Gunshot Sound Detection

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T5 Bootcamp

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SCOPE OF THE PROJECT:

Construct and train a deep Convolutional Neural Network (CNN) detection and classification system focused on recognizing and isolating sounds of gunshot among 9 different other ambient environmental sounds.

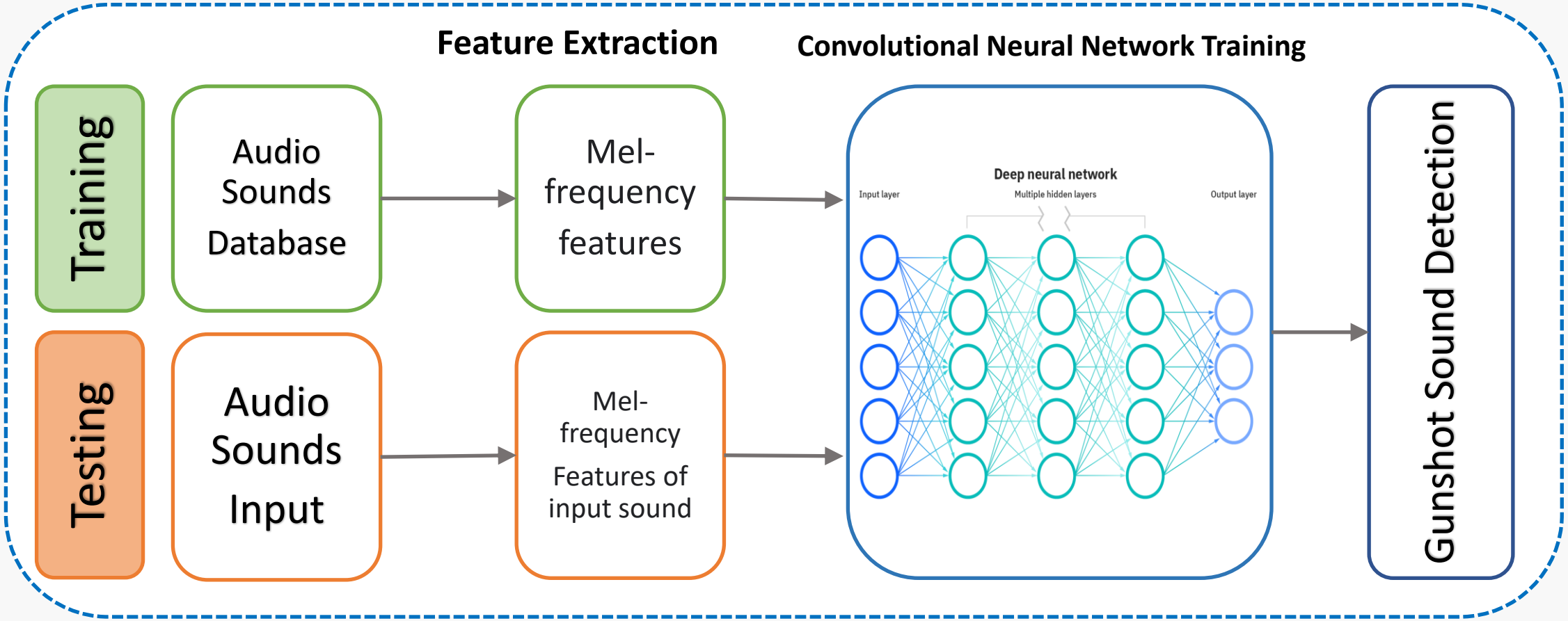
Audio Dataset

UrbanSound8K

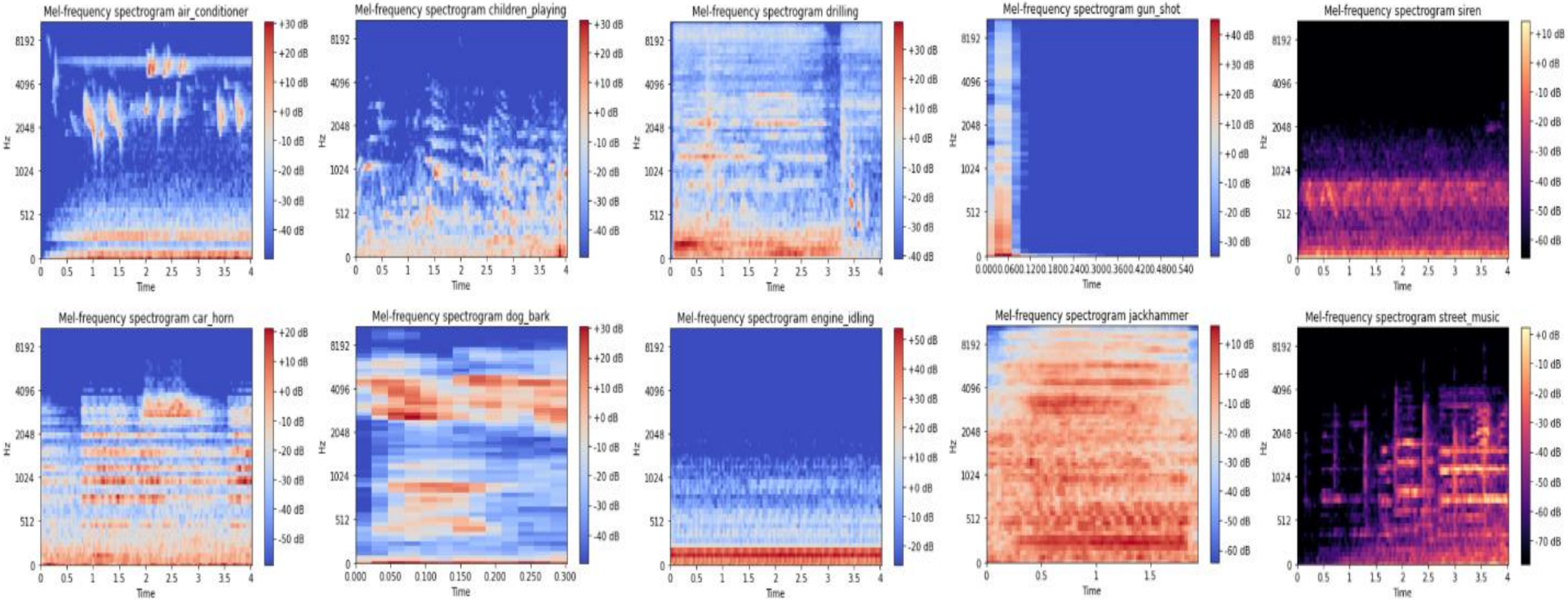
8,732 labelled sound clips

Ten files sort into 10 folds

Proposed Scheme



Feature Extraction

