Homework 3

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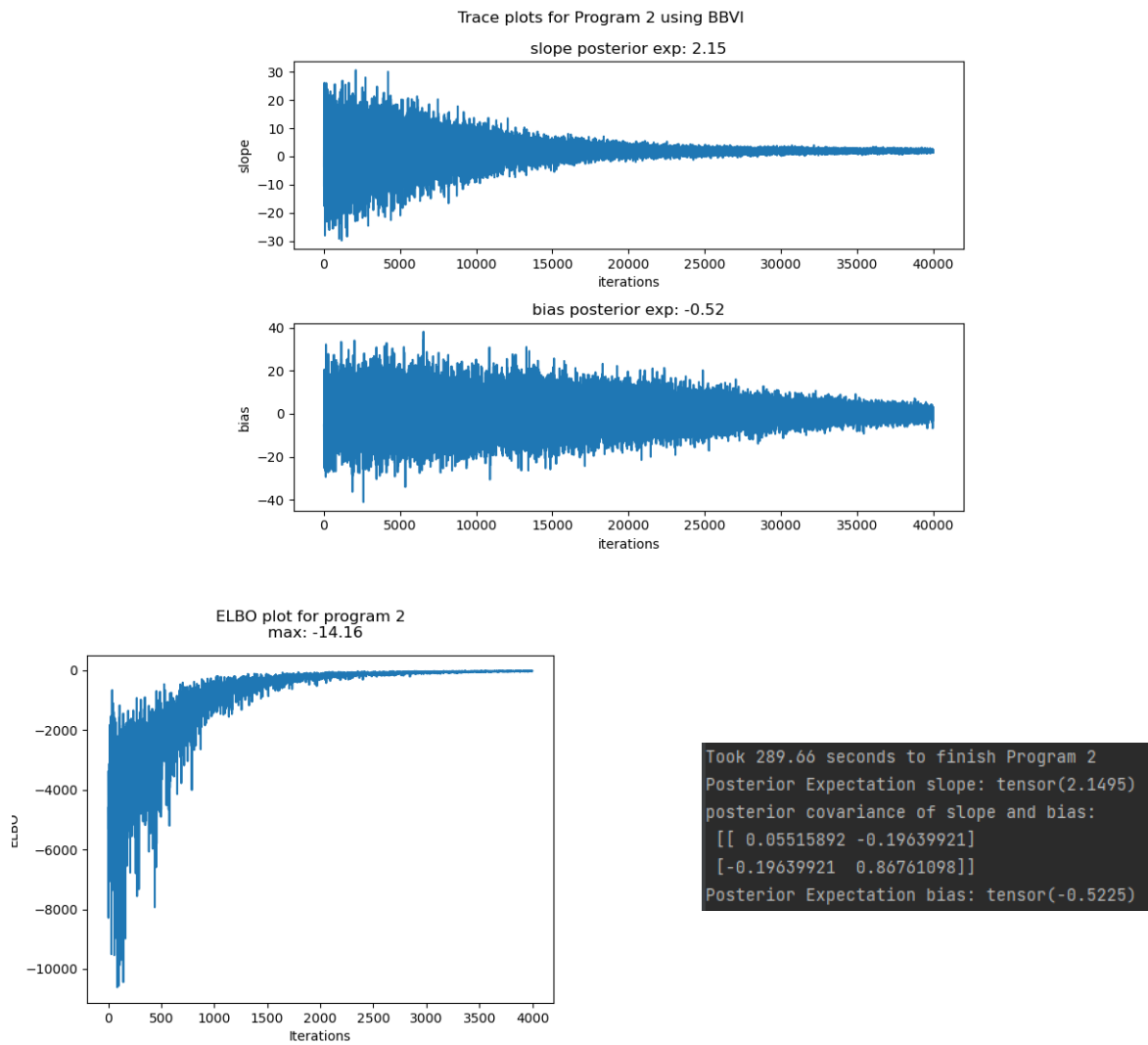
