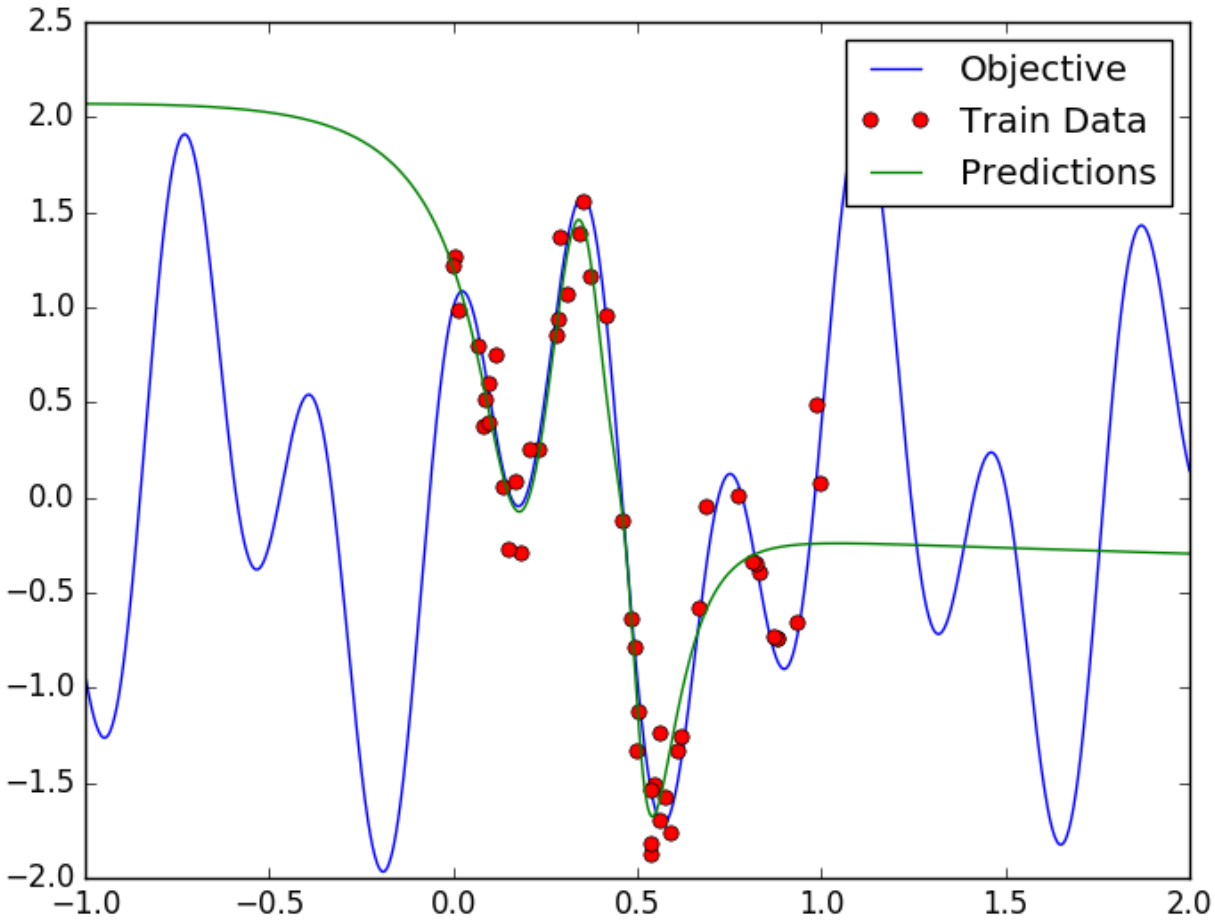
Diagnostic tests on BLR + NN

Attempting to recreate Snoeks paper on BLR+NN

Objective func

f(x) = sin(7x) +cos(17x)

Trained with 50 data points .Figure below simply observes the performance of the NN on the data



