# Convolution

## (An excel experiment)

## Purpose

Compare the effect of different kernel sizes on input data
(and show dynamic array uses )

## Sheet overview

### 3x3

Custom images before/after passing through defined 3x3 kernels

### 5x5

Custom images before/after passing through defined 5x5 kernels

### Accuracy comparison

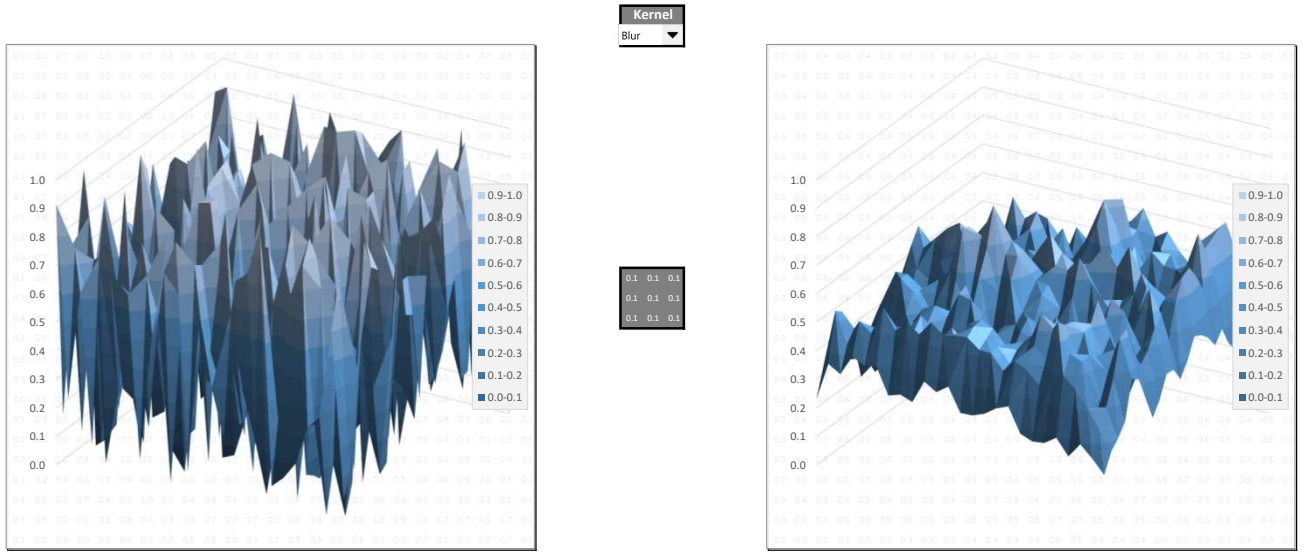
For selected images, how well picked kernels have cut through noise

