

Introduction	ſ
 Diabetes is a critical global health challenge, with Type-2 and gestational diabetes on the rise, often leading to severe complications like cardiovascular disease and kidney failure if undetected. 	•
 Our project harnesses AI to build a predictive model for early diabetes diagnosis, targeting pre-diabetes, Type-2, and gestational diabetes. 	
 By integrating demographic, lifestyle, and biometric data, and leveraging machine learning techniques such as Gradient Boosting and LSTM deep learning models. 	
Global Increase in Pre-Diabetes, Type-2, and Gestational Diabetes Cases (2000-2024)	•
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Objectives

• Early detection and Intervention:

By identifying high-risk individuals early, this project enables timely intervention, reducing the likelihood of diabetes progression and severe complications.

Personalized Health Guidance:

With AI-driven insights tailored to individual risk factors, patients receive customized recommendations, improving lifestyle management and adherence.

Reduced Healthcare Costs:

Preventing or delaying diabetes onset lowers the need for expensive treatments, reducing the financial burden on both patients and healthcare systems.

• Accessible and Scalable Solution:

Once deployed, the model can be accessed widely, providing a costeffective and scalable approach to diabetes screening and prevention, especially in underserved areas.

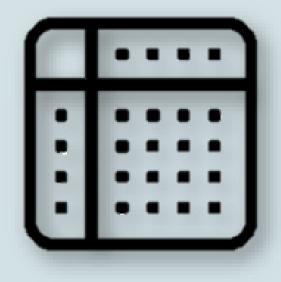
Methodology

Data Collection & Preprocessing:

• Sources: Collected five datasets from sources like GitHub, Kaggle, and CDC, including specialized datasets like the PIMA Indians dataset and the BRFSS survey from CDC.







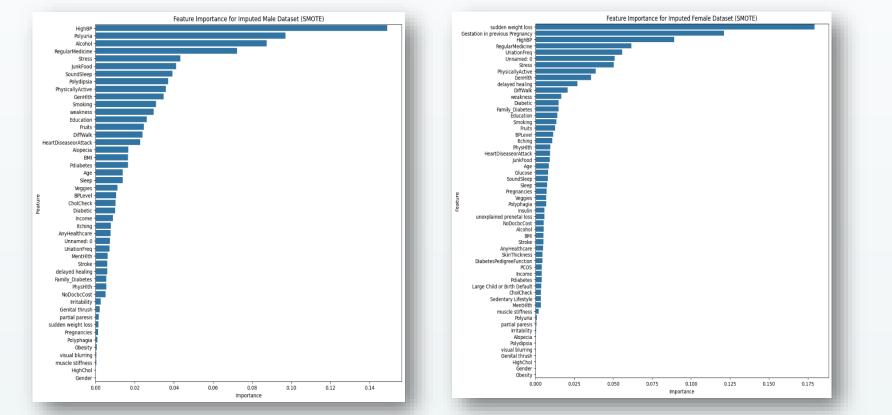


REAL TIME AI POWERED HEALTH COACH FOR DIABETES

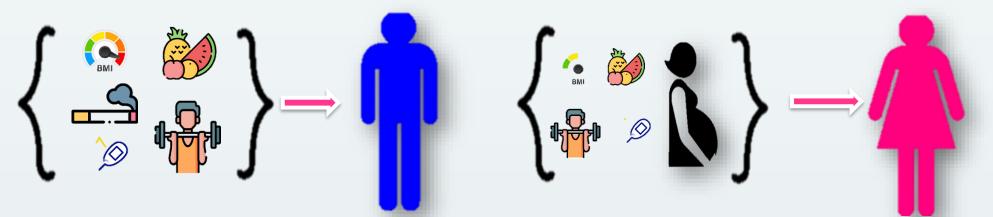
School of Science and Engineering-University of Missouri Kansas City DATA DIVERS (Ashna Ali, Sai Kiran Basetty, Sreevardhan Reddy Soma, Venkata Sai Veeramalla)

Methodology

Feature Selection: Filtered features relevant to diabetes diagnosis (e.g., physical activity, diet, age, BMI).



Gender-Based Split: Separated data into male and female datasets to handle gender-specific diagnoses (e.g., gestational diabetes for females).



Encoding & Scaling: Label-encoded categorical features and normalized numerical values; added a 'Patient_ID' column to organize data for time series analysis.

CGM Data Simulation:

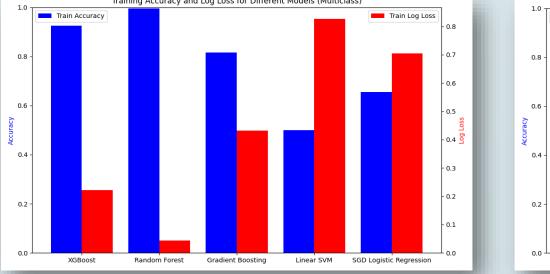
• Data Generation: Simulated Continuous Glucose Monitoring (CGM) data for 24 timestamps per day across all four diabetes classes.

