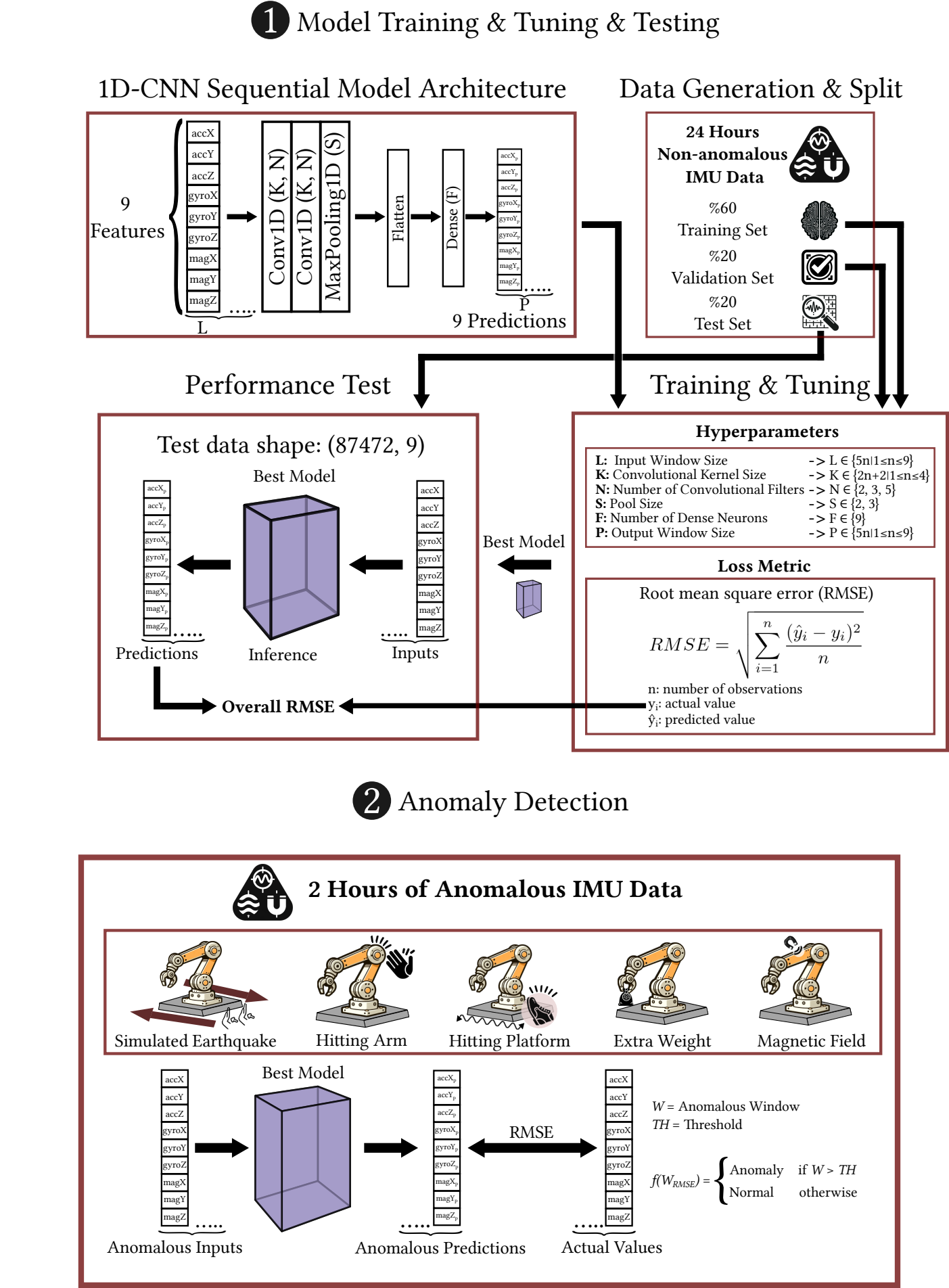
1 Model Training & Tuning & Testing
1D-CNN Sequential Model Architecture
Data Generation & Split
9 Features
accX
accY
accZ
gyroX
gyroY
gyroZ
magX
magY
magZ
L
Conv1D (K, N)
Conv1D (K, N)
MaxPooling1D (S)
Flatten
Dense (F)
P
9 Predictions
24 Hours Non-anomalous IMU Data
%60 Training Set
%20 Validation Set
%20 Test Set
Performance Test
Training & Tuning
Test data shape: (87472, 9)
Best Model
Predictions
Inference
Inputs
Best Model
Overall RMSE
Hyperparameters
L: Input Window Size -> L ∈ {5n|1≤n≤9}
K: Convolutional Kernel Size -> K ∈ {2n+2|1≤n≤4}
N: Number of Convolutional Filters -> N ∈ {2, 3, 5}
S: Pool Size -> S ∈ {2, 3}
F: Number of Dense Neurons -> F ∈ {9}
P: Output Window Size -> P ∈ {5n|1≤n≤9}
Loss Metric
Root mean square error (RMSE)
$RMSE = \sqrt{\sum_{i=1}^{n} \frac{(\hat{y}_i - y_i)^2}{n}}$
n: number of observations
y_i: actual value
$\hat{y}_i$: predicted value
2 Anomaly Detection
2 Hours of Anomalous IMU Data
Simulated Earthquake
Hitting Arm
Hitting Platform
Extra Weight
Magnetic Field
Best Model
Anomalous Inputs
Anomalous Predictions
RMSE
Actual Values
W = Anomalous Window
TH = Threshold
$f(W_{RMSE}) = \begin{cases} \text{Anomaly} & \text{if } W > TH \\ \text{Normal} & \text{otherwise} \end{cases}$