Q1 . i)

Estimations were obtained for different values of N. Also for each value of N the program was run 5 times and the mean and variance were noted.

Estimation obtained using N samples drawn from $q(x)$:

Number of samples	Trial 1		Trial 2		Trial 3		Trial 4		Trial 5	
	Mean	Variance	Mean	Variance	Mean	Variance	Mean	Variance	Mean	Variance
10	75.67	146.00	44.05	472.16	41.66	513.34	45.54	469.88	87.23	787.85
100	49.35	813.79	55.28	854.88	57.86	1141.9	47.12	719.02	50.80	879.70
1000	54.92	954.77	55.28	885.90	53.60	790.53	53.84	944.02	56.10	859.73
10000	54.69	875.22	55.72	882.33	54.06	863.93	54.38	866.80	54.68	854.81
100000	54.9	869.01	55.15	881.62	55.19	881.74	55.04	875.40	54.89	875.44

Estimation obtained using Monte Carlo:

Number of samples	Trial 1		Trial 2		Trial 3		Trial 4		Trial 5	
	Mean	Variance	Mean	Variance	Mean	Variance	Mean	Variance	Mean	Variance
10^5	55.02	871.99	55.05	878.52	54.95	872.54	55.00	872.92	55.03	873.62

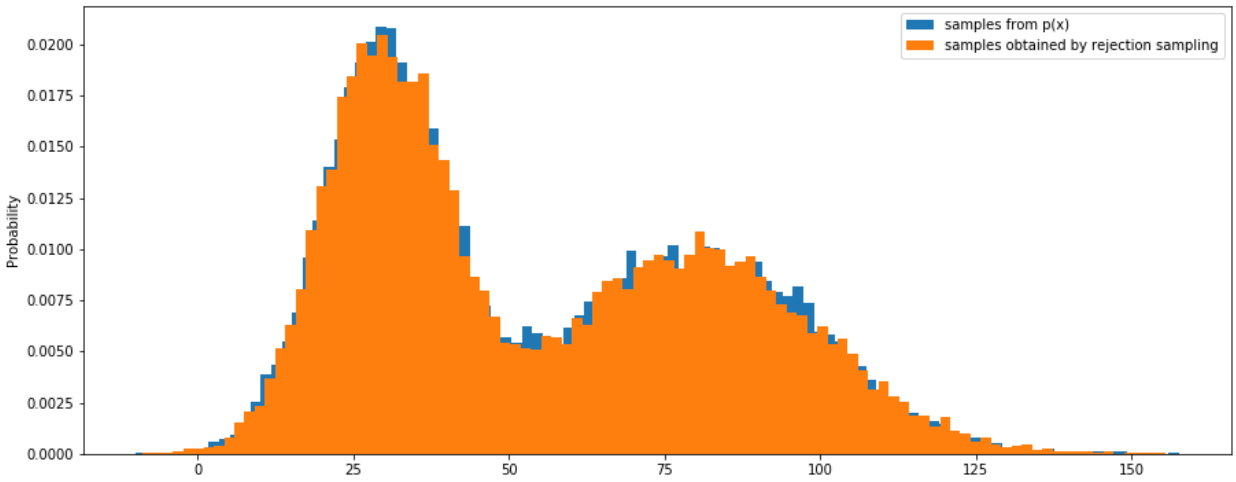
Observing the estimation from Monte Carlo we can say that the correct mean is approximately 55 and the correct variance is approximately 873.

We can clearly see that the estimation obtained using N samples drawn from $q(x)$ tends to the actual values as we increase the value of N. We can also observe that for a given N which is small the mean and variance itself fluctuate as the number of samples randomly drawn is less and hence every iteration will give a different mean and variance.