Neural Net used

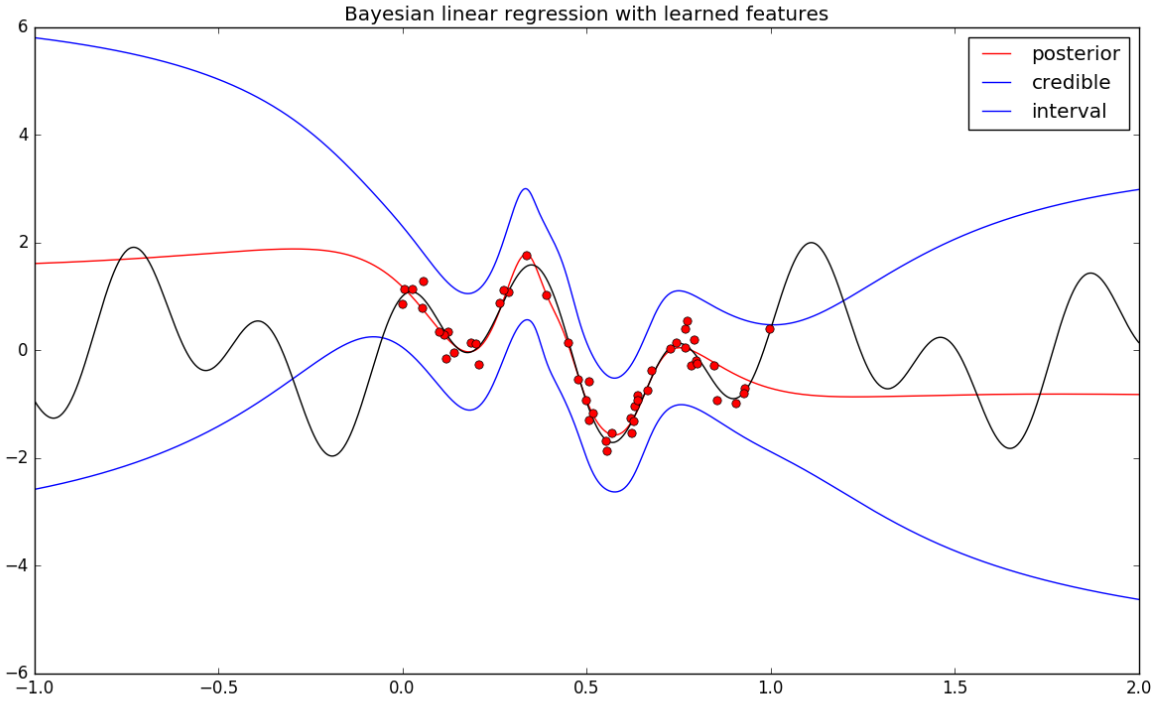
1 -> 50 -> 50 -> 50 -> 1

tanh non linearity

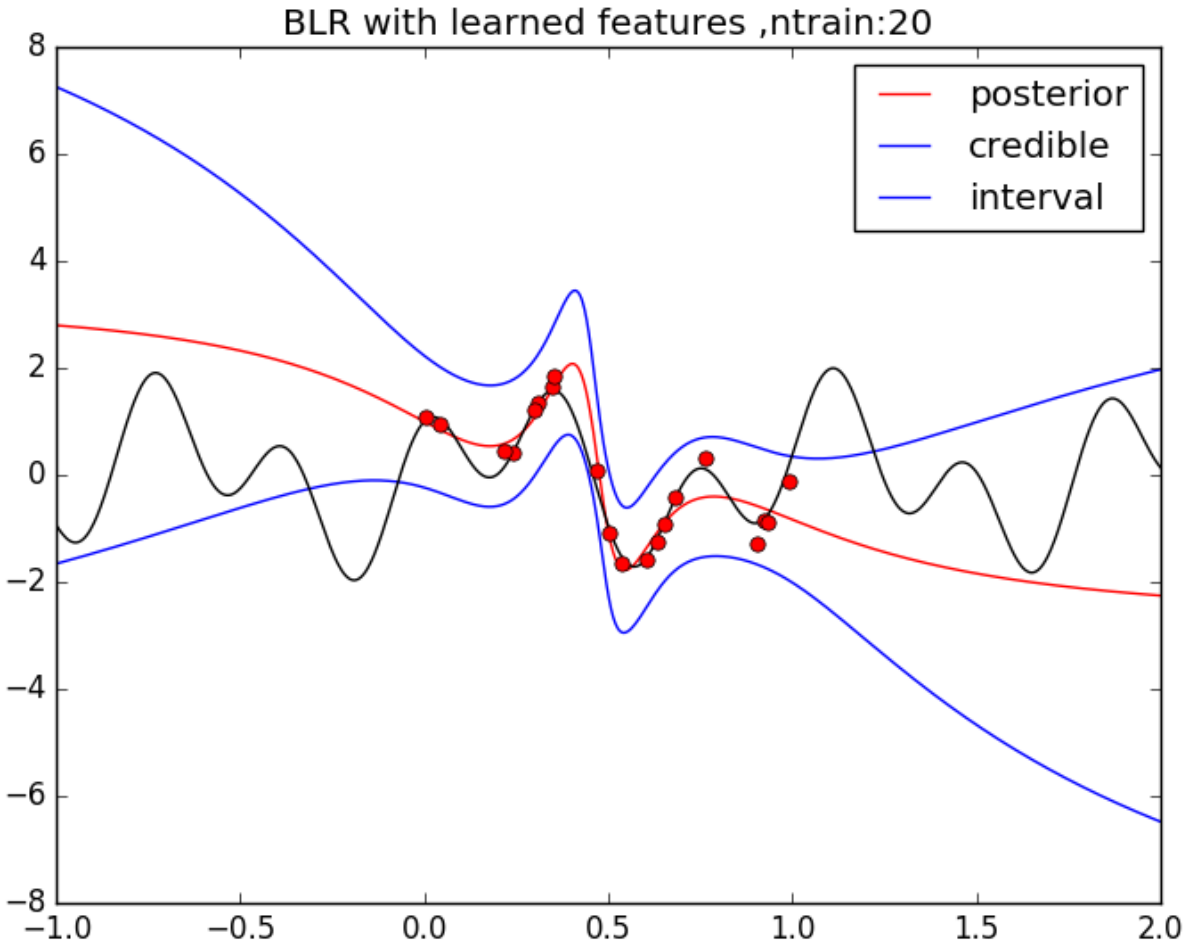
Performance of BLR

The bayesian linear regressor takes the activations of the NN as inputs to probabilistically model the function

