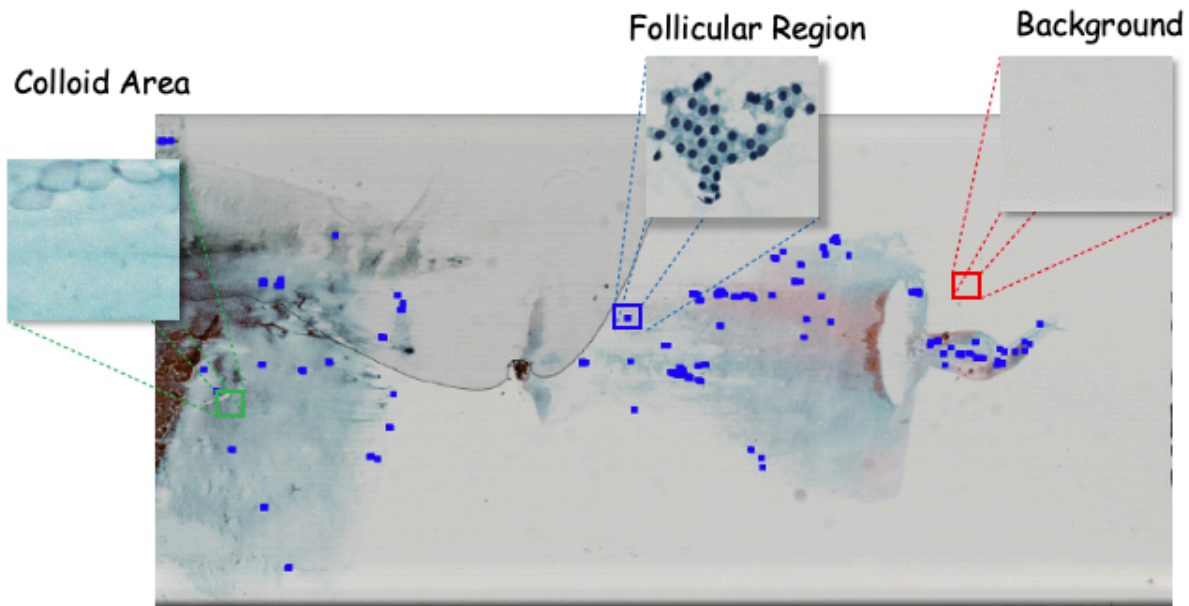


Attention Based Multi-Instance Thyroid Cytopathological Diagnosis with Multi-Scale Feature Fusion

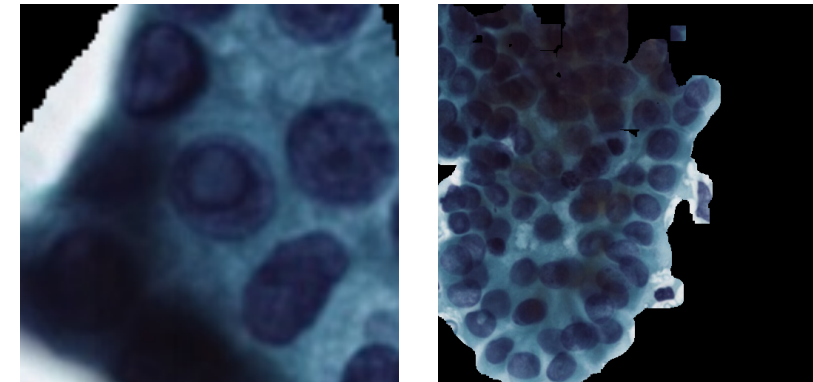
Shuhao Qiu, Yao Guo, Chuang Zhu, Wenli Zhou
Beijing University of Posts and Telecommunications
Beijing, China

Huang Chen
China-Japan Friendship Hospital
Department of Pathology
Beijing, China