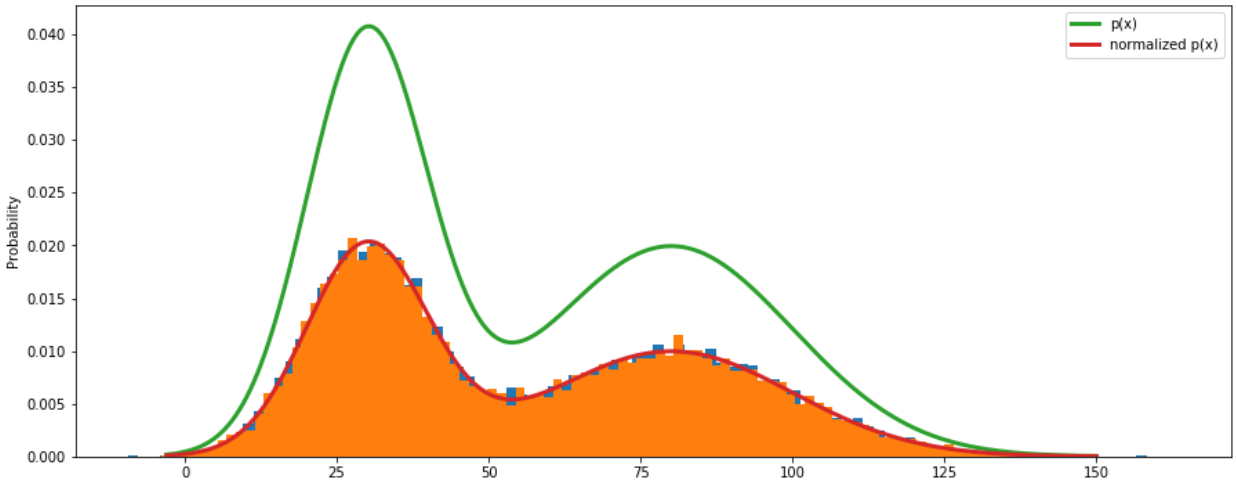
Q1 . ii)

Rejection sampling with a proposal distribution $q(x) = N(50, 30^2)$ was used to generate 20,000 samples from $p(x)$ and was compared against the exact solution corresponding to the given sampling drawn from $p(x)$.

The following histogram shows the distribution of sampling points draw from $p(x)$ and from rejection sampling. We can see that both histograms are almost the same which shows that rejection sampling has correctly sampled from the distribution.



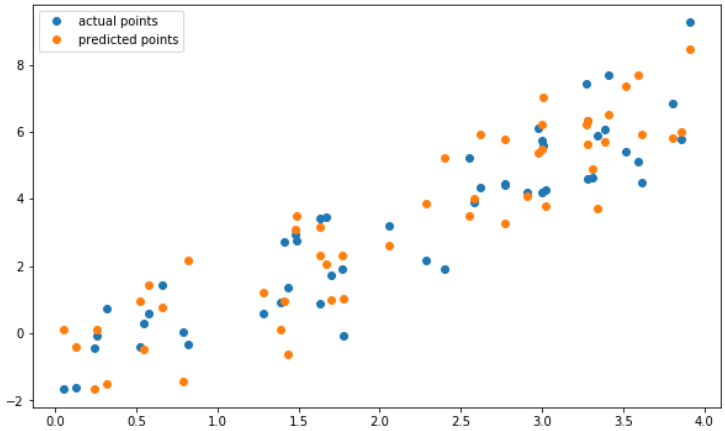
In the figure below the same histogram is plotted along with $p(x)$ and normalized $p(x)$. We can see that the histogram matches normalized $p(x)$ curve which is a proof that the sampling is indeed correct.



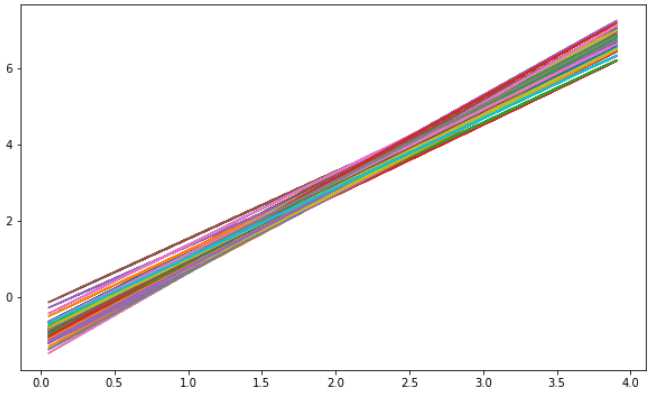
Q2)

5,000 samples were drawn out of the posterior distribution of (w_0, w_1, γ) using Gibbs sampling.