### Kernel definitions

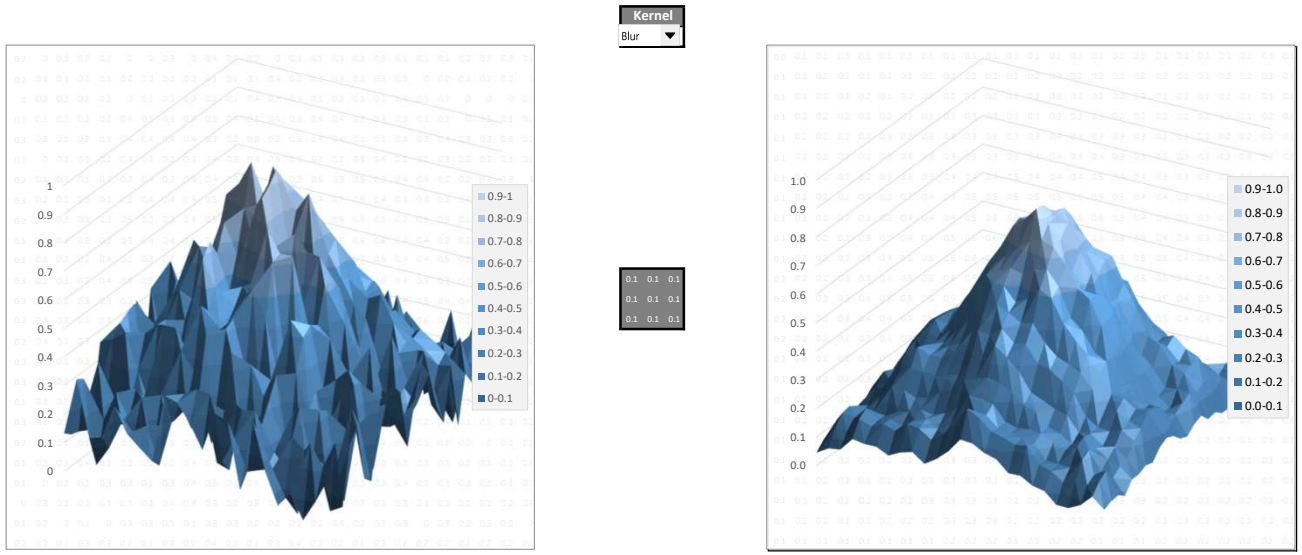
Define kernels here, as NxN matrices

Tip if accessing the worksheet: Press F9 to regenerate random noise

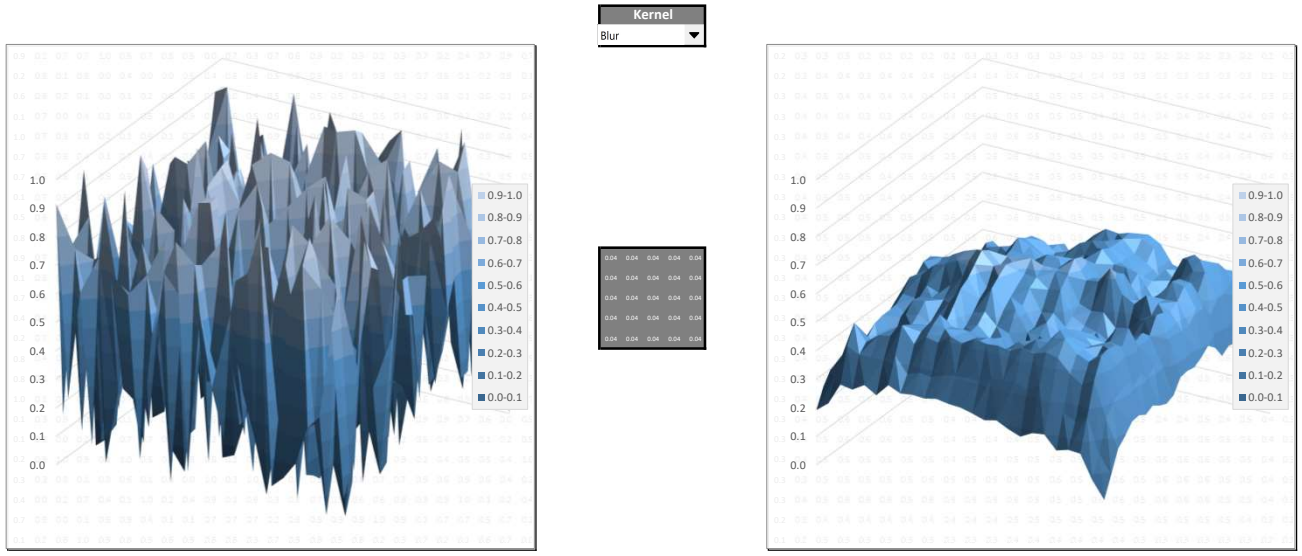
## Uniform noise → Through 3x3 kernel



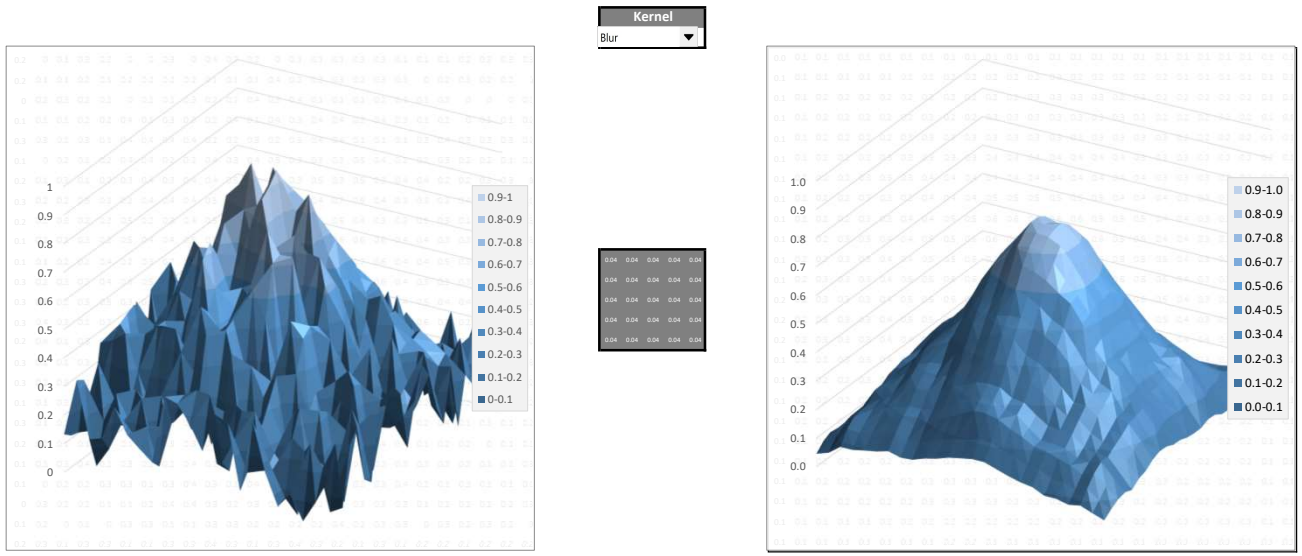

