



Decompose → Keep Shared Signal (Z) → Detect OOD

Robust OOD detection comes from the signal that both features and structure agree on.

Paper



Code



Personal Page



[github.com/DannyW618/TIDE](https://github.com/DannyW618/TIDE)

[danny.wang@uq.edu.au](mailto:danny.wang@uq.edu.au)

ICML 2026, Seoul

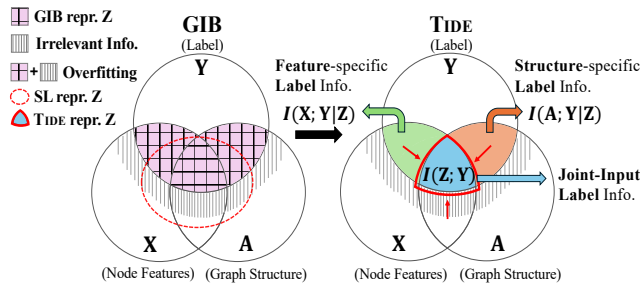
## 1 WHY GRAPH OOD FAILS

OOD nodes hide when one input still looks ID.

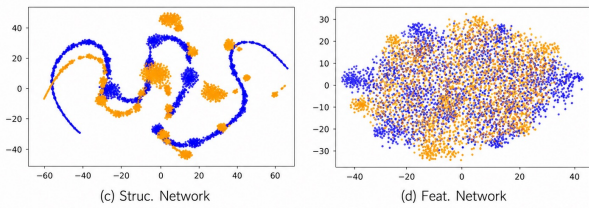
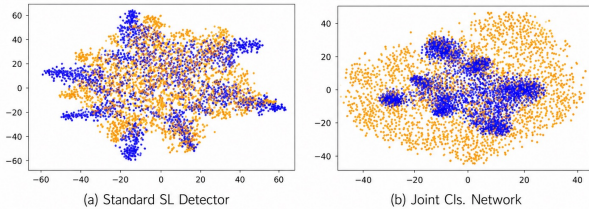
**Feature shifts** break feature cues

**Structure shifts** break graph cues

**Supervised training** mixes spurious signals



### What TIDE Learns

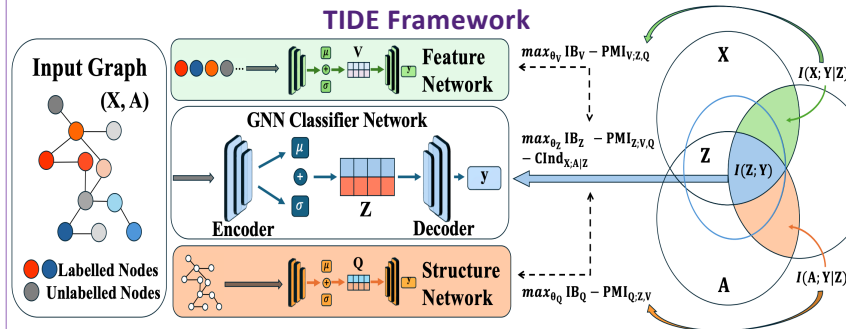
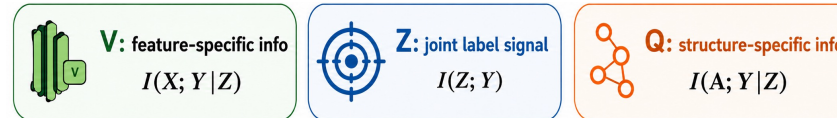


● ID ( $Z_{ID}$ ) ● OOD ( $Z_{OOD}$ )

## 2 OUR SOLUTION: TIDE

### Tri-Component Information Decomposition

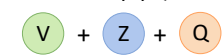
$$I(X, A; Y) = I(Z; Y) + I(X; Y|Z) + I(A; Y|Z)$$



### How OOD Detection Works (Inference)

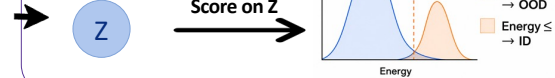
#### Training (ID data only)

Decompose information into V, Z, Q



#### Inference (Test time)

Use only Z Compute Energy Score on Z



✓ Learns only shared signal Z  
Removes shortcuts

Stronger ID/OOD separation  
Wider energy gap

🔒 No OOD samples required

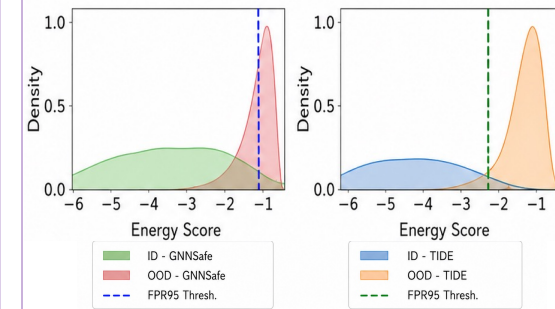
## 3 Key Results

**34%**  
lower FPR95

**Best**  
OOD detection  
across 7 datasets

**Competitive**  
ID accuracy

### Energy Distributions



TIDE achieves a wider energy gap  
→ easier OOD detection.

### Relative Detection Improvement

DATASET	AUROC ↑	FPR95 ↓	ID ACC ↑
Cora	+4.38	+30.44	+0.99
Citeseer	+7.38	+30.06	-0.40
Pubmed	+3.53	+25.02	-0.61
Twitch	+23.39	+34.58	-2.12
Arxiv	+2.14	+4.25	-0.77

**FEATURES CAN LIE. STRUCTURE CAN LIE. TRUST ONLY THE SIGNAL THEY AGREE ON.**