Autocorrelation Analysis

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Introduction

The autocorrelation provides a measure of how a signal correlates with itself at various shifts. Essentially, it quantifies the degree of similarity between a function and a shifted version of itself.

- For purely random noise, the autocorrelation will essentially be a delta function, which means it'll have a peak at (0,0) and will be close to zero elsewhere.
- For a signal with noise, the autocorrelation will still have a peak at (0,0), but the structure away from (0,0) will depend on the signal's shape.
- The value at (0,0) in the autocorrelation is always the highest because it represents the signal's power.

Analysis

Conclusion

Analyzing the 2D autocorrelation provides insights into the structure and patterns present in the signal. The presence of patterns or structures will manifest as distinct shapes in the autocorrelation away from the (0,0) point, while purely random noise will mostly only have a significant value at the (0,0) point.

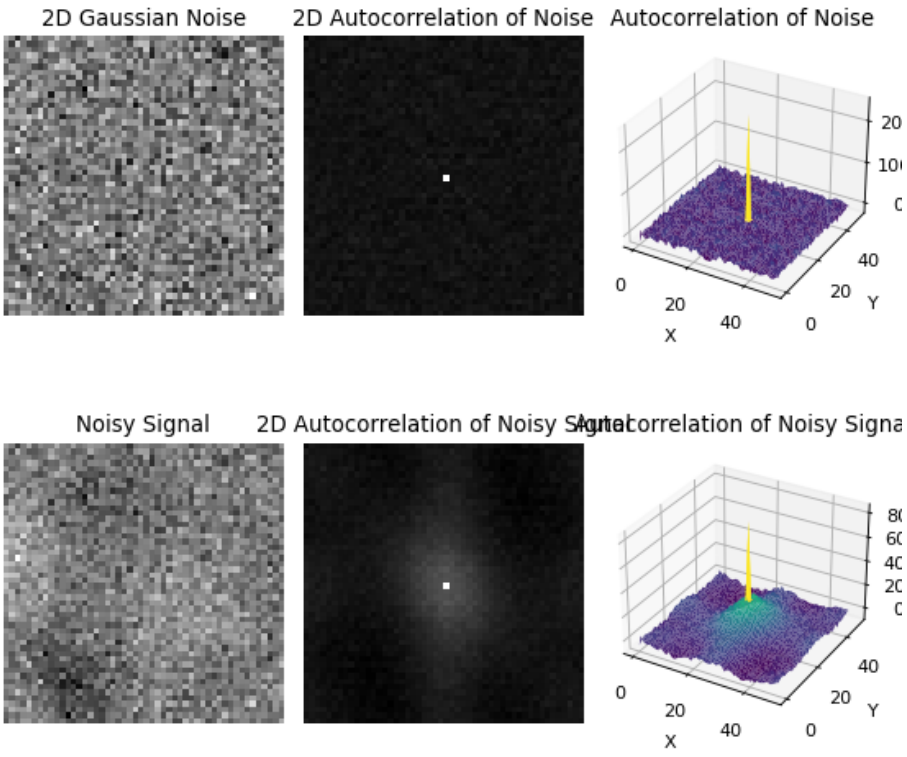
2D Gaussian Noise
2D Autocorrelation of Noise
Autocorrelation of Noise
Noisy Signal
2D Autocorrelation of Noisy Signal
Autocorrelation of Noisy Signa
X
Y
0
20
40

Figure 1: