



Machine Learning

Convolutud Neural Network (CNN)

and CIFAR10



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Data

- CIFAR10 圖片
- 圖片資料組成
- 資料分組

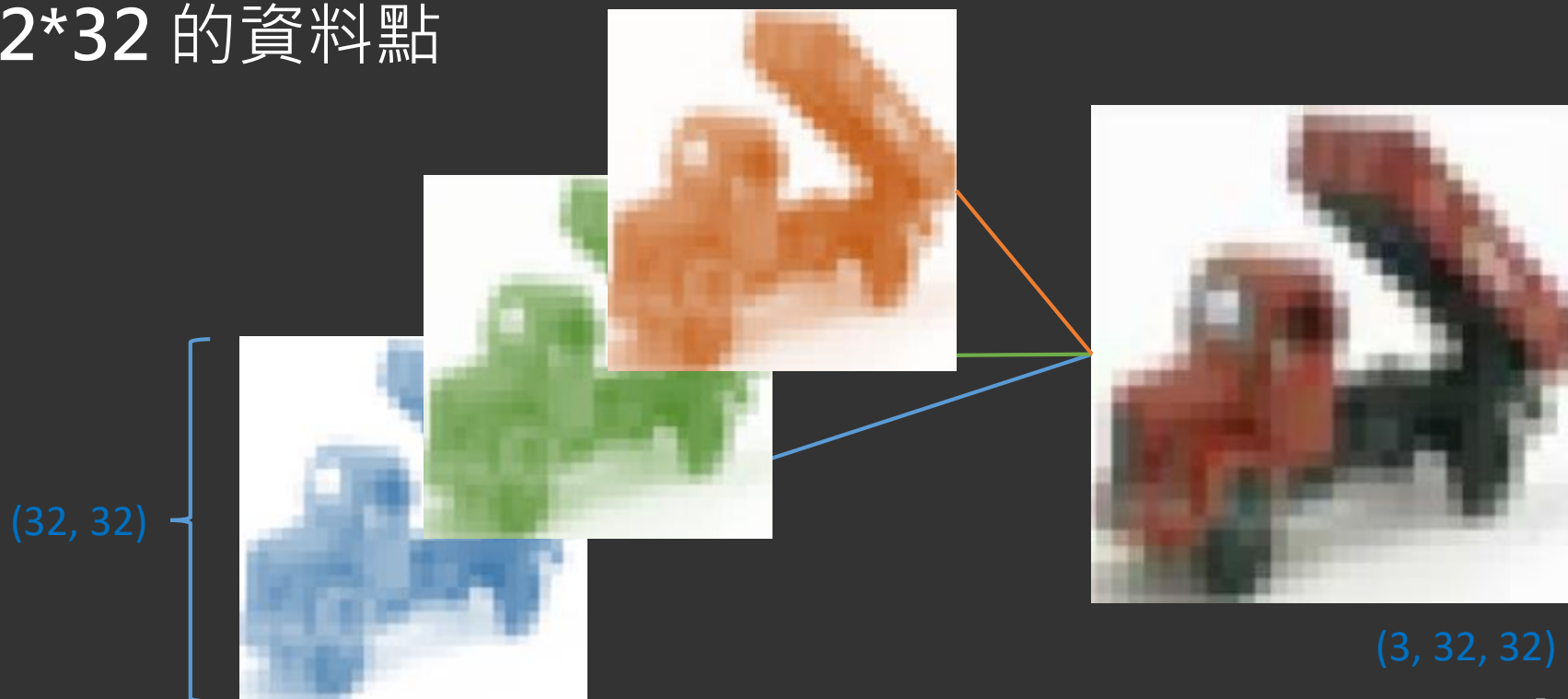
