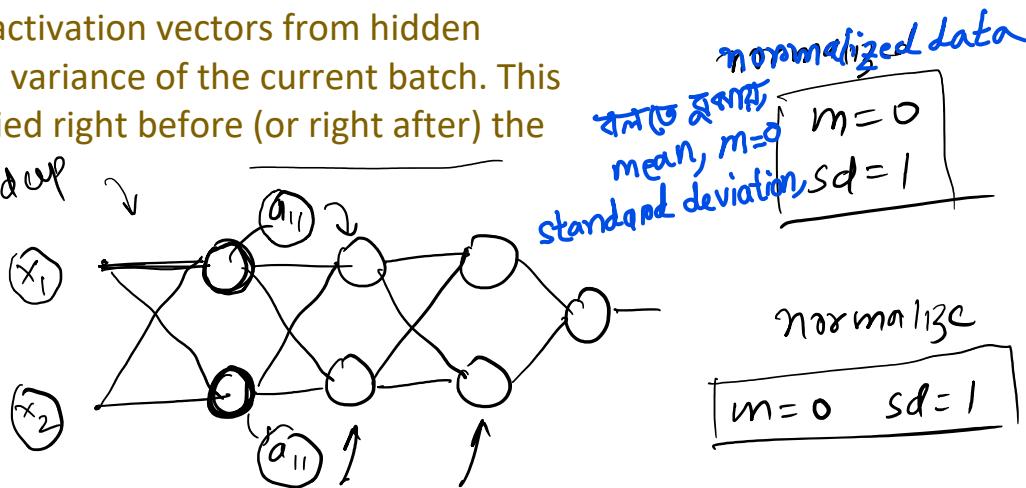


What is Batch Norm?