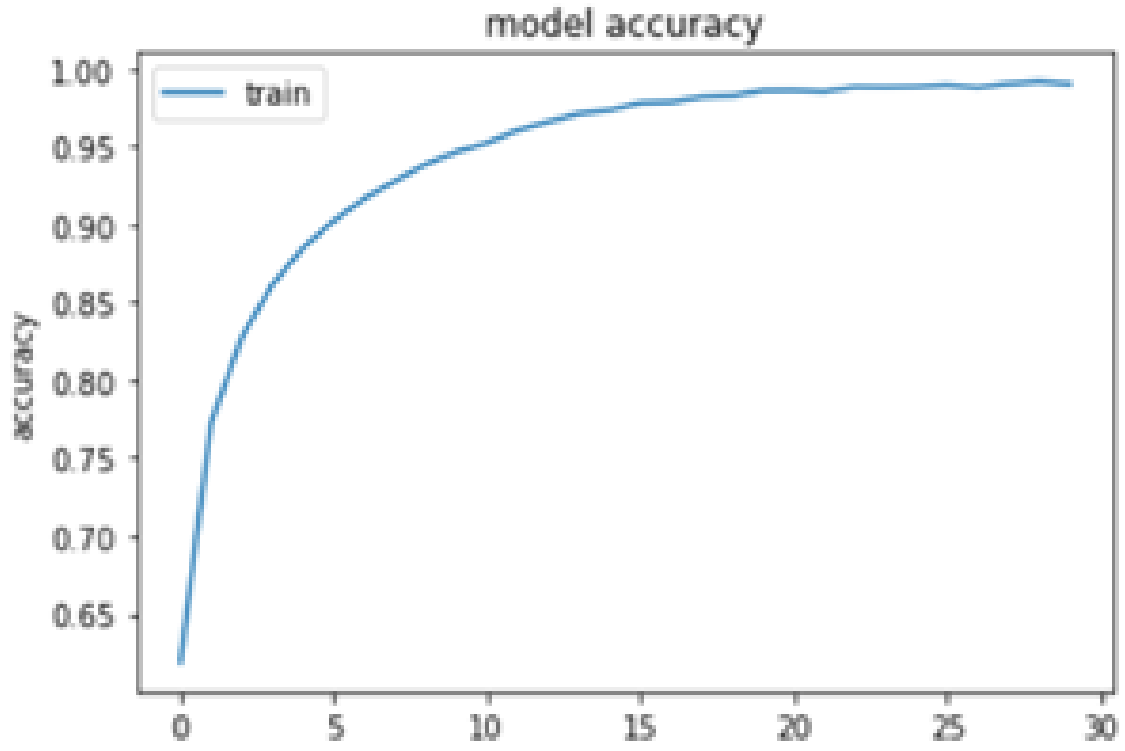


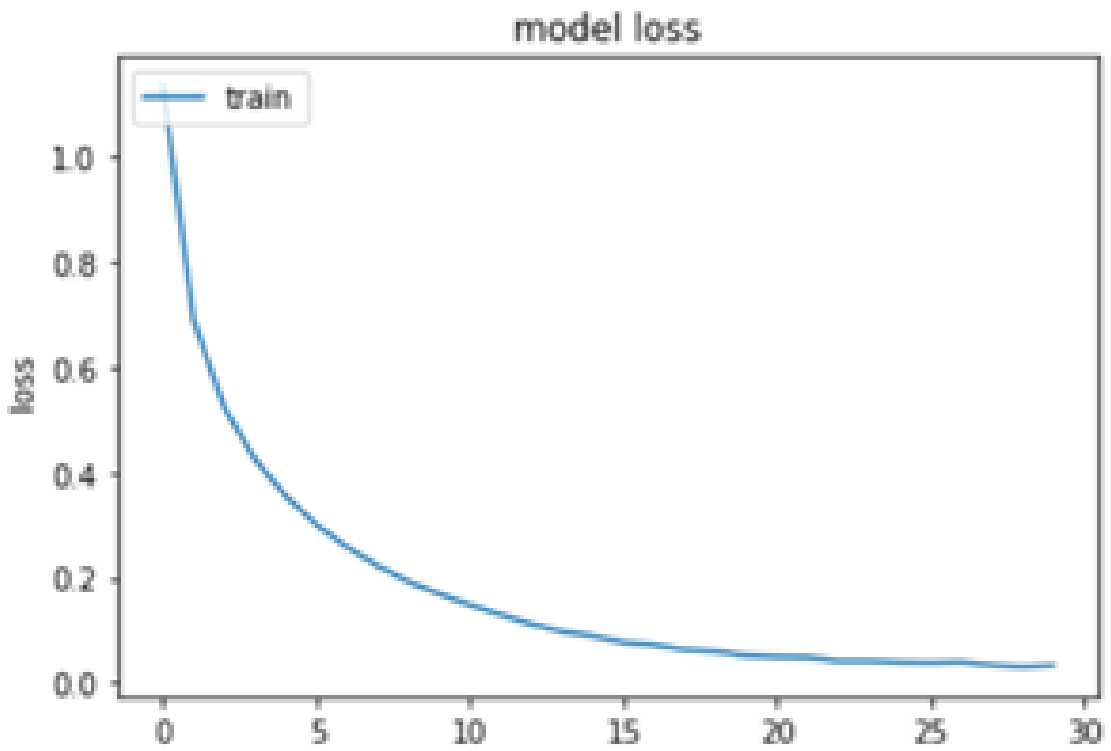
The Convolutional Neural Network Layers

```
cnn_model = keras.models.Sequential()
cnn_model.add(keras.layers.Conv2D(24, sizeofkernel, padding="same", input_shape=input_sha
cnn_model.add(keras.layers.BatchNormalization())
cnn_model.add(keras.layers.Activation("relu"))
cnn_model.add(keras.layers.MaxPooling2D(pool_size=pool_size))

cnn_model.add(keras.layers.Conv2D(32, sizeofkernel,padding="same"))
cnn_model.add(keras.layers.BatchNormalization())
cnn_model.add(keras.layers.Activation("relu"))
cnn_model.add(keras.layers.MaxPooling2D(pool_size=pool_size))

cnn_model.add(keras.layers.Conv2D(64, sizeofkernel, padding="same"))
cnn_model.add(keras.layers.BatchNormalization())
cnn_model.add(keras.layers.Activation("relu"))
cnn_model.add(keras.layers.MaxPooling2D(pool_size=pool_size))

cnn_model.add(keras.layers.Conv2D(128, sizeofkernel, padding="same"))
cnn_model.add(keras.layers.BatchNormalization())
cnn_model.add(keras.layers.Activation("relu"))

cnn_model.add(keras.layers.GlobalMaxPooling2D())
cnn_model.add(keras.layers.Dense(128, activation="relu"))
cnn_model.add(keras.layers.Dense(total_classes, activation="softmax"))
```

