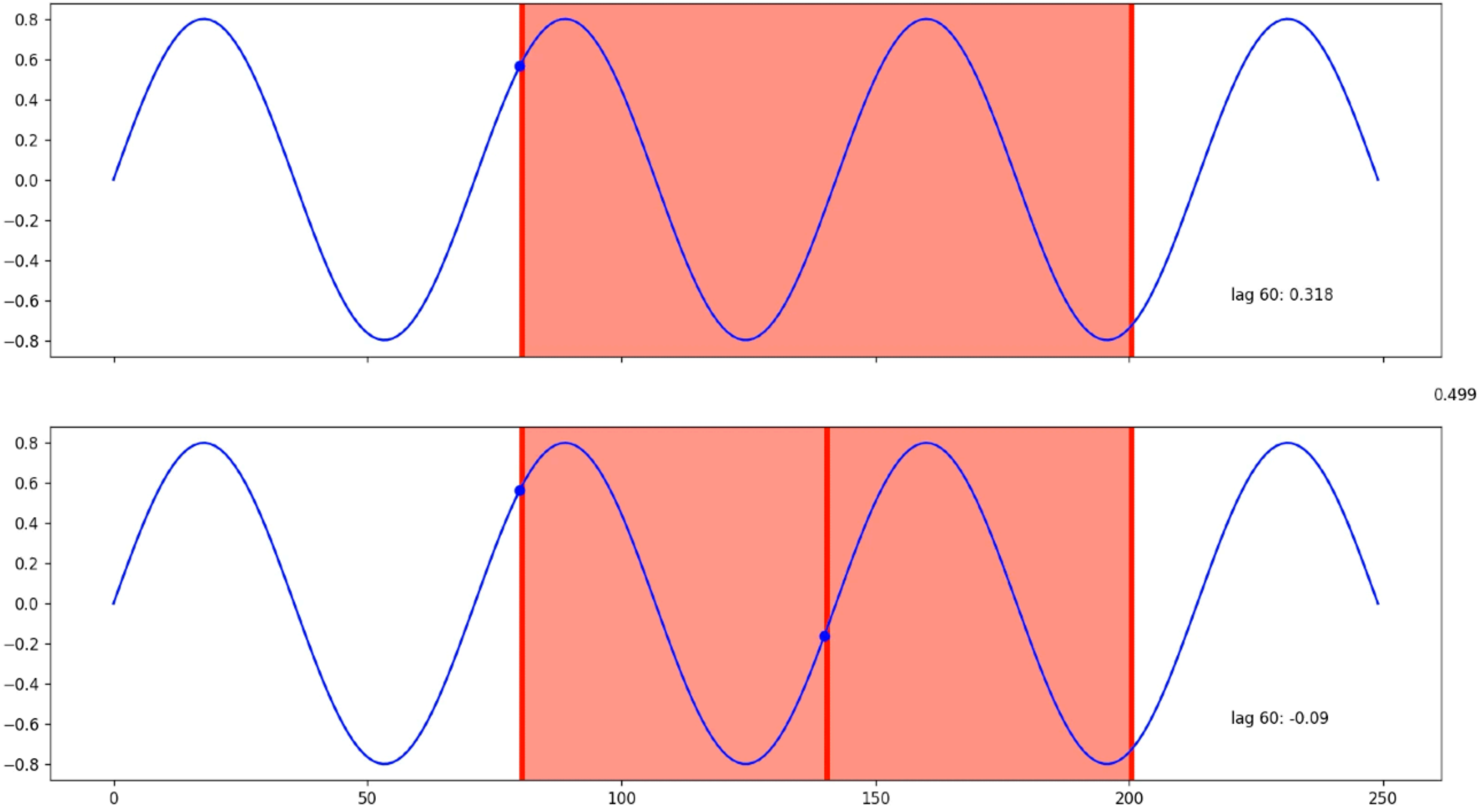


0.8
0.6
0.4
0.2
0.0
−0.2
−0.4
−0.6
−0.8
lag 60: 0.318
0.499
lag 60: -0.09
0
50
100
150
200
250

Average Squared Difference Function

$i=200$

(Current time)

