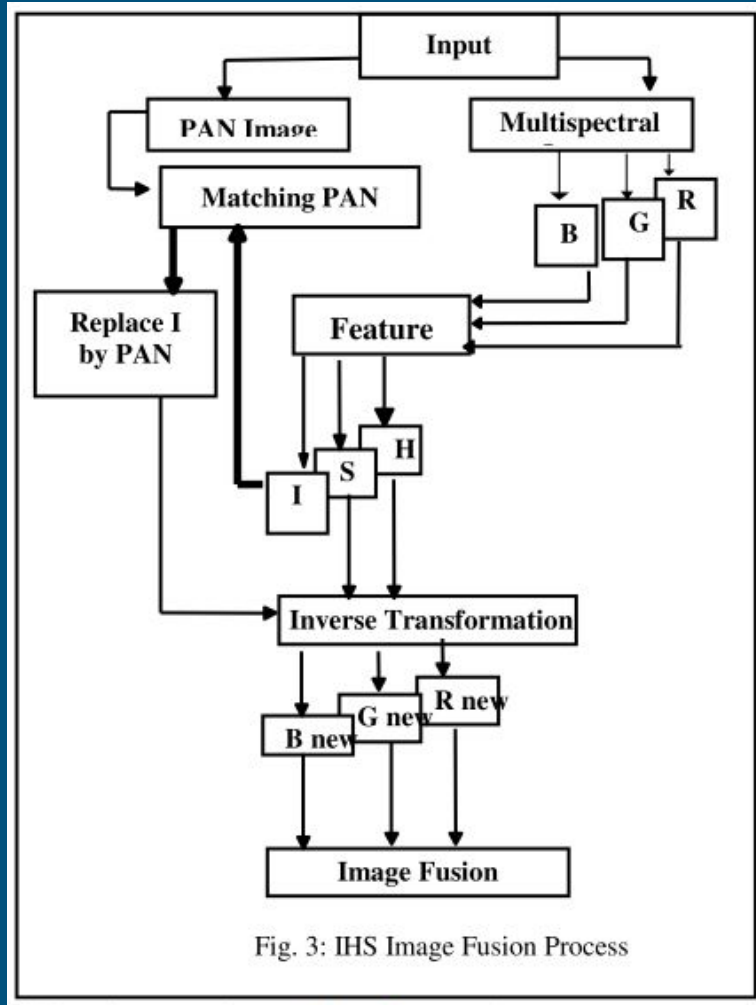


Machine learning on Hyperspectral image



Pansharpening Algorithms For Pre-processing

1. IHS



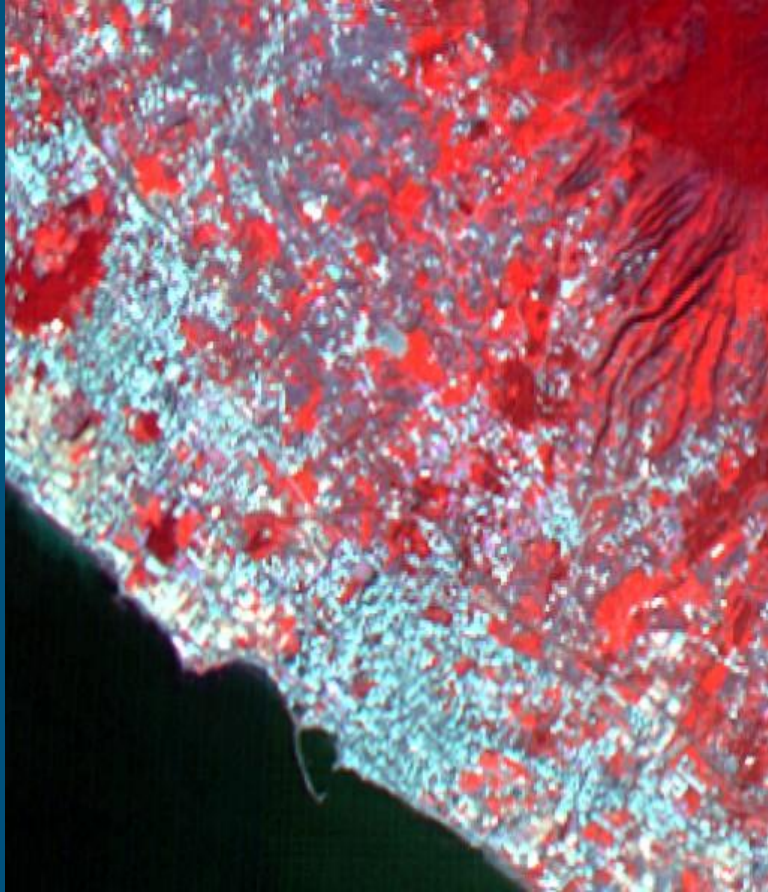