CIFAR10 圖片

- 來源：torchvision.datasets.CIFAR10
- 數量：共60000張圖片
- 種類：10 類群



圖片資料組成

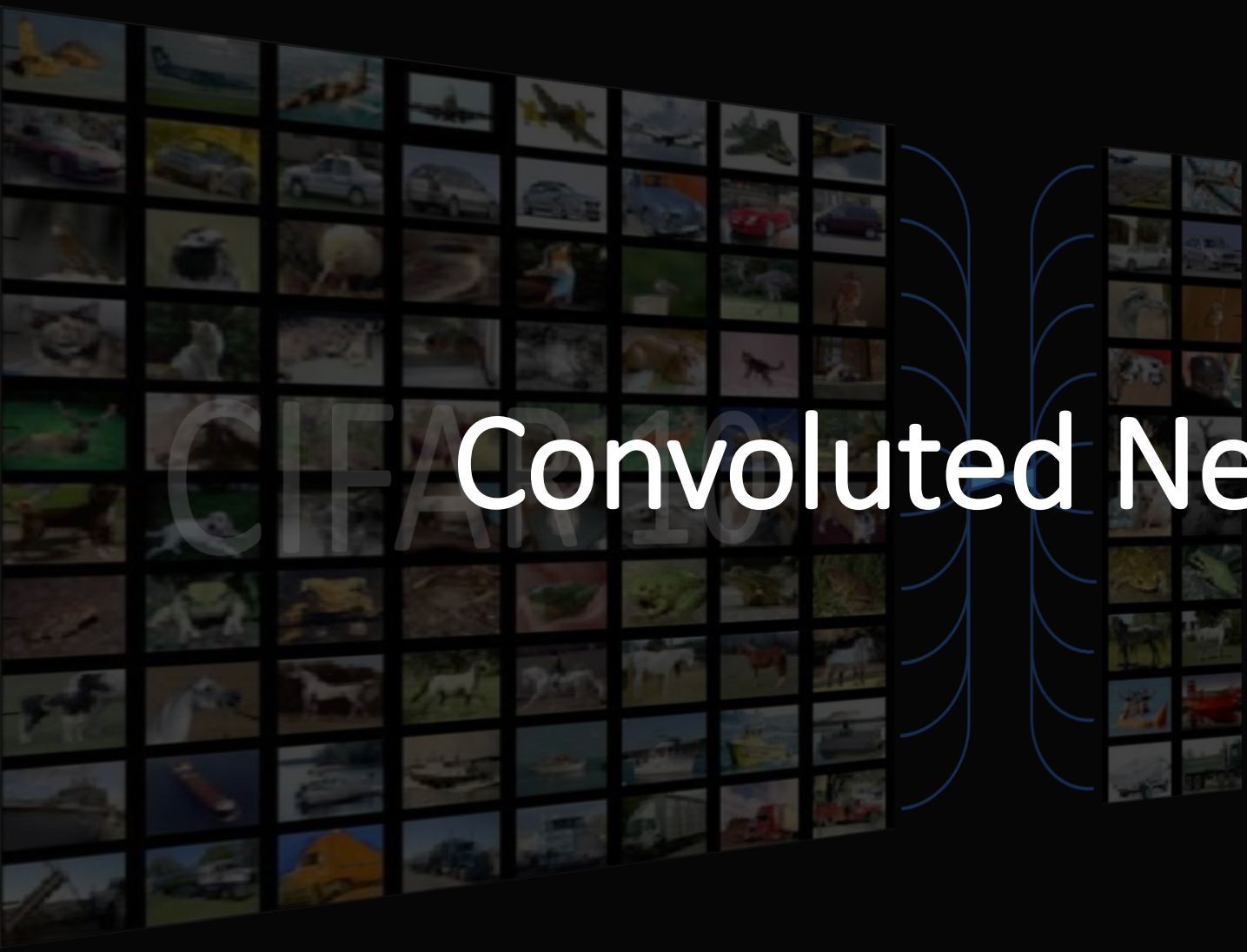
- 每張全彩圖片有一個分類標籤
- 全彩圖片由紅、藍、綠三張單色圖片組成。
- 單色圖片有 $32*32$ 的資料點



