

Image Processing in Microscopy

General Rules: To be admitted to the final exam, you need to have submitted ≥ 4 exercises which are judged “successful”.

Exercise 1: Nonlinear filters (to be presented at ???.???.2019)

Simulate cosmic ray events in Raman images

1) Write a function with the following synopsis:

```
def CosmicRaySim(anImage, NumShots=500, ShotValue=255):
```

This function should receive an image and introduce NumShots “hot” pixels at random locations.

```
Hints: np.random.randint?, anImage.flat[shotpos] = ShotValue
# One-D subindexing of 2D images
anImage = anImage.copy() # to not overwrite the input
```

2) Test it using

```
anImage = nip.readim()
dirtyImg = CosmicRaySim(anImage)
v5(dirtyImg)
```

3) Write a function that removes shot events

```
def RemoveHotPixels(anImage, threshValue=200, kernelSize=3):
The “hot” pixels above the threshValue need to be identified first and then removed.
Hints: mymask=anImage > threshValue
scipy.ndimage.median_filter?
```

The input image should not be changed in the output except at the “hot” pixel location!

Hint: sp.signal.medfilt?

```
anImage[mymask]= filtered[mymask]
```

4) Test your functions and show that it really removes the “hot” pixels. At what concentration does it fail?

```
v5(catE(dirtyImg, RemoveHotPixels(dirtyImg), anImage))
```