2. Brovey Algorithm

$$R_{new} = \frac{R}{(R + G + B)} \times PAN \quad (1)$$

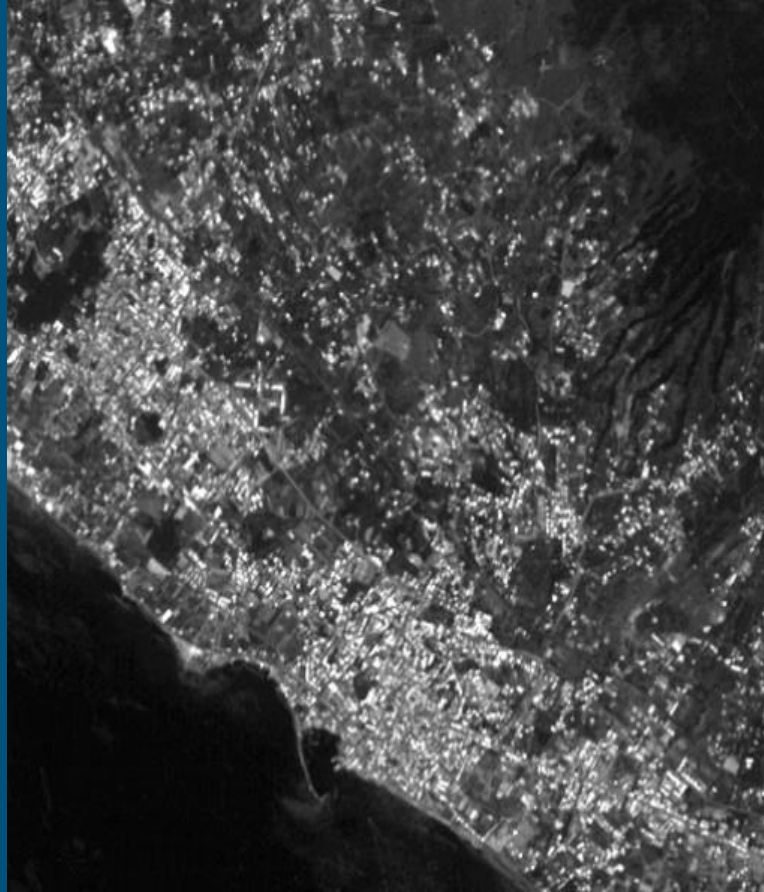
$$G_{new} = \frac{G}{(R + G + B)} \times PAN \quad (2)$$