資料分組

- Training set : 50000張
- Testing set : 10000張



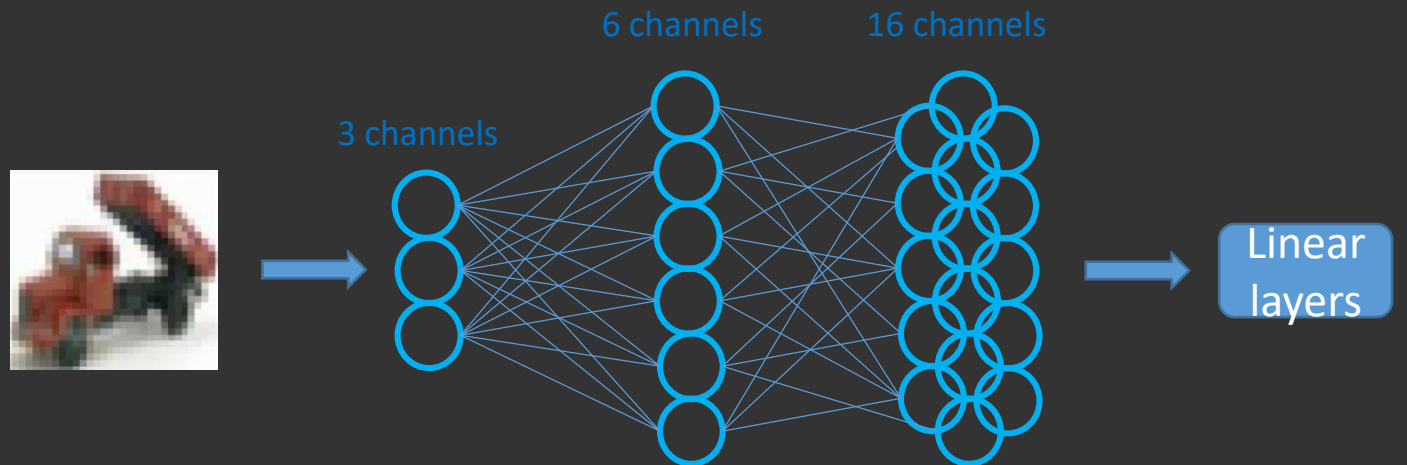


Convolutional Neural Network Model 1

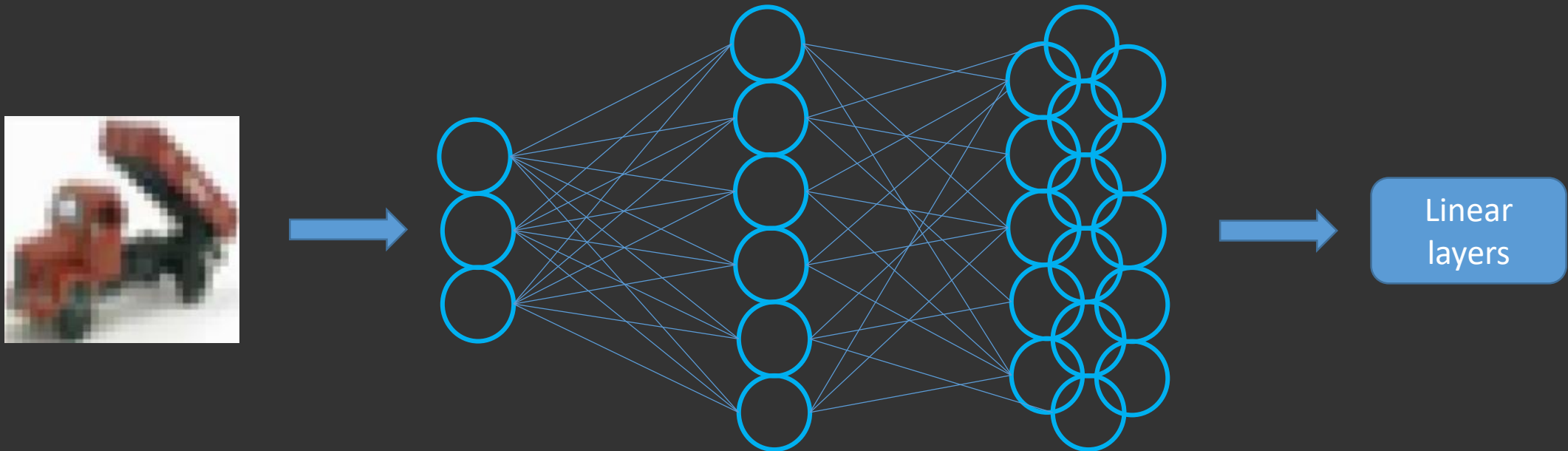
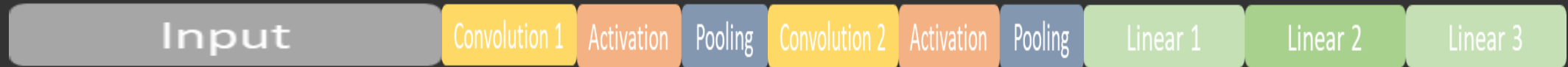
- Layers of Model 1
- Convolutional Net 1
- Parameters