## "Bell" → Through 3x3 kernel



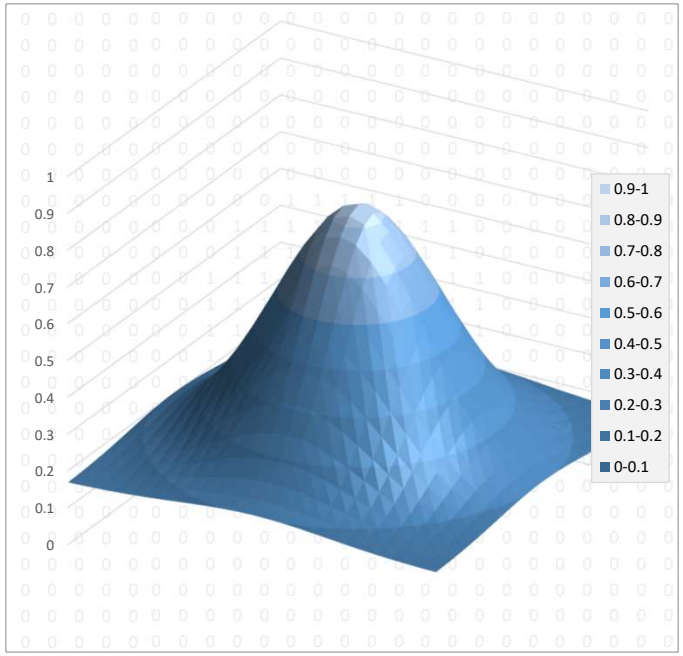
## Uniform noise → Through 5x5 kernel




## "Bell" → Through 5x5 kernel



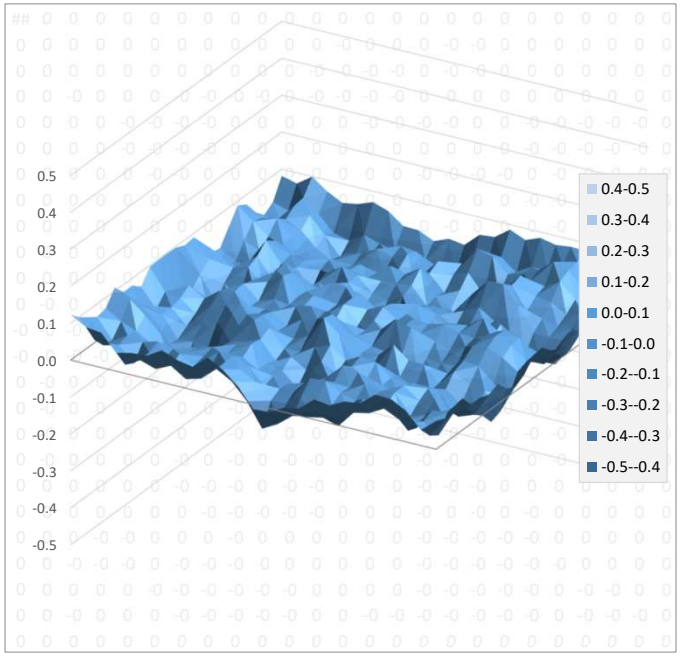
## Known original




(Bell curve, plus 1/2 the range of the random uniform noise)

