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| **Project Title** | Likelihood of obesity diseases provided with customized diet plans | | |
| **Track** | AI and machine learning | | |
| **Supervisor** | Muhammed Mostafa | | |
| **Team Name** | DataFit Squad | | |
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| **Problem Summary** | The prevalence of obesity-related diseases can significantly impact an individual's overall well-being and have adverse effects on the economic growth of society. To address this, we have developed an AI model that predicts an individual's susceptibility to obesity-related diseases. The model considers various attributes related to eating habits, such as frequent consumption of high-caloric foods (FAVC), vegetable consumption frequency (FCVC), number of main meals (NCP), food consumption between meals (CAEC), daily water intake (CH2O), and alcohol consumption (CALC). Additionally, attributes related to physical condition, such as calorie consumption monitoring (SCC), frequency of physical activity (FAF), time spent using technology devices (TUE), and transportation mode used (MTRANS), are considered. Gender, age, height, and weight are also considered user-provided variables. By utilizing this information, we can calculate the daily calorie requirements to achieve an ideal weight based on height and gender. This allows us to create personalized diet plans comprising meals and exercises. For individuals who are underweight, we suggest the daily calorie intake required for weight gain; for those within the normal weight range, we provide guidance on maintaining weight; and for those who are overweight, we offer strategies for losing target weight through recommended exercises and dietary modifications. | | |
| **Methodology** | Our approach began by collecting reliable datasets from Kaggle for training our model. We performed data cleaning by addressing outliers and duplicate rows. However, due to insufficient observations in the first dataset, we merged it with another dataset to ensure higher accuracy.  To handle the categorical and numerical features, we appropriately preprocessed the data. Subsequently, we split the data into training and testing sets to predict the likelihood of obesity diseases using multiple models: a neural network (95% accuracy), logistic regression (93% accuracy), and naïve Bayes for classification (82% accuracy).  We determined that logistic regression outperformed naïve Bayes due to its ease of finding answers for dependent or independent features with large data. Additionally, we implemented a neural network model for multiclass classification consisting of a hidden layer with 34 input features, a ReLU activation function, 15 hidden units, and an output layer with 7 units. This architecture facilitated quick adjustments without heavy reliance on the data's structure, making it suitable for large datasets.  To make the model accessible, we developed a mobile app using Python, Flutter, and Flask. The process involved UI design and the utilization of Python and Flutter to implement the app. We integrated the model into the Flutter app by hosting an API on PythonAnywhere, enabling seamless functionality for users. | | |
| **Achievements and Skills Gained** | 1. Teamwork and leadership 2. Coding skills 3. Gaining more knowledge about medical conditions and diseases. 4. Neural network and machine learning models 5. problem solving 6. Handling and cleaning data to maintain higher accuracy. 7. UI design 8. Mobile app development 9. Learning the right way to do a scientific research and to write a scientific report. | | |

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| **Main Results** |  |
| **Discussion and Conclusion** | In this project, we successfully addressed the prediction of obesity disease likelihood using classification models and a user-friendly mobile app. Logistic regression and neural networks proved effective in predicting obesity disease likelihood, with logistic regression demonstrating higher accuracy. The development of the app provided personalized predictions based on individual characteristics, empowering users to make informed decisions about their well-being. Future improvements include expanding the dataset, refining the models, and further developing the app based on user feedback. By leveraging machine learning techniques, this project contributes to preventive healthcare and emphasizes the potential for data-driven approaches to improve healthcare outcomes. The combination of accurate prediction models and a user-friendly app has the potential to support individuals in maintaining a healthy lifestyle and mitigate the risks associated with obesity-related diseases. |
| **References** | * [Akbar, F. (2022, June 11). Efficient data manipulation with pandas - towards data science. Medium.](https://towardsdatascience.com/efficient-data-manipulation-with-pandas-2cbc4e3824f9) * [Pandey, P. (2021, December 9). Animations with Matplotlib - Towards Data Science. Medium.](https://medium.com/towards-data-science/animations-with-matplotlib-d96375c5442c) * [Jiao, F. (2023, May 4). Panda LLM: Training Data and Evaluation for Open-Sourced Chinese Instruction-Following Large Language Models. arXiv.org.](https://arxiv.org/abs/2305.03025v1) * [Chaudhary, S. (2021, December 12). Why “1.5” in IQR Method of Outlier Detection? - towards data science. Medium.](https://medium.com/p/5d07fdc82097) * [Koech, K. E. (2022, July 1). How neural networks actually work — Python Implementation (Simplified). Medium.](https://medium.com/p/a1167b4f54fe) * [Parbhakar, A. (2018, June 21). Why Data Scientists love Gaussian? - Towards Data Science. Medium.](https://medium.com/p/6e7a7b726859) * [Li, S. (2019, February 27). Building A Logistic Regression in Python, Step by Step. Medium.](https://medium.com/p/becd4d56c9c8) |
| **Future Work and Suggestions** | * We can modify our model to suggest supplements to improve diet plans efficiency. * We can collect better food data to increase diversity of the daily meals to avoid items the user may be allergic to and to be more suitable for vegans or vegetarians. * We can make partnerships with Nutritionists to give advice to the users of the app and to choose their meals combinations depending on their medical cases. * We can provide our application with a database that contain the medical records for each user whether he is a Diabetic or a pressure patient and so on to suggest a better diet plan for him |
| **Group Photo** |  |