Table 1 Cross Validation of dataset

K-Fold	Dataset	
	Negative	Positive
1	1-111	1-360
2	112-222	361-720
3	223-333	721-1080
4	334-444	1801-1440
5	445-555	1441-1800
6	556-666	1801-2160
7	667-777	2161-2520
8	778-888	2521-2880
9	889-999	2881-3240
10	1000-1110	3241-3600

For K1in pneumonia dataset, we removed 1-111 negative samples and 1-360 positive samples as validation dataset while from 112-1110 negative samples and 361 to 3600 positive samples make up the training dataset. We repeated same process for K2 up to K10.

CODE

TRAINING

```
>> imds = imageDatastore('training', ...

    'IncludeSubfolders',true, ...

    'LabelSource','foldernames');

>> [imdsTrain,imdsValidation] = splitEachLabel(imds,0.7,'randomized');

>> numTrainImages = numel(imdsTrain.Labels);

>> net = alexnet;

>> net.Layers
>> inputSize = net.Layers(1).InputSize
>> layersTransfer = net.Layers(1:end-3);
>> numClasses = numel(categories(imdsTrain.Labels))
>> layers = [
    layersTransfer
    fullyConnectedLayer(numClasses,'WeightLearnRateFactor',20,'BiasLearnRateFactor',20)
    softmaxLayer
    classificationLayer];
>> pixelRange = [-30 30];
imageAugmenter = imageDataAugmenter( ...
    'RandXReflection',true, ...
    'RandXTranslation',pixelRange, ...
    'RandYTranslation',pixelRange);
augimdsTrain = augmentedImageDatastore(inputSize(1:2),imdsTrain, ...
    'DataAugmentation',imageAugmenter);
>> augimdsValidation = augmentedImageDatastore(inputSize(1:2),imdsValidation);
>> options = trainingOptions('sgdm', ...
    'MiniBatchSize',10, ...
    'MaxEpochs',20, ...
    'InitialLearnRate',1e-4, ...
    'ValidationData',augimdsValidation, ...
    'ValidationFrequency',3, ...
    'ValidationPatience',Inf, ...
```

```
   'Verbose',true, ...
   'Plots','training-progress');
>> netTransfer = trainNetwork(augimdsTrain,layers,options);
```

VALIDATION

```
>> [YPred,scores] = classify(netTransfer,augimdsValidation);
>> YValidation = imdsValidation.Labels;
>> accuracy = mean(YPred == YValidation)
```

Specificity and Sensitivity

```
>> y = grp2idx(YValidation);
>> test = grp2idx(YPred);
>> classperf(y,test)
```

TESTING

```
>> imdsTest = imageDatastore('Testing', ...
'IncludeSubfolders',true, ...
'LabelSource','foldernames');
>> [YPred,scores] = classify(netTransfer,imdsTest);
>> YValidation = imdsTest.Labels;
>> accuracy = mean(YPred == YValidation)
```