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Hyperspectral Image Reconstruction from RGB images

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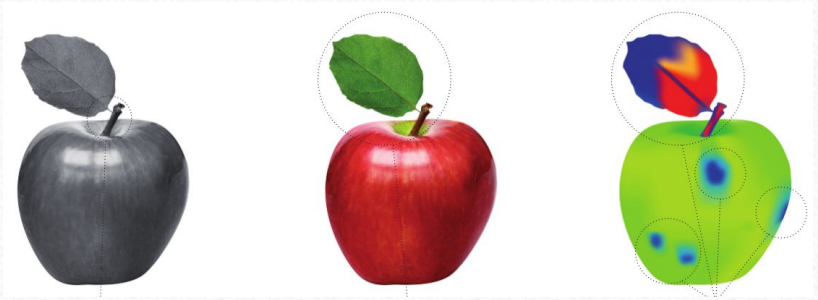
Introduction

- **What is Hyperspectral Imaging?**
- Hyperspectral imaging, like other spectral imaging, collects and processes information from across the electromagnetic spectrum.
- **Why do we need it?**
- The goal of hyperspectral imaging is to obtain the spectrum for each pixel in the image of a scene, with the purpose of finding objects, identifying materials, or detecting processes.



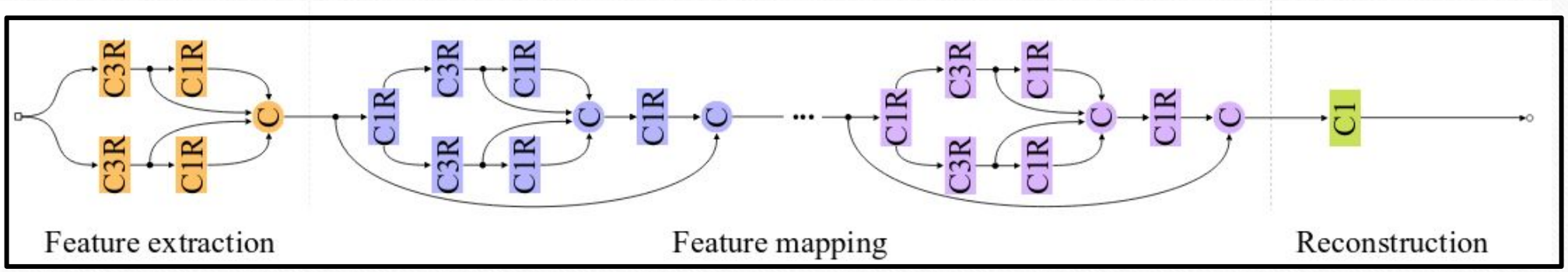
Dataset Used

- **The BGU Natural Hyperspectral Database**
- The database images were acquired using a Specim PS Kappa DX4 hyperspectral camera and a rotary stage for spatial scanning.
- 256 images
- Images were collected at 1392 X 1300 spatial resolution
- Link to the database

