**Project Design Phase**

**Solution Architecture**

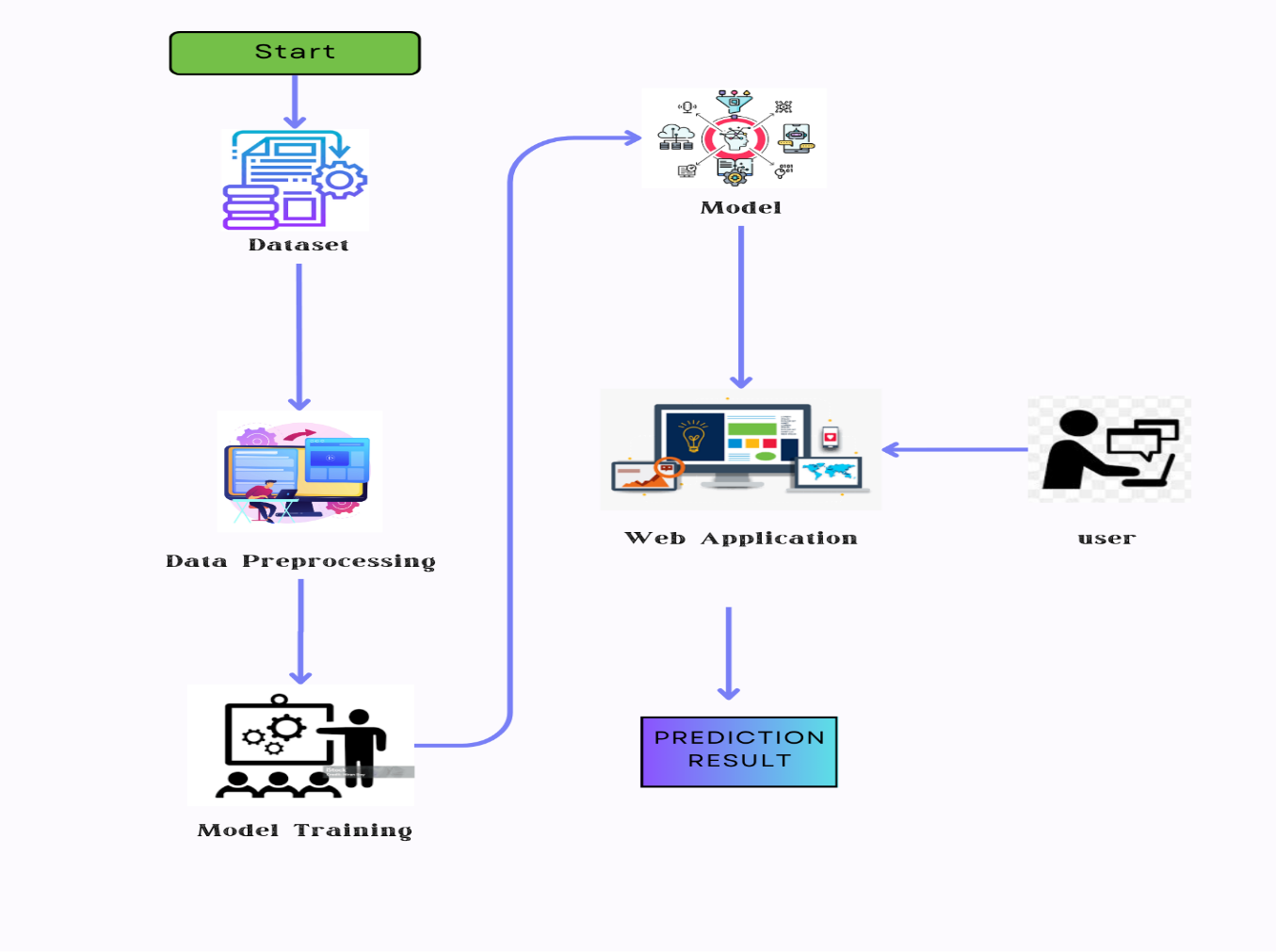
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| --- | --- |
| Date | 30 June 2025 |
| Team ID | LTVIP2025TMID35420 |
| Project Name | Revolutionizing Liver Care : Predicting Liver Cirrhosis Using Advanced Machine Learning Techniques |
| Maximum Marks | 4 Marks |

## Solution Architecture: Solution architecture plays a critical role in bridging the gap between healthcare problems and modern technology-based solutions. In the context of liver cirrhosis prediction, the architecture ensures a streamlined integration of data input, machine learning model inference, and secure result delivery.Early detection of liver cirrhosis can be drastically improved using machine learning models trained on clinical and biochemical data. The system is designed to be modular, scalable, and adaptable to both hospital networks and rural health settings. A key strength of the architecture is its use of explainable AI tools, which help build trust among medical professionals. Objectives of the Solution Architecture include: - Finding the best technological approach to predict liver cirrhosis efficiently and accurately. - Describing the structure, behavior, and flow of the application components. - Defining features and technical requirements for successful implementation. - Providing clear specifications to guide development and delivery.

**Key Components of the Solution Architecture**

* Data Layer: Collects and stores biochemical lab values, patient history, and demographics from clinics and hospitals.
* Preprocessing Layer: Cleans, transforms, and selects features necessary for accurate model predictions.
* ML Model Layer: Implements algorithms like XGBoost or Random Forest, fine-tuned using hyperparameter optimization.
* Interpretability Layer: Uses SHAP/LIME to generate visual explanations of predictions for clinical trust.
* Deployment Layer: A web/mobile interface that provides real-time predictions, scalable via cloud infrastructure.

**Example - Solution Architecture Diagram**

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