27 June 2022 11:00

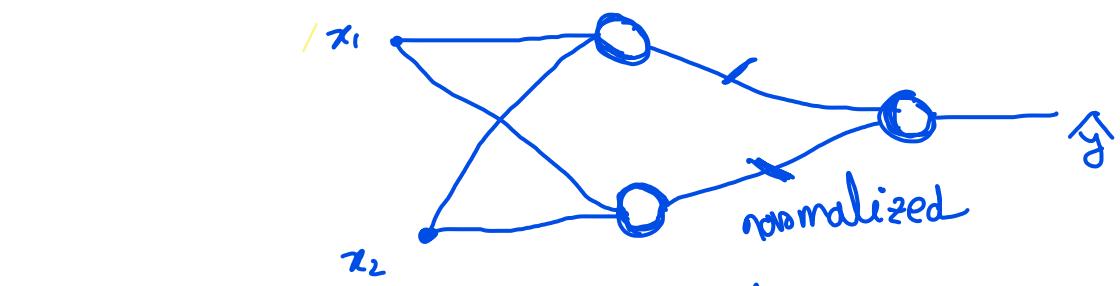
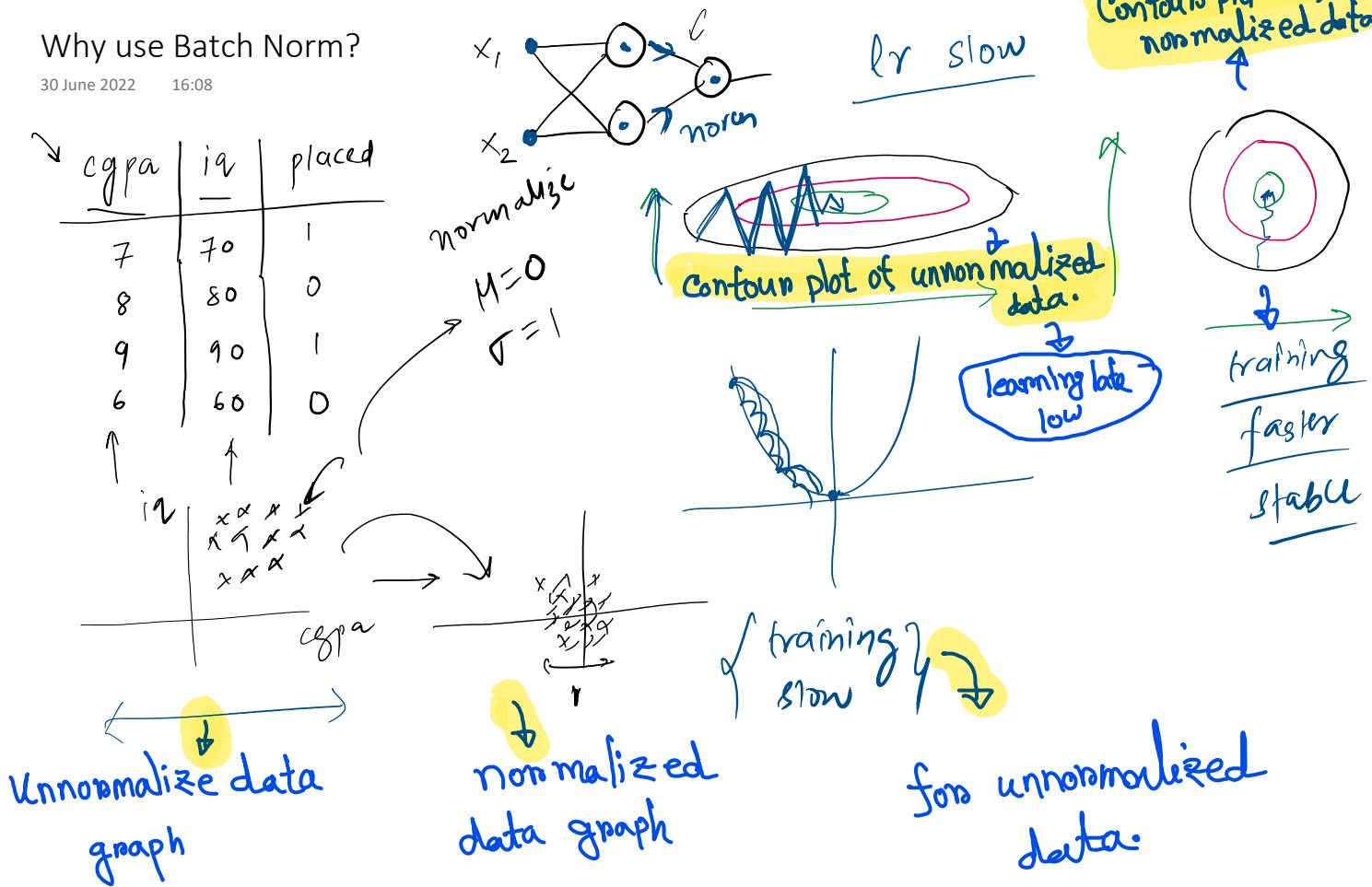
Batch-Normalization (BN) is an algorithmic method which makes the training of Deep Neural Networks (DNN) faster and more stable.

- It consists of normalizing activation vectors from hidden layers using the mean and variance of the current batch. This normalization step is applied right before (or right after) the nonlinear function.



Why use Batch Norm?

30 June 2022 16:08



Batch input data (x_1, x_2) or normalized data: If we don't normalize data converge rate will be slow, so after activation fn output will normalize fast.

