

LLM User Agent for Mining EHR & PGHD Data

Research Overview & Demonstration

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Motivation and Challenges

- EHR and PGHD contain rich longitudinal data
- Clinician overload: Hard to sift for key insights.
- Need for rapid trend detection & decision support
- Combination visualization + AI Summarization
- Opportunities: Patient-generated health Data (PGHD).

System Architecture

- Interface Engine – FHIR Conversion
- HAPI FHIR Server storage
- Llama 3.1 User Agent
- Visualization & Chat Front-End

Dataset

- Types of Data:
 - ADT: Admission, Discharge and Transfer
 - CCDA: Consolidated clinical Document Architecture
 - ORU: Observation Result

Data Preprocessing

- PHI masking & differential privacy
- Code-to-display mapping (LOINC)
- JSON per-patient extraction
- Chronological sorting

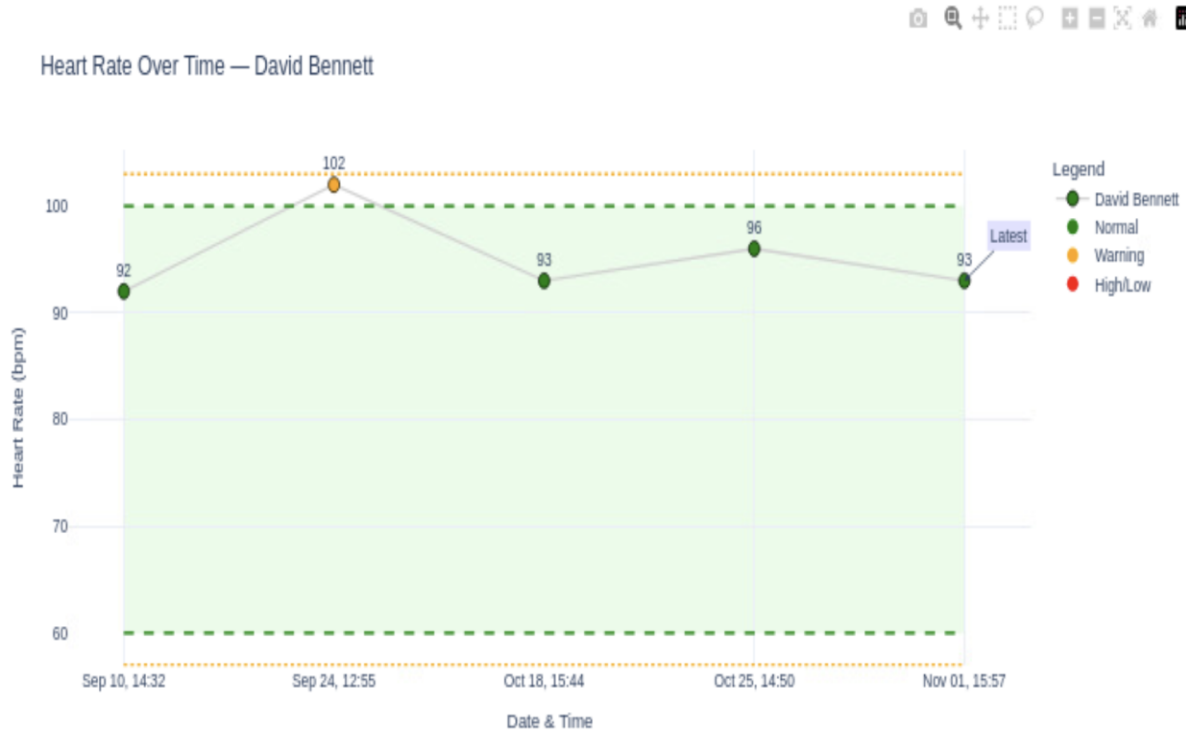
Vital Classifier

- Keyword matching fallback
- LLM few-shot prompt
- Maps queries to vitals

Visualization Engine

- Plotly time series for each visual representation of the patient's vitals.
- Labels such as Markers, Borders helps with the multi-patient overlays.