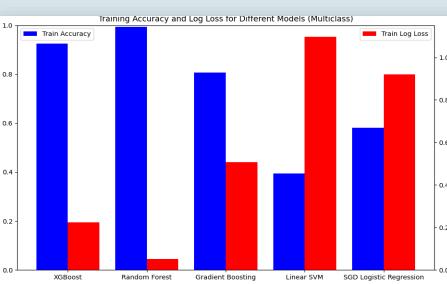
• Preprocessing: Converted timestamps to seconds after midnight and normalized glucose readings and time using MinMax scaling.



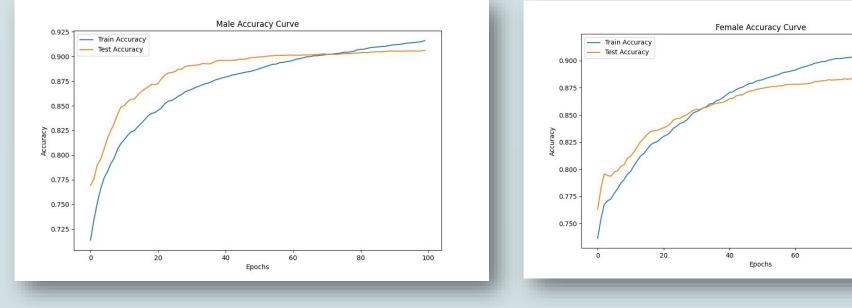
Model Selection (Structured Data):

• Model Testing: Evaluated XGBoost, Random Forest, Gradient Boosting, Linear SVM, and SGD Logistic Regression.



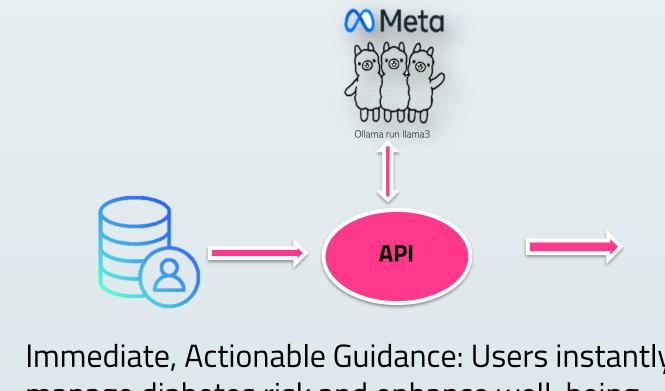


• Results: XGBoost and Random Forest outperformed others, with XGBoost chosen as the final model due to reliable accuracy (around 90-85%).



CGM Model (Time-Series Data):

LLaMA (LLM)FOR RECOMMENDATION:



RESULTS:

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Sign Up	
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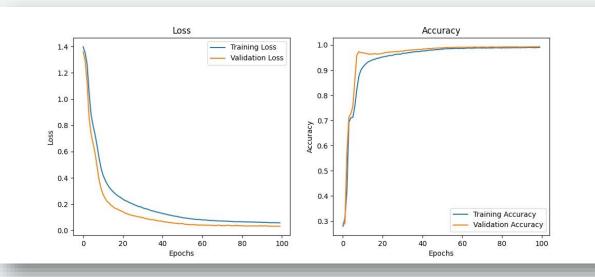


• LSTM Model: Developed an LSTM model for classifying diabetes status based on CGM data, optimized for temporal patterns.

• Preprocessing: Mapped condition and gender to numeric codes, converted timestamps, applied MinMax scaling, and reshaped data into 24-hour sequences per patient.

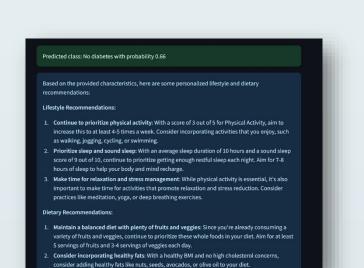
• Training: Trained over 100 epochs with dropout, regularization, early stopping, and learning rate reduction to prevent overfitting.

• Outcome: Achieved effective classification accuracy, enabling reliable predictions of diabetes status from CGM data.



• Personalized Input Collection: Users provide health details like age, BMI, and lifestyle factors through a simple questionnaire.

• LLaMA 3.2 Processing: The model analyzes formatted data via an API, generating personalized health recommendations.

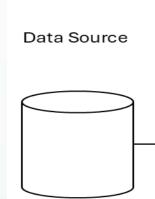


• Immediate, Actionable Guidance: Users instantly receive tailored advice to manage diabetes risk and enhance well-being.

