**Generation Algorithm for ResNet model with 3 Channel Feature Image Dataset**

The results are for the best performing generations of each dataset.

POPULATION\_SIZE = 30  
NUM\_GENERATIONS = 20  
NUM\_PARENTS = 5

individual = {  
 'learning\_rate': 10 \*\* np.random.uniform(-10, -1),  
 'batch\_size': np.random.choice([16, 32, 64, 128]),  
 'dense\_neurons': np.random.choice([128, 256, 512, 1024]),  
 'activation': np.random.choice(['relu', 'tanh', 'sigmoid', 'leaky\_relu', 'elu']),  
 'dropout\_rate': np.random.uniform(0.01, 0.5),  
 'n\_clusters': np.random.randint(2, 20)  
}

CH = Chroma

ME = Mel-Spectrogram

MM = MMFC

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| **DATASET: EMODB - CH\_ME\_MF** | |
| **Optimization completed. Best Accuracy: 0.7943925261497498**  **Best Hyperparameters: {'learning\_rate': 0.003539921133896659, 'batch\_size': 128, 'dense\_neurons': 512, 'activation': 'tanh', 'dropout\_rate': 0.3424750389918616, 'n\_clusters': 8}**  **Classification Report for the Best Model:**  **precision recall f1-score support**  **anger 0.86 0.94 0.90 33**  **boredom 0.76 0.87 0.81 15**  **disgust 0.75 0.55 0.63 11**  **fear 0.71 0.71 0.71 7**  **happiness 0.38 0.33 0.35 9**  **neutral 0.73 0.73 0.73 15**  **sadness 1.00 0.94 0.97 17**  **accuracy 0.79 107**  **macro avg 0.74 0.72 0.73 107**  **weighted avg 0.79 0.79 0.79 107** | |
| **Chosen Hyperparameter Values** | |
| **Learning Rate** | **0.003539921133896659** |
| **Batch Size** | **128** |
| **Dense Neurons** | **512** |
| **Activation** | **tanh** |
| **Dropout Rate** | **0.3424750389918616** |
| **Number of Clusters** | **8** |

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| **DATASET: EMODB - CH\_MF\_ME** | |
| **Optimization completed. Best Accuracy: 0.7757009267807007**  **Best Hyperparameters: {'learning\_rate': 0.001822862018660955, 'batch\_size': 128, 'dense\_neurons': 256, 'activation': 'elu', 'dropout\_rate': 0.04361392422464866, 'n\_clusters': 19}**  **Classification Report for the Best Model:**  **precision recall f1-score support**  **anger 0.86 0.91 0.88 33**  **boredom 0.72 0.87 0.79 15**  **disgust 0.88 0.64 0.74 11**  **fear 0.67 0.29 0.40 7**  **happiness 0.40 0.44 0.42 9**  **neutral 0.65 0.73 0.69 15**  **sadness 1.00 0.94 0.97 17**  **accuracy 0.78 107**  **macro avg 0.74 0.69 0.70 107**  **weighted avg 0.78 0.78 0.77 107** | |
| **Chosen Hyperparameter Values** | |
| **Learning Rate** | **0.001822862018660955** |
| **Batch Size** | **128** |
| **Dense Neurons** | **256** |
| **Activation** | **elu** |
| **Dropout Rate** | **0.04361392422464866** |
| **Number of Clusters** | **19** |

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| **DATASET: EMODB - MF\_CH\_ME** | |
| **Optimization completed. Best Accuracy: 0.8130841255187988**  **Best Hyperparameters: {'learning\_rate': 0.0033153835613301715, 'batch\_size': 32, 'dense\_neurons': 256, 'activation': 'sigmoid', 'dropout\_rate': 0.16949300899312134, 'n\_clusters': 8}**  **Classification Report for the Best Model:**  **precision recall f1-score support**  **anger 0.89 0.97 0.93 33**  **boredom 0.90 0.60 0.72 15**  **disgust 0.89 0.73 0.80 11**  **fear 0.60 0.86 0.71 7**  **happiness 0.60 0.33 0.43 9**  **neutral 0.60 0.80 0.69 15**  **sadness 1.00 1.00 1.00 17**  **accuracy 0.81 107**  **macro avg 0.78 0.76 0.75 107**  **weighted avg 0.82 0.81 0.81 107** | |
| **Chosen Hyperparameter Values** | |
| **Learning Rate** | **0.0033153835613301715** |
| **Batch Size** | **32** |
| **Dense Neurons** | **256** |
| **Activation** | **sigmoid** |
| **Dropout Rate** | **0.16949300899312134** |
| **Number of Clusters** | **8** |

