# Semi-Conductor Image Classification

## Project 2

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# Outline

- **Dataset — Nexperia**
- **Imbalanced Problem**
- **Features Extraction**

  Common NNs — ResNet18, ResNet50

  Stratified Convolution

  Designed Resnet

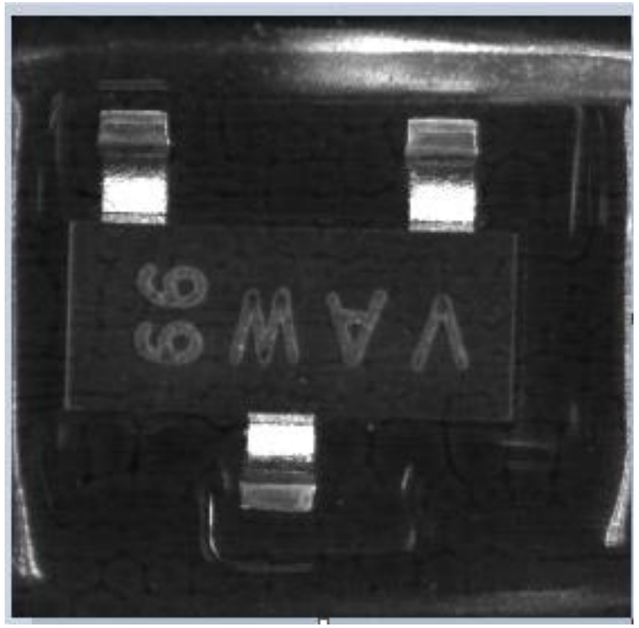
  Model Parameters

- **Visualization**

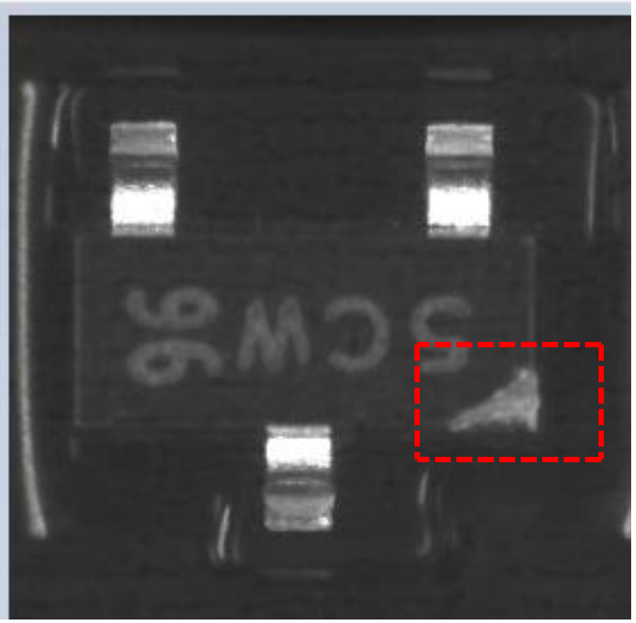
# Dataset — Nexperia

**Dim**: 1 (channel) x 267 (pixel)x 275 (pixel)

**Labels:** 0, 1

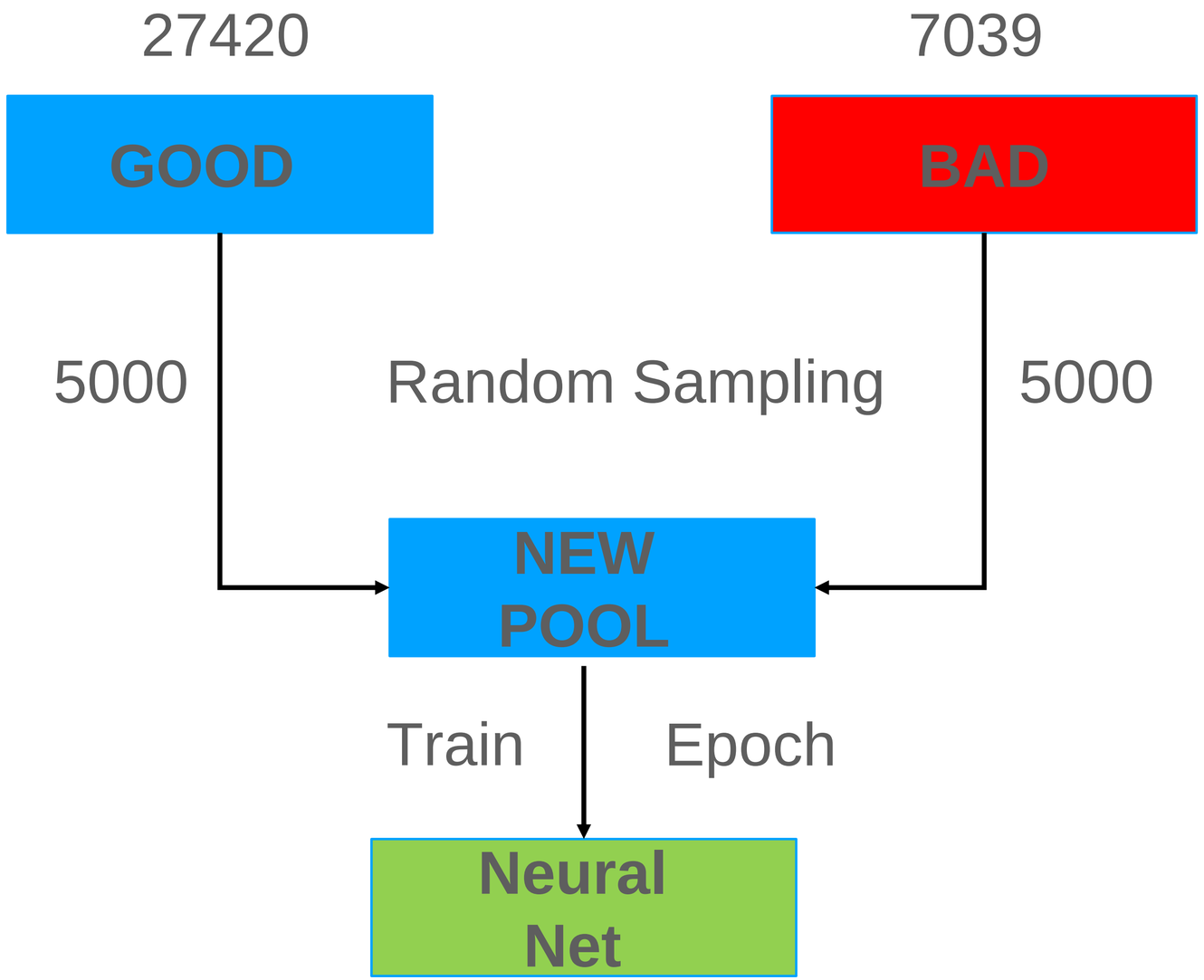


Good(0)