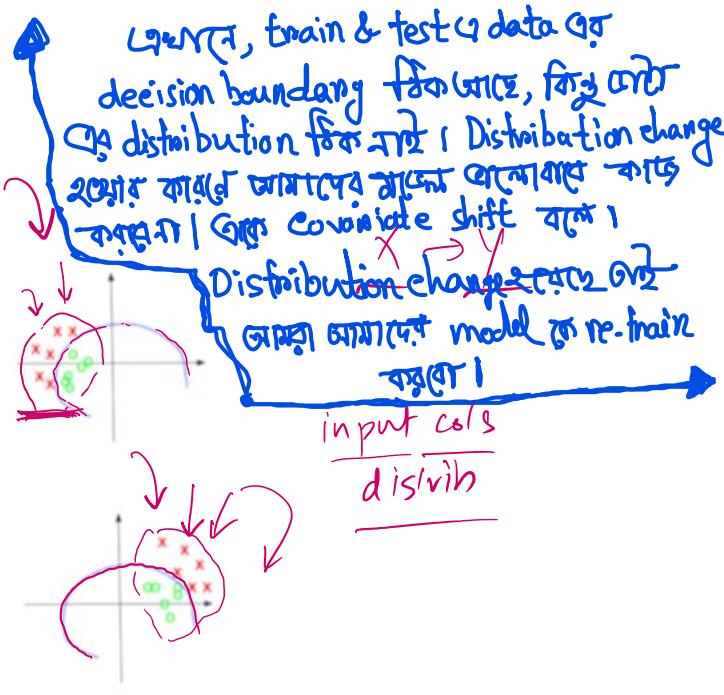
Internal Covariate Shift

27 June 2022 11:02

1st left
see:



$X \rightarrow Y$

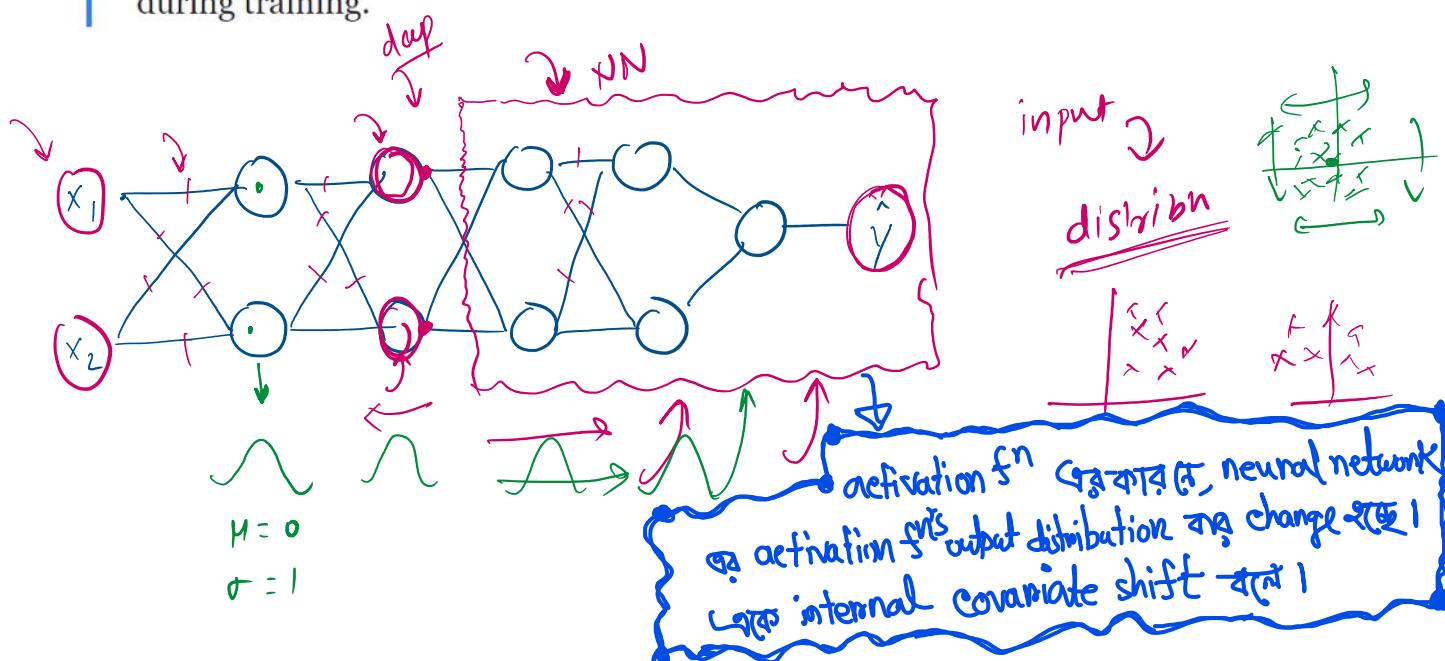


* Internal Covariate Shift:

The authors' precise definition is:

We define Internal Covariate Shift as the change in the distribution of network activations due to the change in network parameters during training.

learning rate
low param init
very carefully
batch normalization
well optimum
soln এ আসবাব!