Experiments

1. HS-ResidualNet
2. Attention HS-ResidualNet
3. Advanced CNN-Dense Net Model
4. UCNN-D
5. DUCNN

Methodology /



- CNN-D block
- Attention Layer
- UCNN-D Model

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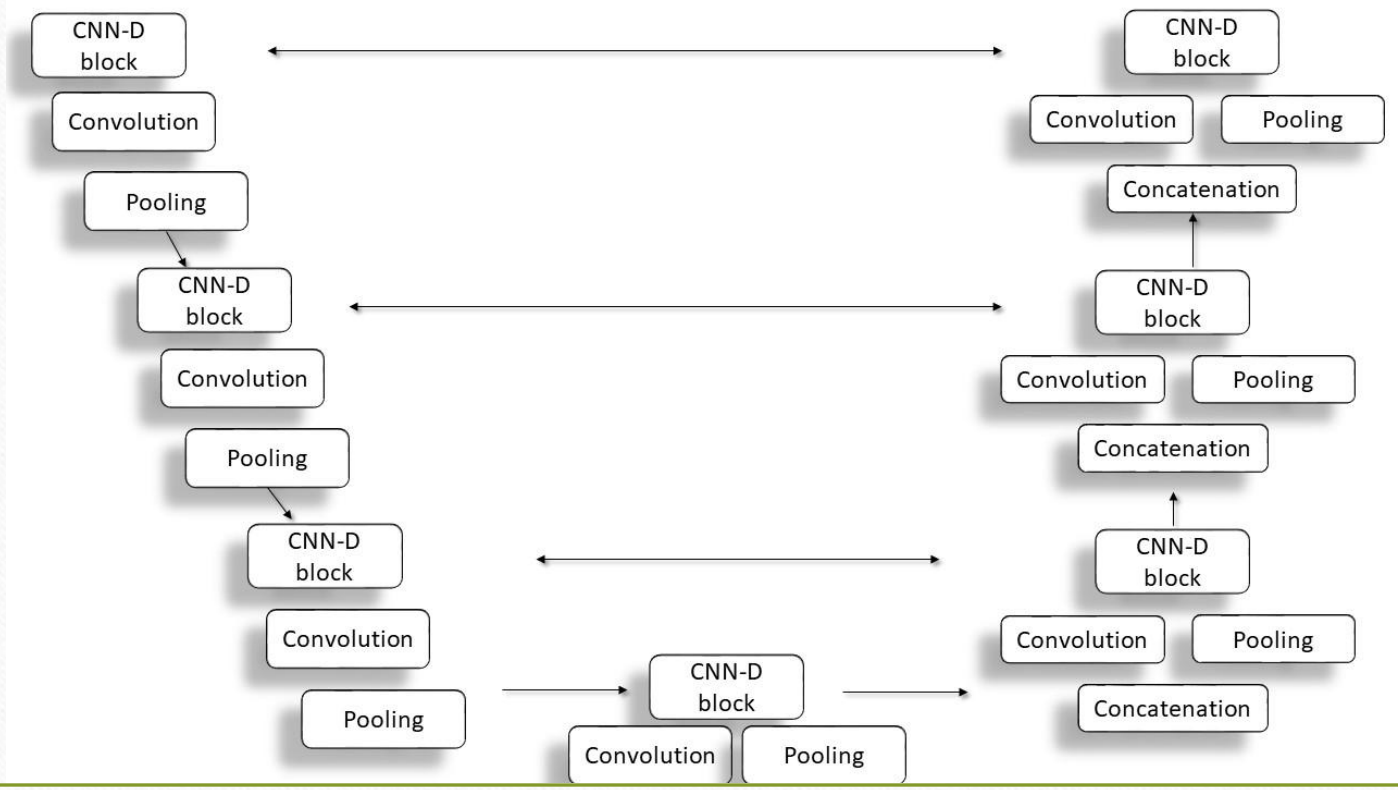
Model Used