Link to repo:
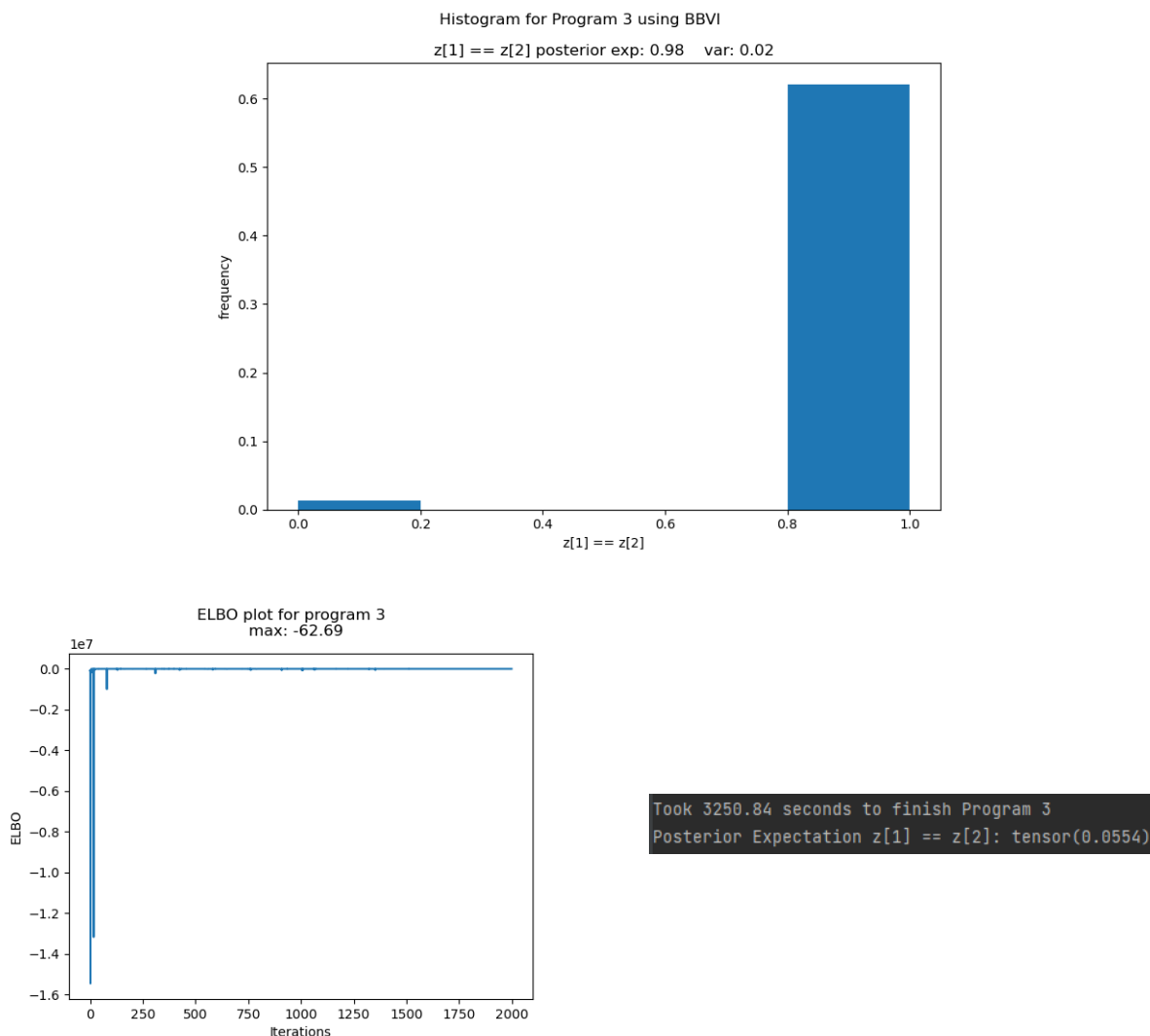https://github.com/keviny2/CPSC532W-Assignments/tree/main/FOPPL

