A Machine Learning Approach for Predicting Children's Future BMI

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BACKGROUND

- Children's future body mass index (BMI) is a major concern for parents and physicians due to the current pediatric obesity epidemic.
- Can we use machine learning techniques to predict children's future BMI?

METHODS

- Children's BMI were collected at two time points from Chinese hospitals between 1989 and 2010 (n = 5662). The age of children ranged from 0 to 17 years.

	Current Mean	Future Mean
Age	6.51 ± 5.19	16.71 ± 5.3
BMI (kg/m^2)	16.71 ± 2.31	18.93 ± 3.18

Sex	n
Male	3140
Female	2522

- We applied seven different machine learning regression techniques to train separate models to predict a child's future BMI.
- The models were trained and tested on 80% of our data (n = 4530).
- The accuracy of models were then evaluated using the remaining 20% of our data (n = 1132).

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RESULTS

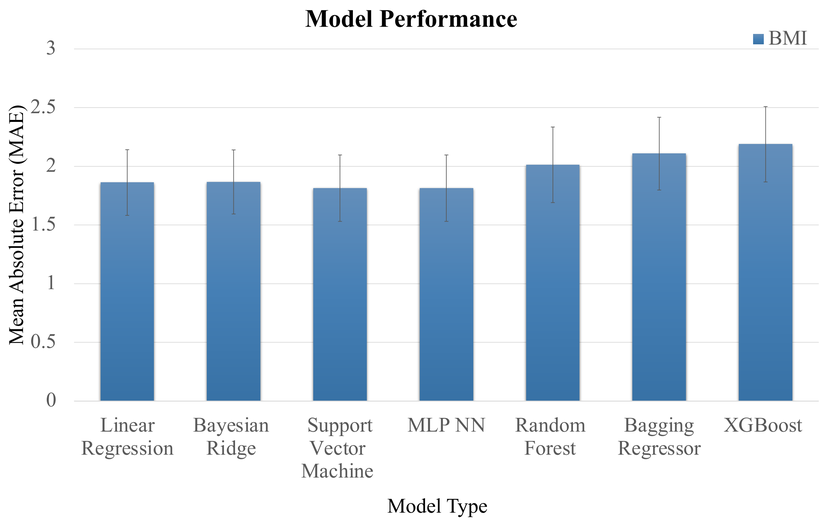

Figure 1: Mean absolute error for BMI (kg/m^2) for each machine learning model. Lower MAE represent improved model performance.

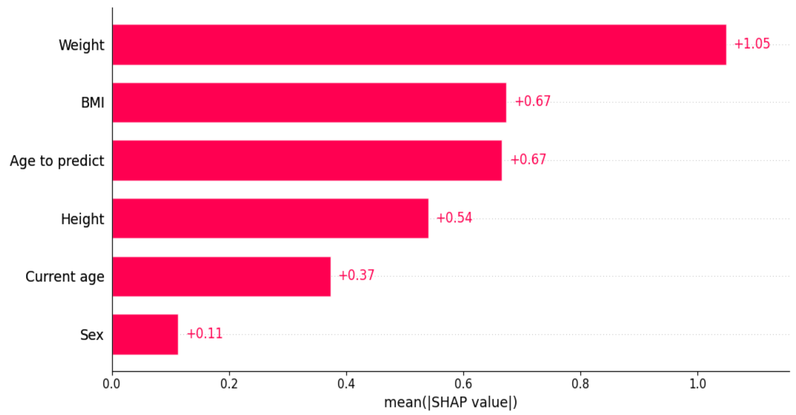

Figure 2: The bar chart represents mean SHAP values (SHapley Additive exPlanations) for each variable corresponding to the importance in predicting future BMI of children.

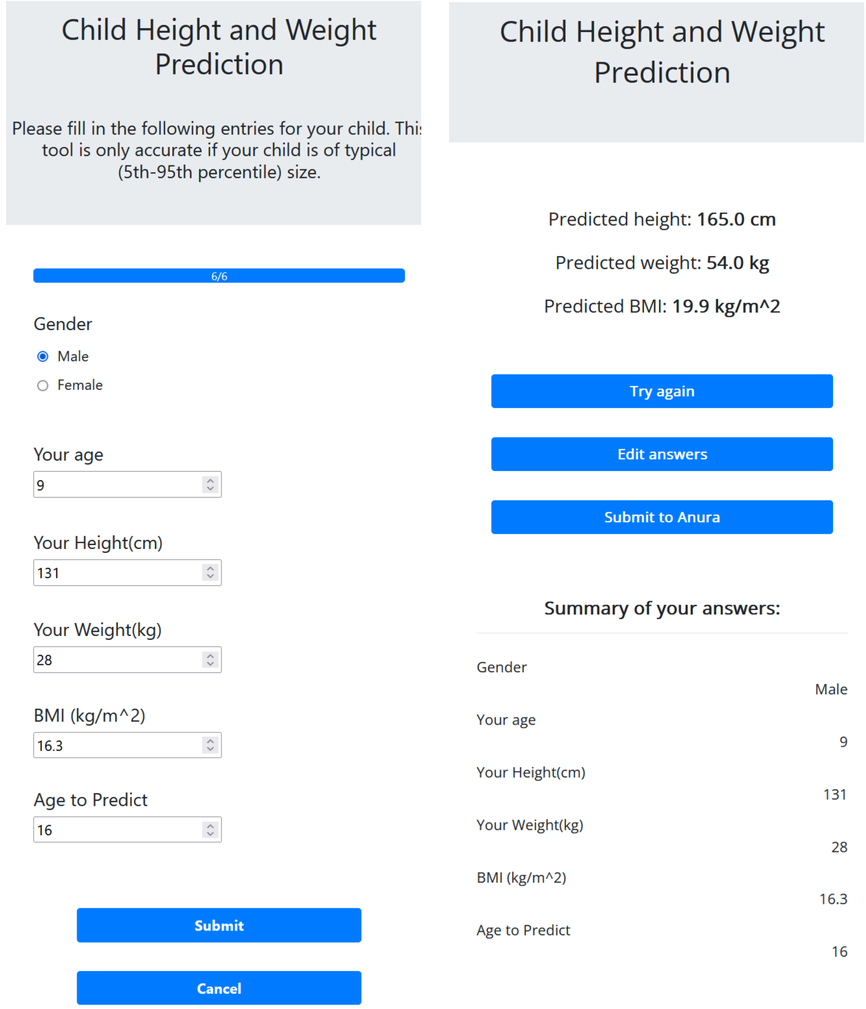

Figure 3: (Left) Questionnaire page of the website to enter the current age, height, weight, BMI and sex of children. (Right) Results page showing generated results from the implemented models, predicting the child's height, weight and BMI.

DISCUSSION

- Support Vector Machine and Multilayer Perceptron (MLP) performed the best in predicting a child's future BMI (Figure 1).
- Weight, BMI and age to predict were the most important factors for predicting BMI in children based on SHAP values (Figures 2).
- We implemented the machine learning models into a website to be filled out by clinicians and parents to make predictions (Figure 3).

Feel free to use our tool to predict a child's future BMI.

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