Heart Rate Over Time — David Bennett



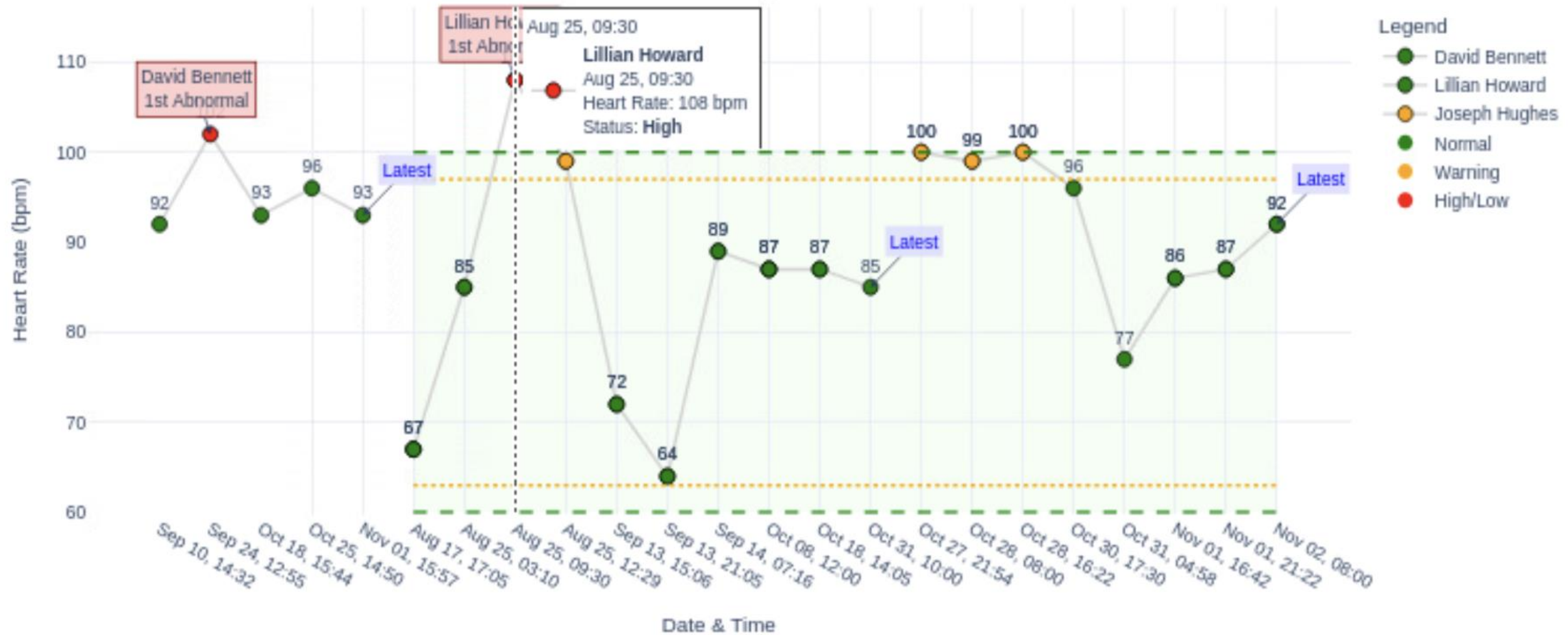
Visualizations of Vitals

- Compares and plots the visuals of each individual patients.
- Used Plotly time-series for each visual to spot on quicker values.