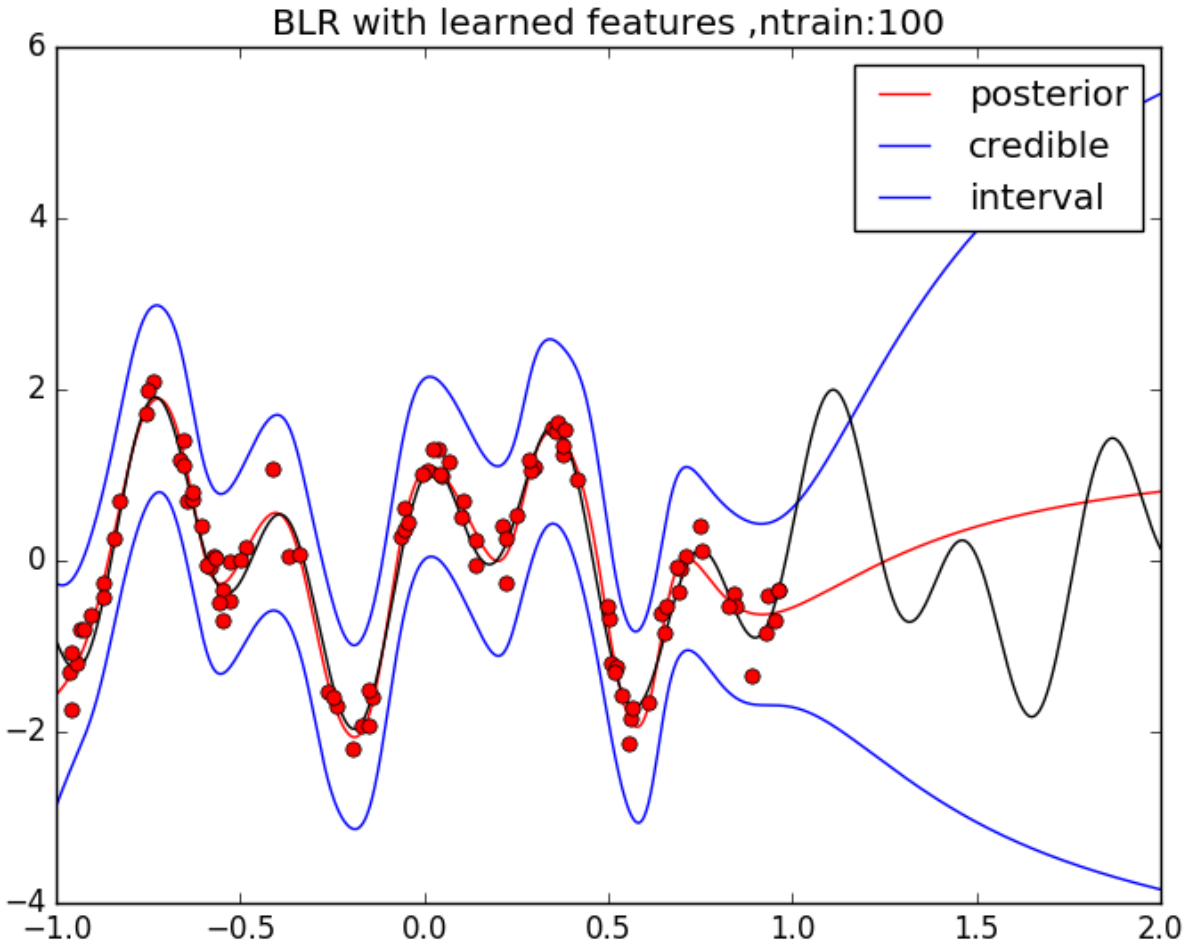
With 50 train points



With 20 train points



Training points spread around


BLR with learned features ,ntrain:100