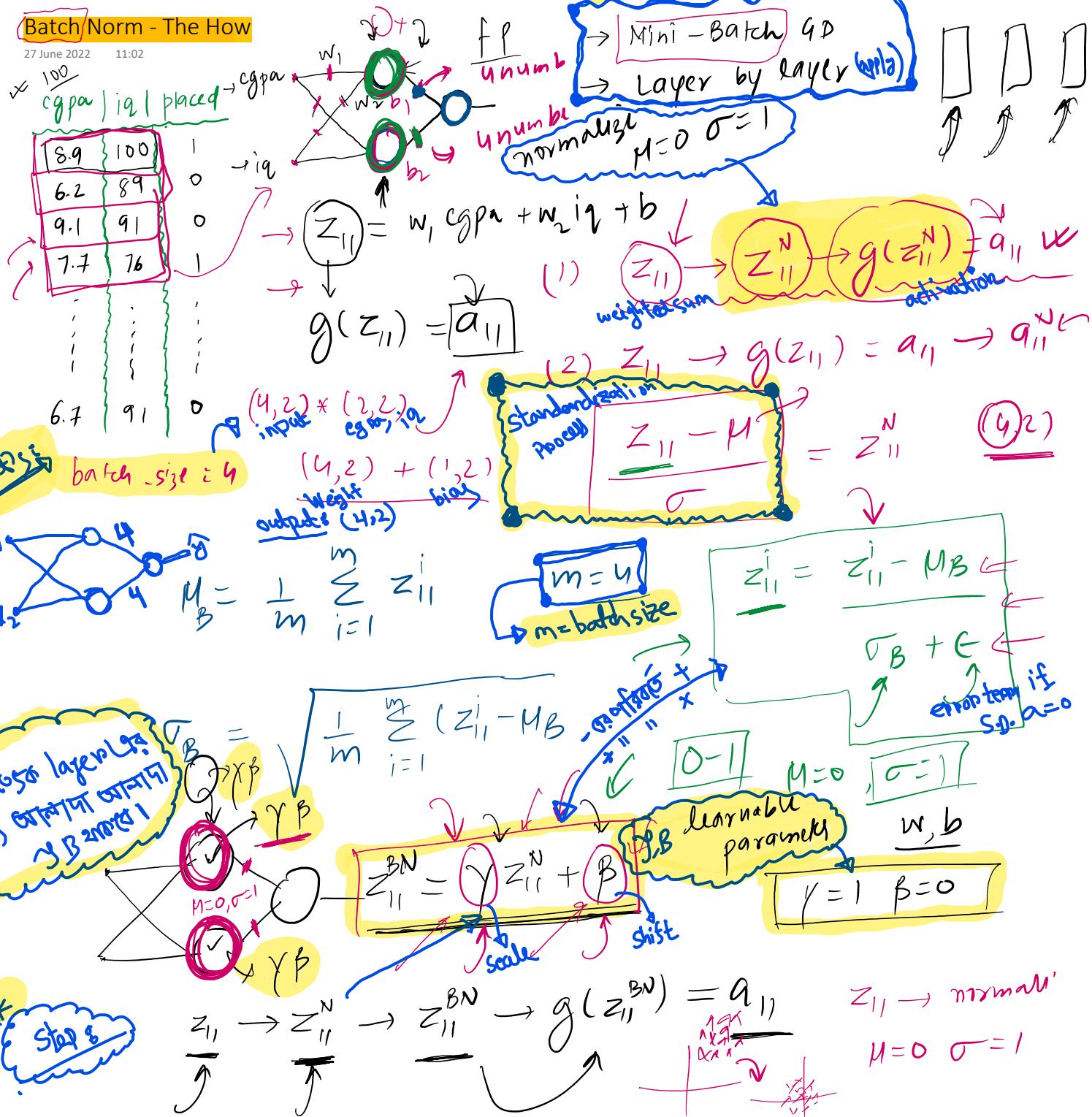
peas → bees → knees → cheese
flea

ଓହି କେବଳ ପରିମାଣନ୍ତିରି କାହାରୁ ଆଶୀର୍ବାଦ କରିବାକୁ ପରିମାଣନ୍ତିରି କରିବାକୁ

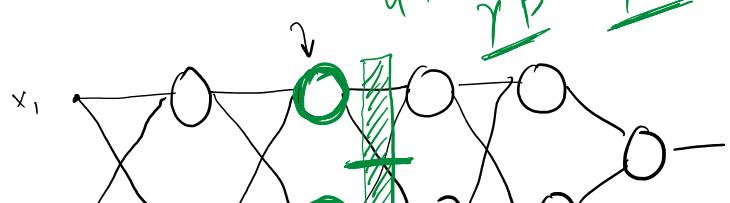
Batch Norm - The How

27 June 2022 11:02

must remember



* * *
জটিল NN প্রতিক্রিয়া
নর্মালাইজড ডাটা নাম্বার ?
normalize data, γ, β



$$\gamma = \gamma - \eta \frac{\partial L}{\partial \gamma}$$

Keras

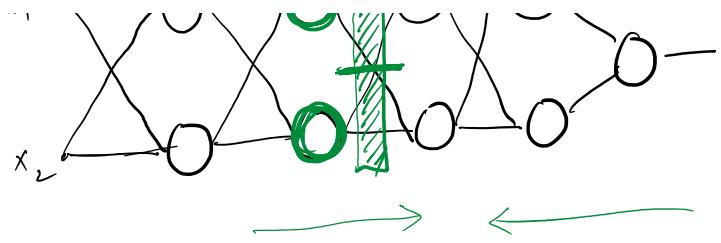
$$\gamma = \gamma + \epsilon, \beta = \beta + \epsilon$$

flexibly \rightarrow normalize দুর্ভাব নাম্বার ?

