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Single Imputation for Audiograms

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Abstract : Audiograms detect hearing impairment, but missing values pose problems. This work explores imputations in an attempt to improve accuracy. This work implements Linear Regression, Lasso, Linear Support Vector Regression, Bayesian Ridge, K Nearest Neighbors (KNN), and Random Forest machine learning techniques to impute audiogram frequencies ranging from 125Hz to 8000Hz. The data contains patients who had or were candidates for cochlear implants. Accuracy is compared across two different Nested Cross-Validation k values. Over 4000 audiograms were used from 800 unique patients. Additionally, training on data combines and compares left and right ear audiograms versus single ear side audiograms. The accuracy achieved using Root Mean Square Error (RMSE) values for the best models for Random Forest ranges from 4.74 to 6.37. The R^{2} values for the best models for Random Forest ranges from .91 to .96. The accuracy achieved using RMSE values for the best models for KNN ranges from 5.00 to 7.72. The R^{2} values for the best models for KNN ranges from .89 to .95. The best imputation models received R^{2} between .89 to .96 and RMSE values less than 8dB. We also show that the accuracy of classification predictive models performed better with our best imputation models versus constant imputations by a two percent increase.

Keywords : machine learning, audiograms, data imputations, single imputations
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