At the End the user is able to know the predicted result along with recommendations. Login page Gender page

Login page	Gender page	Gender Based query form
		Welcome sree, Questionnaire fo Male Patients
rediction App - Sign Up / ۴ o	Welcome sree! Select your gender Select your gender Male Female	Have you been diagnosed with high blood pressure? Yes No Physical activity per week: Not Active Lightly Active Moderately Active Very Active Height [in inches]
		Weight (in pounds) Provide both height and weight for BMI calculation. Average sleep time per day (in hours)
Prediction Along with I	Recommendation using Llama 3.2	Average hours of sound sleep
No diabetes with probability 0.66 evided characteristics, here are some personalized lifestyle and dietary ns: mendations: a prioritize physical activity: With a score of 3 out of 5 for Physical Activity, aim to s to at least 4-5 times a week. Consider incorporating activities that you enjoy, such jogging, cycling, or swimming. eep and sound sleep: With an average sleep duration of 10 hours and a sound sleep ut of 10, continue to prioritize getting enough restful sleep each night. Aim for 7-8 ep to help your body and mind recharge. or relaxation and stress management: While physical activity is essential, it's also on make time for activities that promote relaxation and stress reduction. Consider e meditation, yoga, or deep breathing exercises. mendations: balanced diet with plenty of fruits and veggies: Since you're already consuming a uits and veggies, continue to prioritize these whole foods in your diet. Aim for at least fruits and 3-4 servines of veezies each day.	 Dietary Recommendations: Maintain a balanced diet with plenty of fruits and veggies: Since you're already consuming a variety of fruits and veggies, continue to prioritize these whole foods in your diet. Aim for at least 5 servings of fruits and 3-4 servings of veggies each day. Consider incorporating healthy fats: With a healthy BMI and no high cholesterol concerns, consider adding healthy fats like nuts, seeds, avocados, or olive oil to your diet. Stay hydrated: While there's no specific concern for urination frequency, it's essential to drink plenty of water throughout the day to stay hydrated. General Wellness Recommendations: Listen to your body and take rest days: With a busy schedule and prioritizing physical activity, make sure to listen to your body and take rest days when needed. Stay connected with friends and family: Social connections are vital for mental well-being. Prioritize spending time with loved ones and engaging in activities that bring you joy. Practice self-care and prioritize your mental health: With no concerns for high blood pressure, PCOS, or other health issues, focus on prioritizing your mental health and overall well-being.	

Workflow



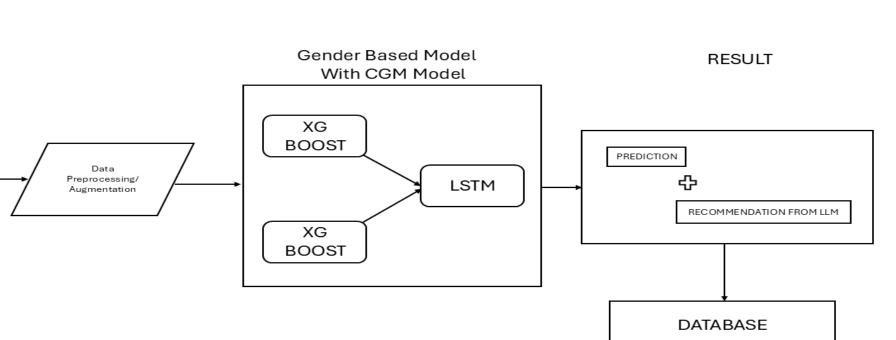
•Patient Compliance and Data Quality: Ensuring accurate data is challenging due to inconsistent patient logging. Future improvements will leverage wearable devices for automated, high-quality data collection.

efficiently.

Conclusion

- management.
- insights.

Reference



Future Work

•Scalability for Real-time Data Handling: Real-time data from multiple users requires a robust backend. Future enhancements will focus on scalable infrastructure to manage simultaneous user data streams

• Our project harnesses machine learning, structured health data, and continuous glucose monitoring to transform early diabetes detection and

• With separate models tailored for male and female health profiles, we enhance prediction accuracy and provide personalized, actionable

• Empowering users in the fight against diabetes and promoting better health outcomes.

1. 2024 Fall CS5588 Data Science Capstone (Instructor: Dr. Yugi Lee)

2. Hasan, Md. K., Alam, Md. A., Das, D., Hossain, E., & Hasan, M. (2020). Diabetes Prediction Using Ensembling of Different Machine Learning Classifiers.IEEEAccess,8,7651676531. https://doi.org/10.1109/access.2020.2989857.

3. Wu, Y.-T., Zhang, C., Ben W.J. Mol, Kawai, A., Li, C., Chen, L., Wang, Y., Sheng, J.-Z., Fan, J., Shi, Y., & Huang, H.-F. (2021). Early Prediction of Gestational Diabetes Mellitus in the Chinese Population via Advanced Machine Learning. The Journal of Clinical Endocrinology and Metabolism 106(3),e1191e1205. https://doi.org/10.1210/clinem/dgaa899.

4. Papers with Code - Diabetes Prediction. (2022). Paperswithcode.com. https://paperswithcode.com/task/diabetes-prediction.

5. Diabetes Prediction using Machine Learning. (n.d.). Kaggle.com. https://www.kaggle.com/code/ahmetcankaraolan/diabetes-predictionusing-machine-learning.

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