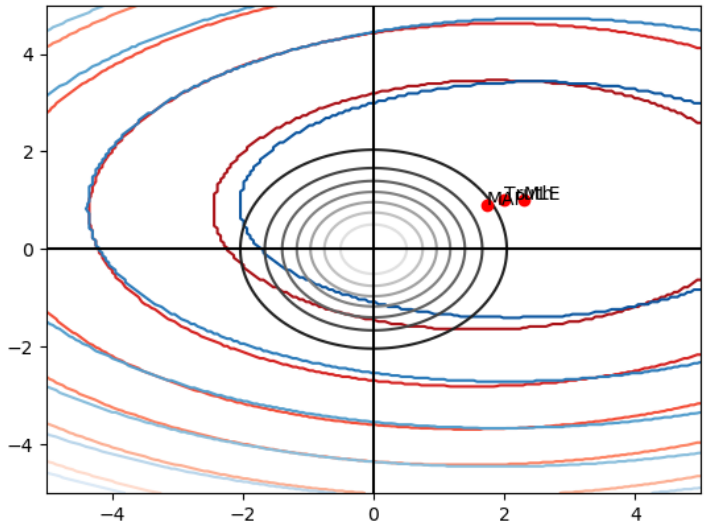
Appendix

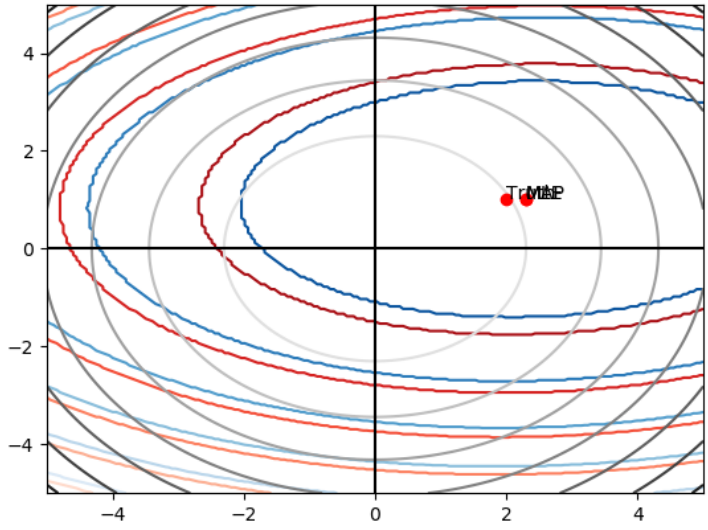
1.

(b)

