# Inference Module Architecture for AD-CNN and FD-CNN

## Target Size: 8

|  |  |
| --- | --- |
| Layer Type | Parameters / Details |
| Conv1d | In: 1 channel, Out: 32 filters, Kernel Size = 4, Stride = 1, Padding = 0 |
| BatchNorm1d | 32 channels |
| Activation | LeakyReLU |
| MaxPool1d | Kernel Size = 2, Stride = 2, Padding = 0 |
| Flatten | Starting from dimension 1 |
| Linear | In Features = 64, Out Features = 1 |

## Target Size: 16

|  |  |
| --- | --- |
| Layer Type | Parameters / Details |
| Conv1d | In: 1 channel, Out: 32 filters, Kernel Size = 4, Stride = 1, Padding = 0 |
| BatchNorm1d | 32 channels |
| Activation | LeakyReLU |
| MaxPool1d | Kernel Size = 2, Stride = 2, Padding = 0 |
| Conv1d | In: 32 channels, Out: 64 filters, Kernel Size = 2, Stride = 1, Padding = 0 |
| BatchNorm1d | 64 channels |
| Activation | LeakyReLU |
| MaxPool1d | Kernel Size = 2, Stride = 2, Padding = 0 |
| Flatten | Starting from dimension 1 |
| Linear | In Features = 128, Out Features = 1 |

## Target Size: 32

|  |  |
| --- | --- |
| Layer Type | Parameters / Details |
| Conv1d | In: 1 channel, Out: 32 filters, Kernel Size = 8, Stride = 1, Padding = 0 |
| BatchNorm1d | 32 channels |
| Activation | LeakyReLU |
| MaxPool1d | Kernel Size = 4, Stride = 4, Padding = 0 |
| Conv1d | In: 32 channels, Out: 64 filters, Kernel Size = 2, Stride = 1, Padding = 0 |
| BatchNorm1d | 64 channels |
| Activation | LeakyReLU |
| MaxPool1d | Kernel Size = 2, Stride = 2, Padding = 0 |
| Flatten | Starting from dimension 1 |
| Linear | In Features = 128, Out Features = 1 |

## Target Size: 64

|  |  |
| --- | --- |
| Layer Type | Parameters / Details |
| Conv1d | In: 1 channel, Out: 32 filters, Kernel Size = 8, Stride = 1, Padding = 0 |
| BatchNorm1d | 32 channels |
| Activation | LeakyReLU |
| MaxPool1d | Kernel Size = 4, Stride = 4, Padding = 0 |
| Conv1d | In: 32 channels, Out: 64 filters, Kernel Size = 4, Stride = 1, Padding = 0 |
| BatchNorm1d | 64 channels |
| Activation | LeakyReLU |
| MaxPool1d | Kernel Size = 4, Stride = 4, Padding = 0 |
| Flatten | Starting from dimension 1 |
| Linear | In Features = 128, Out Features = 1 |

## Target Size: 128

|  |  |
| --- | --- |
| Layer Type | Parameters / Details |
| Conv1d | In: 1 channel, Out: 32 filters, Kernel Size = 16, Stride = 1, Padding = 0 |
| BatchNorm1d | 32 channels |
| Activation | LeakyReLU |
| MaxPool1d | Kernel Size = 8, Stride = 4, Padding = 0 |
| Conv1d | In: 32 channels, Out: 64 filters, Kernel Size = 8, Stride = 1, Padding = 0 |
| BatchNorm1d | 64 channels |
| Activation | LeakyReLU |
| MaxPool1d | Kernel Size = 4, Stride = 4, Padding = 0 |
| Flatten | Starting from dimension 1 |
| Linear | In Features = 320, Out Features = 64 |
| BatchNorm1d | 64 channels |
| Activation | LeakyReLU |
| Linear | In Features = 64, Out Features = 1 |

## Target Size: 256

|  |  |
| --- | --- |
| Layer Type | Parameters / Details |
| Conv1d | In: 1 channel, Out: 32 filters, Kernel Size = 16, Stride = 1, Padding = 0 |
| BatchNorm1d | 32 channels |
| Activation | LeakyReLU |
| MaxPool1d | Kernel Size = 8, Stride = 6, Padding = 0 |
| Conv1d | In: 32 channels, Out: 64 filters, Kernel Size = 8, Stride = 1, Padding = 0 |
| BatchNorm1d | 64 channels |
| Activation | LeakyReLU |
| MaxPool1d | Kernel Size = 4, Stride = 4, Padding = 0 |
| Conv1d | In: 64 channels, Out: 128 filters, Kernel Size = 4, Stride = 1, Padding = 0 |
| BatchNorm1d | 128 channels |
| Activation | LeakyReLU |
| MaxPool1d | Kernel Size = 2, Stride = 2, Padding = 0 |
| Flatten | Starting from dimension 1 |
| Linear | In Features = 256, Out Features = 1 |