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| **DATASET: EMODB - MF\_ME\_CH** | |
| **Optimization completed. Best Accuracy: 0.7943925261497498**  **Best Hyperparameters: {'learning\_rate': 0.005785085295403311, 'batch\_size': 64, 'dense\_neurons': 512, 'activation': 'relu', 'dropout\_rate': 0.4594341659670518, 'n\_clusters': 2}**  **Classification Report for the Best Model:**  **precision recall f1-score support**  **anger 0.82 0.97 0.89 33**  **boredom 0.86 0.80 0.83 15**  **disgust 0.67 0.55 0.60 11**  **fear 0.57 0.57 0.57 7**  **happiness 0.33 0.11 0.17 9**  **neutral 0.87 0.87 0.87 15**  **sadness 0.85 1.00 0.92 17**  **accuracy 0.79 107**  **macro avg 0.71 0.69 0.69 107**  **weighted avg 0.76 0.79 0.77 107** | |
| **Chosen Hyperparameter Values** | |
| **Learning Rate** | **0.005785085295403311** |
| **Batch Size** | **64** |
| **Dense Neurons** | **512** |
| **Activation** | **relu** |
| **Dropout Rate** | **0.4594341659670518** |
| **Number of Clusters** | **2** |

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| **DATASET: EMODB - ME\_CH\_MF** | |
| **Optimization completed. Best Accuracy: 0.7383177280426025**  **Best Hyperparameters: {'learning\_rate': 0.002390765345641303, 'batch\_size': 16, 'dense\_neurons': 128, 'activation': 'elu', 'dropout\_rate': 0.3093848891143648, 'n\_clusters': 18}**  **Classification Report for the Best Model:**  **precision recall f1-score support**  **anger 0.78 0.94 0.85 33**  **boredom 1.00 0.53 0.70 15**  **disgust 1.00 0.64 0.78 11**  **fear 0.43 0.43 0.43 7**  **happiness 0.40 0.22 0.29 9**  **neutral 0.54 0.93 0.68 15**  **sadness 1.00 0.82 0.90 17**  **accuracy 0.74 107**  **macro avg 0.73 0.65 0.66 107**  **weighted avg 0.78 0.74 0.73 107** | |
| **Chosen Hyperparameter Values** | |
| **Learning Rate** | **0.002390765345641303** |
| **Batch Size** | **16** |
| **Dense Neurons** | **128** |
| **Activation** | **elu** |
| **Dropout Rate** | **0.3093848891143648** |
| **Number of Clusters** | **18** |

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| **DATASET: EMODB - ME\_MF\_CH** | |
| **Optimization completed. Best Accuracy: 0.8130841255187988**  **Best Hyperparameters: {'learning\_rate': 0.005187513215627214, 'batch\_size': 64, 'dense\_neurons': 128, 'activation': 'sigmoid', 'dropout\_rate': 0.18608787150080355, 'n\_clusters': 18}**  **Classification Report for the Best Model:**  **precision recall f1-score support**  **anger 0.86 0.97 0.91 33**  **boredom 0.83 0.67 0.74 15**  **disgust 0.86 0.55 0.67 11**  **fear 0.50 0.71 0.59 7**  **happiness 0.75 0.33 0.46 9**  **neutral 0.82 0.93 0.87 15**  **sadness 0.85 1.00 0.92 17**  **accuracy 0.81 107**  **macro avg 0.78 0.74 0.74 107**  **weighted avg 0.82 0.81 0.80 107** | |
| **Chosen Hyperparameter Values** | |
| **Learning Rate** | **0.005187513215627214** |
| **Batch Size** | **64** |
| **Dense Neurons** | **128** |
| **Activation** | **sigmoid** |
| **Dropout Rate** | **0.18608787150080355** |
| **Number of Clusters** | **18** |

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| **DATASET: RAVDESS – CH\_ME\_MF** | |
| **Optimization completed. Best Accuracy: 0.5659722089767456**  **Best Hyperparameters: {'learning\_rate': 0.0015639222392476264, 'batch\_size': 128, 'dense\_neurons': 256, 'activation': 'relu', 'dropout\_rate': 0.32686230099155295, 'n\_clusters': 5}**  **Classification Report for the Best Model:**  **precision recall f1-score support**  **angry 0.66 0.68 0.67 31**  **calm 0.72 0.78 0.75 46**  **disgust 0.52 0.73 0.61 33**  **fearful 0.62 0.58 0.60 43**  **happy 0.43 0.29 0.34 42**  **neutral 0.45 0.25 0.32 20**  **sad 0.37 0.37 0.37 35**  **surprised 0.59 0.71 0.64 38**  **accuracy 0.57 288**  **macro avg 0.55 0.55 0.54 288**  **weighted avg 0.56 0.57 0.55 288** | |
| **Chosen Hyperparameter Values** | |
| **Learning Rate** | **0.0015639222392476264** |
| **Batch Size** | **128** |
| **Dense Neurons** | **265** |
| **Activation** | **Relu** |
| **Dropout Rate** | **0.32686230099155295** |
| **Number of Clusters** | **5** |

