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MoDau: Symmetry-informed Mother–Daughter imputation for planned missing periodontal data

Communication Info

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Abstract

Partial-mouth and unilateral periodontal protocols reduce exam time but can bias prevalence estimates, for clinically relevant probing pocket depth (PPD) thresholds [1]. We introduce MoDau (Mother–Daughter), a symmetry-informed imputation framework for planned unilateral missingness that exploits contralateral information while allowing imperfect (fuzzy) oral symmetry. Mother models trained on NHANES 2011–12 use XGBoost and a directional symmetry measure [2, 3] to generate soft-label priors; Daughter models impute missing contralateral PPD from observed sites and these priors, optionally aided by a small target-sample New_Mother to reduce dataset shift. Robustness was assessed via noise-perturbed simulations, using RMSE/MAE/R² plus distributional (density overlap, KS) and epidemiologic (PPD \geq 4 mm prevalence agreement) targets [4]. MoDau achieved high accuracy with strongest agreement at higher PPD values and generally preserved PPD \geq 4 mm prevalence without systematic bias.

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