1 Program 1

2   Program 2

Trace plots for Program 2 using BBVI

slope posterior exp: 2.15

bias posterior exp: -0.52

ELBO plot for program 2
max: -14.16

```
Took 289.66 seconds to finish Program 2
Posterior Expectation slope: tensor(2.1495)
posterior covariance of slope and bias:
 [[ 0.05515892 -0.19639921]
 [-0.19639921  0.86761098]]
Posterior Expectation bias: tensor(-0.5225)
```

3 Program 3

Histogram for Program 3 using BBVI
z[1] == z[2] posterior exp: 0.98   var: 0.02

ELBO plot for program 3
max: -62.69

```
Took 3250.84 seconds to finish Program 3
Posterior Expectation z[1] == z[2]: tensor(0.0554)
```

4 Program 4

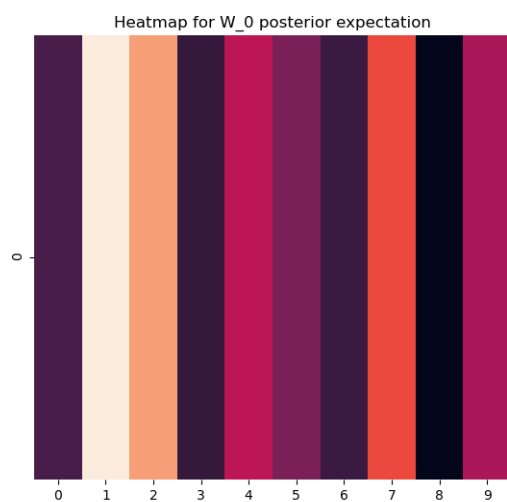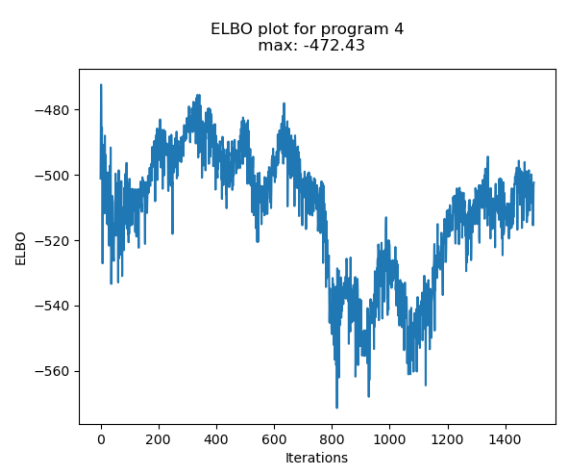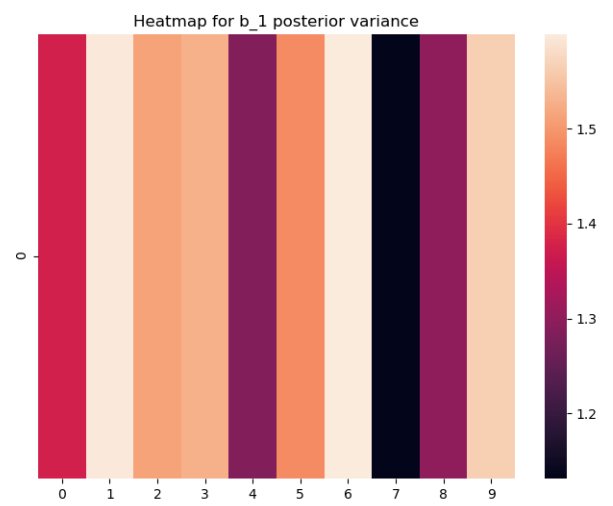Black-box variational inference (BBVI) is more generic compared to parameter estimation via gradient descent. In BBVI, we compute an estimate of the gradient of the evidence lower bound (ELBO) using a sampling procedure instead of obtaining the gradient of the ELBO analytically. This renders BBVI applicable to a range of complicated models that parameter estimation via gradient descent will not be able to handle.

