

COVID-19 INFANT GROWTH ANALYSIS AND PERIOD PREDICTION

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ABSTRACT

- The project analyzes how the COVID-19 pandemic impacted early childhood growth and developmental milestones.
- The dataset included age, height, weight, milestone scores, and speech development scores of infants.
- XGBoost 2.0 and TabPFN models were applied to classify time periods as pre-, during-, and post-COVID based on child development data.
- Feature importance analysis revealed that milestone and speech development scores were the most influential predictors for classifying the COVID period.



PROBLEM STATEMENT

- The COVID-19 pandemic has affected how infants grow and develop, both physically and mentally.
- Factors like weight, height, age milestones, and speech development may have changed because of the pandemic.
- It's important to study infant data to find patterns and understand how COVID-19 has influenced their growth.
- This project uses computer models (XGBoost and TabPFN) to check and classify the health and development of infants.
- The goal is to use this analysis to find early signs of developmental problems and help doctors and parents make better health decisions for infants.



OBJECTIVES

- Data Collection
- Data Cleaning and Preprocessing
- Data Splitting
- Model Creation and Training
- Model Prediction
- Model Evaluation
- Visualization (feature importance)
- Future Prediction
- Flask App



Motivation

- COVID-19 didn't just affect adults – it also had an impact on babies, who are growing and developing fast.
- We still don't know much about how the pandemic changed babies' health and development
- If we can find early signs of slow growth or delays, parents and doctors can help babies sooner.
- Using machine learning helps us study baby health data and find useful patterns.
- This project hopes to give helpful information to parents and doctors to keep babies healthy and growing well.



Literature Review

- Many studies during and after COVID-19 have looked at how the pandemic affected children's health and development. However, most of them focused on adults or older children, not on infants.
- Studies by Green et al. (2023) and Berthelot et al. (2020) followed children over time and showed that stress and less social interaction during the pandemic affected their growth and development.
- Classic works by Bayley (2006), Hoff (2006), and Shonkoff & Phillips (2000) explain how children learn and grow, especially through language and social interaction.
- Reports from WHO (2018), UNICEF (2021), and Harvard University (2020) stress that it's important to find developmental problems early so children can get help quickly.

