CNNS 2

Lab 5 2/20/25

BEFORE WE START!

Get everything ready

1) Follow this link to the dataset
2) Login or create a Kaggle account
3) Download the dataset
4) Run your sbatch jupyter.scr on Greene
5) Copy the data over to Greene
6) Unzip in data

CNN Considerations

Layers

!) Determine the number of layers and hidden layers
2) Decide if layers should be convolution of pooling layers
3) Determine if layers should be followed by activations or normalization

Convolution Layers

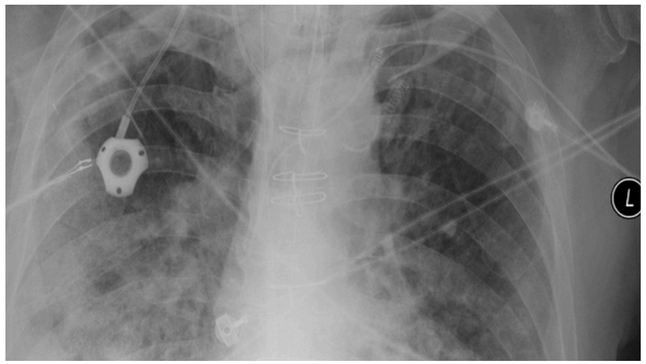
1) Number of filters and their bias
2) Kernel size
3) Padding
4) Stride

Other Considerations

1) Learning rate
2) Momentum parameters
3) Addition of noise

NIH Chest X-ray Dataset

30,805 unique patients



112,120 X-ray images

Random Sample of NIH Chest X-ray Dataset

5,606 images and labels

BATCH NORMALIZATION

Input: Values of x over a mini-batch: $\mathcal{B} = \{x_{1...m}\}$;
Parameters to be learned: γ, β
Output: $\{y_i = \mathrm{BN}_{\gamma,\beta}(x_i)\}$

$$\mu_{\mathcal{B}} \leftarrow \frac{1}{m}\sum_{i=1}^{m} x_i \qquad \text{// mini-batch mean}$$

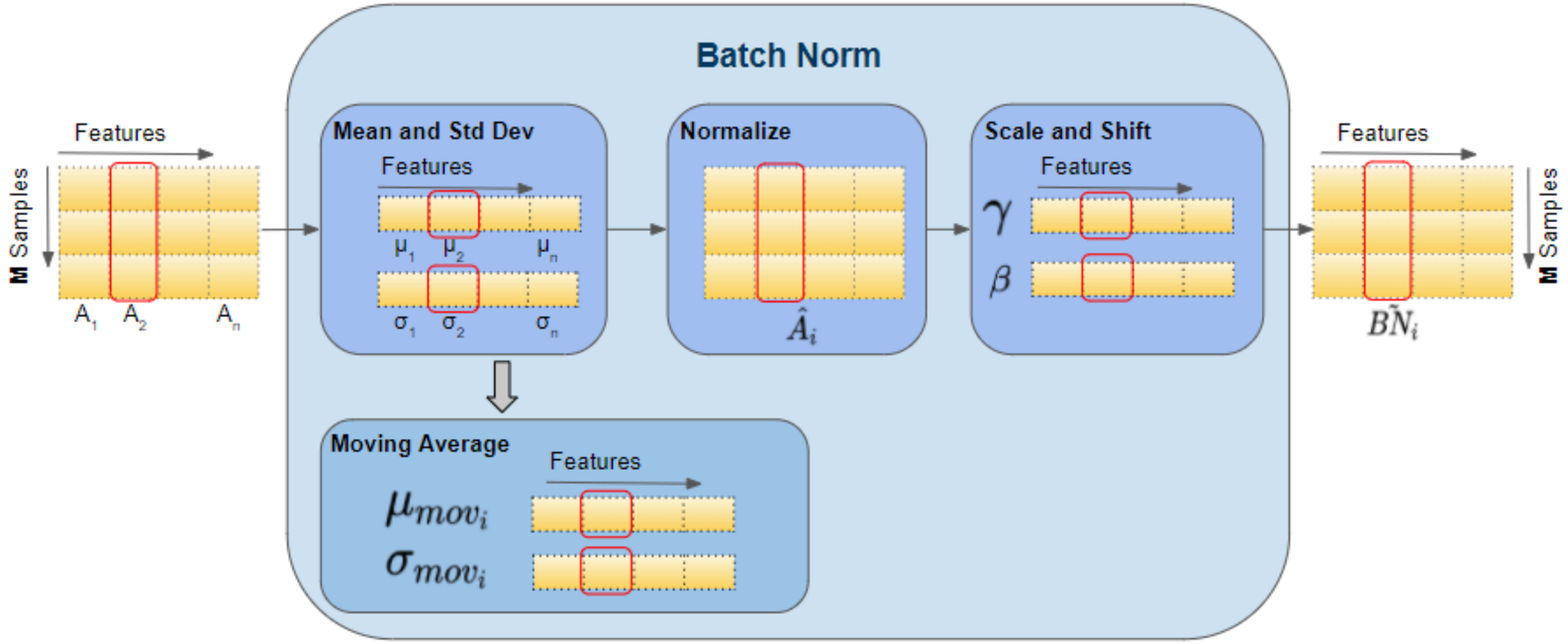
$$\sigma^2_{\mathcal{B}} \leftarrow \frac{1}{m}\sum_{i=1}^{m}(x_i - \mu_{\mathcal{B}})^2 \qquad \text{// mini-batch variance}$$

$$\widehat{x}_i \leftarrow \frac{x_i - \mu_{\mathcal{B}}}{\sqrt{\sigma^2_{\mathcal{B}} + \epsilon}} \qquad \text{// normalize}$$

$$y_i \leftarrow \gamma\widehat{x}_i + \beta \equiv \mathrm{BN}_{\gamma,\beta}(x_i) \qquad \text{// scale and shift}$$

Algorithm 1: Batch Normalizing Transform, applied to activation x over a mini-batch.

BATCH NORMALIZATION



Any questions?