$$B_{new} = \frac{B}{(R + G + B)} \times PAN \quad (3)$$

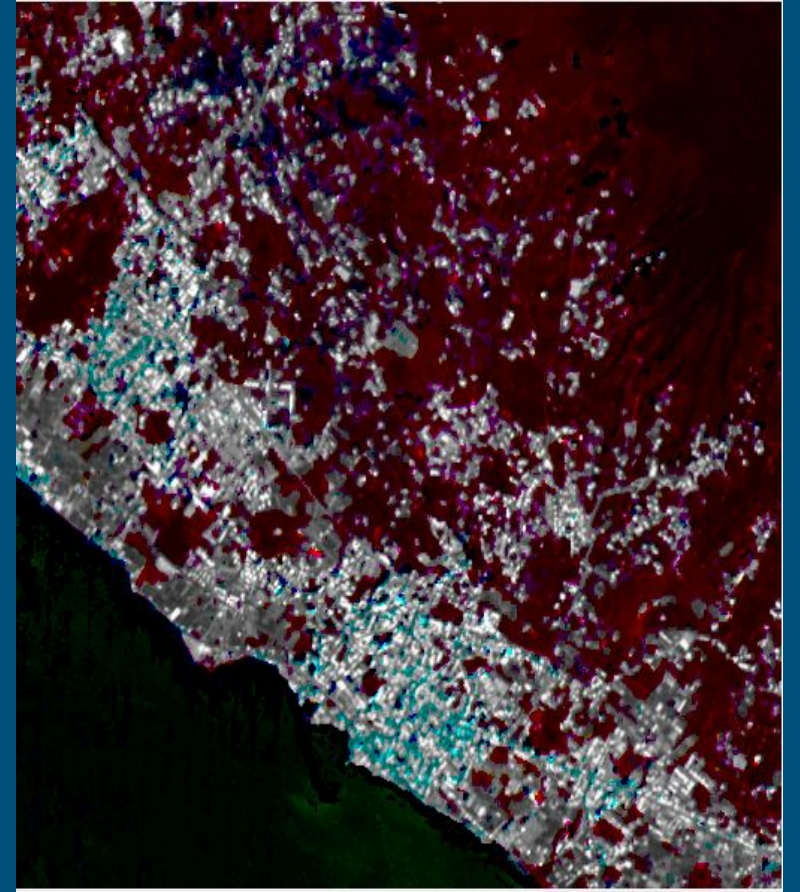
Multispectral Image



Panchromatic Image

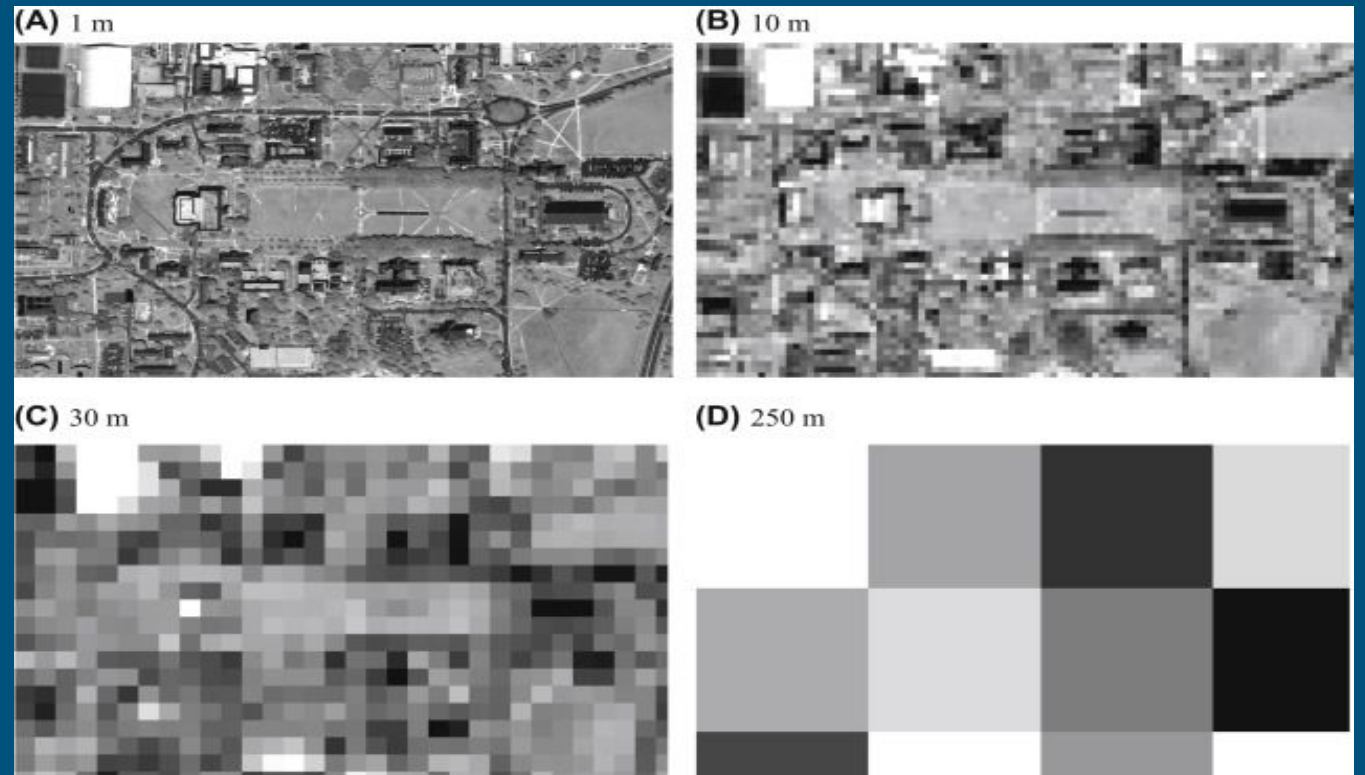


Fused Image



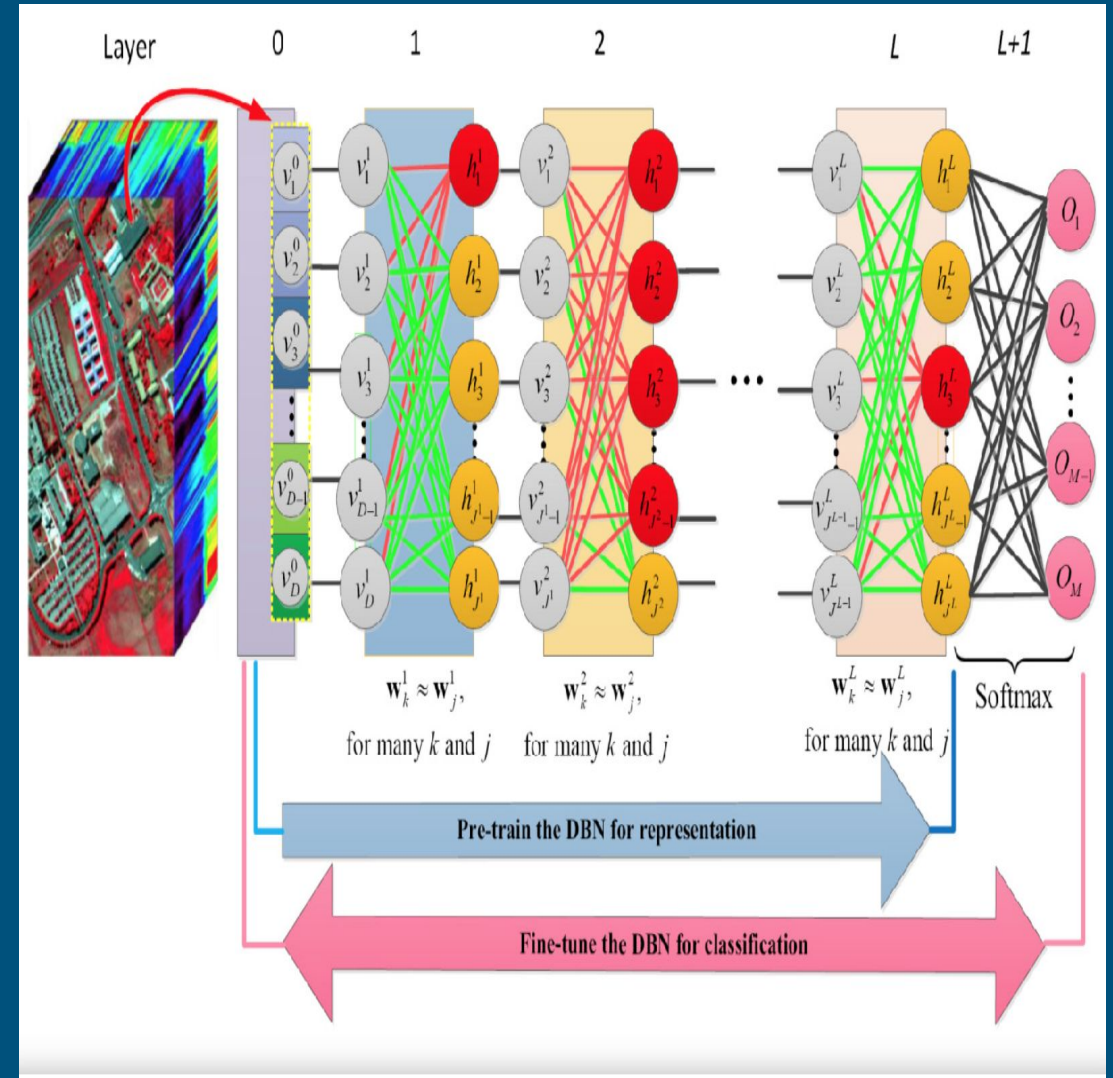
Conclusion:

- 1) We explored how hyperspectral imaging is much better than multispectral imaging vis-a-vis spectral resolution.
- 2) The trade-off between spatial and spectral resolution has been addressed by development and implementation of machine learning models and with pre-processing methods like pan-sharpening algorithm



Futuristic Trend - Deep Learning

- DL outperforms the limitation of conventional ML techniques, which have the ability to process natural data in their raw form to extract high-level spatial-spectral features.
- DL is modelled by neural networks (NNs) with many hidden layers.



REFERENCES

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