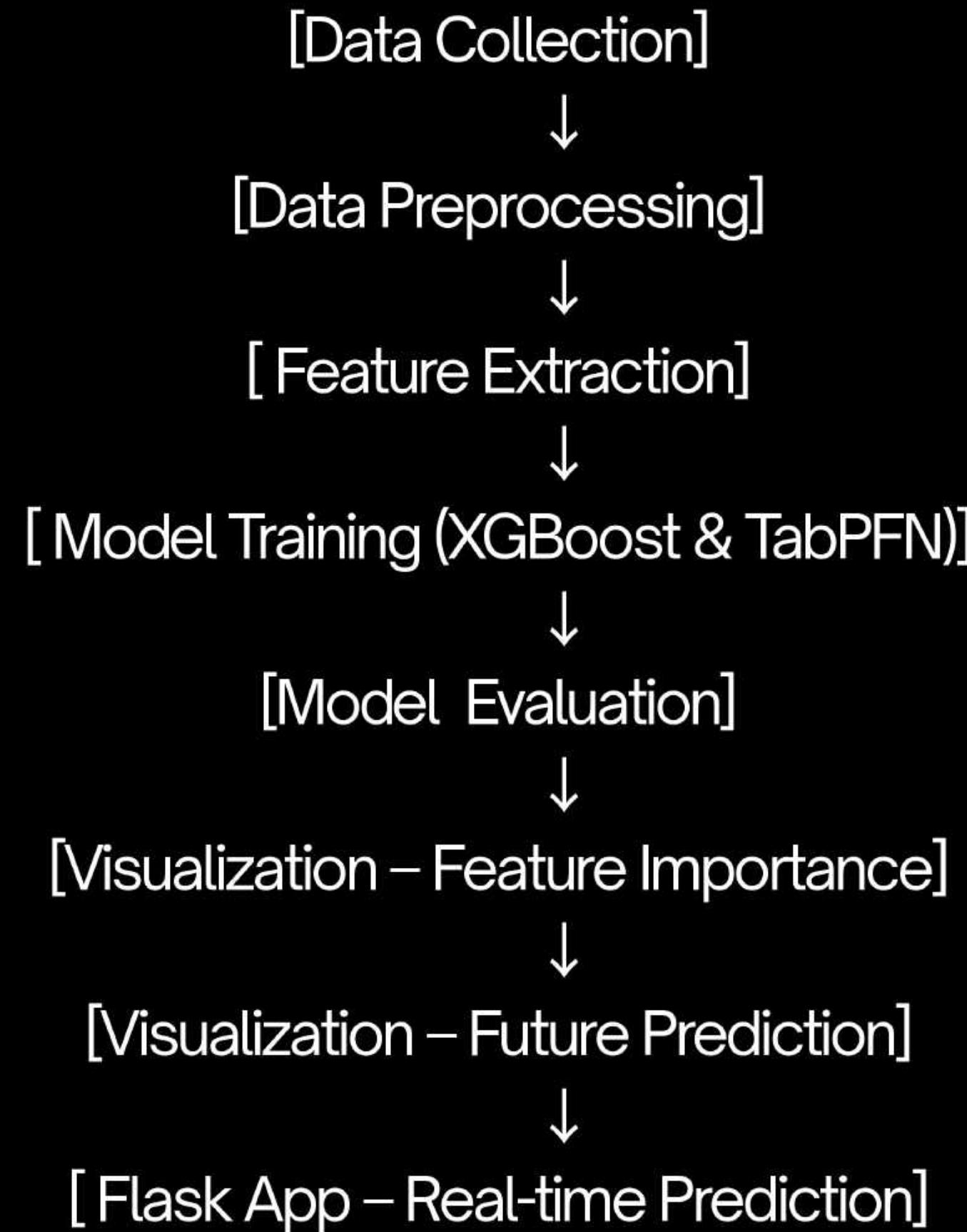


PROPOSED SYSTEM

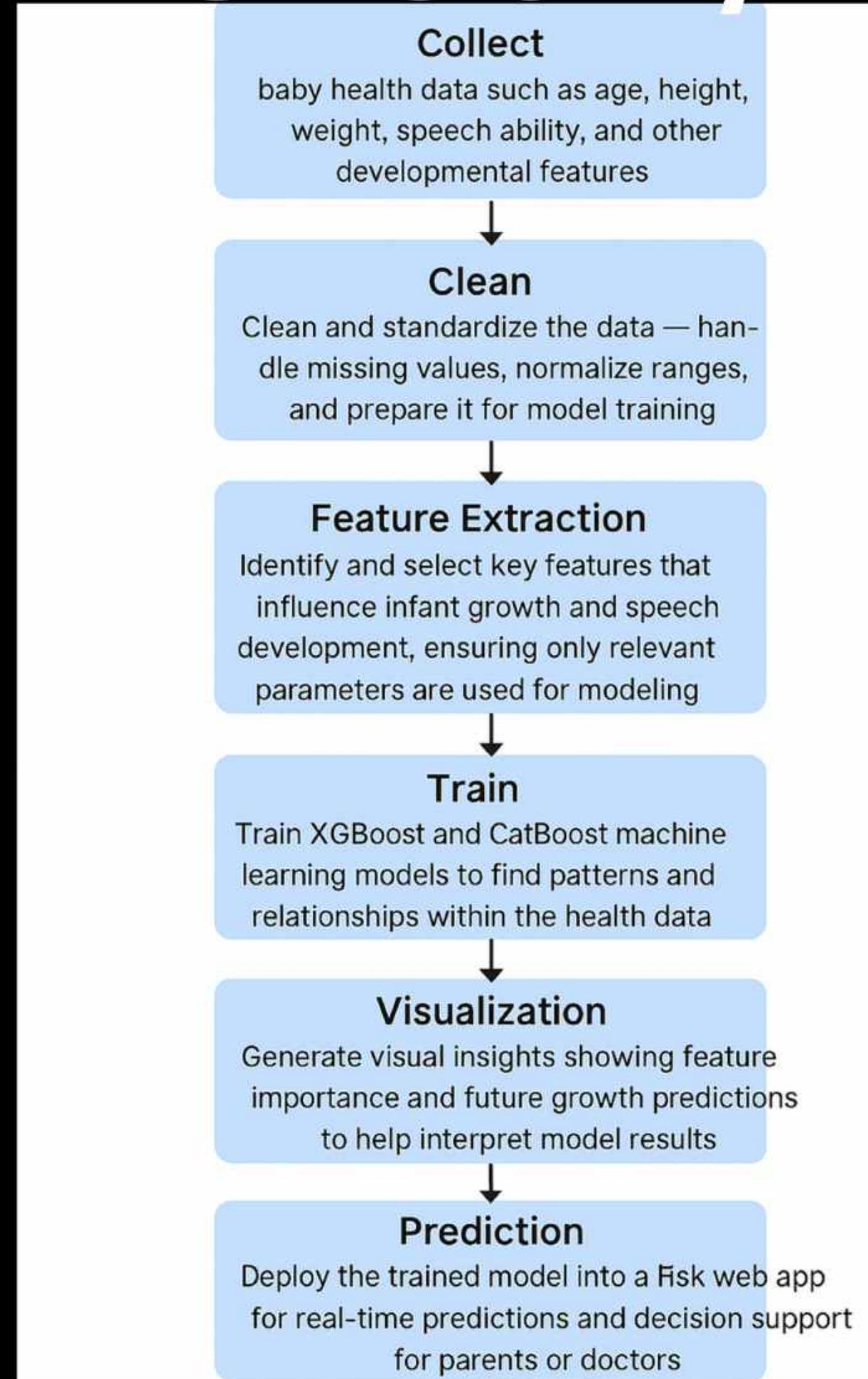
- We collect information about babies – like their age, height, weight, and speech development.
- We clean the data and make sure it's ready to use.
- We pick out the most useful details that show how babies are growing.
- We train computer models (XGBoost and CatBoost) to check if a baby's development is normal or delayed.
- We test how well the models work and see which factors matter the most.
- Finally, we give helpful insights so parents and doctors can spot early signs of slow growth.