posterior
credible
interval
6
4
2
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−1.0
−0.5
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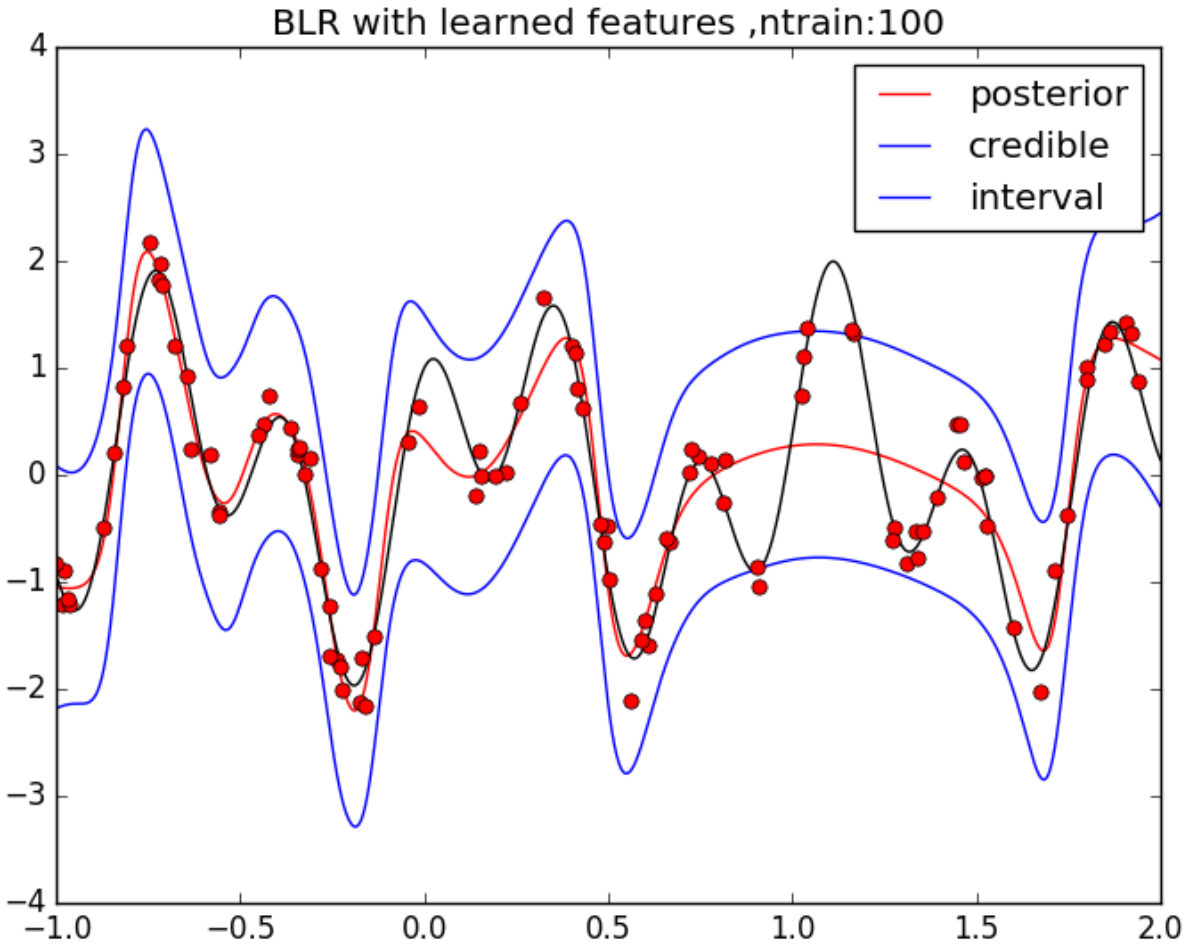
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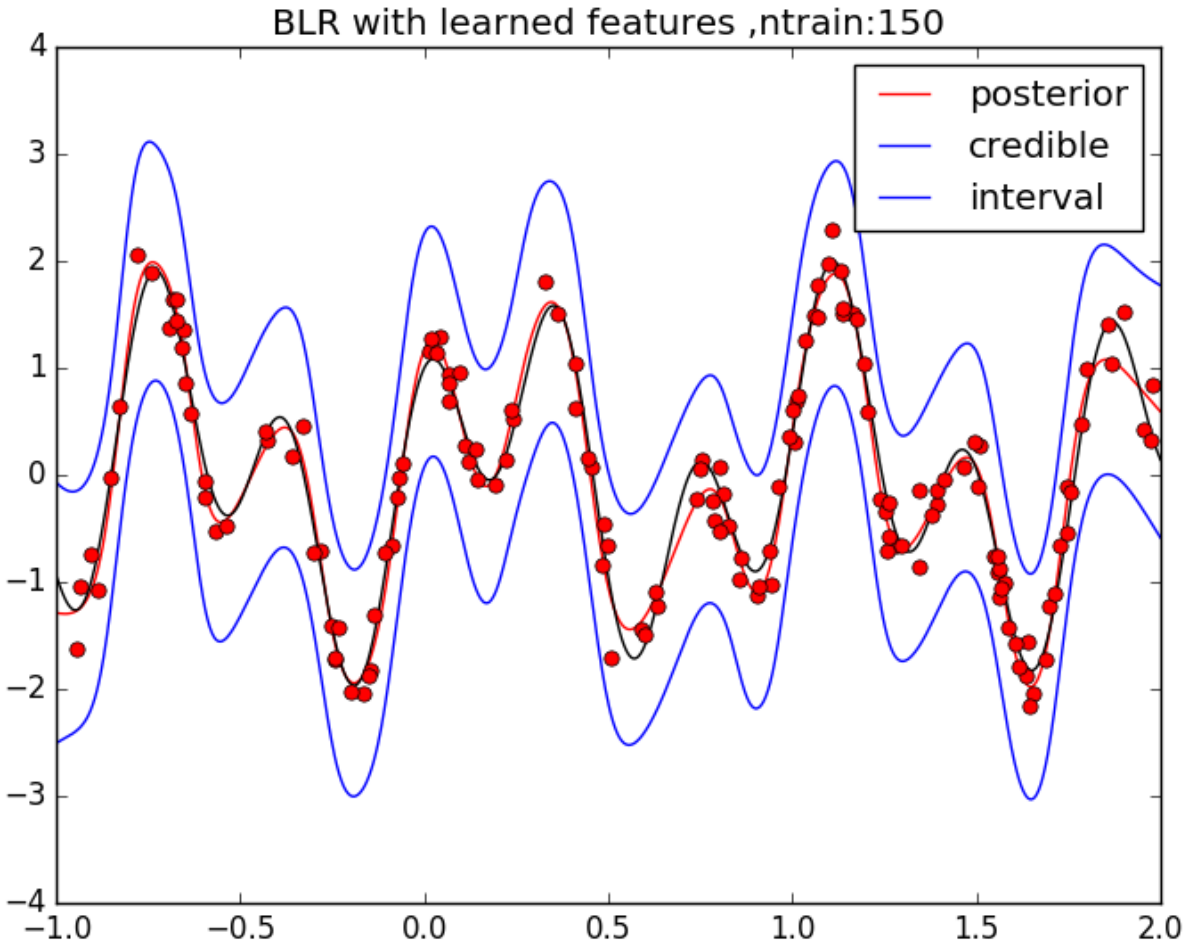
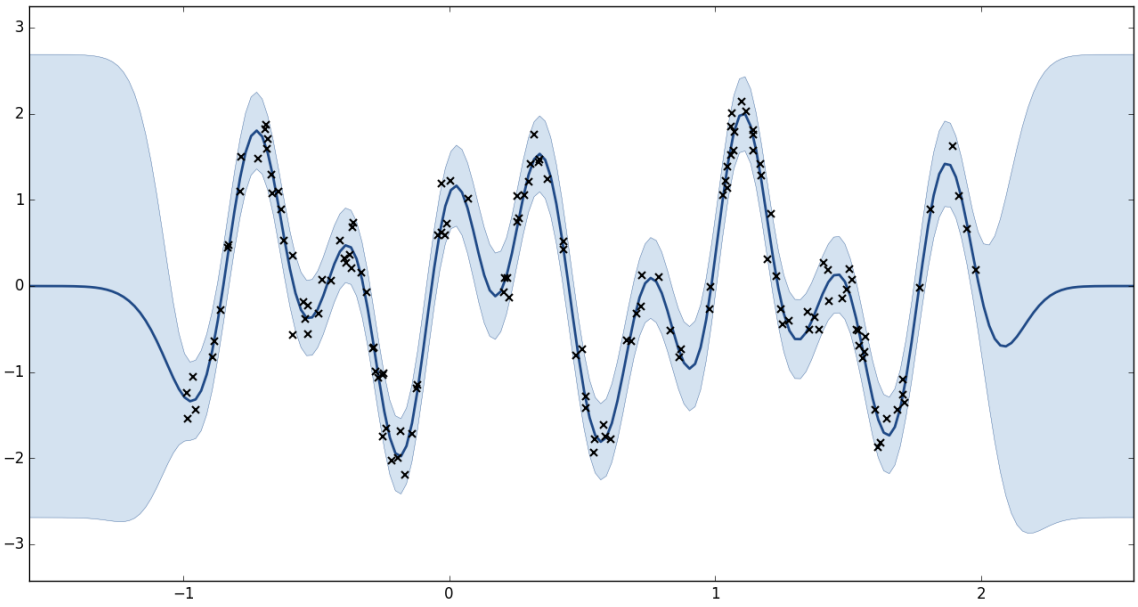


