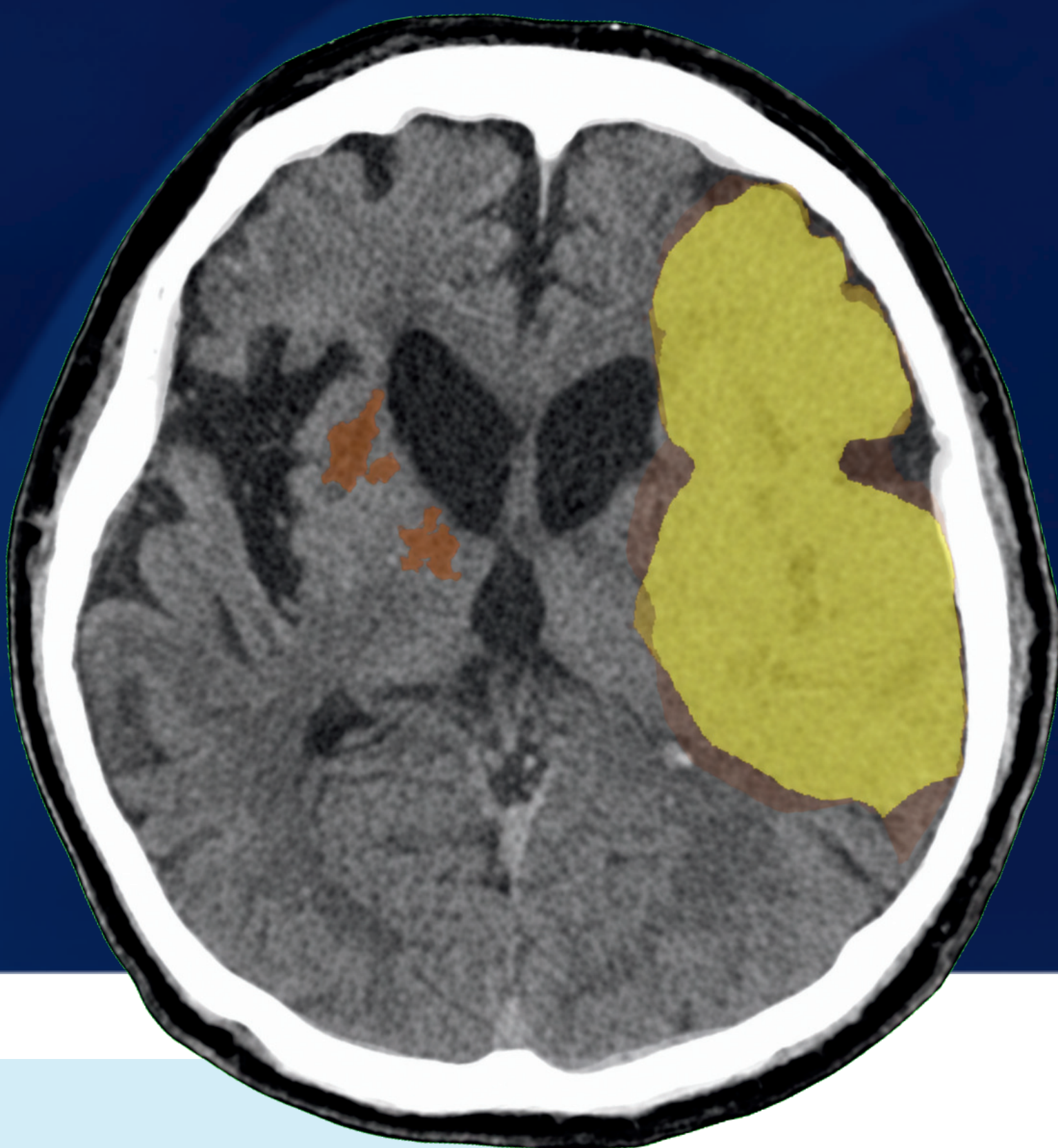


Multimodal Fusion of Non-Contrast CT and Clinical Data for Admission Stroke Severity Classification: A Multisite Evaluation in Indonesian Cohorts