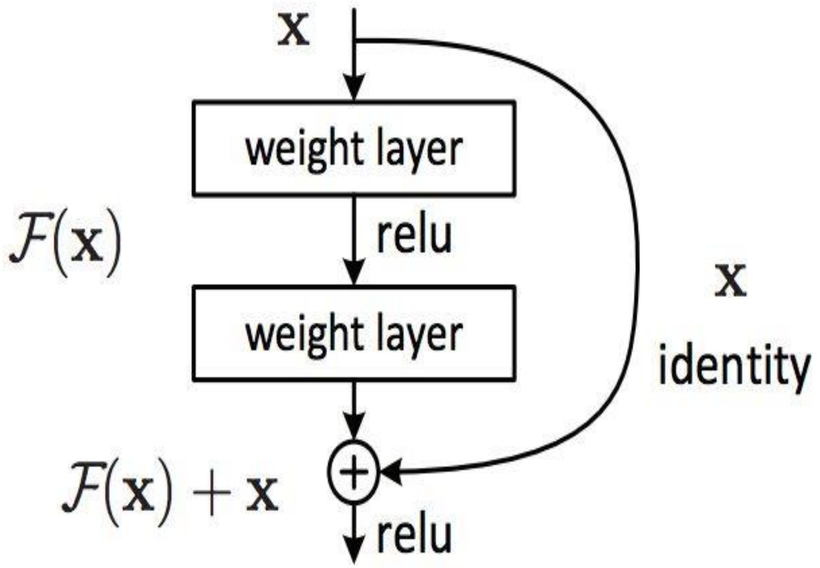


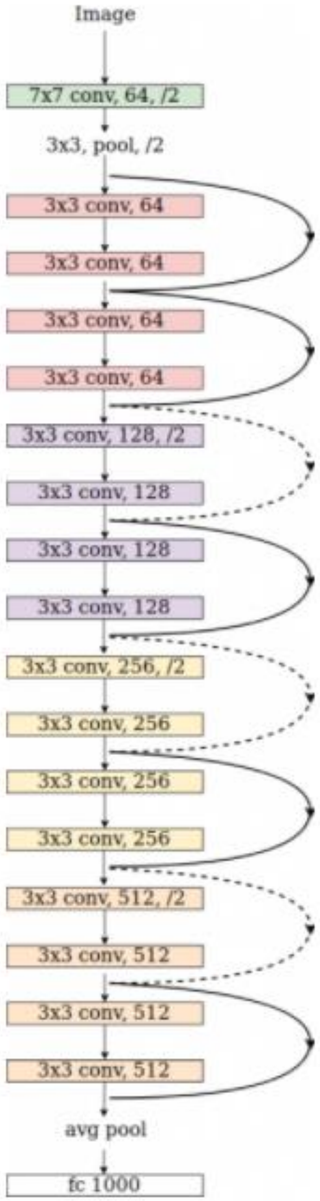
Bad(1)

