# ANN
# COURSE 4 - WEAK 2
# CNN SUMMARY

## By:
## Mohamed Ahmed Nassar
## Noha Ahmed

- LeNet5 is used to recognize hand-written digit
- Very deep neural networks are hard to train because of vanishing/exploding gradients
- ResNet is a very deep network that consists of many similar blocks
- There are two types of blocks in ResNet
  - Identity block (shortcut is just a path without any operation)
  - Residual block (shortcut has an operation to adjust the sizes before addition)
- ResNet uses shortcuts to overcome vanishing/exploding gradient and ease the learning
- in plain networks when neural networks gets extremely deeper it becomes very hard to train and training error gets worse
- ResNet could be very very deep without suffering from training complexity
- ResNet is work well because it could learn the identity block by just set the direct pass weights and bias equal to zero which equivalent to eliminate some layers
- 1x1 Convolution is used to collapse (i.e Shrink) a depth dimension while keeping other dimension
- 1x1 convolution is also used to decrease the amount of operations by maybe a factor of 10 or more
- inception network uses different operation and hyper-parameters on the same layer then stacking them together
- inception network save the time of retraining the same network many times with different parameters
- Inception networks uses intermediate predictors to check out if the network doing well in an earlier part of it
- Based on the fact that earlier network layers learns the basic features like (edges, corners and interset-points) so transfer learning is a very good way to increase training speed and reduce computation power
- Transfer learning is about uses the weights of other network and just fine tune the final layers on the dataset
- We could use other weights as a good initialization and start training from it, or freezing the earlier layers and just update the weights of the final layers
- To increase the amount of data on a small dataset also to introduce different types of noise to make our network generalize well and focus on the real features we could introduce data augmentation

- Data augmentation is about transforming, resealing, changing brightness and adding different types of noise on our images so the network learn to ignore all of these factor and focus on the real object regardless the environment that contain it