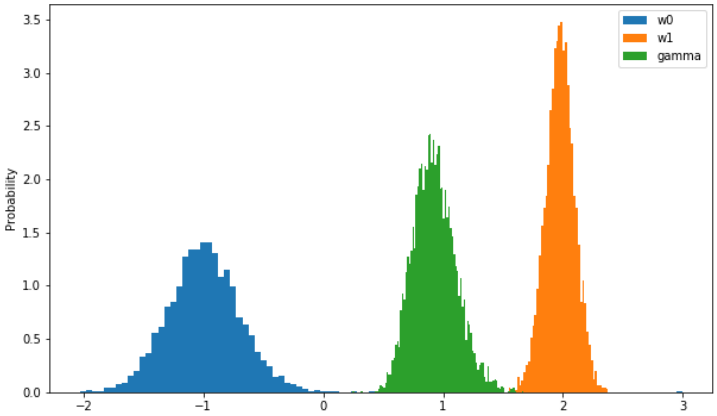
The median of these samples was taken and the predicted solution using these samples were plotted against the actual solution in the graph below



In the graph below, the last 50 realizations of (w_0, w_1) were used to plot $y = w_0 + w_1 * x$ for each set of (w_0, w_1).



The histogram shows the distribution of (w_0, w_1, γ). We can see that majority of the samples are at their actual values. That is of $w_0 = (-1),\ w_1 = 2,\ \gamma = 1.$



PROJECT PROPOSAL REVIEW

1

Alejandro Villasmil and Christian de Abreu

We propose to create a deep neural network with the capabilities to reconstruct music perceived by the brain using EEG signals.

- Did the author(s) clearly articulate what they want to do?

The project outline and what they intend to achieve has been clearly defined.

- Did they provide sufficient references on the problem and the methods they propose?

Yes, enough references have been provided on the methods that they plan to implement. But references have not been provided on data acquisition method. Also, I am assuming that there is no data set that is already available online since they have not provided a source.

- Did they provide sufficient details of their approach (e.g. data-sets, model architectures, training objectives, validation, etc.)?

I feel they need to focus on their approach for obtaining data in case they don't find a readymade data set. The process might be time consuming and they may need to use data augmentation of some kind to increase the number of samples that they have. Model architectures, training objectives and validation have been explained briefly but not in detail.

- Do you find the project compelling enough to be presented in class?

YES. This project has a lot of real-world applications and if successfully completed it would be interesting to see its results.

SCORE 95/100

2

Sifan Wang: Humpback Whale Identification

- Did the author(s) clearly articulate what they want to do?

The project outline and what they intend to achieve has been clearly defined. It also clearly mentions the challenges that would be faced during the training.

- Did they provide sufficient references on the problem and the methods they propose?

Yes, enough references have been provided on the methods that they plan to implement.

- Did they provide sufficient details of their approach (e.g. data-sets, model architectures, training objectives, validation, etc.)?

Model architectures, training objectives and validation have been explained in complete detail including brief comments on data augmentation, prediction accuracy, regularization, etc.

- Do you find the project compelling enough to be presented in class?

YES. This project would be implementing various new techniques that we have not yet seen in the class.

SCORE 100/100

3

Ken Hashiyama: Automated detection of pathological inclusions in Alzheimer's disease

- Did the author(s) clearly articulate what they want to do?

The project proposal thoroughly covers the background of the problem statement, current methods, its drawbacks and proposed solutions. It also clearly mentions the challenges that would be faced during the when tackling the problem and the model that they intend to use.

- Did they provide sufficient references on the problem and the methods they propose?

Yes, enough references have been provided on the methods that they plan to implement. No reference has been given for the source of the training data set.

- Did they provide sufficient details of their approach (e.g. data-sets, model architectures, training objectives, validation, etc.)?

Model architectures has been explained systematically, including the layers activation function and size of the CNN. The loss function, optimization function, training objective and evaluation criteria have also been explained in detail.

- Do you find the project compelling enough to be presented in class?

YES. This project would be challenging, and it would be implementing U-Net which is something new and we have not yet seen in the class.

SCORE 100/100

4

Shuliang Tian and Han Wang

- Did the author(s) clearly articulate what they want to do?

Yes, they wish to compare different stochastic optimization methods over time.

- Did they provide sufficient references on the problem and the methods they propose?

They have stated various state of the art research work and current proposals that have attempted to tackle the problem of improving the time using SGD and also stated there could be problems in finding the gradients cheaply. They have given mathematical definitions of the methods they proposed generically.

- Did they provide sufficient details of their approach (e.g. data-sets, model architectures, training objectives, validation, etc.)?

They have just mentioned they want to reduce the time by reducing the cost associated with evaluating the gradients but not how they are going to evaluate. However they have given detailed explanation of the mathematical model

- Do you find the project compelling enough to be presented in class?

This project is definitely interesting and theoretical, but I don’t think it is compelling enough to be presented in class

SCORE 95/100