Background

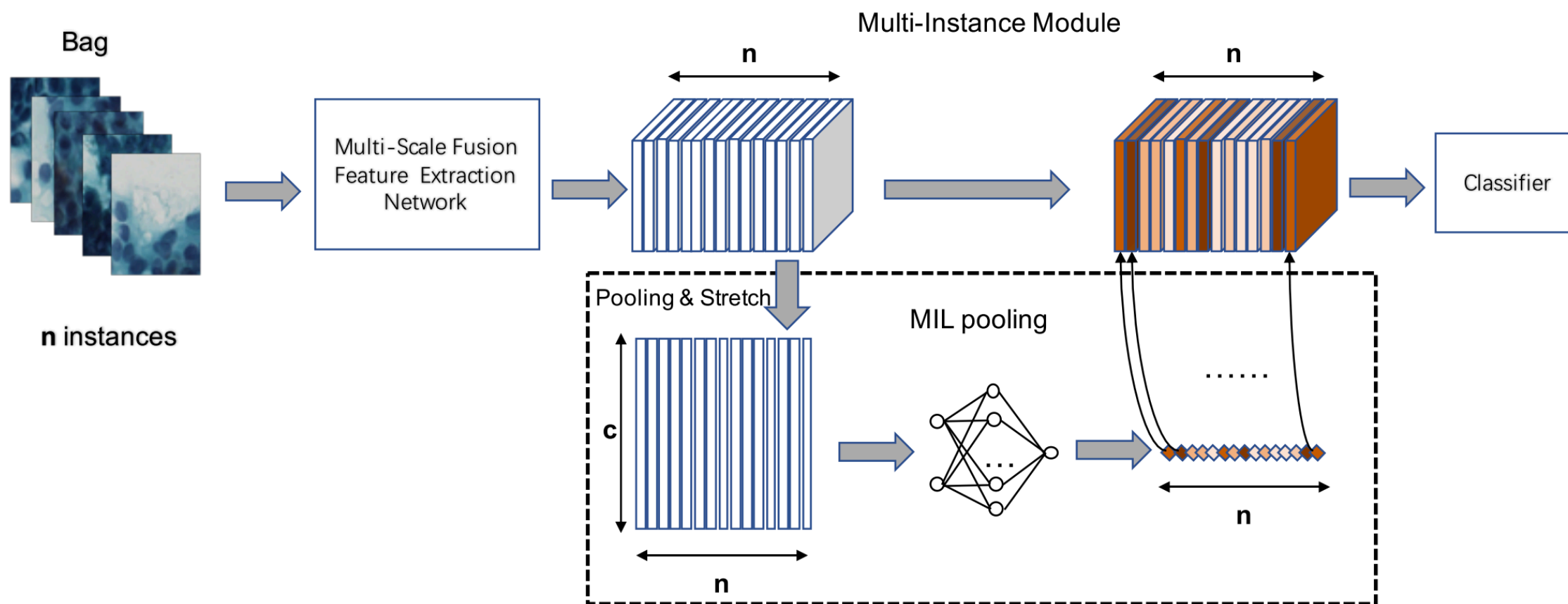


Small Key Area

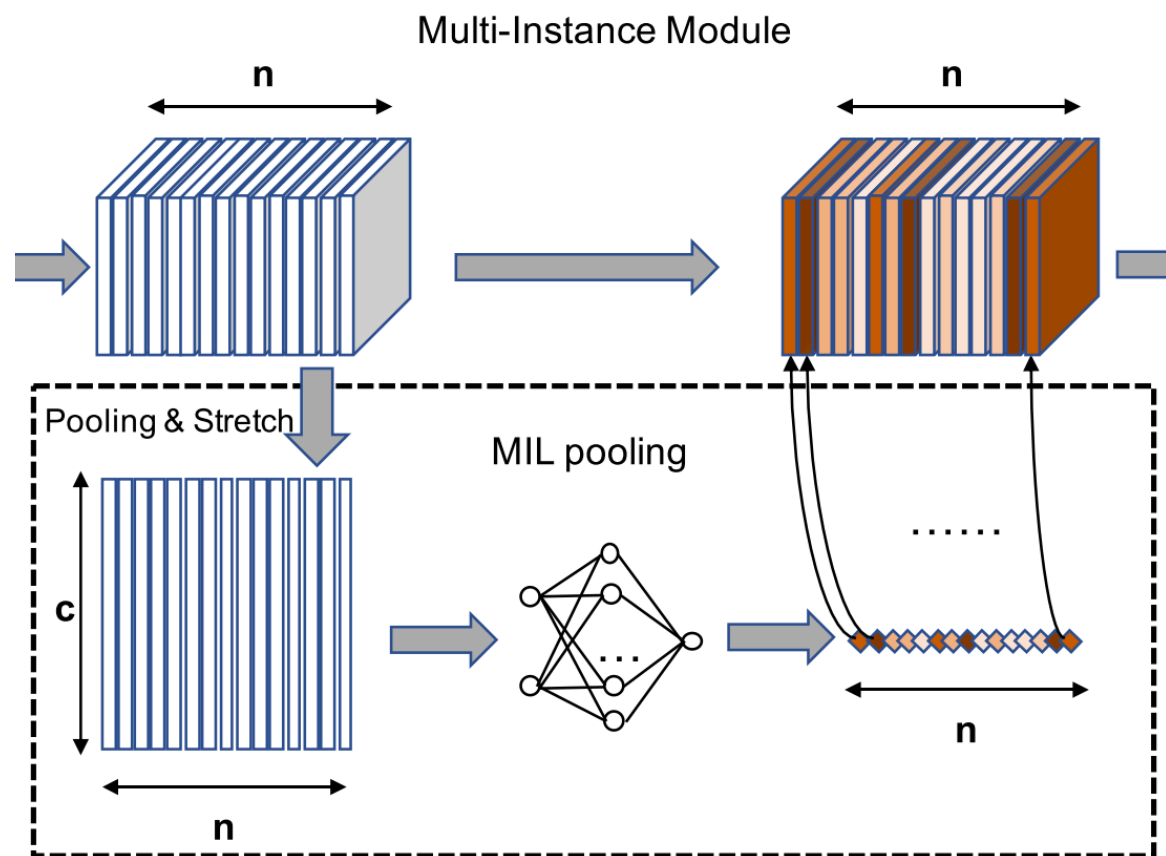


Visual Feature in Different Scales

Overview



Attention Based Multi-Instance Framework

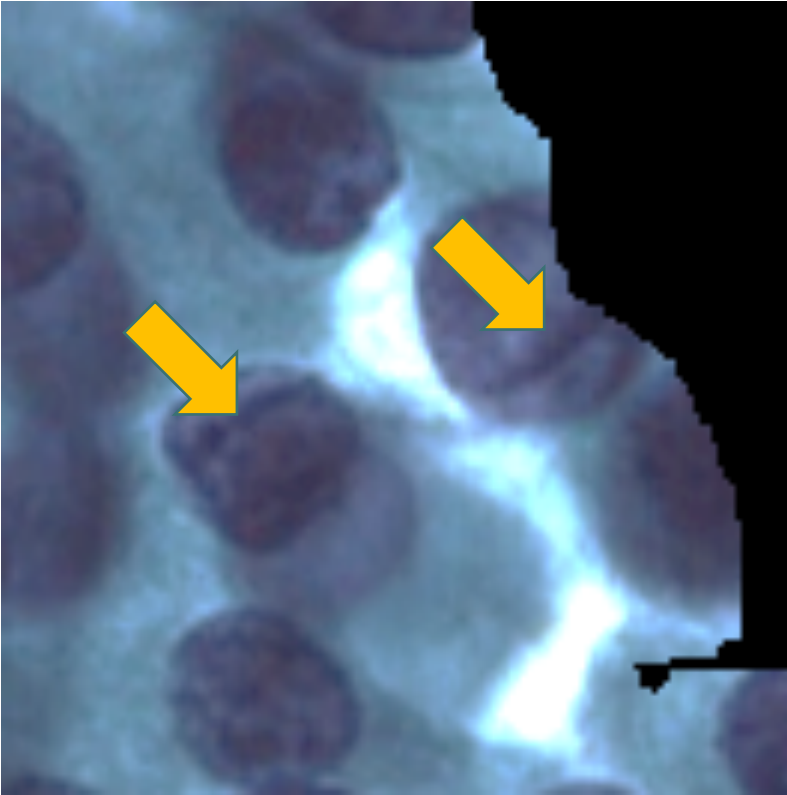


Original Feature Map: $F_i \in \mathbb{R}^{n \times C \times m \times m}$

Weight Vector: $v_0 = W_2^T \times (\tanh(W_1^T \times v_i))$

Weighted Feature Map: $F_a = v_0 \times F_i$

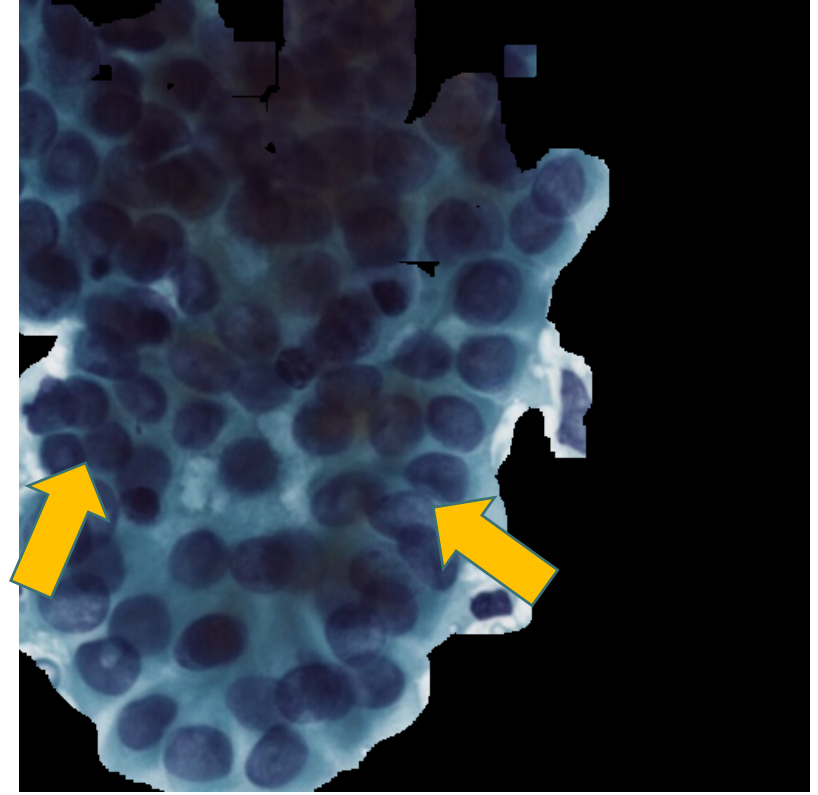
Multi-Scale Feature Fusion



Nuclear groove

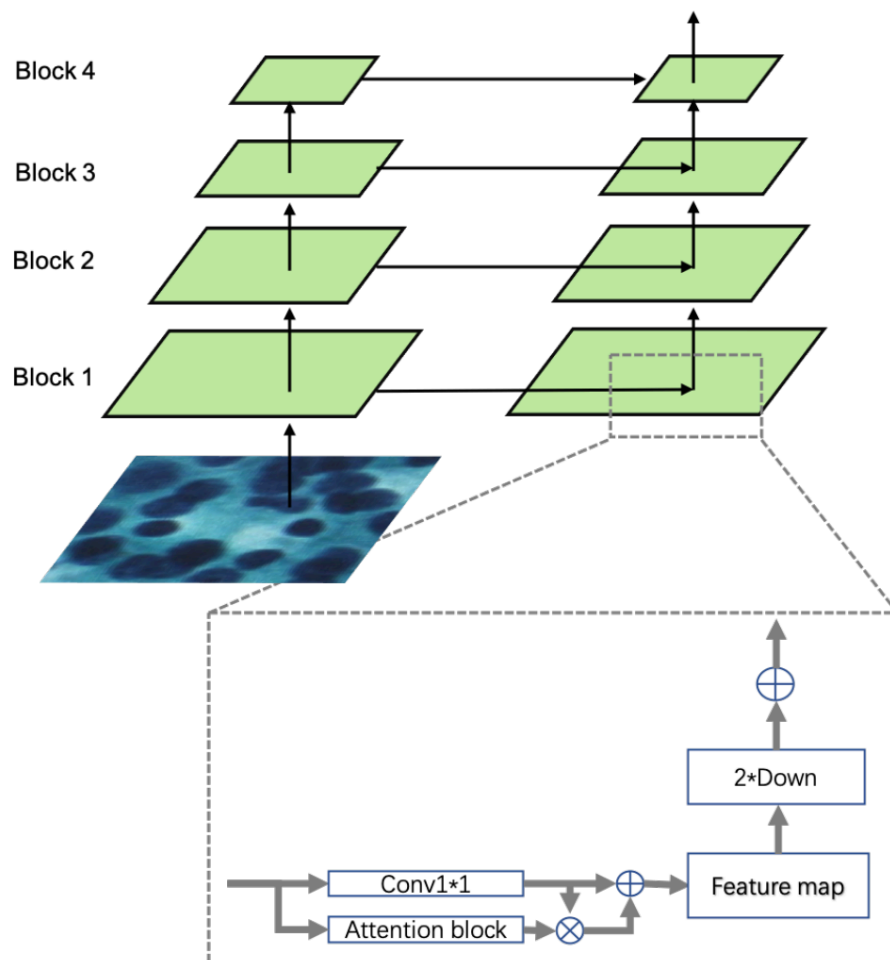


