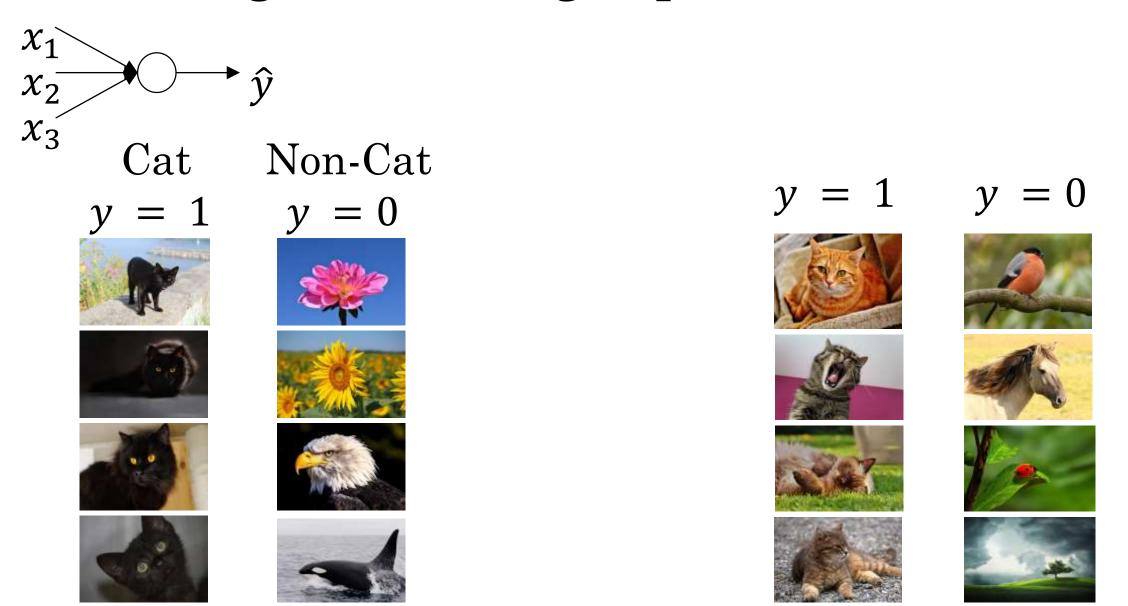


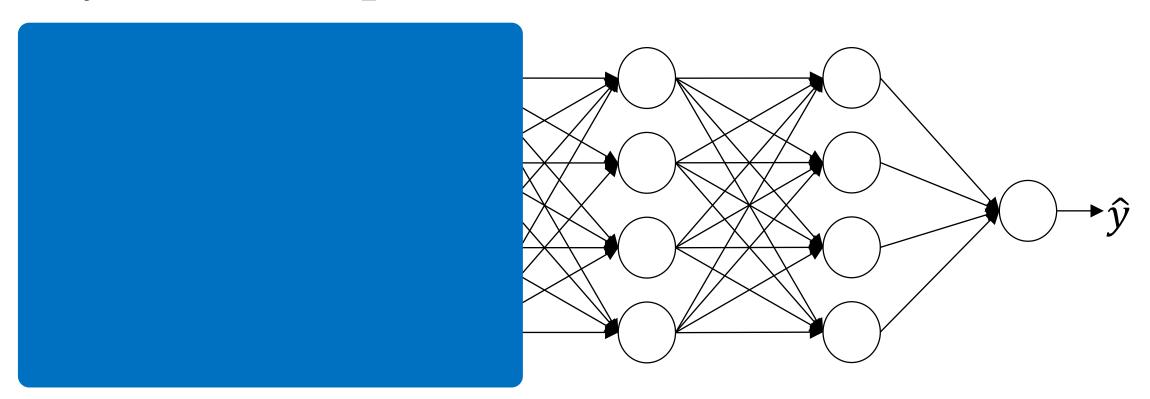
# Batch Normalization

# Why does Batch Norm work?

## Learning on shifting input distribution



### Why this is a problem with neural networks?



### Batch Norm as regularization

- Each mini-batch is scaled by the mean/variance computed on just that mini-batch.
- This adds some noise to the values  $z^{\lfloor l \rfloor}$  within that minibatch. So similar to dropout, it adds some noise to each hidden layer's activations.
- This has a slight regularization effect.