2 x lag (n)

x_j

$$x_{j-n}^{2}$$

Blue dot is

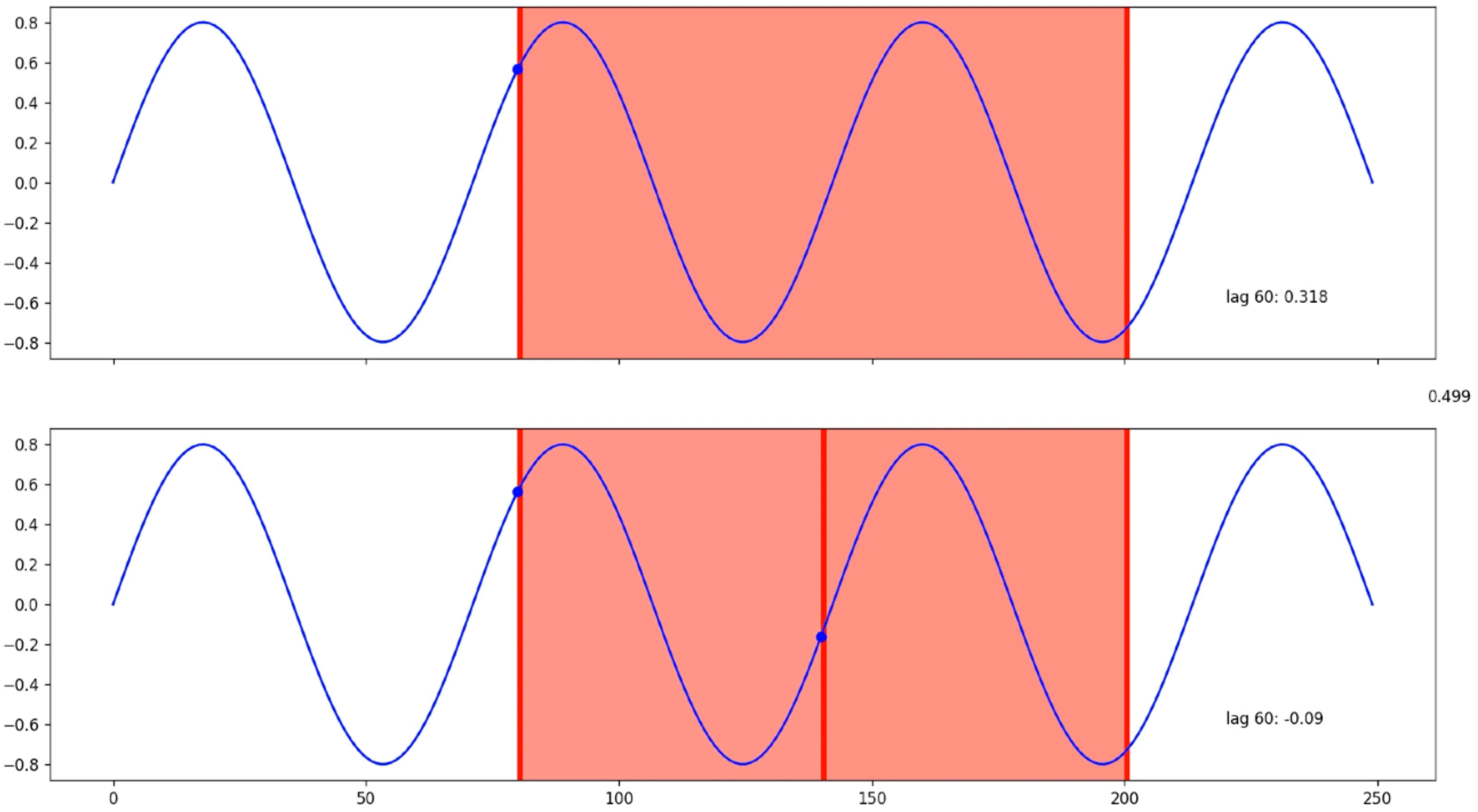
