

Problem2

April 7, 2021

```
[ ]: import sys
import os
```

```
[ ]: import numpy as np
import matplotlib.pyplot as plt

import tensorflow.compat.v2 as tf
import tensorflow_probability as tfp
tf.enable_v2_behavior()

plt.rcParams['figure.figsize'] = [8.0, 6.0]
plt.rcParams['figure.dpi'] = 100
```

```
[ ]: tfd = tfp.distributions
dtype = np.float32
```

0.1 Probability distribution

Make the probability distribution equal to a sum of Normal distributions. The tensorflow_probability function *tfp.distributions.Mixture* is used to combine two *tfp.distributions.Normal* distributions.

```
[ ]: mix = 0.3
g = tfd.Mixture( cat=tfd.Categorical(probs=[mix, 1.-mix]),
                 components=[tfd.Normal(loc=0.0, scale=1.0), tfd.Normal(loc=6.0,
↪scale=1.25),])
```

```
[ ]: samples = tfp.mcmc.sample_chain(
    num_results=5000,
    current_state=dtype(1),
    kernel=tfp.mcmc.RandomWalkMetropolis(g.log_prob),
    num_burnin_steps=500,
    trace_fn=None,
    seed=0)
```

```
[ ]: sample_mean = tf.math.reduce_mean(samples, axis=0)
      sample_std = tf.sqrt(
          tf.math.reduce_mean(
              tf.math.squared_difference(samples, sample_mean),
              axis=0))

      print('Estimated mean: {}'.format(sample_mean))
      print('Estimated standard deviation: {}'.format(sample_std))
```