System Architecture / Design

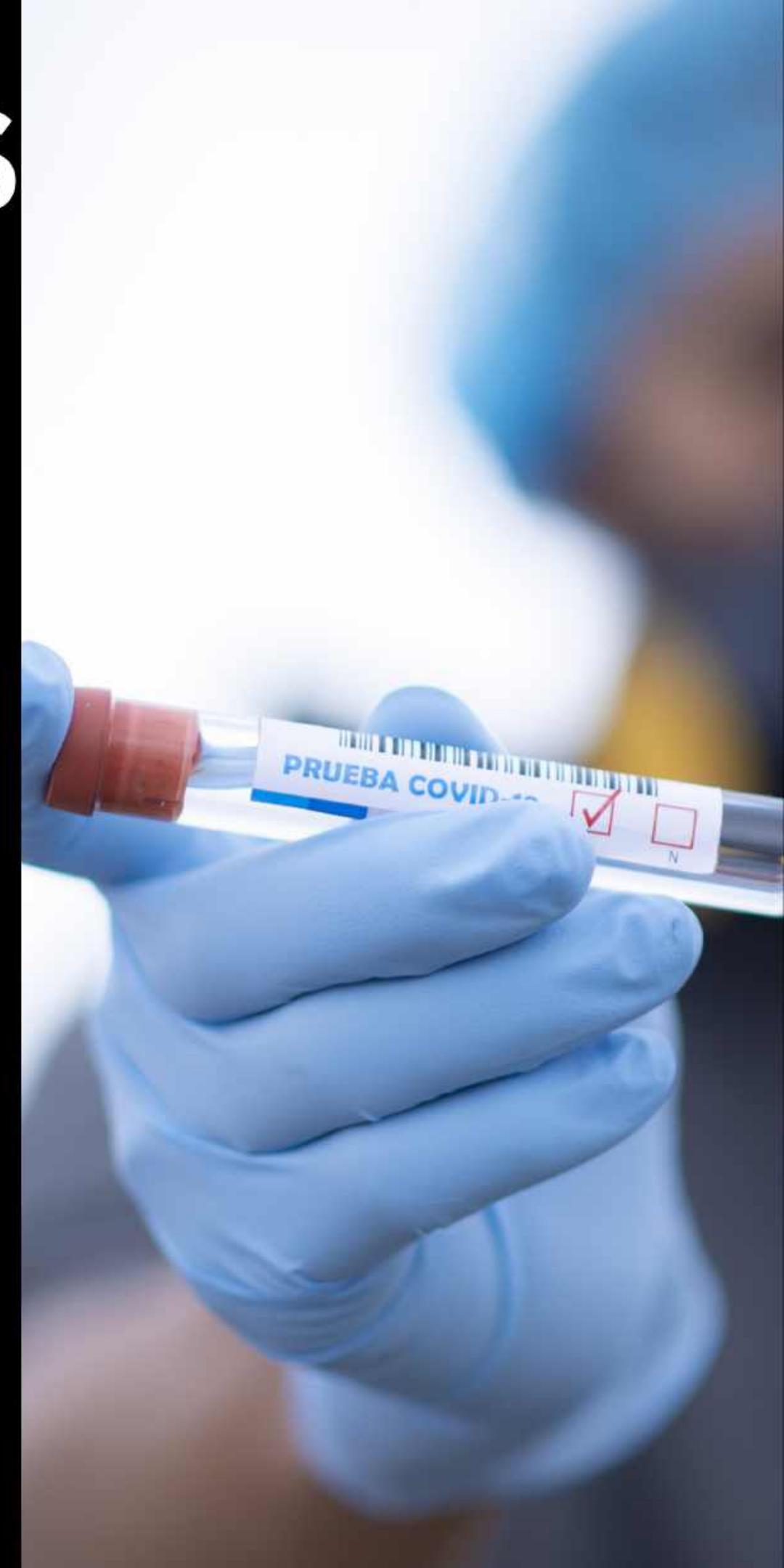


METHODOLOGY / WORKFLOW



TOOLS AND TECHNOLOGIES

- Programming Language : Python
- Libraries: pandas, numpy, matplotlib, scikit-learn, xgboost, TabPFN, flask , threading, time, requests, os, pyngork
- Environment: Jupyter Notebook
- Visualization: Matplotlib
- Model Deployment: Flask



Implementation

XGBoost

- Dataset of infant health records was cleaned and preprocessed.
- Features like age, weight, speech score, Milestone score , and COVID period were used.

	[[27 9 4] [12 18 10] [6 12 22]]	precision	recall	f1-score	support
0	0.60	0.68	0.64	40	
1	0.46	0.45	0.46	40	
2	0.61	0.55	0.58	40	
accuracy				0.56	120
macro avg		0.56	0.56	0.56	120
weighted avg		0.56	0.56	0.56	120

TabPFN

- XGBoost and TabPFN models were trained to classify infant development.

RESULTS

- Both models gave good accuracy and recall.
- TabPFN performed slightly better for prediction.
- Matplotlib showed top factors: speech score, age, and weight.

	Detailed Classification Report:	precision	recall	f1-score	support
0	0.74	0.65	0.69	40	
1	0.39	0.50	0.44	40	
2	0.59	0.50	0.54	40	
accuracy				0.55	120
macro avg		0.57	0.55	0.56	120
weighted avg		0.57	0.55	0.56	120

CONCLUSION

- The study highlights that the COVID-19 pandemic may have influenced infant growth and development patterns.
 - Using machine learning, we can identify infants who might be at risk of developmental delays.
 - Early detection allows parents and healthcare professionals to take timely actions and provide necessary support.
 - Overall, this project promotes data-driven insights to improve early childhood care and developmental outcomes.

REFERENCES

- Deoni et al. (2022) – Impact of COVID-19 on infant brain development.
- Shuffrey et al. (2022) – Language development in infants during the pandemic.
- WHO (2018), UNICEF (2021) – Reports on early childhood health and development.
- Green et al. (2023), Berthelot et al. (2020) – Effects of environmental stress on child growth.



Thank You