Blue dot is

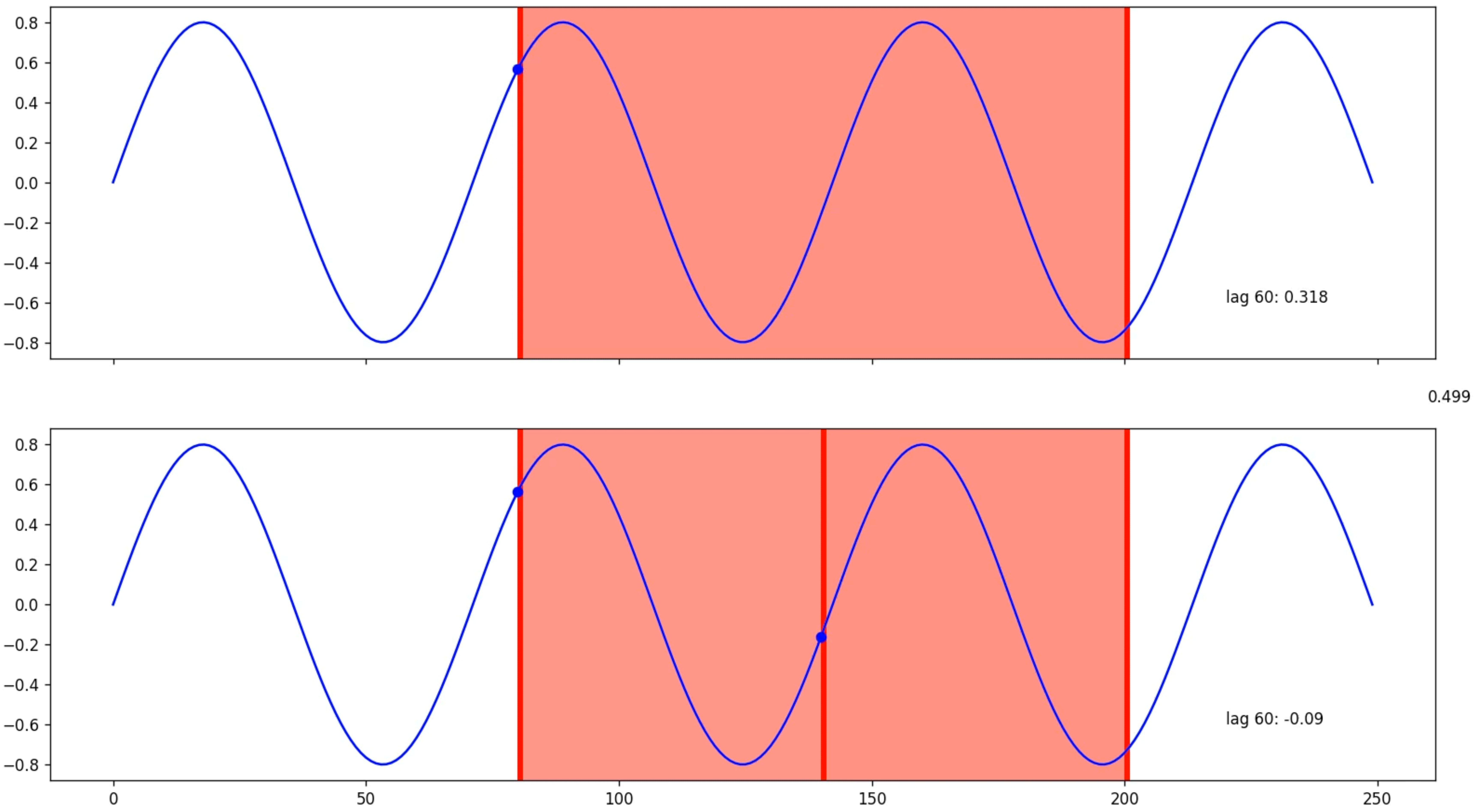
$$H_i(L) = \sum_{j=0}^{j=L} x_j x_{j-n}$$