Simple GP 150 train points



BayesOPt

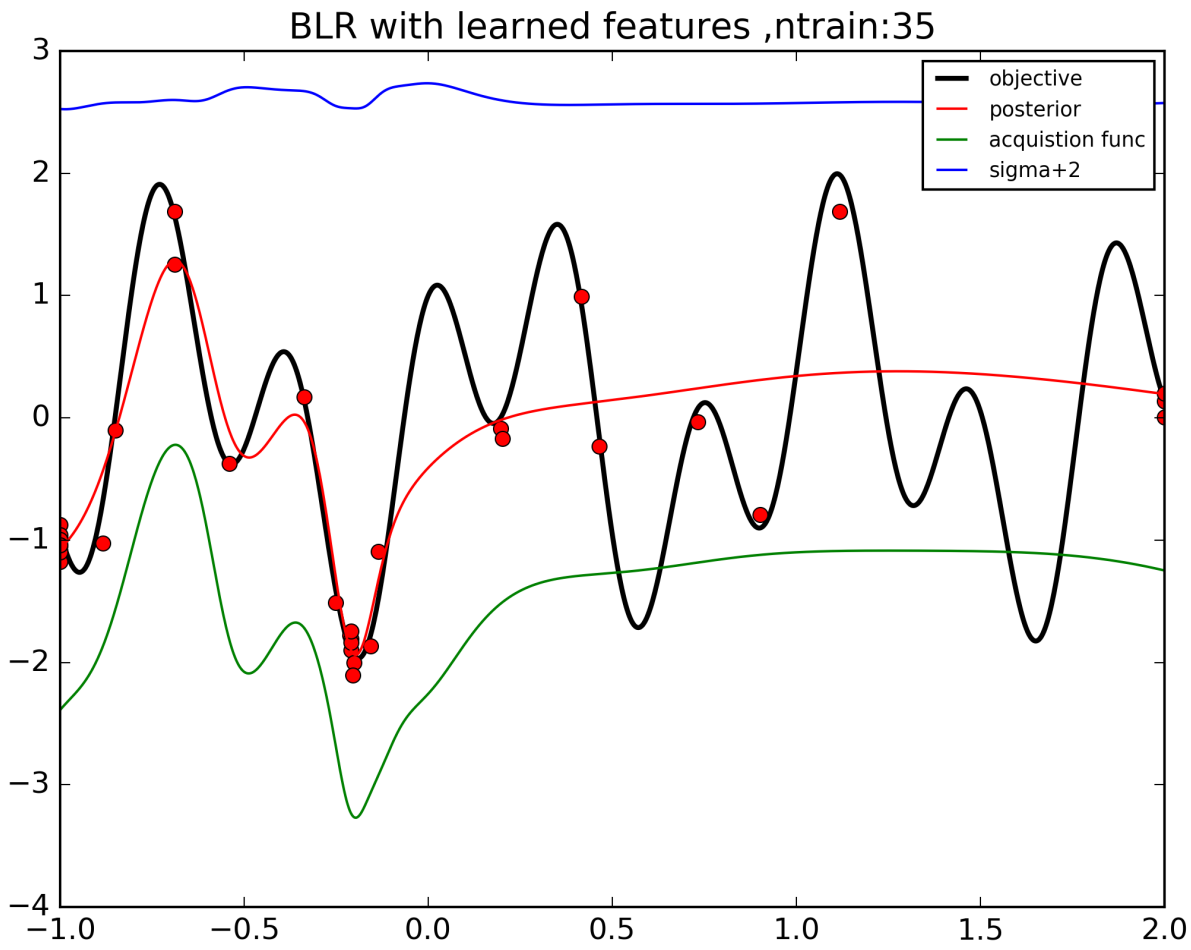
Using GP-UCB

```
def acquisition_UCB(m, s, k):
    a = m - k * s
    return a
```