CNN-D block
Convolution
Pooling
CNN-D block
Convolution
Pooling
CNN-D block
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CNN-D block
Convolution
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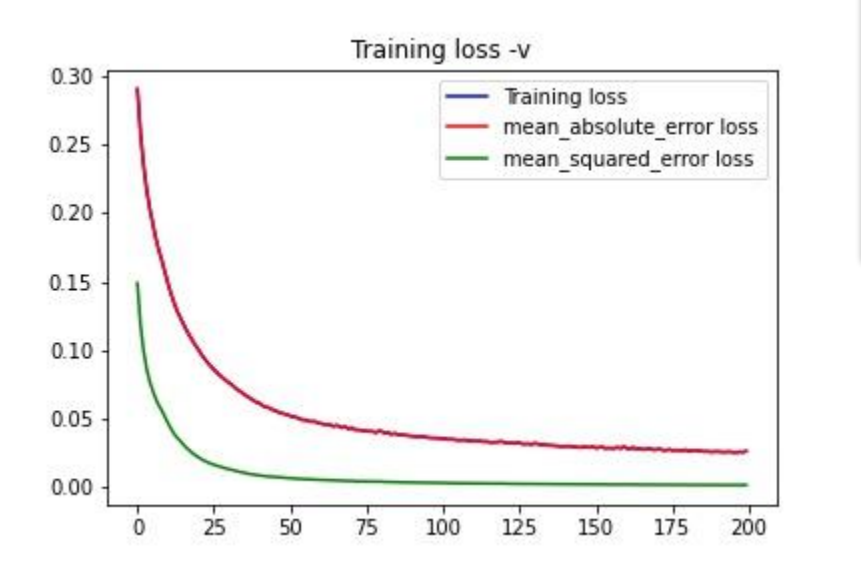
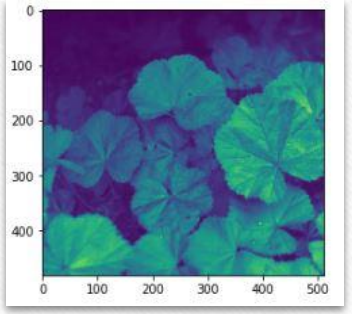
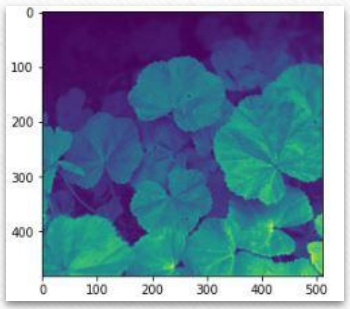
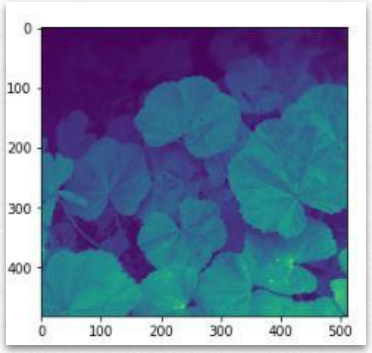
Concatenation
CNN-D block
Convolution
Pooling
Concatenation

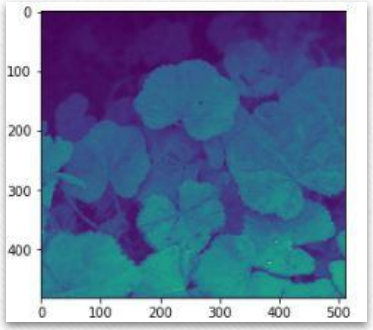
Results Achieved











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Conclusion

1.HS-ResidualNet-

Epochs	Batch Size	loss	mae	mse	Val_loss	Val_mae	Val_mse
100	64	0.1678	0.1678	0.0587	0.2111	0.2111	0.6159
200	64	0.1122	0.1122	0.0343	0.1321	0.1321	0.0458

2.Attention HS-ResNet Model

Epochs	Batch Size	loss	mae	mse	Val_loss	Val_mae	Val_mse
100	64	0.2729	0.2729	0.1791	0.1234	0.1234	0.0321
200	64	0.1003	0.1003	0.0241	0.1046	0.1046	0.0286

3.Advanced CNN-Dense Net Model

Epochs	Batch Size	loss	mae	mse	Val_loss	Val_mae	Val_mse
100	64	0.111	0.111	4.21e-03	0.126	0.0126	4.98e-03
200	64	0.0776	0.776	2.44e-03	0.0798	0.0798	2.098e-03

4.UCNN-D(preferred model)

b	Start neuron	epoch	Batch Size	loss	mae	mse	Val loss	Val mae	Val mse
3	64	100	64	0.1883	0.1883	0.0823	0.1500	01500	0.0459
3	64	200	64	0.1639	0.1639	0.0773	0.1348	0.1348	0.0406

5. DUCNN

b	Start neuron	epoch	Batch Size	loss	mae	mse	Val loss	Val mae	Val mse
3	128	100	64	0.1687	0.1687	0.0620	0.1117	0.1117	0.024

References

- NTIRE 2018 Challenge on Spectral Reconstruction from RGB Images [Link]
- HSCNN+: Advanced CNN-Based Hyperspectral Recovery from RGB Images [Link]

Thank You