Comparison of Regression Techniques to Predict Attractiveness from Facial Colour Cues

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I. Skin Colour and Facial Attractiveness
- Various facial colour cues were identified as valid predictors of facial attractiveness.
- Conventional studies on single colour variables simplified the complex nature of attractiveness judgement on real human faces.
- Predicting attractiveness from various colour cues is difficult due to the high number of candidate variables and their correlations.

II. Facial Images and Colour Analysis
- One hundred images of real human faces (Chinese samples) were used as the experimental materials.
- The colour was rigorously controlled to represent the naturally occurring facial colour variations in Chinese populations.
- A total of sixty-five explanatory colour variables were calculated for each facial image.

III. Facial Attractiveness Evaluation
- Judgement of perceived facial attractiveness was made based on the skin colour using a 7-point Likert-type scale.
- Two separate attractiveness evaluation data were collected through psychophysical experiments.

IV. Modelling and Analysis Procedures
- Literature Review
- Facial Colour Analysis
- Correlation Analysis
- Irrelevant Variables Removed
- N = 21
- Ordinary Least Squares (OLS)
- Subset Selection (SF, SB)
- Dimension Reduction (PCR, PLSR)
- Regularization (RR, LASSO, EN)

V. Predictive Accuracy and Model Fit
- The out-of-sample root-mean-square error for dimension reduction and regularization methods was better than the classical least-squares.
- The best ML algorithm (EN) predicted facial attractiveness within 0.67 points on a 7-point scale.

VI. Conclusions
- Eight strategies for robust regression of high-dimensional datasets were compared to predict attractiveness from facial colour cues.
- Here we evaluated statistical and ML algorithms for utilizing facial colour cues for attractiveness prediction based on realistic skin models.
- From both well-predicting and interpretable perspectives, ML techniques with feature selection (EN) were recommended for attractiveness modelling.
- Our results also demonstrated the importance of colour to facial attractiveness which is comparable to those structural features.