# Imbalanced Problem-Boostrapping



# Common models(Resnet-18)

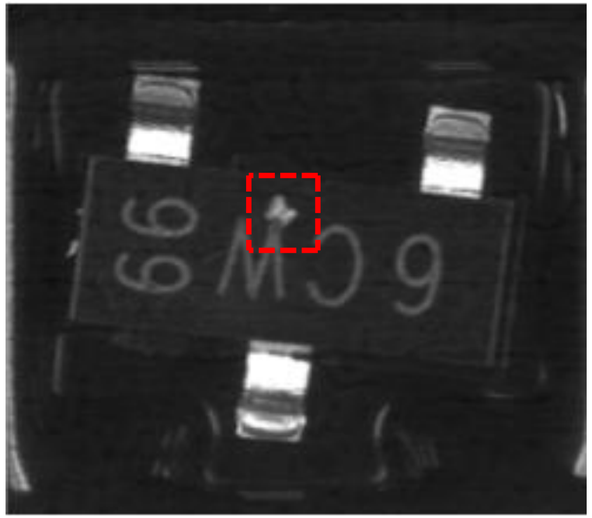


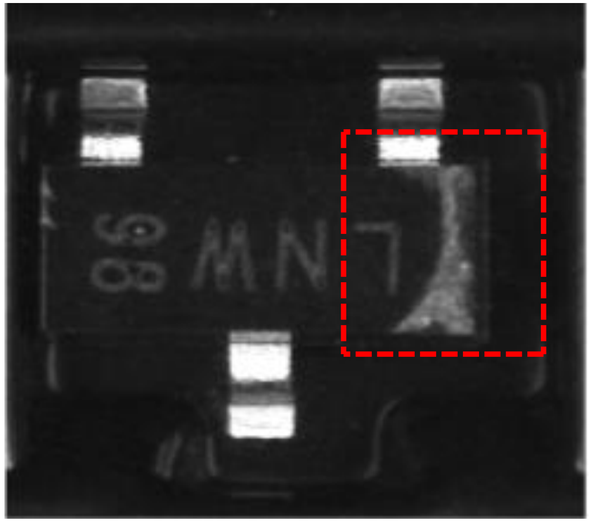



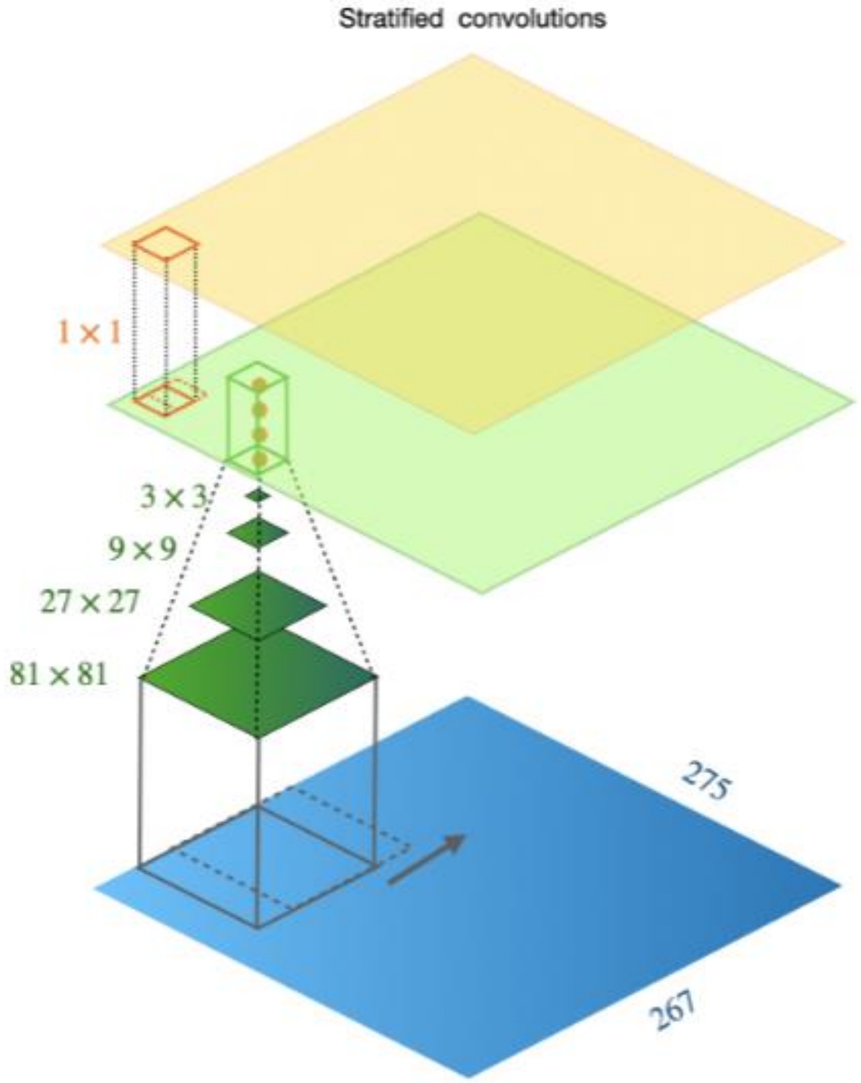

Resnet-18 Architecture.

| layer name | output size | 18-layer |
|---|---|---|
| conv1 | 112×112 | |
| conv2_x | 56×56 | $\begin{bmatrix} 3\times3, 64 \\ 3\times3, 64 \end{bmatrix}\times2$ |
| conv3_x | 28×28 | $\begin{bmatrix} 3\times3, 128 \\ 3\times3, 128 \end{bmatrix}\times2$ |
| conv4_x | 14×14 | $\begin{bmatrix} 3\times3, 256 \\ 3\times3, 256 \end{bmatrix}\times2$ |
| conv5_x | 7×7 | $\begin{bmatrix} 3\times3, 512 \\ 3\times3, 512 \end{bmatrix}\times2$ |
| | 1×1 | |