Pseudo-inclusion body



Crowd, Heterotypic

Multi-Scale Feature Fusion



Multi-Scale Feature Fusion

Lateral Connection

$$F_0 = Conv_{1 \times 1}(F_i) \oplus Attention(F_i)$$

$$Attention(F_i) = \omega(Pooling(F_i)) \otimes F_i$$

Experiment Results

EXPERIMENT RESULTS ON THYROID DATASET

	Acc	Recall	Pre	F1
ResNet-18 Baseline	0.881	0.890	0.860	0.869
ResNet-18 + MSF	0.865	0.780	0.910	0.828
ResNet-18 + MSFwA	0.932	0.910	0.935	0.921
ResNet-34 Baseline	0.842	0.710	0.930	0.781
ResNet-34 + MSF	0.896	0.852	0.914	0.879
ResNet-34 + MSFwA	0.851	0.697	0.952	0.800

Experiment Results

EXPERIMENT RESULTS ON THYROID DATASET COMPARED WITH OTHER METHODS

	Acc	Recall	Pre	F1
WELDON+ResNet-18 [14]	0.839	0.807	0.823	0.815
WELDON+ResNet-34 [14]	0.879	0.871	0.862	0.864
mi-net [3]	0.831	0.742	0.852	0.793
MI-net [3]	0.844	0.841	0.841	0.842
MI-Net+DS [3]	0.886	0.868	0.877	0.87
MI-Net+RC [3]	0.859	0.774	0.889	0.828
MIMS [9]	0.873	0.774	0.923	0.842
ResNet-18 + MSFwA (Ours)	0.932	0.910	0.935	0.921

Thyroid Dataset

EXPERIMENT RESULTS ON BREAST CANCER DATASET

	Acc	Recall	Pre	F1
WELDON+ResNet-18 [14]	0.696	0.808	0.612	0.696
WELDON+ResNet-34 [14]	0.746	0.883	0.651	0.750
mi-net [3]	0.714	0.875	0.618	0.724
MI-net [3]	0.721	0.925	0.623	0.743
MI-Net+DS [3]	0.739	0.891	0.661	0.752
MI-Net+RC [3]	0.732	0.875	0.636	0.737
MIMS [9]	0.750	0.792	0.679	0.731
ResNet-18 Baseline (Ours)	0.772	0.975	0.658	0.786
ResNet-18 + MSF (Ours)	0.768	0.883	0.687	0.768
ResNet-18 + MSFwA (Ours)	0.796	0.967	0.689	0.804

Breast Cancer Dataset



Conclusion

- Multi-Instance framework for Thyroid Cytopathological Diagnosis
- Multi-scale feature fusion with attention mechanism
- Higher accuracy

—— Thanks For Watching ——