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| Notations | Abbreviations |

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| **FLE-CNN** | Federated learning-based Ensemble CNN scheme to detect intrusions in the industry 5.0-driven healthcare system |
| **DL** | Deep learning |
| **DoS** | Denial-of-service attack |
| **IDS** | Intrusion detection systems |
| **CNN** | Convolutional neural network |
| **SVM** | Support Vector Machine |
| **KNN** | *k*-nearest neighbours |
| **TP** | True positive |
| **FP** | False positive |
| **TN** | True negative |
| **FN** | False negative |

**Input**: Local dataset Di​ at hospital  
**Parameters**:

* k for KNN
* Number of communication rounds R
* Real-time packet stream P

**Output**: Local model weights wSVM,wKNN,wDT

**Training Phase:**

1. **For** each hospital client Hi∈HH\_i \in HHi​∈H:  
   2. Load the local dataset DiD\_iDi​  
   3. Remove duplicate records  
   4. Split into features XXX and labels yyy  
   5. Train/test split (70/30)  
   6. Standard scale numerical features  
   7. One-hot encode categorical features in XXX  
   8. Label encode target variable yyy  
   9. Apply PCA for dimensionality reduction  
   10. Train base models: SVM, KNN(kkk), Decision Tree, CNN  
   11. Evaluate and get local model accuracies:  
     aSVM,aKNN,aDT,aCNNa\_{SVM}, a\_{KNN}, a\_{DT}, a\_{CNN}aSVM​,aKNN​,aDT​,aCNN​  
   12. Compute normalized ensemble weights:  
     wj=ajaSVM+aKNN+aDT+aCNN∀j∈{SVM,KNN,DT,CNN}w\_j = \frac{a\_j}{a\_{SVM} + a\_{KNN} + a\_{DT} + a\_{CNN}} \quad \forall j \in \{SVM, KNN, DT, CNN\}wj​=aSVM​+aKNN​+aDT​+aCNN​aj​​∀j∈{SVM,KNN,DT,CNN}  
   13. Send local weights wjw\_jwj​ to the cloud server
2. **End For**