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283
PATIENTS

Indonesian acute ischemic stroke cohort



3
COHORTS

RSCM-1 (n=90)
RSCM-2 (n=108)
RSPON (n=85)



2
HOSPITALS

RSCM | RSPON

INDONESIAN DATA
FOR HEALTHIER
TOMORROWS



Background

NIHSS quantifies stroke severity but requires a trained assessor. NCCT is the imaging routinely available in Indonesian stroke care, and its early ischemic change is subtle. Since severity also depends on lesion location, age and comorbidity, we tested whether fusing NCCT with clinical data improves four-class NIHSS-in prediction and generalises to an unseen hospital.



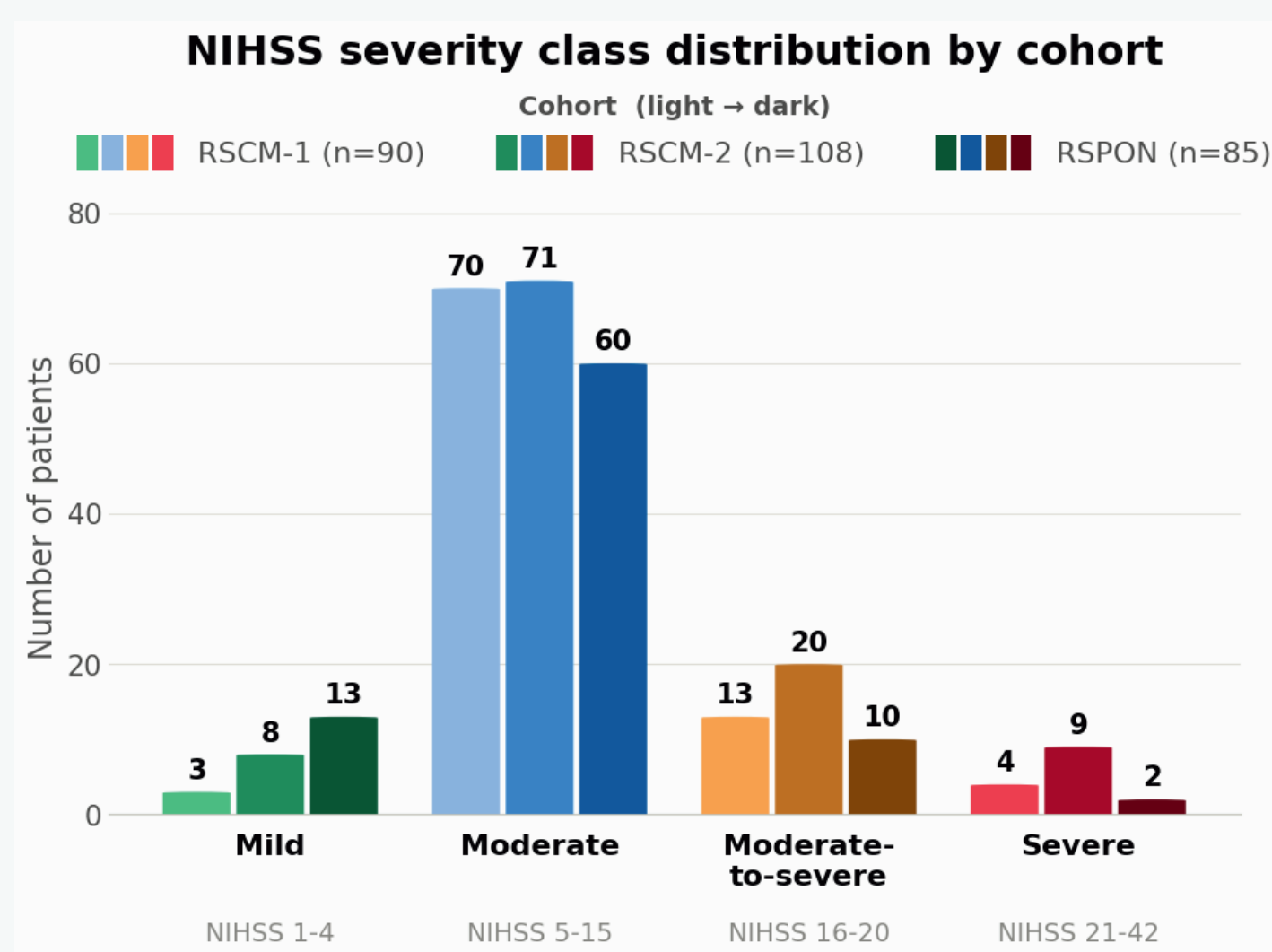
Objectives

- 1 Compare multimodal and unimodal models.
- 2 Evaluate cross-site robustness using LODO.