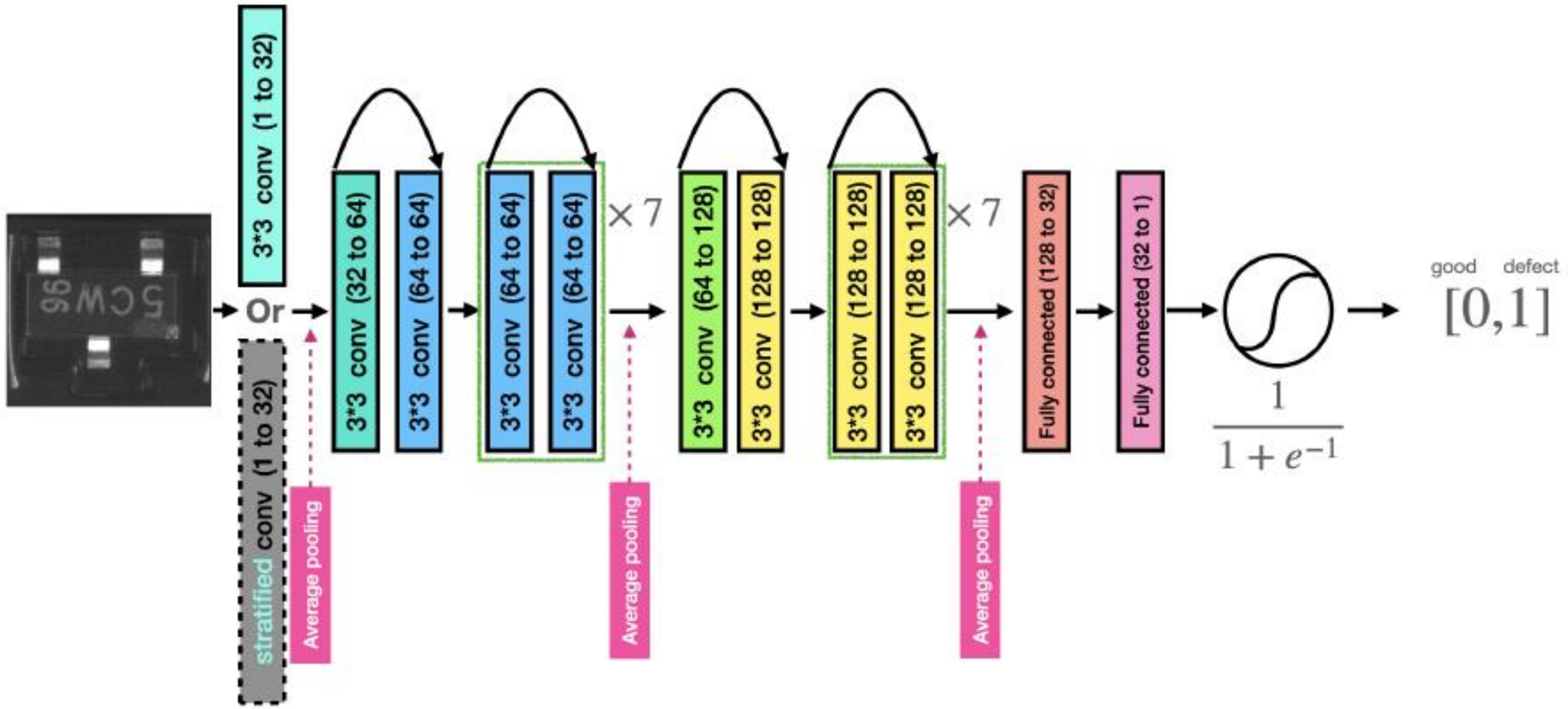
# Stratified Convolution





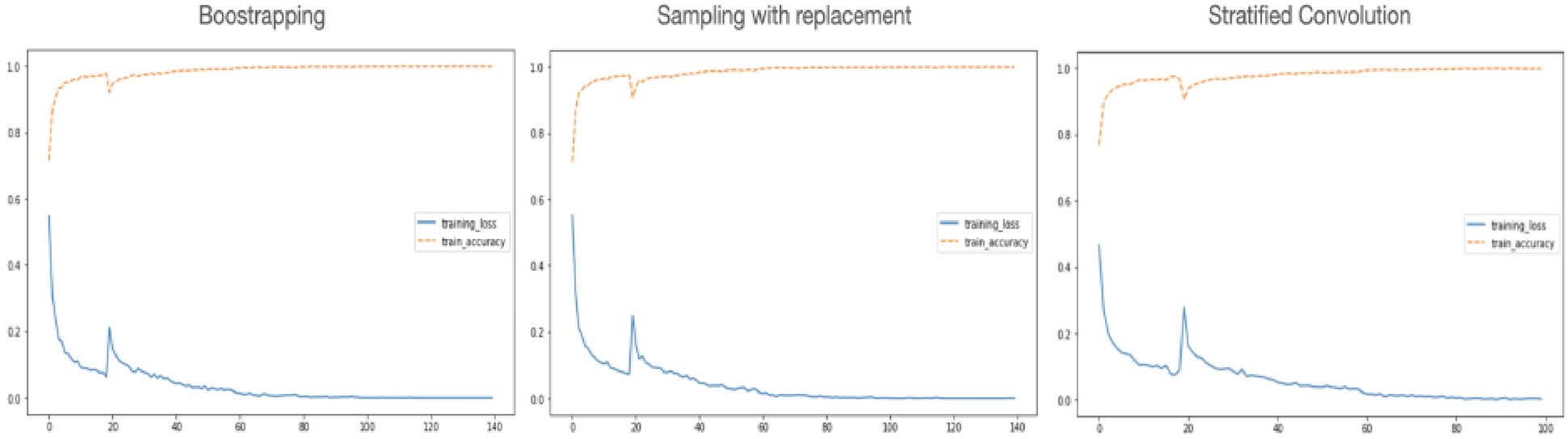


# Designed Resnet




Architecture

# Training




# Results

‘B’ for Boostrapping ‘S’ for sampling without replacement

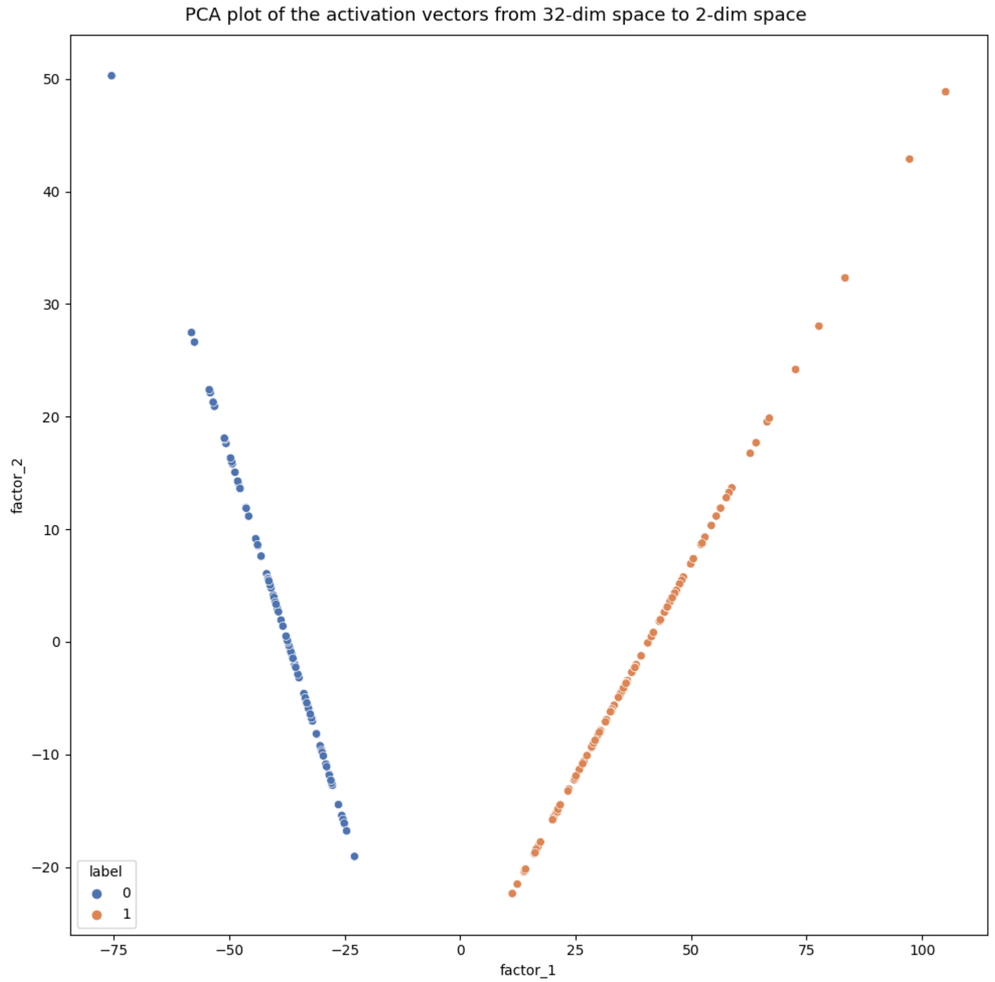
| Models | parameters | AUC on Leaderboard |
|---|---|---|
| ResNet18-B | 11,177,025 | 0.99587 |
| Normal-2000B | 2,878,241 | 0.99631 |
| Normal-7000B | 2,878,241 | 0.99710 |
| Normal-5000S | 2,878,241 | 0.99696 |
| Normal-5000B | 2,878,241 | 0.99779 |
| Stratified-5000B | 3,118,497 | **0.99830** |