## Target Size: 512

|  |  |
| --- | --- |
| Layer Type | Parameters / Details |
| Conv1d | In: 1 channel, Out: 32 filters, Kernel Size = 16, Stride = 1, Padding = 0 |
| BatchNorm1d | 32 channels |
| Activation | LeakyReLU |
| MaxPool1d | Kernel Size = 8, Stride = 8, Padding = 0 |
| Conv1d | In: 32 channels, Out: 64 filters, Kernel Size = 8, Stride = 1, Padding = 0 |
| BatchNorm1d | 64 channels |
| Activation | LeakyReLU |
| MaxPool1d | Kernel Size = 8, Stride = 8, Padding = 0 |
| Conv1d | In: 64 channels, Out: 128 filters, Kernel Size = 4, Stride = 1, Padding = 0 |
| BatchNorm1d | 128 channels |
| Activation | LeakyReLU |
| MaxPool1d | Kernel Size = 2, Stride = 2, Padding = 0 |
| Flatten | Starting from dimension 1 |
| Linear | In Features = 128, Out Features = 1 |

# Inference Module Architecture for AD-FCNN and FD-FCNN

## Target Size: 8

|  |  |
| --- | --- |
| Layer | Parameters / Details |
| Linear | In Features: 8, Out Features: 10 |
| BatchNorm1d | 10 channels |
| Activation | LeakyReLU |
| Linear | In Features: 10, Out Features: 1 |

## Target Size: 16

|  |  |
| --- | --- |
| Layer | Parameters / Details |
| Linear | In Features: 16, Out Features: 10 |
| BatchNorm1d | 10 channels |
| Activation | LeakyReLU |
| Linear | In Features: 10, Out Features: 1 |

## Target Size: 32

|  |  |
| --- | --- |
| Layer | Parameters / Details |
| Linear | In Features: 32, Out Features: 16 |
| BatchNorm1d | 16 channels |
| Activation | LeakyReLU |
| Linear | In Features: 16, Out Features: 1 |

## Target Size: 64

|  |  |
| --- | --- |
| Layer | Parameters / Details |
| Linear | In Features: 64, Out Features: 32 |
| BatchNorm1d | 32 channels |
| Activation | LeakyReLU |
| Linear | In Features: 32, Out Features: 1 |

## Target Size: 128

|  |  |
| --- | --- |
| Layer | Parameters / Details |
| Linear | In Features: 128, Out Features: 64 |
| BatchNorm1d | 64 channels |
| Activation | LeakyReLU |
| Linear | In Features: 64, Out Features: 32 |
| BatchNorm1d | 32 channels |
| Activation | LeakyReLU |
| Linear | In Features: 32, Out Features: 1 |

## Target Size: 256

|  |  |
| --- | --- |
| Layer | Parameters / Details |
| Linear | In Features: 256, Out Features: 128 |
| BatchNorm1d | 128 channels |
| Activation | LeakyReLU |
| Linear | In Features: 128, Out Features: 64 |
| BatchNorm1d | 64 channels |
| Activation | LeakyReLU |
| Linear | In Features: 64, Out Features: 1 |

## Target Size: 512

|  |  |
| --- | --- |
| Layer | Parameters / Details |
| Linear | In Features: 512, Out Features: 256 |
| BatchNorm1d | 256 channels |
| Activation | LeakyReLU |
| Linear | In Features: 256, Out Features: 128 |
| BatchNorm1d | 128 channels |
| Activation | LeakyReLU |
| Linear | In Features: 128, Out Features: 1 |

# 1D-CNN using all 4,200 bands

|  |  |
| --- | --- |
| Layer | Parameters / Details |
| Conv1d | Input: 1 channel, Output: 32 filters, Kernel Size = 16, Stride = 1, Padding = 0 |
| BatchNorm1d | 32 channels |
| Activation | LeakyReLU |
| MaxPool1d | Kernel Size = 16, Stride = 16, Padding = 0 |
| Conv1d | Input: 32 channels, Output: 64 filters, Kernel Size = 8, Stride = 1, Padding = 0 |
| BatchNorm1d | 64 channels |
| Activation | LeakyReLU |
| MaxPool1d | Kernel Size = 16, Stride = 16, Padding = 0 |
| Conv1d | Input: 64 channels, Output: 128 filters, Kernel Size = 4, Stride = 1, Padding = 0 |
| BatchNorm1d | 128 channels |
| Activation | LeakyReLU |
| MaxPool1d | Kernel Size = 8, Stride = 8, Padding = 0 |
| Flatten | Starting from dimension 1 |
| Linear | Input Features: 128, Output Features: 1 |

# Hardware

Processor: Intel(R) Core(TM) i7-8700 CPU @ 3.20GHz   3.19 GHz

GPU: NVIDIA GeForce GTX 1060 (6GB)

Installed RAM: 32.0 GB

Operating System: Windows 11