## 3x3 Residuals

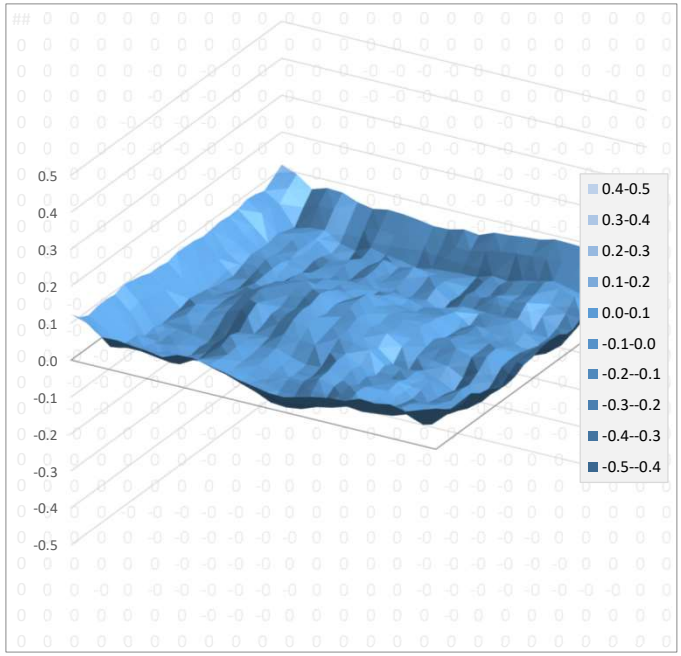
Off by: 12.6%
SDev: 0.038




(Off by = NRMSE. Defined as RMSE, normalized by the average of original entries)

## 5x5 Residuals

Off by: 12.5%
SDev: 0.033




(Off by = NRMSE. Defined as RMSE, normalized by the average of original entries)

# Kernel definitions

**3x3** | **5x5** | **...**

**Kernel list:**
Blur
Horizontal blu
Vertical blur

**Kernel list:**
Blur
Horizontal blur
Vertical blur

**Kernel list:**

| *Blur* | | |
|---|---|---|
| 0.1 | 0.1 | 0.1 |
| 0.1 | 0.1 | 0.1 |
| 0.1 | 0.1 | 0.1 |
| | | |
| *rizontal bl* | | |
| -0.1 | -0.1 | -0.1 |
| 0.6 | 0.6 | 0.6 |
| -0.1 | -0.1 | -0.1 |
| | | |
| *ertical blu* | | |
| -0.1 | 0.6 | -0.1 |
| -0.1 | 0.6 | -0.1 |
| -0.1 | 0.6 | -0.1 |

| *Blur* | | | | |
|---|---|---|---|---|
| 0.04 | 0.04 | 0.04 | 0.04 | 0.04 |
| 0.04 | 0.04 | 0.04 | 0.04 | 0.04 |
| 0.04 | 0.04 | 0.04 | 0.04 | 0.04 |
| 0.04 | 0.04 | 0.04 | 0.04 | 0.04 |
| 0.04 | 0.04 | 0.04 | 0.04 | 0.04 |
| | | | | |
| *Horizontal blur* | | | | |
| -0.04 | -0.04 | -0.04 | -0.04 | -0.04 |
| -0.04 | -0.04 | -0.04 | -0.04 | -0.04 |
| 0.36 | 0.36 | 0.36 | 0.36 | 0.36 |
| -0.04 | -0.04 | -0.04 | -0.04 | -0.04 |
| -0.04 | -0.04 | -0.04 | -0.04 | -0.04 |
| | | | | |
| *Vertical blur* | | | | |
| -0.04 | -0.04 | 0.36 | -0.04 | -0.04 |
| -0.04 | -0.04 | 0.36 | -0.04 | -0.04 |
| -0.04 | -0.04 | 0.36 | -0.04 | -0.04 |
| -0.04 | -0.04 | 0.36 | -0.04 | -0.04 |
| -0.04 | -0.04 | 0.36 | -0.04 | -0.04 |