Batch Norm \rightarrow Layer

4 learnable
 γ, β

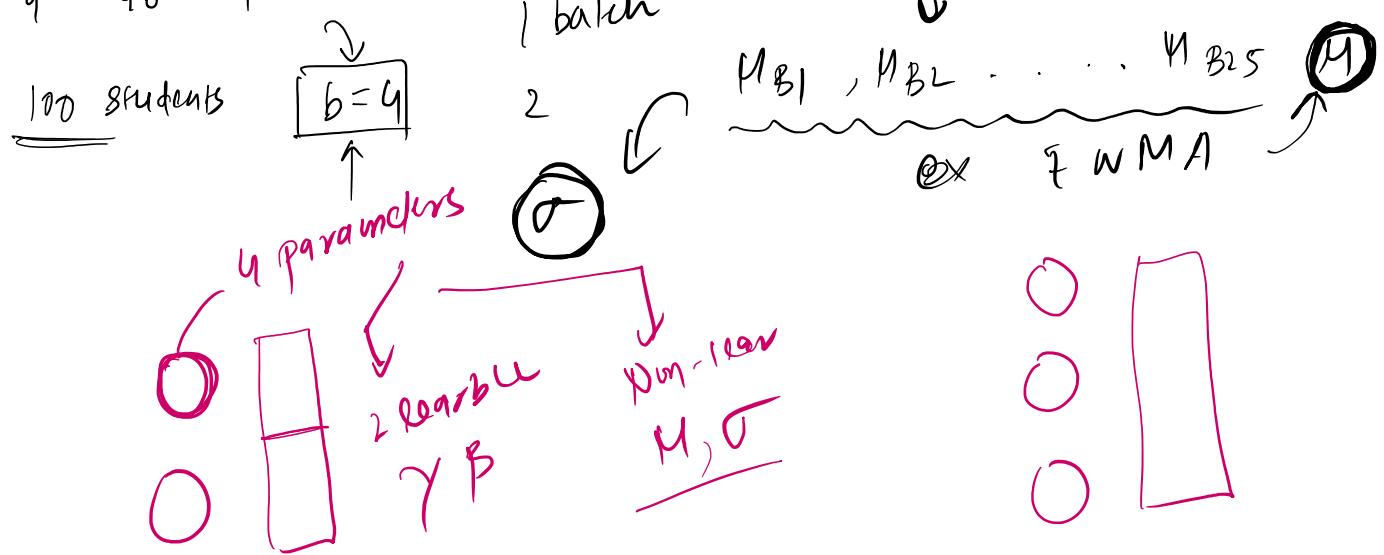
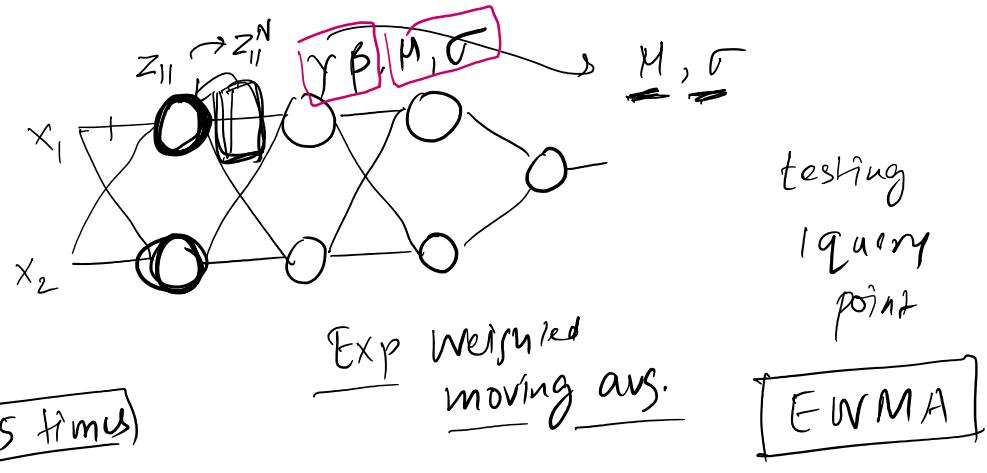
$$\gamma = \gamma - \eta \frac{\partial L}{\partial \gamma}$$



Batch Norm during test

27 June 2022 11:03

cgpa	ia	placed
8	80	1
7	70	0
6	60	1
:	:	:
9	90	1

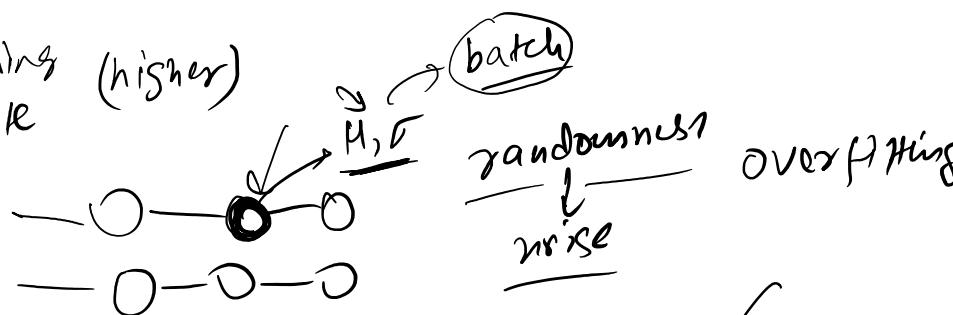


$$3 \times 4 = 12$$

6
6

Advantages

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- 1) stable → hyperpara → wider range of robustness
- 2) faster → learning rate (higher)
batch
- 3) Regularizer →
↓
dropout

- 4) weight init impact reduce


Keras Implementation

27 June 2022 11:03

```
model = Sequential()  
  
model.add(Dense(3,activation='relu',input_dim=2))  
model.add(BatchNormalization()) ←  
model.add(Dense(2,activation='relu')) ←  
model.add(BatchNormalization()) ←  
model.add(Dense(1,activation='sigmoid'))
```