Layers of Model 1

- Convolution : 2 layers
- Activation function : ReLU function
- Pooling : MaxPool
- Linear : Linear + ReLU, 3 Layers



Convolution Net 1



Parameters

- Epochs : 100 (將Training set 完整訓練100次)
- Batch : 4 / per batch (4張照片為一組)
- Learning rate : 0.001 (學習速率)





Training Results 1

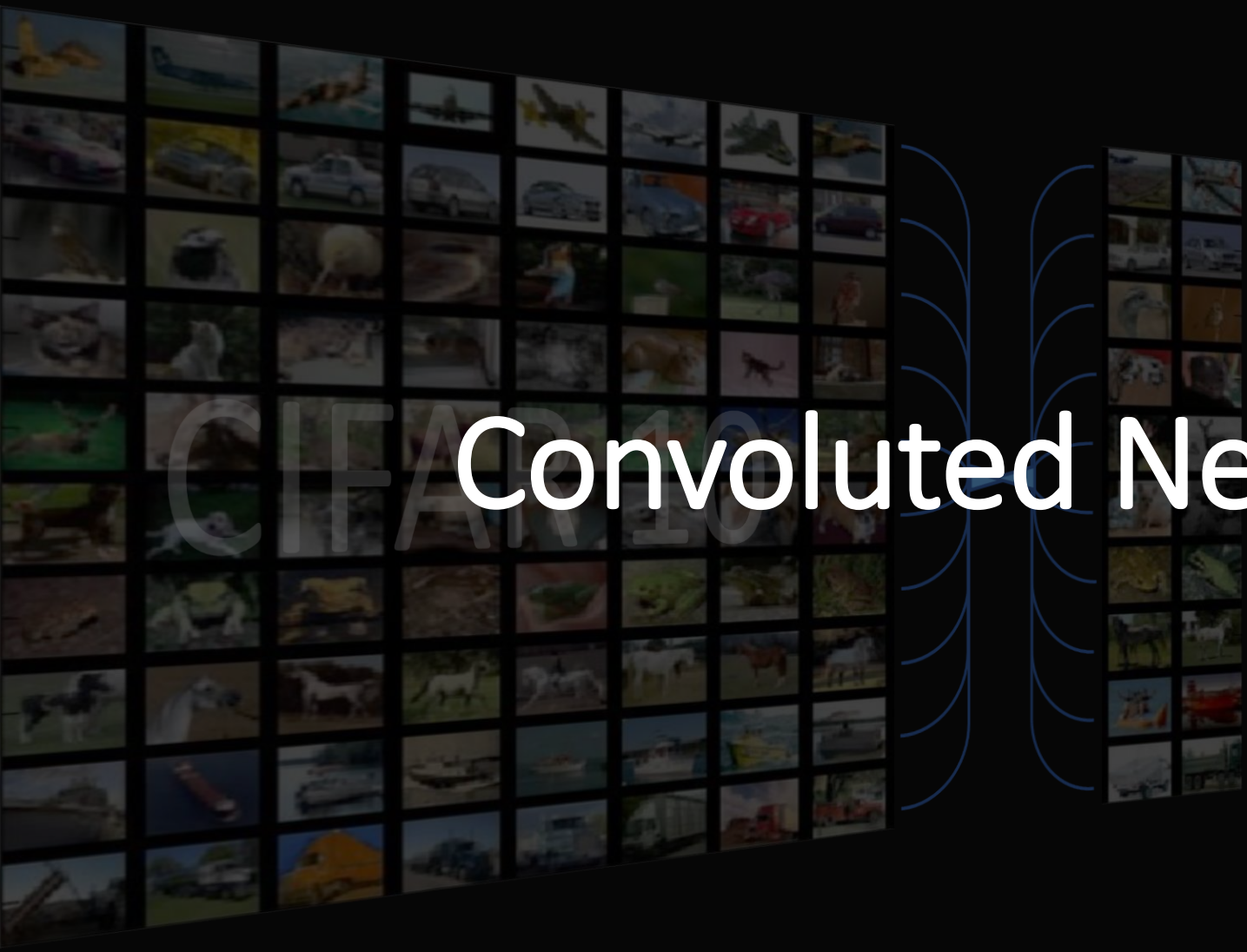
Result of Model 1

- Accuracy of the model :

Accuracy of the network: 60.59 %

- Accuracy of each class :

Accuracy of plane: 62.5 %
Accuracy of car: 77.6 %
Accuracy of bird: 42.8 %
Accuracy of cat: 44.6 %
Accuracy of deer: 56.1 %
Accuracy of dog: 56.6 %
Accuracy of frog: 63.3 %
Accuracy of horse: 63.4 %
Accuracy of ship: 74.8 %
Accuracy of truck: 64.2 %