$\sigma_h = 1$

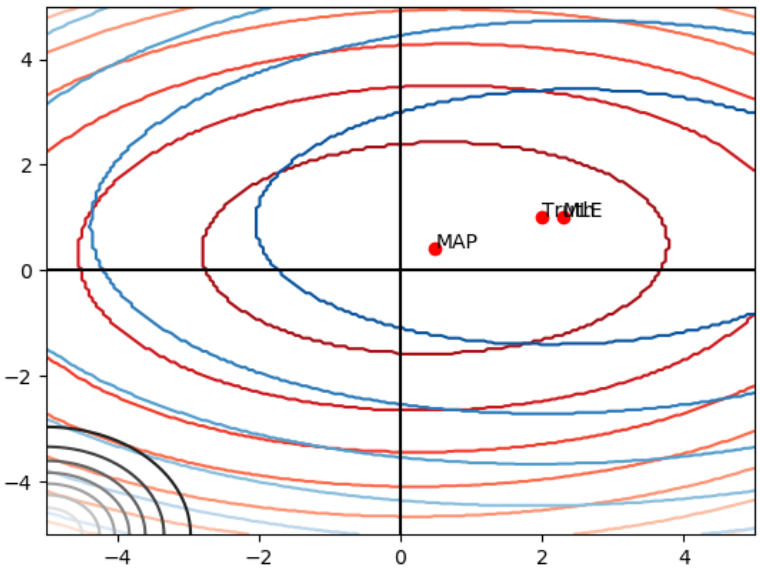


$\sigma_h = 10$

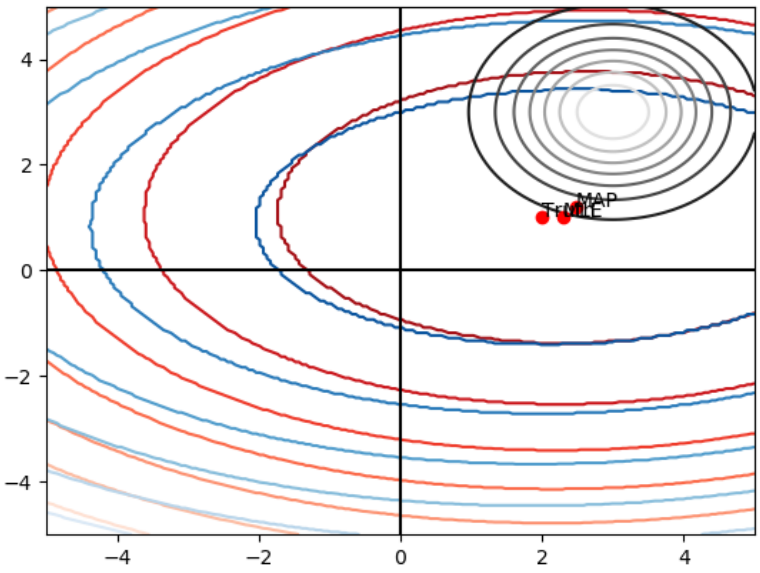


(c)

$\mu_\theta = \begin{matrix} -5 \\ -5 \end{matrix}$:

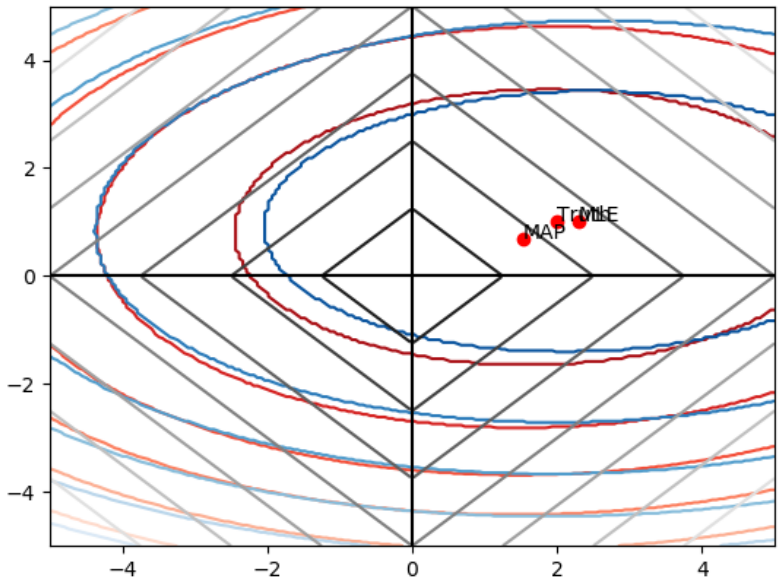


$\mu_\theta = \begin{matrix} 3 \\ 3 \end{matrix}$

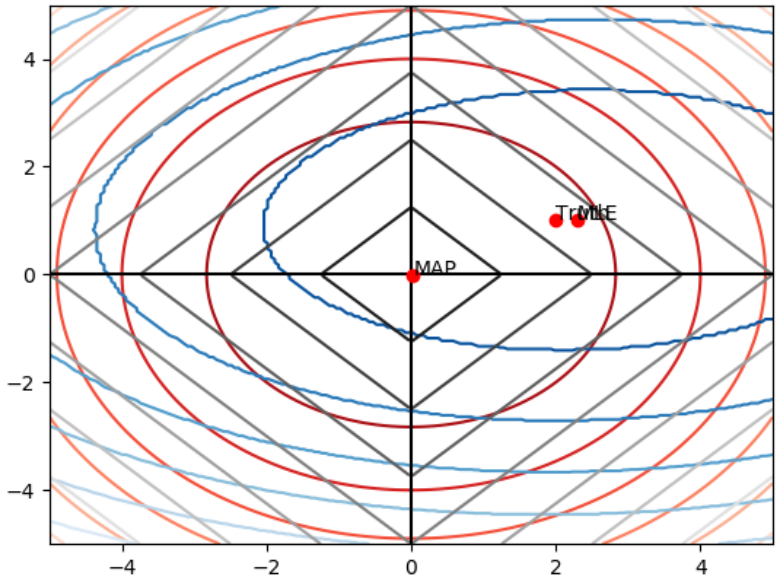


(e)

