Peak Detection - TranPD Model Implementation

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Autonomous Multisensor Systems

TranPD

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Data Preprocessing	Transformer Model	Two-Phase Decoding	Training & Reconstruction	Detect Peaks
Data Ingestion	Positional Encoding	**Phase 1:** Input + zero error = predict x1 (initial reconstruction)	Epochs = 50	Threshold - 98%
Normalization	**Encoder** (temporal pattern learning)	**Phase 2:** Input + error = predict x2 (final reconstruction)	D_Model = 8, 16	
Sliding Windows	**Decoder** (sequence reconstruction)		Loss = **MSE between x2 and input**	
W - 30, 60 B - 128	Output layer		Optimizer: **Adam**	
Train : Test - 80 : 20			error = MAE between recon and true	

Dataset

DMC2_S_CP2_52

Shape : (42016, 56)

Train : Test - 60 : 40

X_train shape: **(25191, 30)**

X_test shape: **(16795, 30)**

TranPD - Results

Num_Peaks for Train/Test - 80/20

Win_size	Latent_dim	Num_of_Peaks
30	8	168
60	16	336

TranPD Results : Ws-30, Ds-8

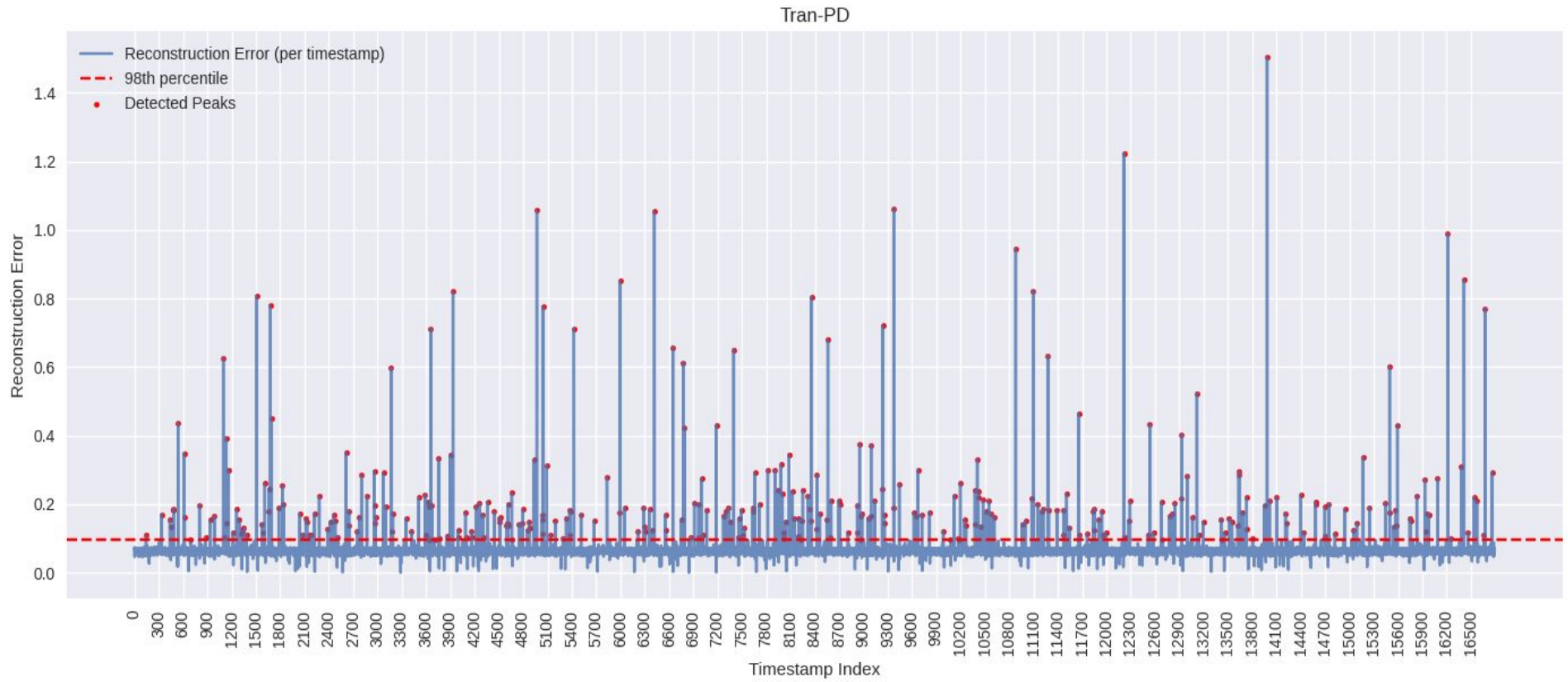

Fig : Reconstruction Error Plot - **336 Peaks, D_size : 8, W_size : 30**

TranPD - Peak Details : Ws-30, Ds-8

Peaks Dataset

Train/Test - 60/40

98th Percentile Threshold: 0.0961

Timestamp	True Value	Recon_value	Recon_error	Peak
1325	-2.29	-2.35	0.06117391	0
1326	-1.66	-1.81	0.15360876	1
1327	-2.3378913	-2.349548	0.06105676	0

TranPD - Results : Ws-60, Ds-16

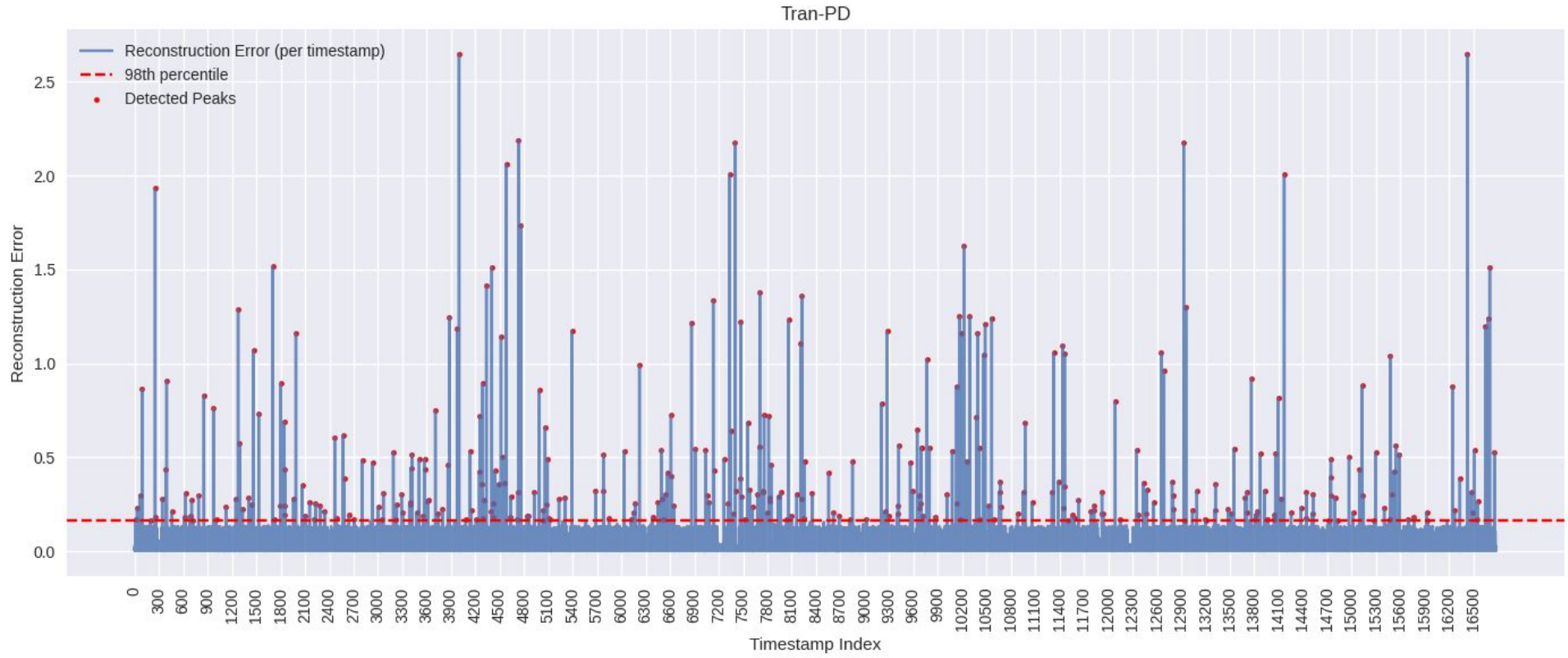

Fig : Reconstruction Error Plot - **Peaks, D_size :16, W_size : 60**

References

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Thank You For Your Attention!

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