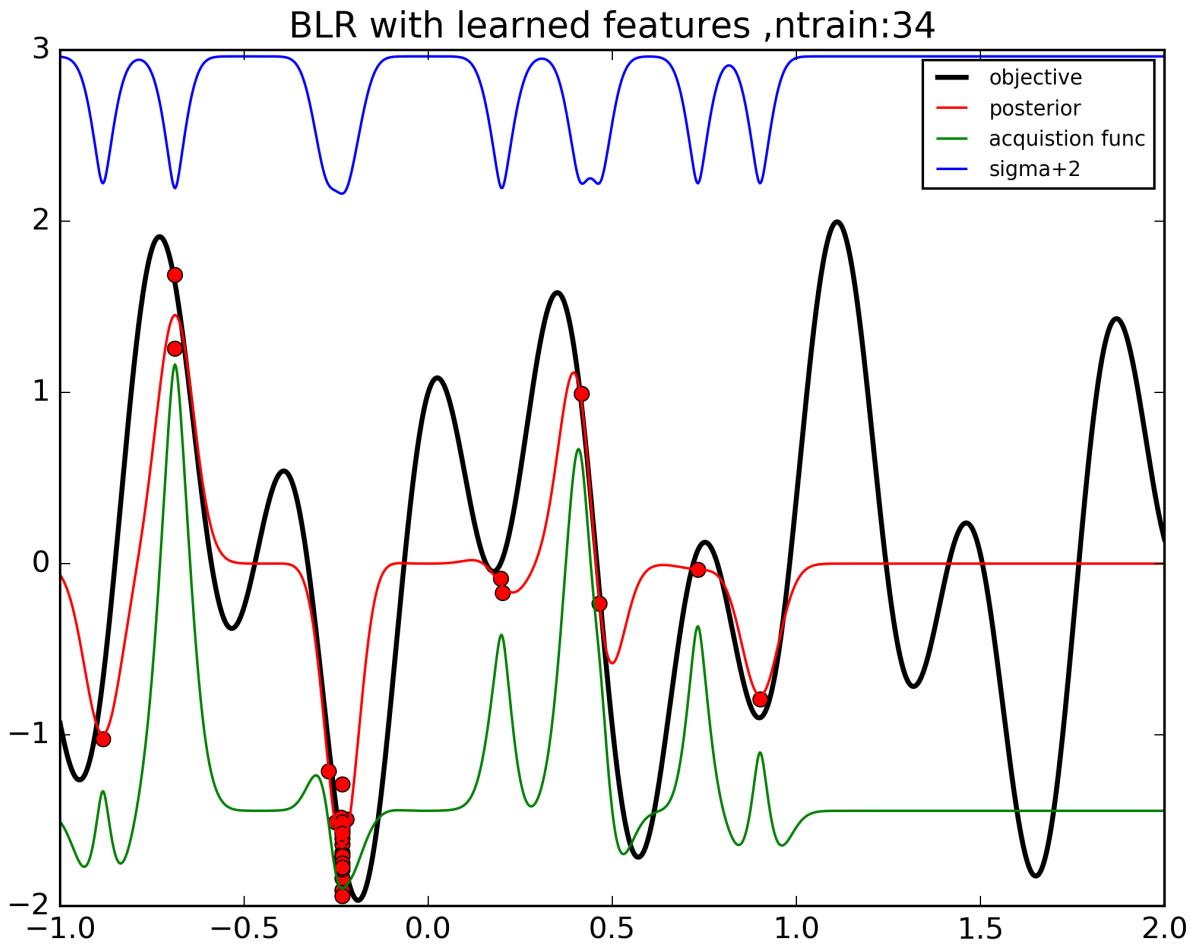
BLR+NN does not seem to model uncertainties very well. Its ok but not as accurate as a GP

This makes BO challenging

The magnitude of S.D was shifted and plotted separately. Standard deviation does not accurately describe our beliefs about the uncertainty in the function