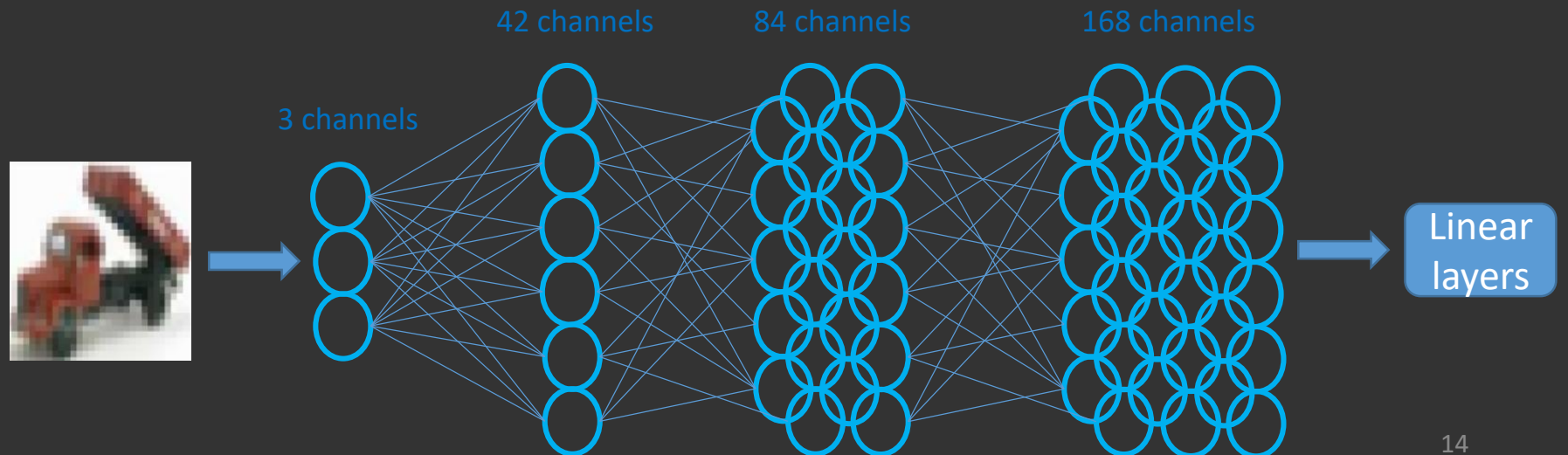


Convolutional Neural Network Model 2

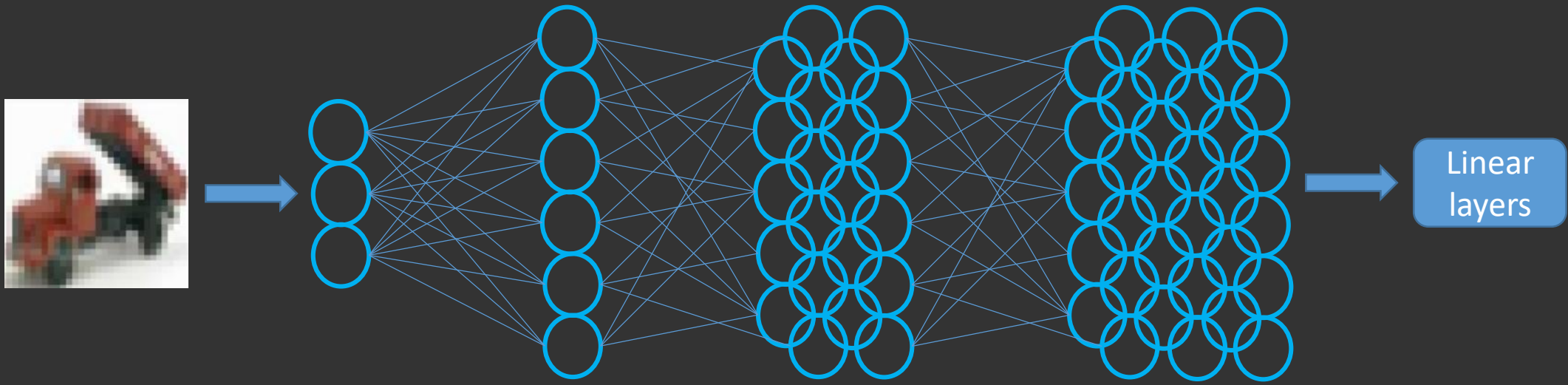
- Layers of Model 2
- Convolutional Net 2
- Parameters

Layers of Model 2

- Convolution : 3 layers
- Activation function : ReLU function
- Pooling : MaxPool
- Linear : Linear function, 4 Layers



Convolution Net 2



Parameters

- Epochs : 100 (將Training set 完整訓練100次)
- Batch : 4 / per batch (4張照片為一組)
- Learning rate : 0.001 (學習速率)



* 100 Epochs



Training Results 2

Result of Model 2

- Accuracy of the model :

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Accuracy of the network: 73.12 %
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- Accuracy of each class :