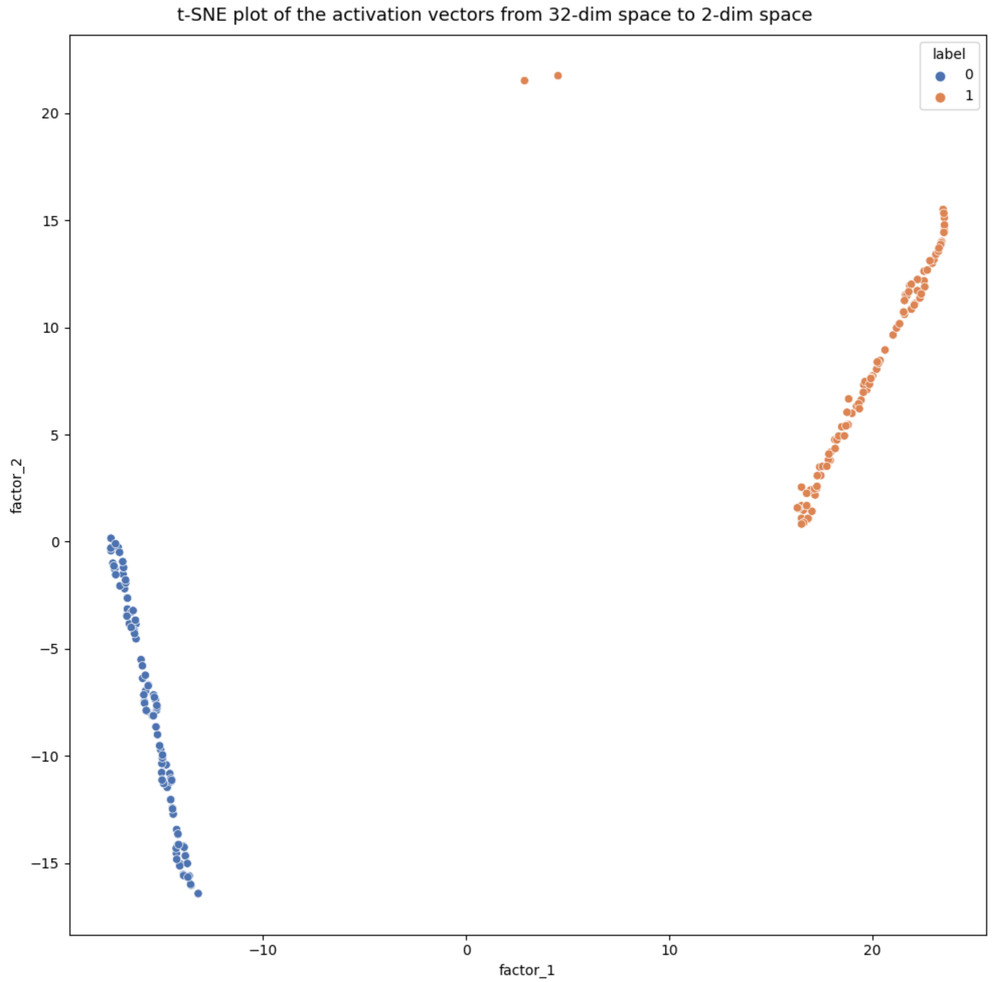
# Model Parameters

| Model | Parameters | AUC |
|---|---|---|
| Resnet18 | $11\times10^6$ | 0.9958 |
| Resnet50 | 25.5×106 | OUT OF MEMORY STORAGE BASE ON SINGLE GPU |
| Designed Resnet | $2.87\times10^6$ | 0.9978 |
| Stratified Convolution | 3.11×106 | 0.9983 |

# Visualization

**activation vectors** 32-dim, viewed by PCA and t-SNE



# Thank you !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