$P(\theta_i) \sim L(0, 1)$



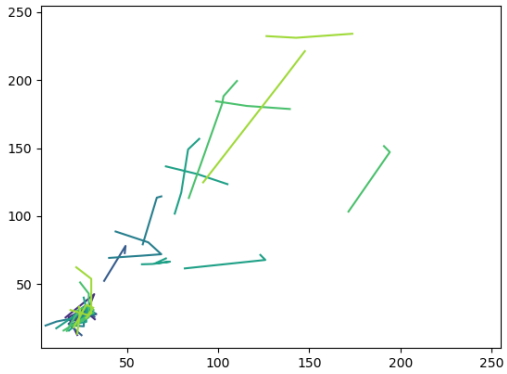
$P(\theta_i) \sim L(0, 0.0001)$



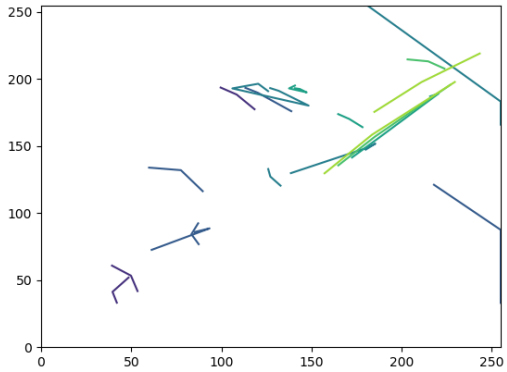
4.

(a)

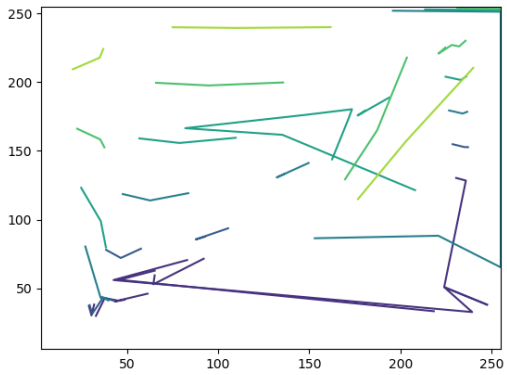
0^{th} image



10^{th} image



20^{th} image



Their corresponding control vectors are:

```
0th image control vector: [ 0. -1.  0.]
10th image control vector: [-1.         -0.45111084 -1.        ]
20th image control vector: [0.         0.         0.37368774]
```

(c)

```
Average squared Euclidien distance for different lambda on training set: [1.256702068937529e-15,
1.25669241758656e-13, 1.2565943984111686e-11, 1.2556154166406199e-09, 1.2459339631725425e-07]
```

(d)

```
Average squared Euclidien distance for different lambda on training set after scale: [3.255747498
915746e-07, 2.910512290768579e-05, 0.0015903814573038663, 0.034773122042375766, 0.254402961467970
3]
```

(e)

```
Average squared Euclidien distance for different lambda on test set: [2.0792664172815383e-16, 2.0
7926090800701e-14, 2.0792067442486828e-12, 2.0786652769260328e-10, 2.073269975904201e-08]
Average squared Euclidien distance for different lambda on test set after scale: [5.4858500599334
95e-08, 5.2638881496879074e-06, 0.0003806734444981973, 0.011336004792241953, 0.13159252242709102]
```

(f)

```
Condition number of training data without standardization: 52711693.12866252
Condition number of training data with standardization: 444.7259317110044
Condition number of test data without standardization: 28927142.279349737
Condition number of test data with standardization: 39339.65804431199
```