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Accuracy of plane: 78.3 %  
Accuracy of car: 83.3 %  
Accuracy of bird: 62.8 %  
Accuracy of cat: 58.9 %  
Accuracy of deer: 67.7 %  
Accuracy of dog: 62.9 %  
Accuracy of frog: 79.3 %  
Accuracy of horse: 75.0 %  
Accuracy of ship: 81.8 %  
Accuracy of truck: 81.2 %
```

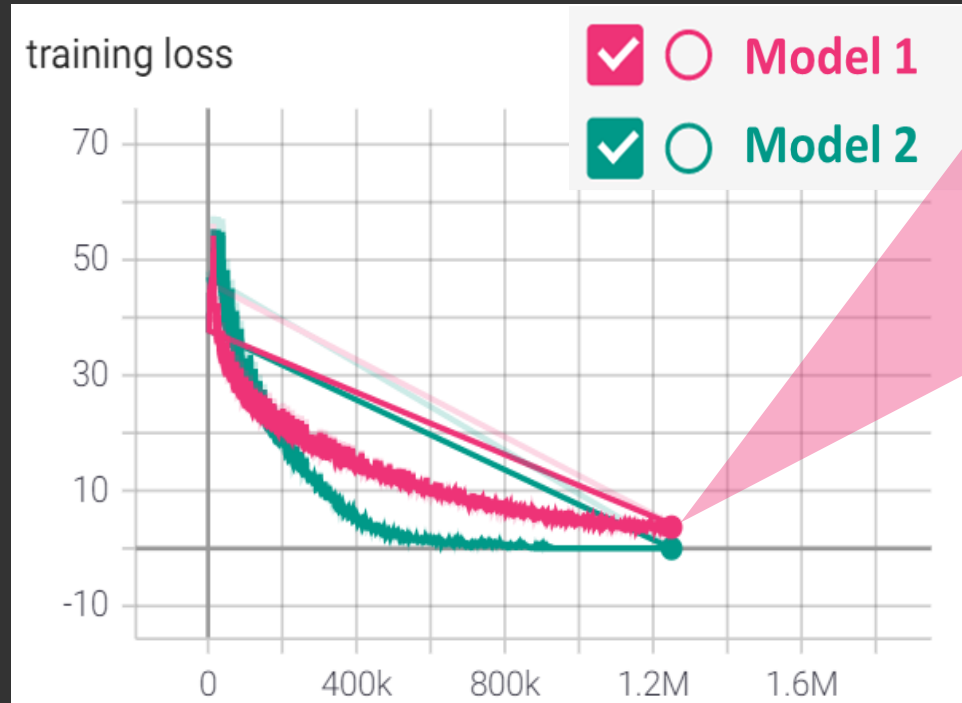



Model Optimization

History of Loss

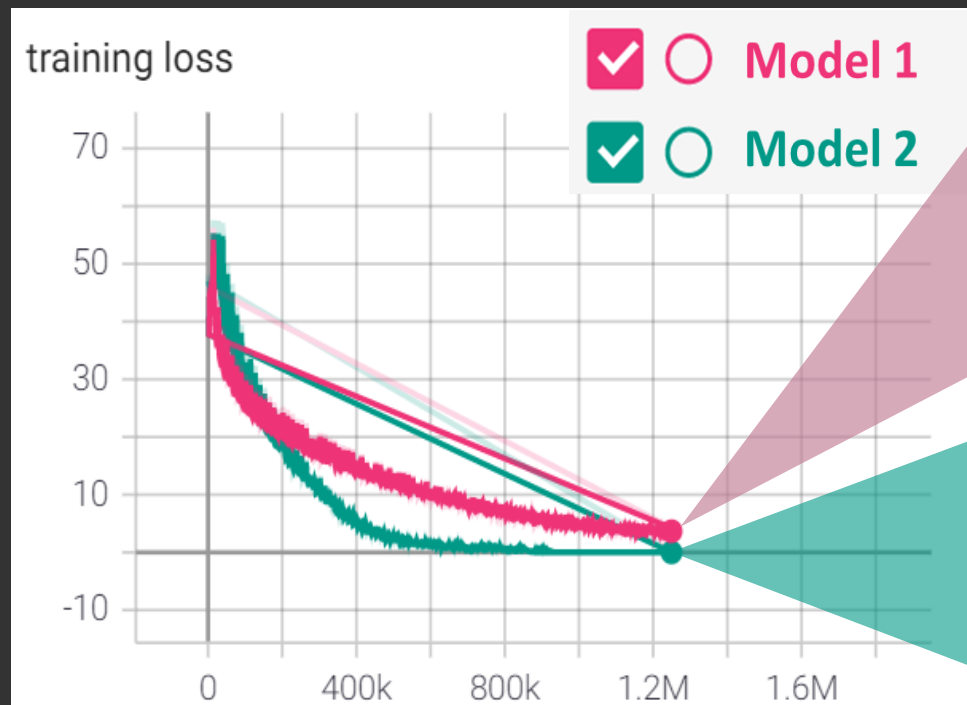


History of Loss



