Biomarker Time Series Visualization Dashboard – Development & Hosting Report

1. Project Objective

As part of the EcoTown Health Tech Internship assignment, the goal of this project was to develop and deploy a Biomarker Time Series Visualization Dashboard. The dashboard visualizes key biomarkers—lipid profile, creatinine, Vitamin D, Vitamin B12, and HbA1c—across multiple time points using interactive charts.

The aim was to help healthcare professionals track patient biomarkers quickly and identify deviations from clinical ranges briefly.

2. Development Process

2.1 Data Extraction (Python)

- Two PDF reports were selected from the Google Drive "Sample Reports" folder.
- A Python script was created using PyMuPDF (fitz) to extract tables and key-value biomarker pairs.
- **Data was structured into JSON format containing:**
    1. Patient name, age, and date
    2. Biomarker values, units, reference ranges, low and high thresholds
    3. Extracted Biomarkers:
    4. Total Cholesterol, LDL, HDL, Triglycerides
    5. Creatinine
    6. Vitamin D, Vitamin B12
    7. HbA1c

2.2 Frontend Visualization (JavaScript + Chart.js)

- Implemented using plain HTML, CSS, and JavaScript.
- Chart.js was used to create bar and time series line charts.
- A dropdown allows users to switch between multiple reports.
- Colour coding was added:
- Green: within clinical range
- Red: out-of-range
- Tooltips show biomarker value, unit, and normal range.

3. Architecture Decisions Log

Area	Decision	Justification
Framework	Vanilla JS	Simple, fast-loading MVP
Charting Library	Chart.js via CDN	Lightweight, responsive, no setup needed
Hosting	Vercel (static)	HTTPS by default, zero config required
File Storage	JSON files in project root	Ensures clean path resolution
Removed Tooling	No Vite, no build system	Avoided deployment conflicts

4. Clinical Ranges Reference

Biomarker	Unit	Normal Range
Total Cholesterol	mg/dL	125–200
LDL	mg/dL	<100
HDL	mg/dL	>40
Triglycerides	mg/dL	<150
Creatinine	mg/dL	0.6–1.3
Vitamin D	ng/mL	30–100
Vitamin B12	pg/mL	211–911
HbA1c	%	4.0–5.6

Clinical ranges were sourced from Mount Sinai and MarkerDB.

5. Performance Benchmarks

Metric	Result
Load Time	< 1 second
Chart Render Time	~100ms
JSON Parse Time	< 50ms
Mobile Responsiveness	Fully responsive

Tested across Chrome, Firefox, Edge.

6. Security Considerations

- No external API dependencies
- No user input = no injection risk
- Data served over HTTPS via Vercel
- JSON only read, not written
- Minimal surface area = minimal vulnerabilities

7. Deployment Steps (Vercel)

- Deleted Vite-related files (package. Json, node_modules, vite.config.js)
- Moved all JSON data files to project root
- Updated paths in JS: fetch ("/biomarkers1.json")
- Committed and pushed final repo to GitHub
- Connected GitHub repo to Vercel
- Vercel auto-deployed dashboard at: https://biomark-dashboard.vercel.app

8. Dashboard Layout

- Header: Patient name, age, and report date
- Dropdown: Select different reports (time series simulation)
- Main Chart: Interactive bar chart for biomarkers
- Tooltip: Value, unit, clinical range
- Colors: Red (abnormal), Green (normal)

9. Required Features Implemented

Feature	Status
Multi-series time series charts	Success
Clinical range indicators	Success
Interactive tooltips	Success
Responsive mobile/desktop design	Success
Static hosting with public access	Success

10. Deliverables

Item	Links/Description
Dashboard URL	https://biomark-dashboard.vercel.app
GitHub Repo	https://github.com/ChethanNazre/biomark-dashboard
JSON Files	biomarkers1.json, biomarkers2.json, etc.
Demo Video	https://youtu.be/zoz1qlv4F7s

11. Conclusion & Future Scope

This dashboard successfully delivers a clinical time series visualization MVP with clean, minimal code, and reliable performance. Future scope includes:

- Adding zoom/pan and time filters
- Uploading custom reports via file input
- Exporting visuals to PDF or PNG
- Integrating AI summaries or alerts based on data