DA6007 week 8

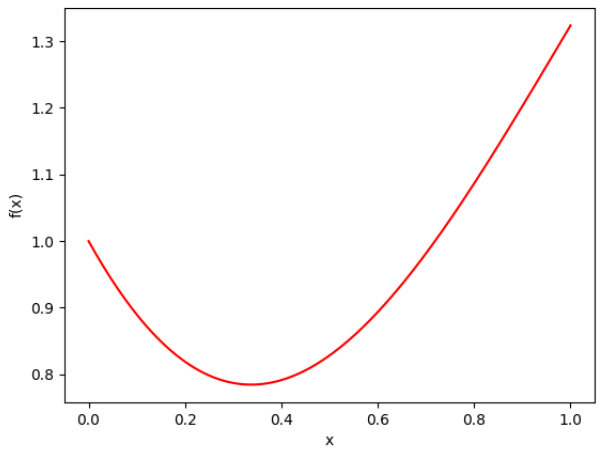
February 23, 2024

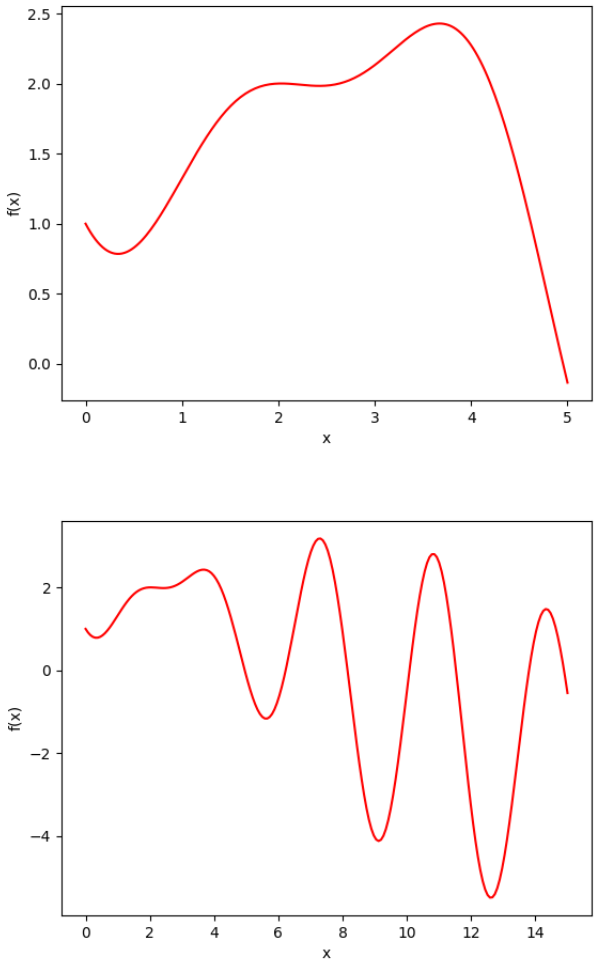
Parameter for non-linear function

- A very non linear function, lot of bumps, e.g sin and cos.
- With sine and cosine can create uneven bumps.

- One way to increase non-linearity is to increase range (Like in the figures below).
- Another way is to add more terms to (1) (More complex).

