

# SPECTRAL IMAGING - Image where each pixel is a spectrum

- Medical imaging
- Biology
- Industry
- Agriculture
- Arts



Can you detect green banana with 1-channel gray scale image (left)? No! You need 3-channels RGB image (right).  
**Spectral image can have 100s of spectral channels!**

**Spectral Imaging helps to distinguish and classify objects when we cannot do it using our eyes.**

### Samples

- Anything suitable for traditional photo camera can be imaged with Spectral Camera. Microscopic imaging is available.

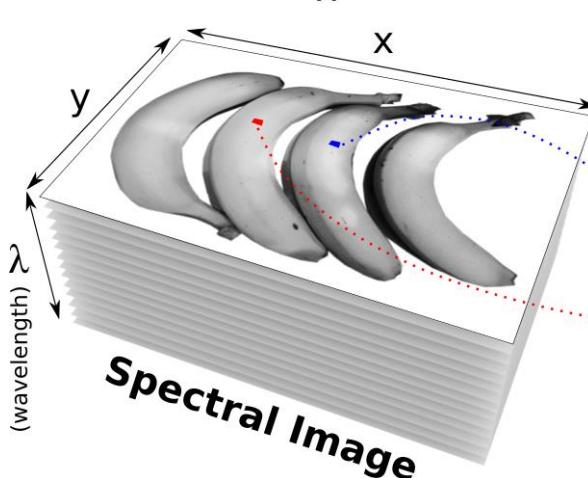
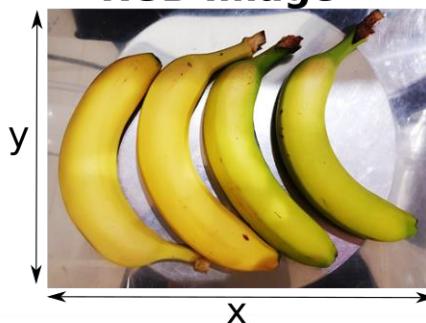
### Research questions

- Distinguish different materials by its 'color' including UV and IR parts of spectrum. This is a simple way to distinguish and classify objects.

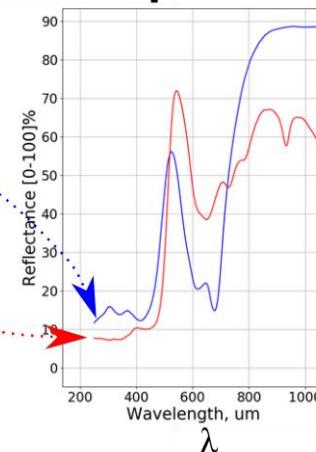
## Spectral cameras

1. Mobile spectral camera: imaging is almost as simple as using traditional SLR photo camera.
2. Advanced spectral cameras can be used only in the lab.
3. **Imaging process is simple.**
4. The results of measurements are spectral images – size of 100 Mb to 30 Gb.
5. After imaging spectral data should be analyzed using computer. One can use commercial software or do the same in Matlab, Python, R, C++.  
**This may be the most time consuming part of the work.**

### RGB Image



**Very easy to see the difference in spectra!**



#### Spectral camera Specim V10

Range: 400-1000 nm  
Spectral pixels: 1080  
Step: 0.6 nm  
Spatial pixels: 2144 x ...

#### Spectral camera Specim N25

Range: 1000-2500 nm  
Spectral pixels: 256  
Step: 6 nm  
Spatial pixels: 320 x ...

#### Spectral Specim IQ (portable)

Range: 400-1000 nm  
Spectral pixels: 204  
Step: 3 nm  
Spatial pixels: 512 x 512

#### Compact line spectral camera

Size of conventional SLR-camera



Usually tripod needed

Watch video " Exploring data with Specim IQ": [youtu.be/eAc-0RLv6W0](https://youtu.be/eAc-0RLv6W0)

### CONTACT

Dmitry Semenov, +358 50 3043941, [dmitry.semenov@uef.fi](mailto:dmitry.semenov@uef.fi)  
Arto Koistinen, +358 44 716 3260, [arto.koistinen@uef.fi](mailto:arto.koistinen@uef.fi)

