Supplementary Material of HAMIL-QA: Hierarchical Approach to Multiple Instance Learning for LGE MRI Quality Assessment

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Method	#Patches	#Sub-bags	Acc	AUROC	F1 Score
ABMIL	60	X	0.643 ± 0.028	0.647 ± 0.013	0.433 ± 0.093
DTFD-MIL	60	5	0.588 ± 0.049	0.568 ± 0.062	0.448 ± 0.110
DTFD-MIL	60	6	0.604 ± 0.075	0.637 ± 0.065	0.242 ± 0.242
DTFD-MIL	60	7	0.592 ± 0.037	0.582 ± 0.043	0.398 ± 0.202
HAMIL-QA	60	5	0.647 ± 0.034	0.647 ± 0.034	**0.623 ± 0.028**
HAMIL-QA	60	6	**0.682 ± 0.030**	**0.700 ± 0.009**	0.596 ± 0.084
HAMIL-QA	60	7	0.663 ± 0.044	**0.705 ± 0.010**	0.524 ± 0.138
ABMIL	80	X	0.639 ± 0.037	0.637 ± 0.050	0.497 ± 0.130
DTFD-MIL	80	5	0.553 ± 0.035	0.563 ± 0.047	0.149 ± 0.149
DTFD-MIL	80	6	0.577 ± 0.058	0.598 ± 0.076	0.356 ± 0.156
DTFD-MIL	80	7	**0.659 ± 0.007**	**0.673 ± 0.016**	**0.669 ± 0.005**
HAMIL-QA	80	5	0.608 ± 0.016	0.598 ± 0.015	0.504 ± 0.019
HAMIL-QA	80	6	0.616 ± 0.041	0.636 ± 0.045	0.567 ± 0.056
HAMIL-QA	80	7	0.651 ± 0.045	0.642 ± 0.045	0.567 ± 0.056
ABMIL	100	X	0.647 ± 0.020	0.661 ± 0.022	0.577 ± 0.042
DTFD-MIL	100	5	0.667 ± 0.014	0.663 ± 0.015	0.601 ± 0.056
DTFD-MIL	100	6	0.631 ± 0.046	0.616 ± 0.053	0.423 ± 0.187
DTFD-MIL	100	7	0.647 ± 0.020	0.660 ± 0.021	**0.626 ± 0.036**
HAMIL-QA	100	5	0.620 ± 0.045	**0.669 ± 0.020**	0.458 ± 0.205
HAMIL-QA	100	6	0.647 ± 0.045	0.645 ± 0.053	0.547 ± 0.098
HAMIL-QA	100	7	**0.675 ± 0.034**	0.664 ± 0.043	0.513 ± 0.114

Table 1: Comparative analysis of Attention based MIL (ABMIL) [1], DTFD-MIL [2], and our method. We used patch size (60, 60) throughout the experiments. The results are presented as mean ± standard deviation of 3 runs, reflecting the performance of each method under the specified conditions (number of patches, number of sub-bags).

We have used different number of patches and number of sub-bags as hyperparameters for each method and have chosen the best model based on the validation set.

Method	MACs/FLOPS	Number of Parameters
Fully Supervised	180.8B	14.59M
ABMIL	2.0B	14.57M
DTFD-MIL	1.99B	14.57M
HAMIL-QA	0.24B	5.12M

Table 2: Computational Complexity and Number of Parameters for Different Methods

References

1. Ilse, M., Tomczak, J., Welling, M.: Attention-based deep multiple instance learning. In: International conference on machine learning. pp. 2127–2136. PMLR (2018)
2. Zhang, H., Meng, Y., Zhao, Y., Qiao, Y., Yang, X., Coupland, S.E., Zheng, Y.: Dtfd-mil: Double-tier feature distillation multiple instance learning for histopathology whole slide image classification. In: Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition. pp. 18802–18812 (2022)