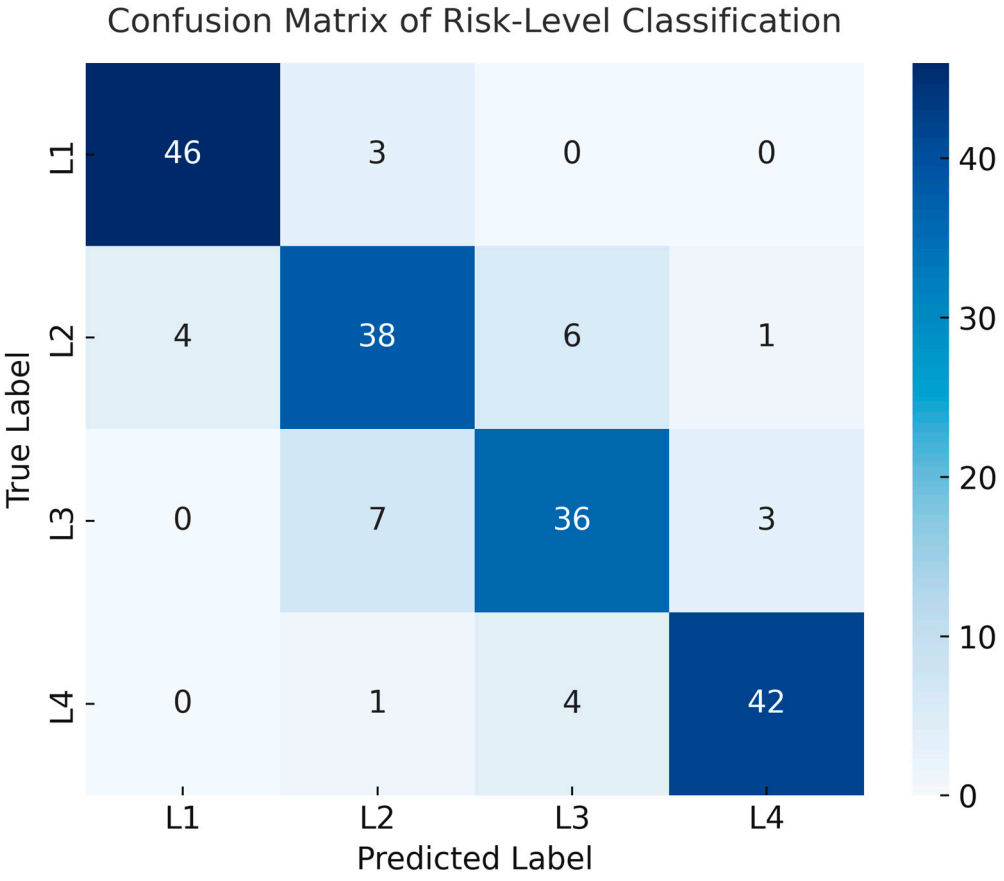
Supplementary Materials

Code S1. Pseudocode for Improved SimAM Attention (P5 Layer):

```
# Pseudocode for improved SimAM attention (P5 layer)
def Improved_SimAM(x, alpha=0.7):
    mu_g, sigma_g = x.mean(), x.var()
    A_g = torch.sigmoid((x - mu_g) / (sigma_g + 1e-5))
    mu_l = F.avg_pool2d(x, kernel_size=3, stride=1, padding=1)
    sigma_l = ((x - mu_l) ** 2).mean()
    A_l = torch.sigmoid((x - mu_l) / (sigma_l + 1e-5))
    M = make_center_mask(x.shape, sigma_p=0.3)
    A = alpha * A_g + (1 - alpha) * A_l
    return x * (A * M)
```

Figure S1. Confusion Matrix for Four-Level Risk Classification (L1–L4).

The matrix illustrates the correspondence between predicted and ground-truth labels in the test set. High diagonal dominance indicates good overall performance, while most misclassifications occur between adjacent levels (L2↔L3), reflecting the intrinsic semantic overlap between medium and high-risk scenarios.


Confusion Matrix of Risk-Level Classification
True Label
Predicted Label
L1
L2
L3
L4
46
3
0
0
4
38
6
1
0
7
36
3
0
1
4
42
40
30
20
10
0