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| **DATASET: RAVDESS – CH\_MF\_ME** | |
| **Optimization completed. Best Accuracy: 0.5902777910232544**  **Best Hyperparameters: {'learning\_rate': 0.00018225484891737202, 'batch\_size': 128, 'dense\_neurons': 256, 'activation': 'relu', 'dropout\_rate': 0.4248925690788338, 'n\_clusters': 17}**  **Classification Report for the Best Model:**  **precision recall f1-score support**  **angry 0.72 0.68 0.70 31**  **calm 0.70 0.76 0.73 46**  **disgust 0.50 0.64 0.56 33**  **fearful 0.76 0.65 0.70 43**  **happy 0.45 0.43 0.44 42**  **neutral 0.43 0.45 0.44 20**  **sad 0.50 0.46 0.48 35**  **surprised 0.59 0.58 0.59 38**  **accuracy 0.59 288**  **macro avg 0.58 0.58 0.58 288**  **weighted avg 0.59 0.59 0.59 288** | |
| **Chosen Hyperparameter Values** | |
| **Learning Rate** | **0.00018225484891737202** |
| **Batch Size** | **128** |
| **Dense Neurons** | **256** |
| **Activation** | **Relu** |
| **Dropout Rate** | **0.4248925690788338** |
| **Number of Clusters** | **17** |

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| **DATASET: RAVDESS – MF\_CH\_ME** | |
| **Optimization completed. Best Accuracy: 0.5694444179534912**  ***Best Hyperparameters: {'learning\_rate': 4.8132043013915454e-05, 'batch\_size': 16, 'dense\_neurons': 1024, 'activation': 'tanh', 'dropout\_rate': 0.3001269432079028, 'n\_clusters': 7}***  ***Classification Report for the Best Model:***  ***precision recall f1-score support***  ***angry 0.72 0.58 0.64 31***  ***calm 0.75 0.83 0.78 46***  ***disgust 0.52 0.52 0.52 33***  ***fearful 0.62 0.58 0.60 43***  ***happy 0.38 0.48 0.42 42***  ***neutral 0.23 0.15 0.18 20***  ***sad 0.42 0.37 0.39 35***  ***surprised 0.71 0.79 0.75 38***  ***accuracy 0.57 288***  ***macro avg 0.54 0.54 0.54 288***  ***weighted avg 0.57 0.57 0.56 288*** | |
| **Chosen Hyperparameter Values** | |
| **Learning Rate** | **4.8132043013915454e-05** |
| **Batch Size** | **16** |
| **Dense Neurons** | **1024** |
| **Activation** | **tanh** |
| **Dropout Rate** | **0.3001269432079028** |
| **Number of Clusters** | **7** |

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| **DATASET: RAVDESS – MF\_ME\_CH** | |
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| **Chosen Hyperparameter Values** | |
| **Learning Rate** |  |
| **Batch Size** |  |
| **Dense Neurons** |  |
| **Activation** |  |
| **Dropout Rate** |  |
| **Number of Clusters** |  |

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| **DATASET: RAVDESS – ME\_CH\_MF** | |
| **Optimization completed. Best Accuracy: 0.5486111044883728**  **Best Hyperparameters: {'learning\_rate': 0.0005697037757272632, 'batch\_size': 128, 'dense\_neurons': 128, 'activation': 'sigmoid', 'dropout\_rate': 0.3605730792982549, 'n\_clusters': 11}**  **Classification Report for the Best Model:**  **precision recall f1-score support**  **angry 0.62 0.68 0.65 31**  **calm 0.65 0.78 0.71 46**  **disgust 0.43 0.61 0.51 33**  **fearful 0.59 0.53 0.56 43**  **happy 0.43 0.29 0.34 42**  **neutral 0.45 0.45 0.45 20**  **sad 0.41 0.31 0.35 35**  **surprised 0.67 0.68 0.68 38**  **accuracy 0.55 288**  **macro avg 0.53 0.54 0.53 288**  **weighted avg 0.54 0.55 0.54 288** | |
| **Chosen Hyperparameter Values** | |
| **Learning Rate** | **0.0005697037757272632** |
| **Batch Size** | **128** |
| **Dense Neurons** | **128** |
| **Activation** | **Sigmoid** |
| **Dropout Rate** | **0.3605730792982549** |
| **Number of Clusters** | **11** |

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| **DATASET: RAVDESS – ME\_MF\_CH** | |
| **Optimization completed. Best Accuracy: 0.625**  **Best Hyperparameters: {'learning\_rate': 0.0001319655009256774, 'batch\_size': 32, 'dense\_neurons': 512, 'activation': 'relu', 'dropout\_rate': 0.4718816764682105, 'n\_clusters': 16}**  **Classification Report for the Best Model:**  **precision recall f1-score support**  **angry 0.72 0.68 0.70 31**  **calm 0.73 0.76 0.74 46**  **disgust 0.63 0.73 0.68 33**  **fearful 0.62 0.58 0.60 43**  **happy 0.55 0.55 0.55 42**  **neutral 0.56 0.45 0.50 20**  **sad 0.46 0.49 0.47 35**  **surprised 0.68 0.68 0.68 38**  **accuracy 0.62 288**  **macro avg 0.62 0.61 0.62 288**  **weighted avg 0.63 0.62 0.62 288** | |
| **Chosen Hyperparameter Values** | |
| **Learning Rate** | **0.0001319655009256774** |
| **Batch Size** | **32** |
| **Dense Neurons** | **512** |
| **Activation** | **relu** |
| **Dropout Rate** | **0.4718816764682105** |
| **Number of Clusters** | **16** |