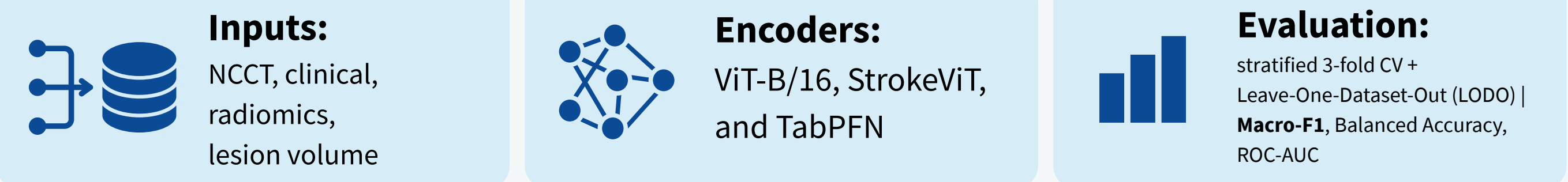


Cohort

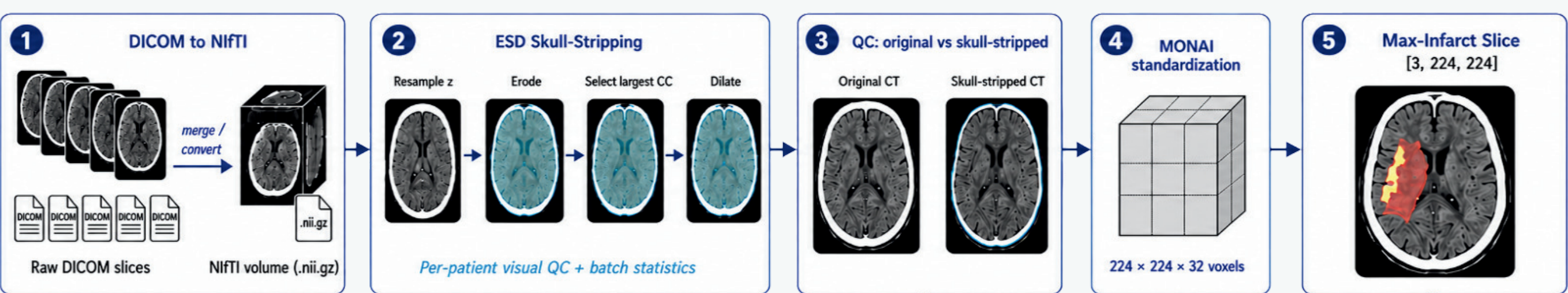
RSCM-1 n=90 | RSCM-2 n=108 | RSPON n=85



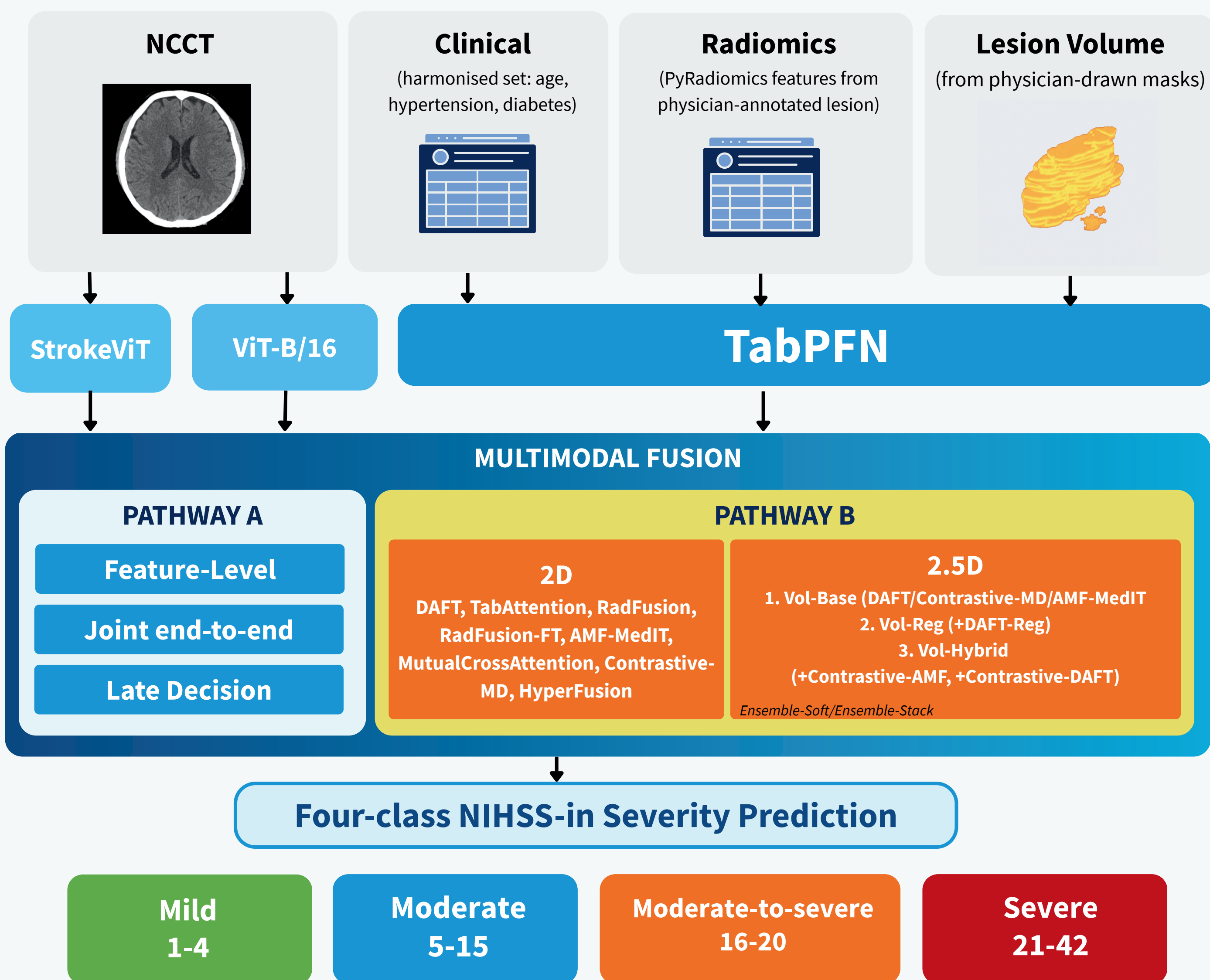
Methods



NCCT Preprocessing Pipeline



Overall Architecture



Key Findings

- Multimodal fusion can improve admission stroke severity classification, with benefits varying by cohort and strategy.
- RSCM-2 performed best using all four modalities; ablation highlighted physician-annotated lesion volume as a key predictor.
- Across three Indonesian cohorts, all methods declined under LODO. DAFT showed the greatest relative robustness, but gains did not consistently generalise.



Limitations

Small, imbalanced cohorts; two institutions; single seed; restricted clinical variables (3); annotation-dependent pathway. Severe class undetected (recall 0.00–0.22; n=2–9)



Conclusion & Future Work

Multimodal fusion improves within-cohort severity classification, but gains do not transfer reliably across hospitals. The peak on RSCM-2 marks what is reachable with all modalities studied here, including physician annotations.