Heatmap for W_0 posterior expectation

Heatmap for b_0 posterior expectation

t 1am

Heatmap for W_1 posterior expectation

Heatmap for b_1 posterior expectation

Heatmap for W_0 posterior variance

Heatmap for b_0 posterior variance

Heatmap for W_1 posterior variance

Heatmap for b_1 posterior variance

ELBO plot for program 4
max: -472.43
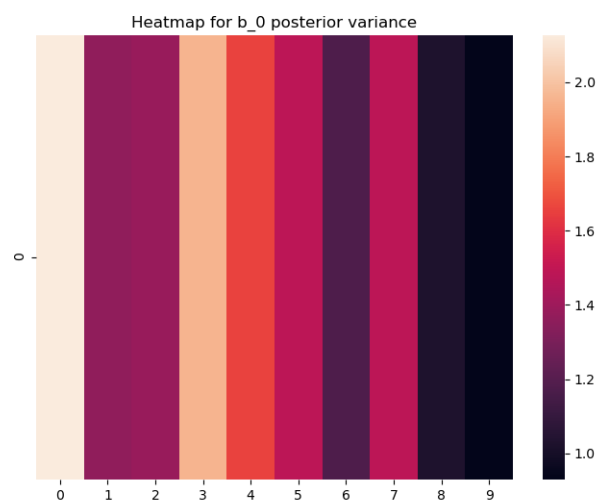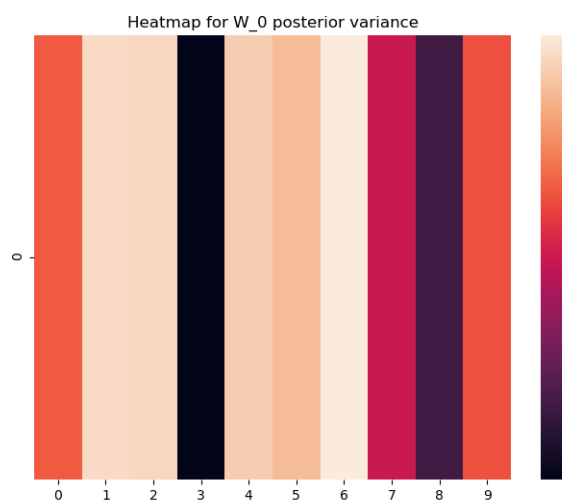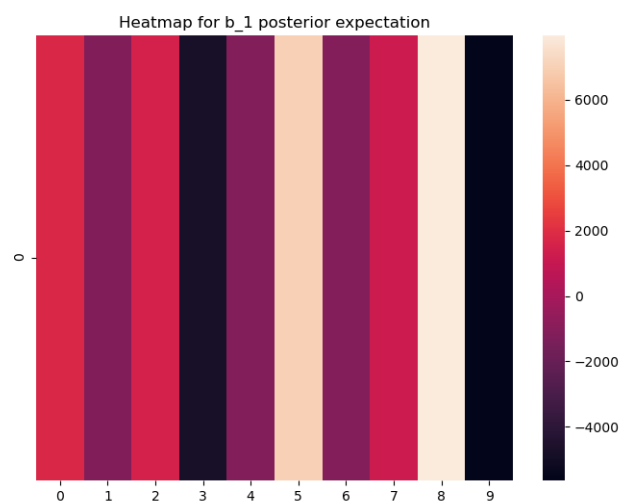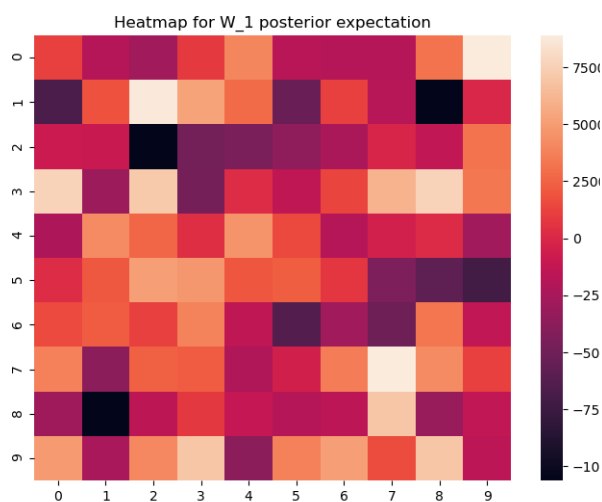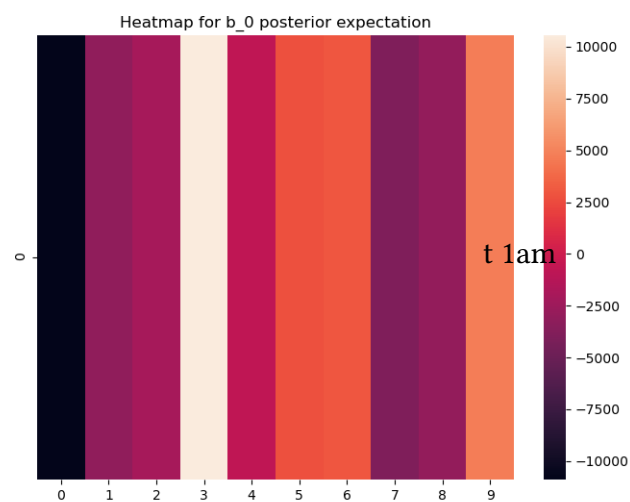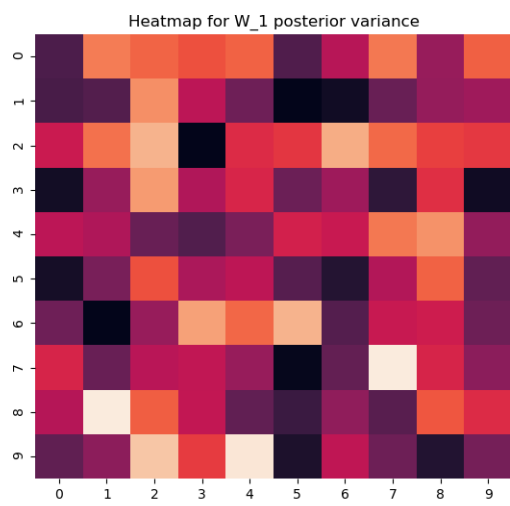
Took 2234.32 seconds to finish Program 4

5 Program 5