Coding Basics

Deep Learning Codes

- Invariably w Python interface
- Useful with GPU version

Tensor Flow

- As a “retained” mode operation
  - ❑ Define the network graphs
  - ❑ Then execute
- Vs. “immediate” mode operation like Pytorch
- Choose wisely, the investment can be hard to undo or repeat

General Prog Skeleton

- Network preparation
  - Define network
  - Backup network
  - Restore network
- Data preparation
  - Read and partition (x: data, y: label)
  - Randomize
  - Batch

General Runtime Skeleton

- Book-keeping
  - Pnratio
  - Class weight, sample weight, etc.
  - Prediction from CNN
  - Cost, # correct, accuracy definition
  - Optimizer

General Runtime Skeleton

```
Repeat for # training cycles :
    Evaluate current error (evaluation data set)
    Backup Network
    Get current training batch
    Repeat for #epochs:
        Repeat for #batches
            Sess.run([optimizer, cost], feed_dict={x: epoch_x, y:epoch_y}
        Update training error (premature stop condition)
    Re-evaluate current error (evaluation data set)
    If not better:
        Restore Network
    Else:
        Save Network
```

Important Details

- Small problems (small networks and data sets)
  - Do whatever you want and probably ok
- Large problems
  - Tricky convergence
  - Catch bad iterations early
    - Patterns in learning indicating likely failure
    - Validate after each learning cycle before it is too late
  - Annealing process
    - Large step size, more epochs, smaller training samples initially
    - Small step size, fewer epochs, large training samples subsequently