$$E_i(L) = \sum_{j=0}^{2L} x_j^2$$

$$x_{j-n}$$

Blue dot is


lag 60: 0.318
0.499
lag 60: -0.09



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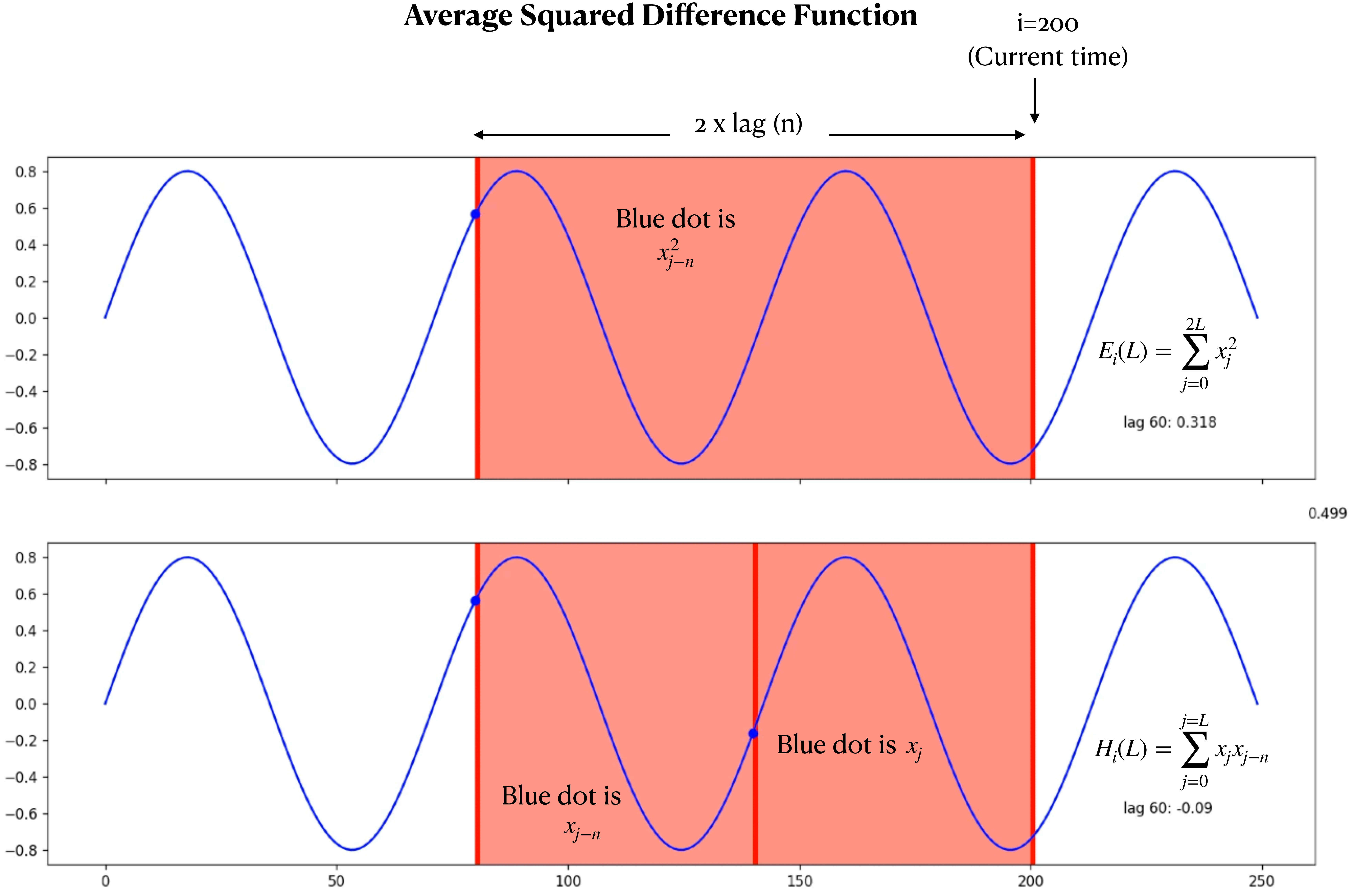
Average Squared Difference Function



Average Squared Difference Function

$$E_i(L) \geqq 2H_i(L)$$

and that $E_i(L)$ is nearly equal to $2H_i(L)$ only at values of L that are periods of repetition of the data. Because the scaling of the data, $\{x_j\}$, is unknown, the term "nearly" must be interpreted relative to the energy of the signal. This results in a threshold test for detecting periodicity:

$$E_i(L) - 2H_i(L) \leqq eps\ E_i(L) \quad (6)$$

where "eps" is a small number. When this condition is satisfied by varying the value of L, then L is a period of repetition of the data.

- E represents the "energy" of the signal
- H represents the actual auto-correlation result
- Idea is that E would be "perfect" auto-correlation, so $E - 2 * H$ should be very close to zero
- In the patent "very close" is defined as epsilon (a convention from maths), between 0 and 0.4
- This gives a consistent measure of how periodic the signal is at any given time, *independent of amplitude*
- Anything greater than epsilon (i.e. 0.4) is classed as not periodic