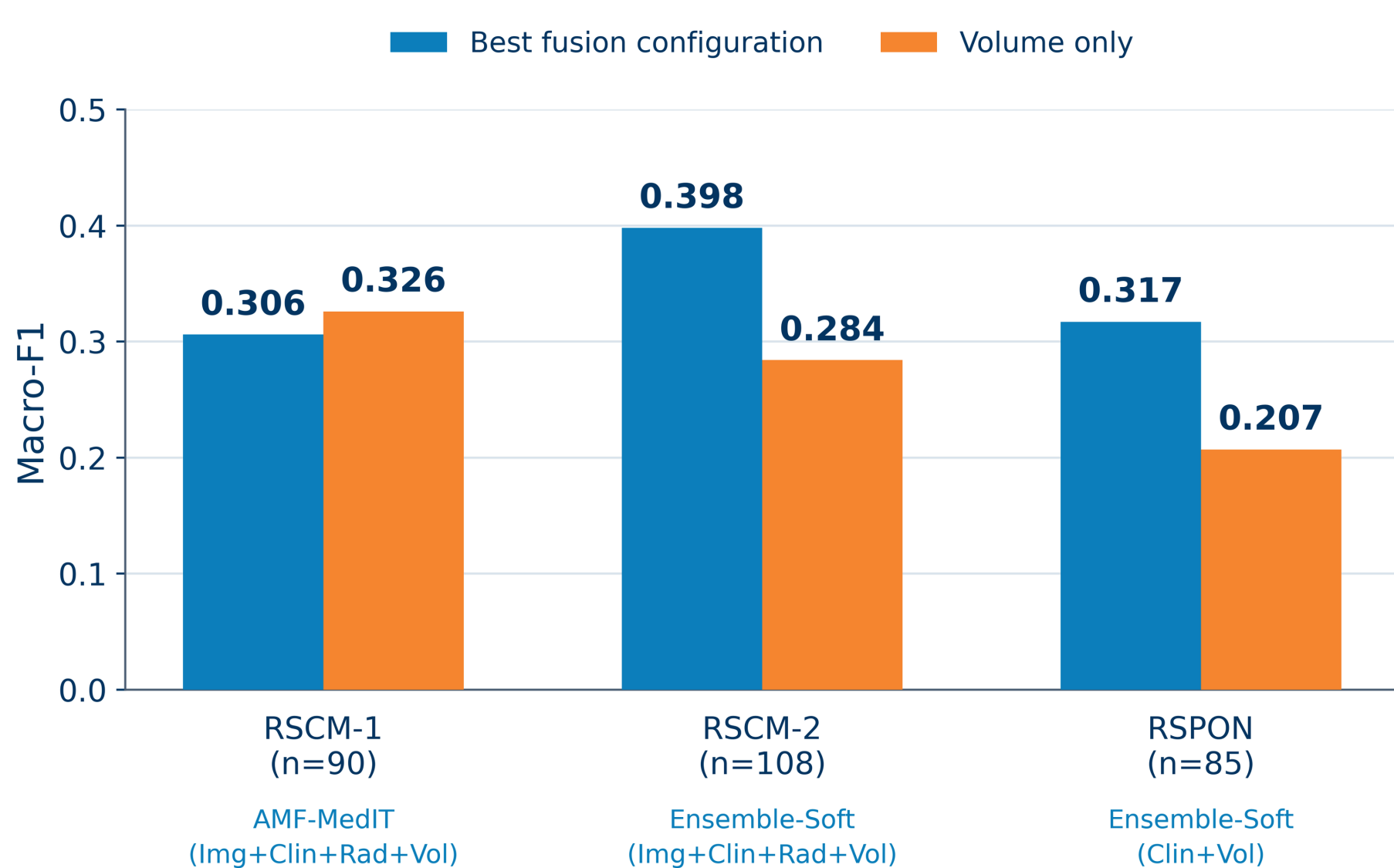


Multi-seed validation
ASPECTS
Automated lesion segmentation



Results

Peak Internal Performance (Macro-F1)

