CMPEN 454 Project 1

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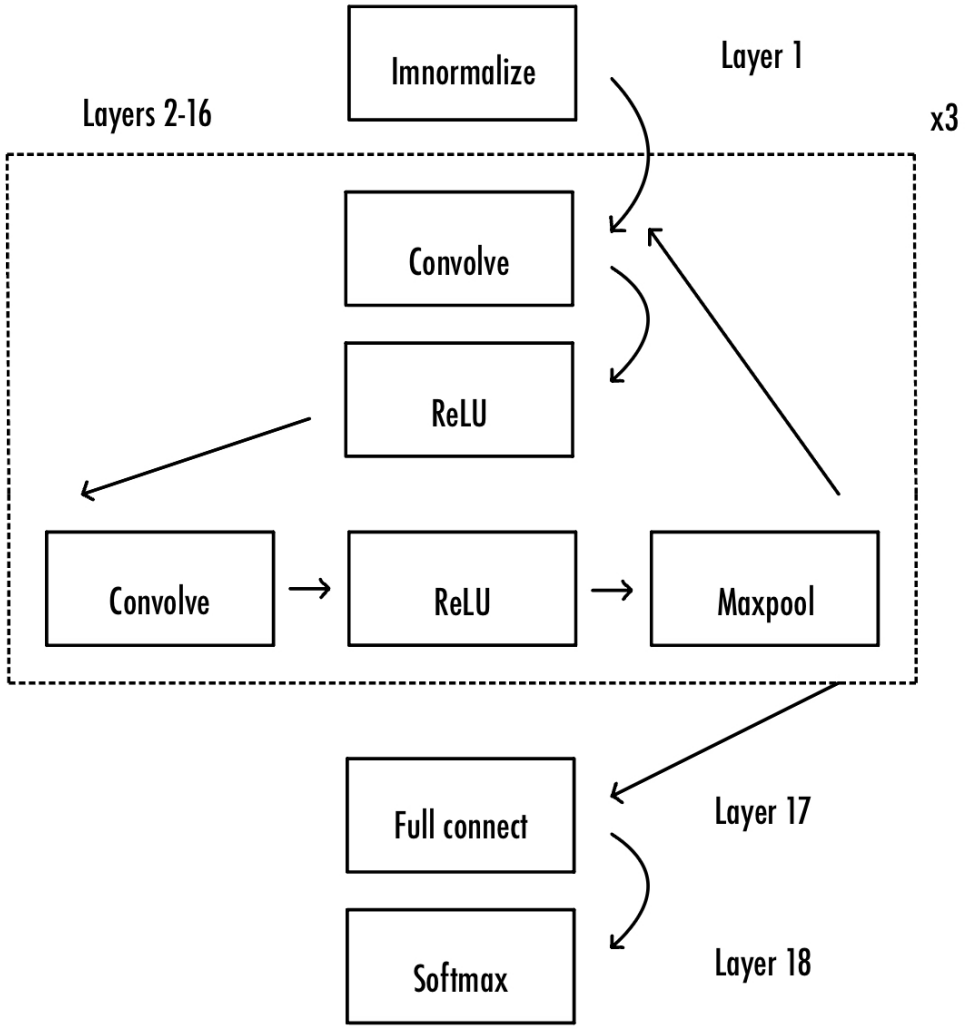
Summary

- Classifying images by applying CNN
  - **imnormalize** transforms the range from 0 to 255 to -0.5 to 0.5
    convolve applies the given filters to the input arrays, doing the core work of the classifier
    relu thresholds the values to introduce non-linear behavior into the model (most real-world data is nonlinear)
    maxpool takes local maxima, and uses them to reduce the size, and thus computational complexity of the image
    fullconnect flattens the layers and returns a vector of probabilities for each category
    softmax identifies the most likely feature

- Beginnings to training a network to detect images

Flow Control



Experimental Behavior

- The image classifier was able to predict the images in the CIFAR-10 dataset with 43.7% accuracy
- It took ~10 minutes to run the classifier on all 10,000 images in the dataset
- Did not need to rewrite anything, but code be made more efficient

Experimental Behavior

- Imnormalize-O(m+n) cannot be made faster
- Convolve-O(m*n*p*q) can speed up computation by caching the filter response at the beginning of the out for loop and summing at the end- reduces number of convolutions and uses builtin MATLAB
- Relu-O(m+n) cannot be made faster
- Maxpool-O(m*n*d) can speed up computation by using builtin MATLAB
- Fullconnect-O((m+n)*size(filterbank,4)) cannot be made faster
- Softmax-O(m+n) cannot be made faster

Confusions Matrix

	'airplane'	'automobile'	'bird'	'cat'	'deer'	'dog'	'frog'	'horse'	'ship'	'truck'
'airplane'	531	41	65	37	10	8	18	38	210	42
'automobile'	40	519	9	26	10	7	19	29	111	230
'bird'	87	8	386	117	97	70	104	88	25	18
'cat'	39	18	127	325	45	136	186	89	13	22
'deer'	53	6	270	69	259	38	162	114	22	7
'dog'	19	7	151	222	49	281	111	125	20	15
'frog'	10	7	120	125	93	23	557	33	9	23
'horse'	32	7	73	98	77	94	54	533	13	19
'ship'	192	84	35	44	7	8	10	16	542	62
'truck'	69	191	23	41	4	9	30	68	127	438

- Above 50%
  - Airplane
  - Automobile
  - Frog
  - Horse
  - Ship
- Below 50%
  - Bird
  - Cat
  - Deer
  - Dog
  - Truck

Work Distribution

- Bharavi Misra
  - apply_convolve
  - apply_imnormalize
  - apply_relu
  - apply_softmax
  - main.m
- Andrei Dawinan
  - apply_fullconnect
- Andrew Ho
  - apply_maxpool