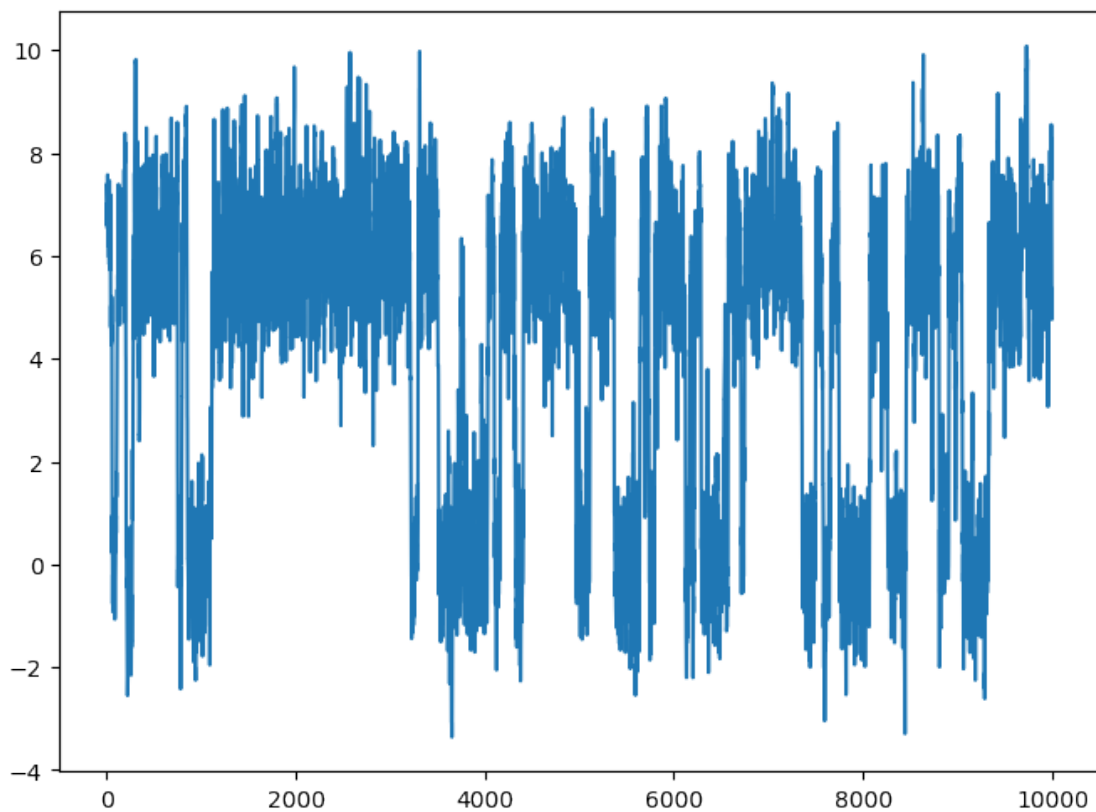
Estimated mean: 4.174340724945068

Estimated standard deviation: 2.9990310668945312

0.2 Plot the time series of the "walker"

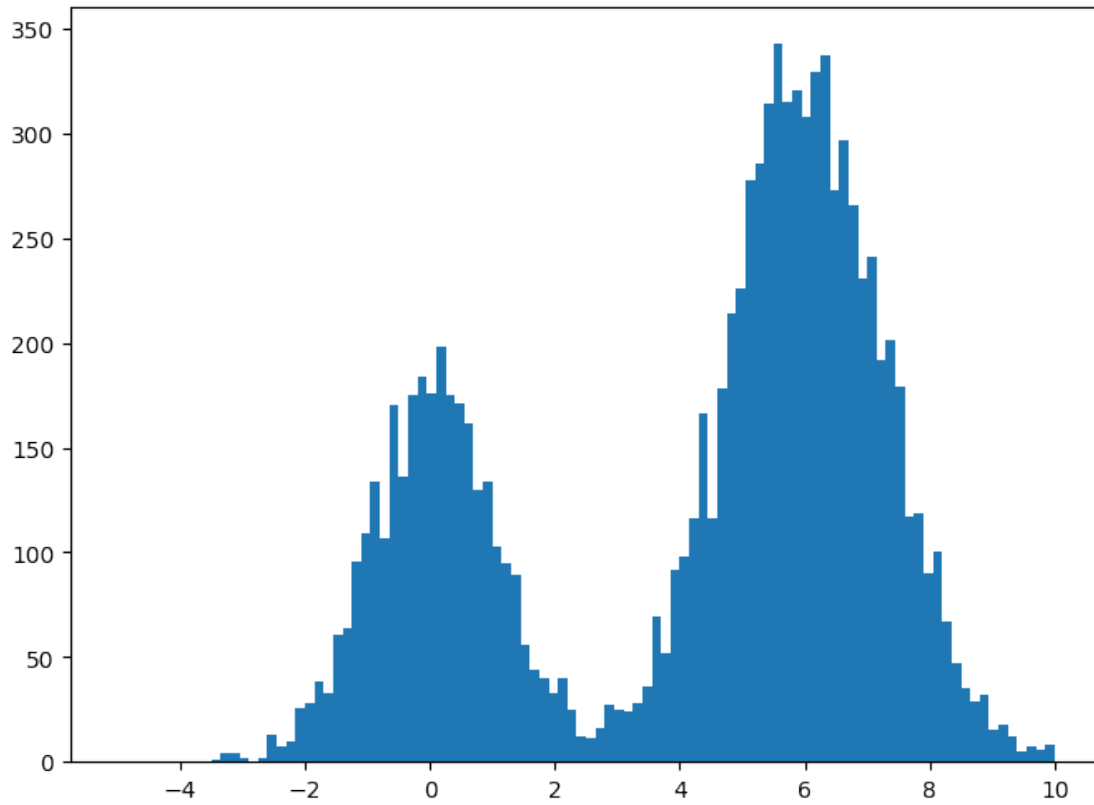
```
[ ]: plt.plot(samples)
```

```
[ ]: [ <matplotlib.lines.Line2D at 0x7f0f72a434d0> ]
```



0.3 Plot the distribution that MH arrives at

```
[ ]: res = plt.hist( samples, bins=100, range=(-5,10) )  
plt.show()
```



```
[ ]:
```