$$f(x) = \sin(1.9x) + 2\cos(0.2x) - 2\sin(1.6x) - \cos(2x) \tag{1}$$



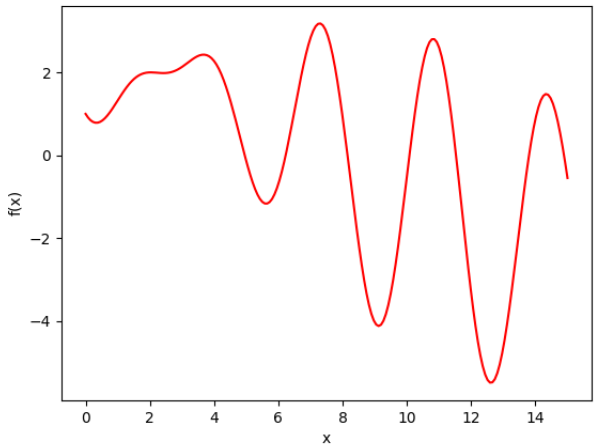


Noise variance

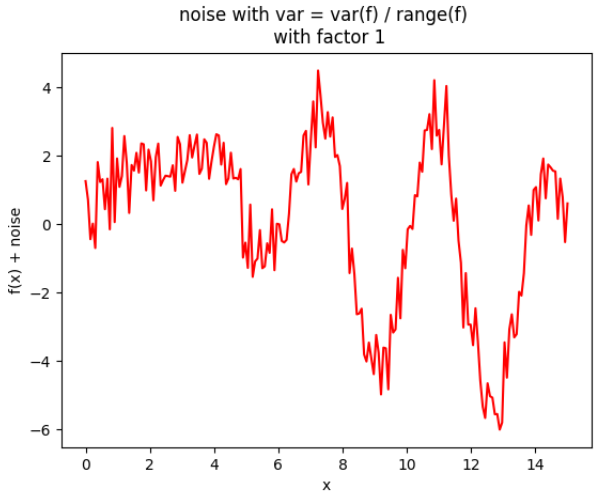
Variance of image divided by range of image and multiplied by some factor $\delta > 0$.

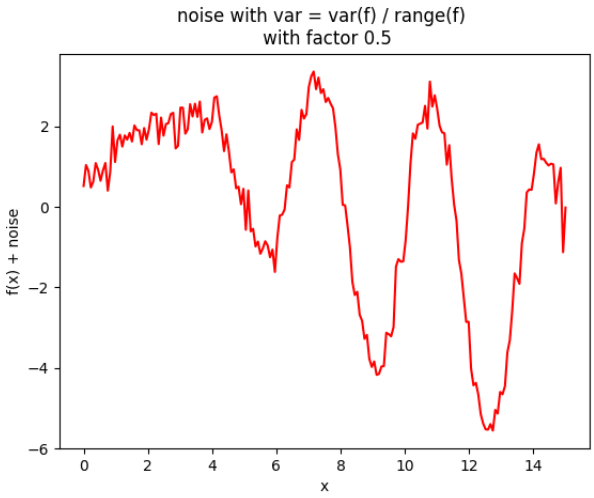
$$var_{noise} = \frac{V(f)}{range(f)} \cdot \delta \tag{2}$$

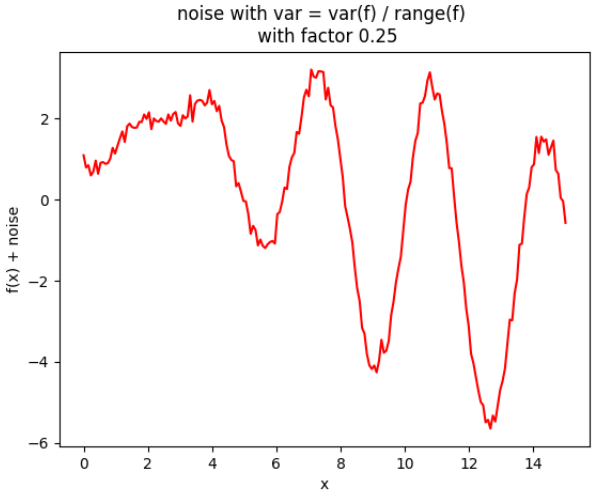
First we have function (1) in the range zero to fifteen.

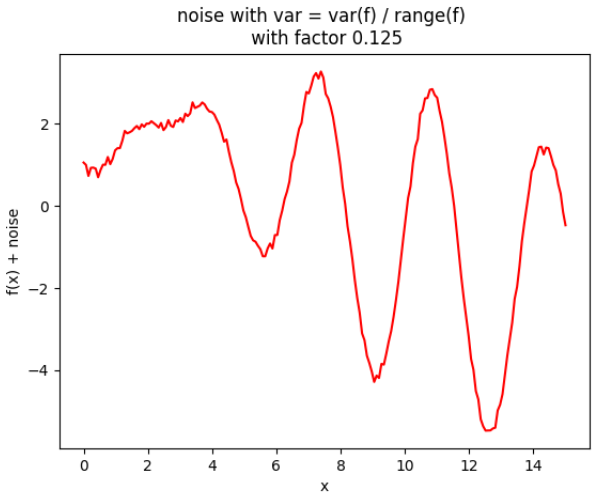


And then we can add some Gaussian noise with variance var_{noise} and factor $\delta \in \{1, 0.5, 0.25, 0.125\}$.




noise with var = var(f) / range(f)
with factor 0.5
f(x) + noise
x
2
0
−2
−4
−6
0
2
4
6
8
10
12
14


noise with var = var(f) / range(f)
with factor 0.25
f(x) + noise
x
2
0
−2
−4
−6
0
2
4
6
8
10
12
14



Q: What factor δ should we use?

Architecture

- Simpler network.
- Batch normalization.

Q: Should batch normalization have learnable parameters?

Q: Why have batch normalization before and not after ReLu?

Q: How should we do the skip connections?

Initialization

Gaussian distributed initialization with variance 0.01.

Q: Is variance 0.01 good?