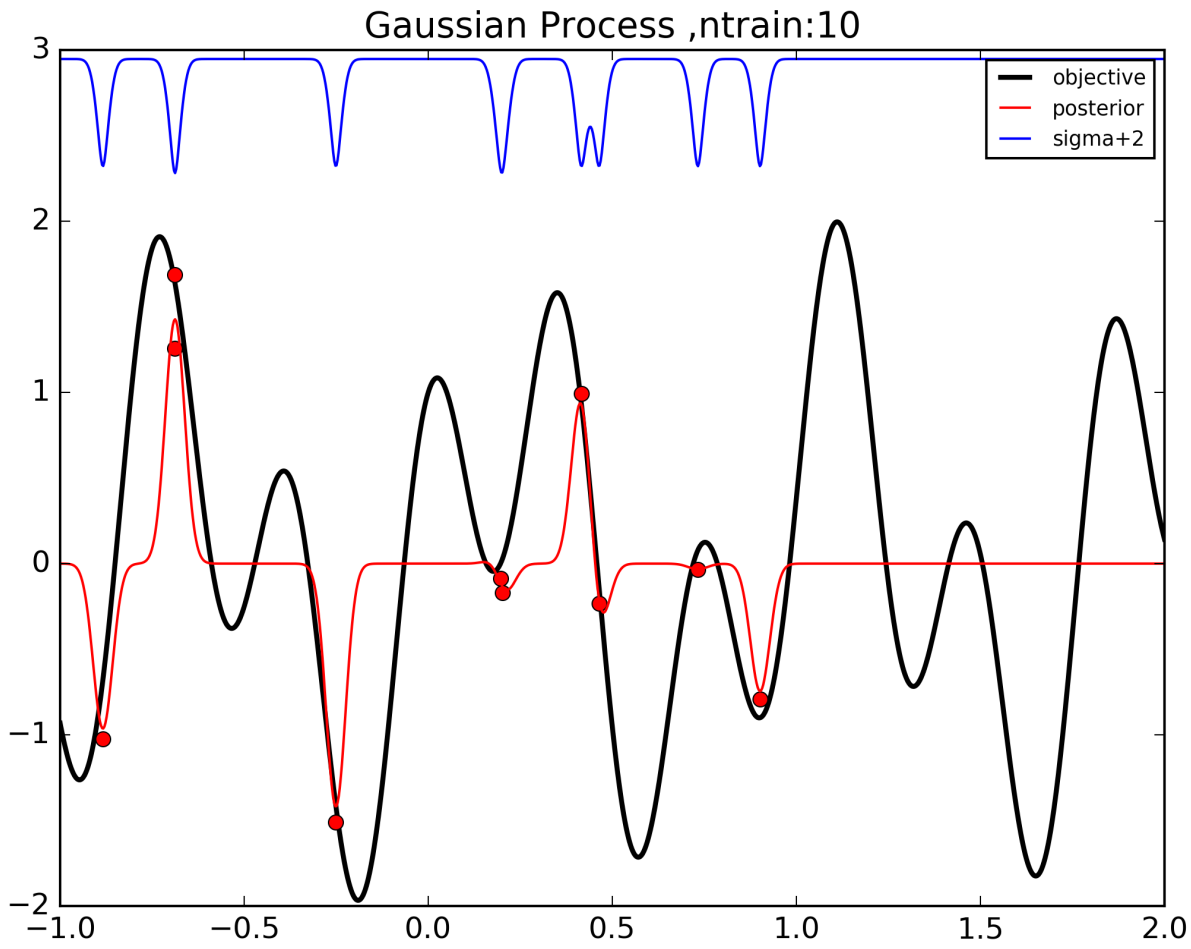


For comparison , GP's show more accurate reflection of our beliefs about uncertainty



Uncertainties

Using same dataset on GP and NN+BLR


Gaussian Process ,ntrain:10
objective
posterior
sigma+2
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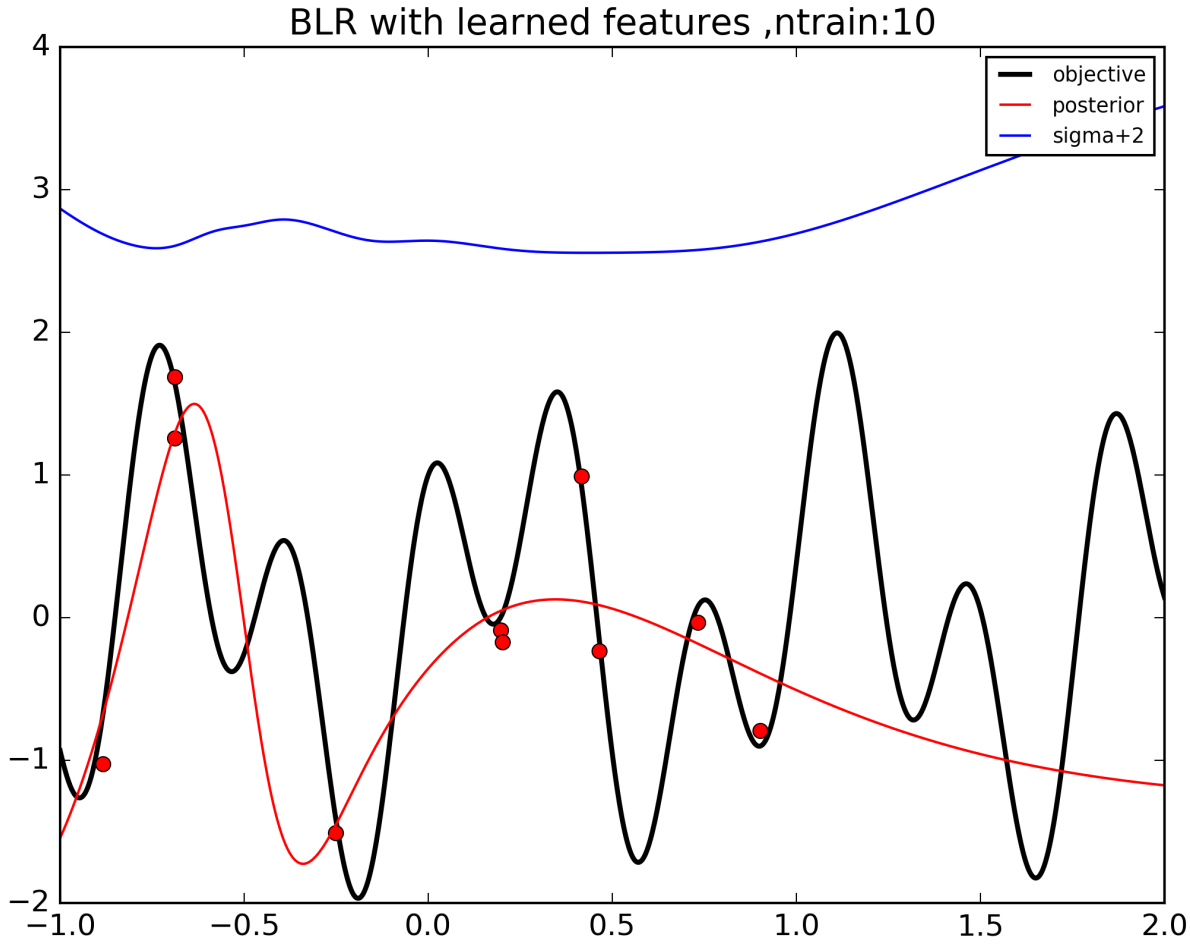
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