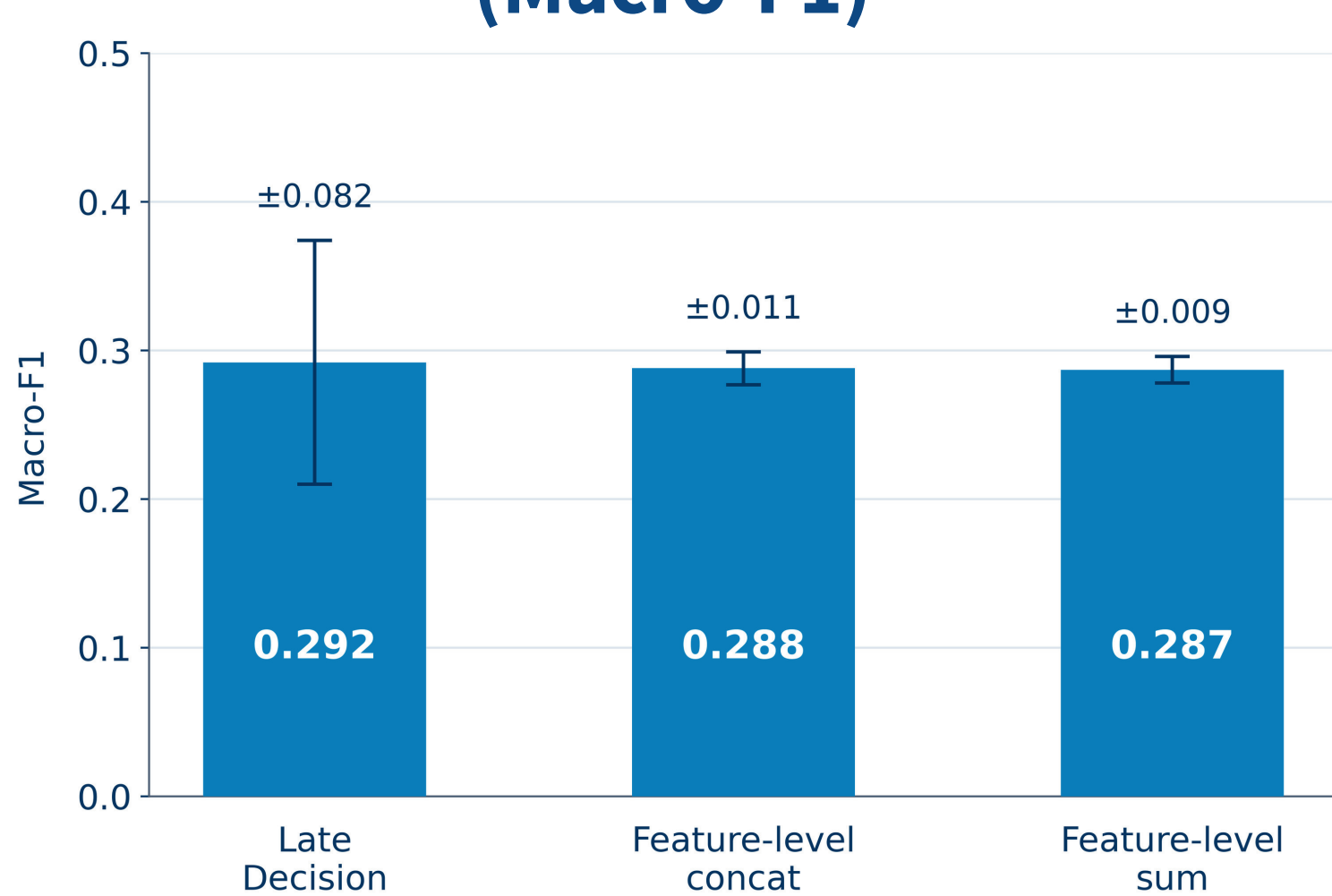


**PEAK
MACRO-F1**

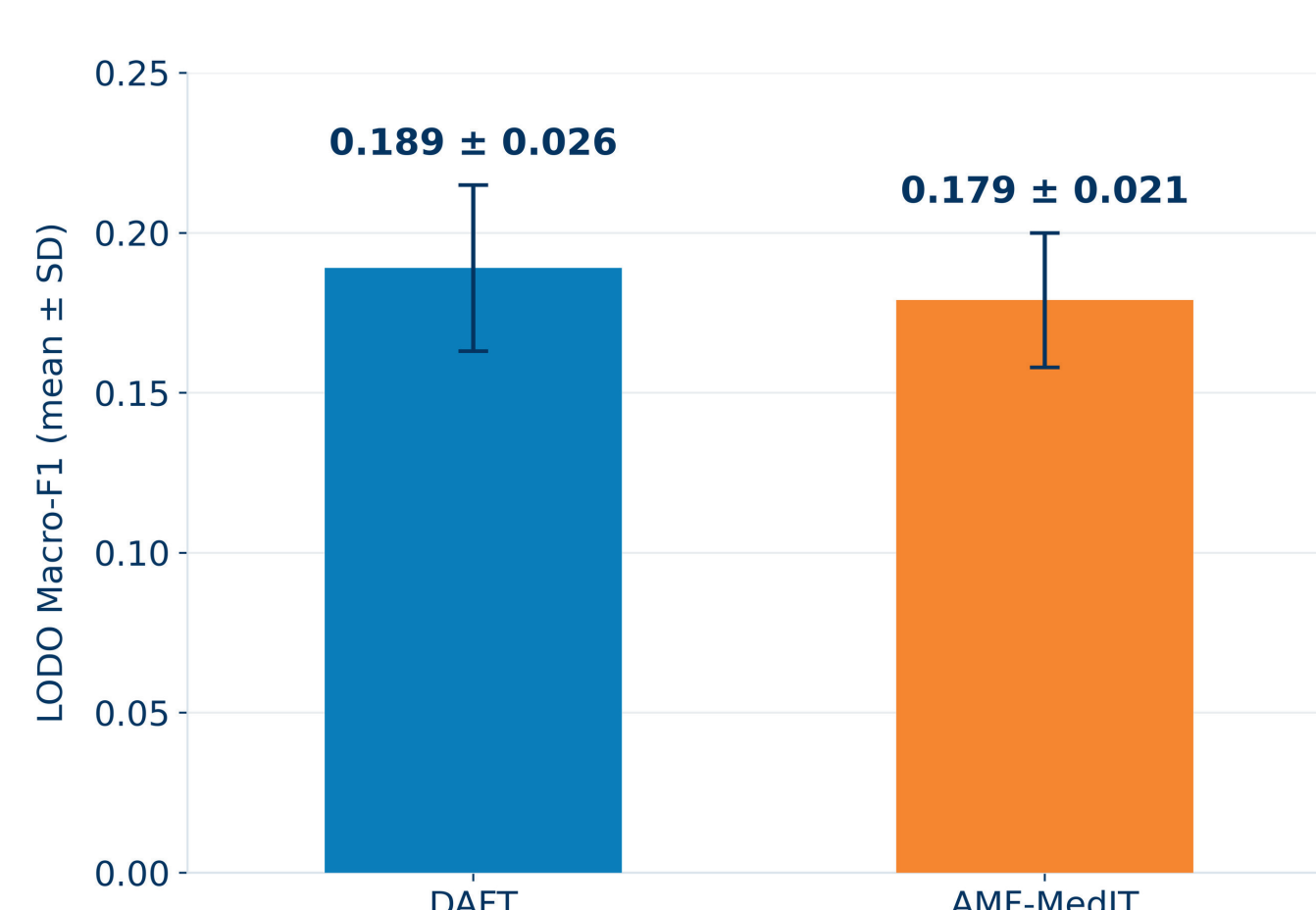
**RSCM-2
Ensemble-Soft
All four modalities**

Img + Clinical + Radiomics + LesionVol

Average LODO Performance (Macro-F1)



LODO Performance of DAFT & AMF-MedIT (Macro-F1)



DAFT achieved a higher mean Macro-F1 (0.189 ± 0.026) than AMF-MedIT (0.179 ± 0.021), while AMF-MedIT showed lower cross-cohort variability. Bars represent mean performance; error bars indicate standard deviation, not confidence intervals.



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