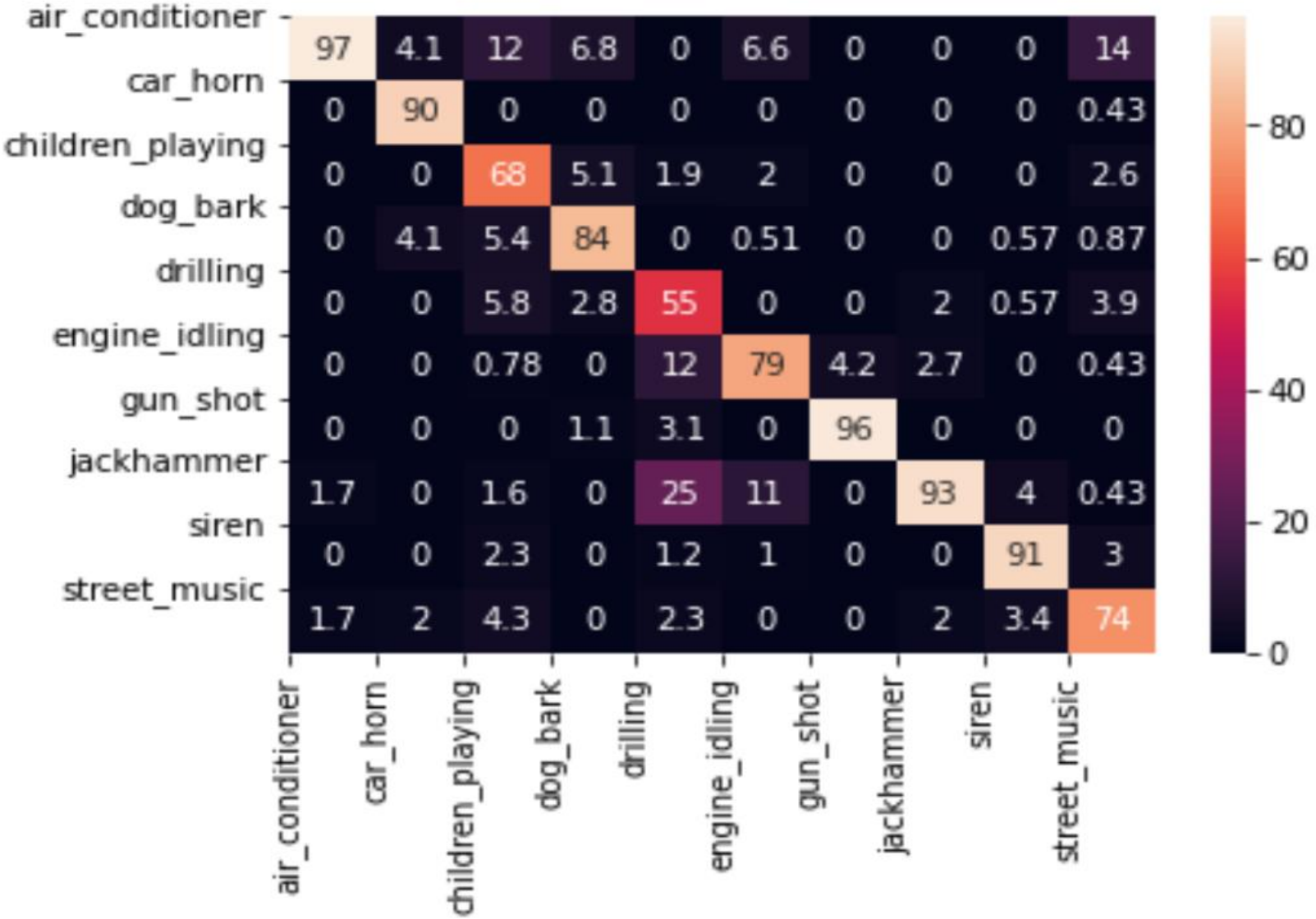
- Four convolutional layers
- Every convolutional layer followed by:
- batch normalization
- Activation-relu.
- Max-pooling layer.
- In the end, soft max layer added to calculate the probabilities of Audio classes/categories

Model Accuracy & Loss





Confusion Matrix



Results

Overall-Score of Model	Percentage
Accuracy	0.78
F1-Score	0.80
Precision	0.82
Recall	0.80

Future Work

- Combining the gunfire action with gunshot sound detection system.
- 3D location of Southern border of KSA would be fit to the model.
- Use acoustic sensing technology to identify the location of the gunshot and send alarm to mentoring networks.

THANK YOU