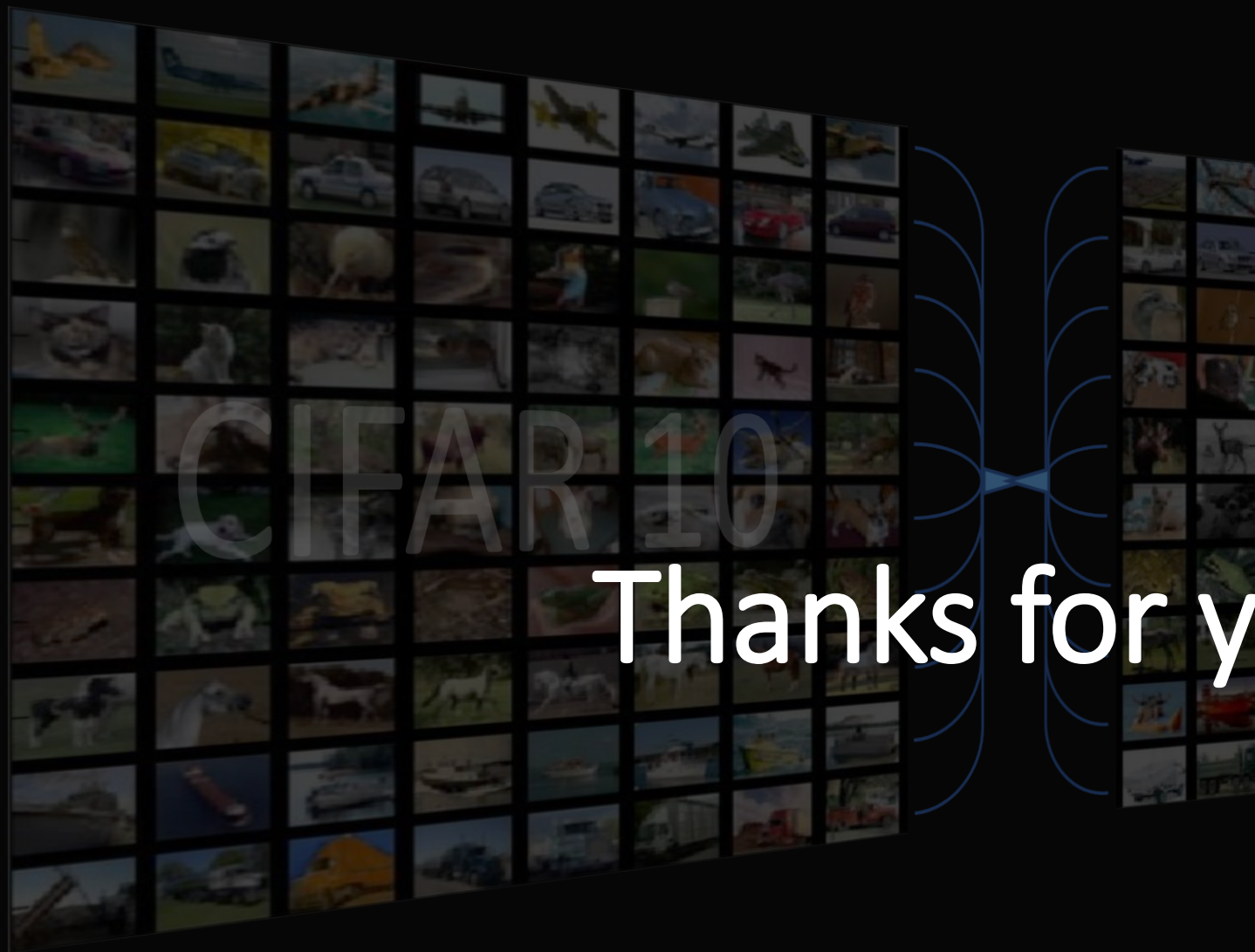
Epoch [100/100], Step [2000/12500], Loss: 0.0051
Epoch [100/100], Step [4000/12500], Loss: 0.0037
Epoch [100/100], Step [6000/12500], Loss: 0.0096
Epoch [100/100], Step [8000/12500], Loss: 1.3091
Epoch [100/100], Step [10000/12500], Loss: 0.0298
Epoch [100/100], Step [12000/12500], Loss: 0.1472

History of Loss



Epoch [100/100], Step [2000/12500], Loss: 0.0051
Epoch [100/100], Step [4000/12500], Loss: 0.0037
Epoch [100/100], Step [6000/12500], Loss: 0.0096
Epoch [100/100], Step [8000/12500], Loss: 1.3091
Epoch [100/100], Step [10000/12500], Loss: 0.0298
Epoch [100/100], Step [12000/12500], Loss: 0.1472

Epoch [100/100], Step [2000/12500], Loss: 0.0001
Epoch [100/100], Step [4000/12500], Loss: 0.0000
Epoch [100/100], Step [6000/12500], Loss: 0.0002
Epoch [100/100], Step [8000/12500], Loss: 0.0000
Epoch [100/100], Step [10000/12500], Loss: 0.0000
Epoch [100/100], Step [12000/12500], Loss: 0.0000



Thanks for your Attention