Image of multi-patient Heart Rate chart

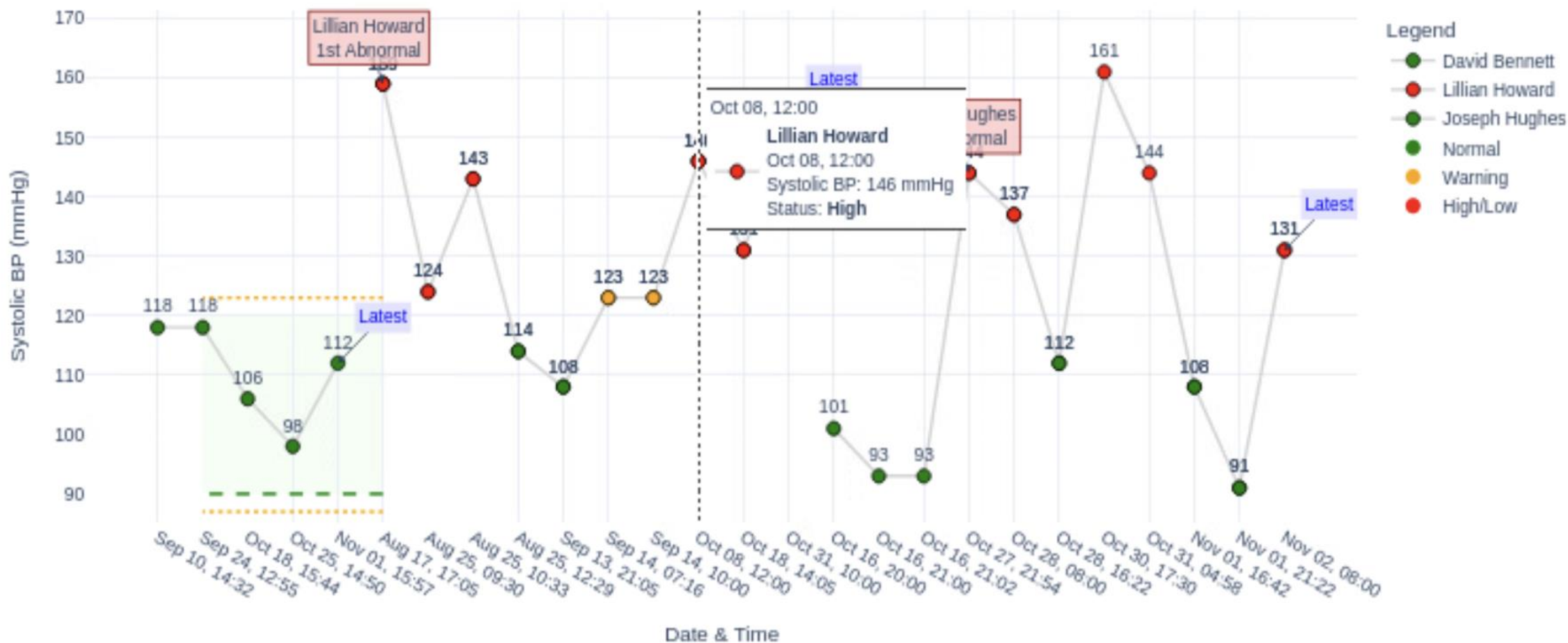


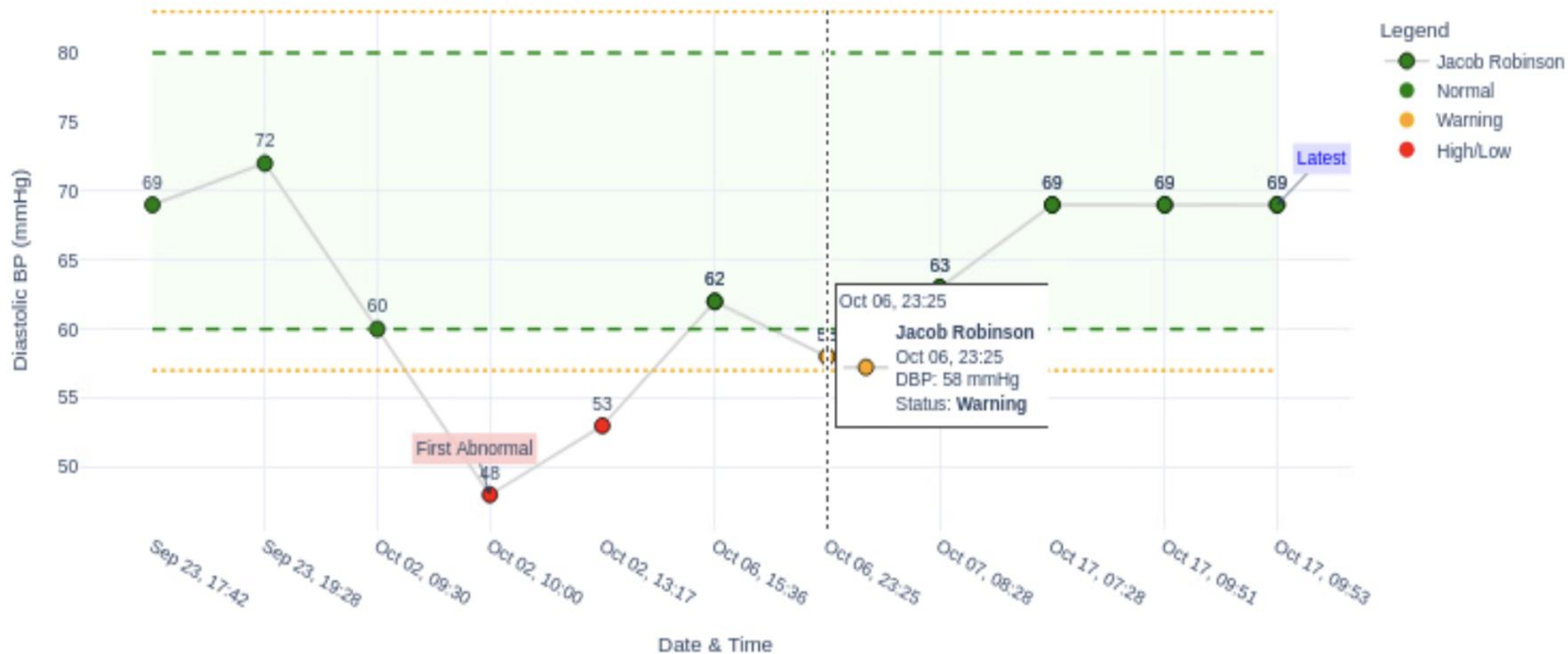
Heart Rate Over Time — 3 Patients

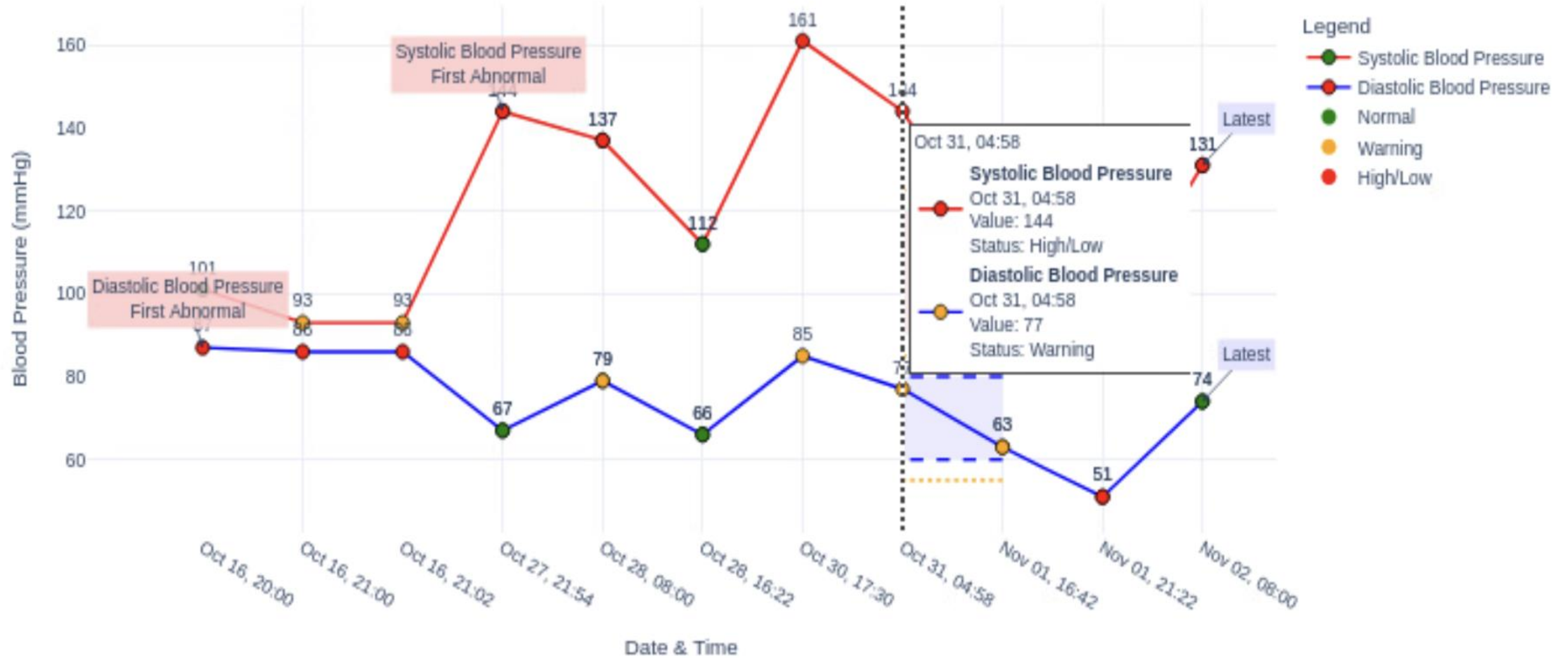


Systolic Blood Pressure Over Time — 3 Patients

Systolic Blood Pressure







Generative Summary of a Patient

Ella Adams' systolic blood pressure has been trending upward over the past month, indicating uncontrolled hypertension. The recent readings suggest a possible increase in cardiac workload. I recommend adjusting her antihypertensive medication and scheduling a follow-up appointment in two weeks to reassess her blood pressure. The early observations are as follows: Oct 14 12:00: 147.0 unit, Oct 14 13:02: 170.0 unit, Oct 28 11:35: 164.0 unit, Oct 28 12:20: 171.0 unit. Further testing may be necessary to rule out underlying conditions contributing to her elevated blood pressure. I suggest monitoring her blood pressure at home and reporting any significant changes. A comprehensive review of her medication regimen and potential lifestyle modifications should also be considered. Regular follow-up appointments will be crucial in managing her hypertension. I will keep a close eye on her condition and adjust her treatment plan



Welcome to the Patient Chat Session. Type 'exit' to quit.

You: Hello

Please tell me which patient (by full name): ['Ella Adams', 'David Bennett', 'Lillian Howard', 'Joseph Hughes']

You: David Bennett

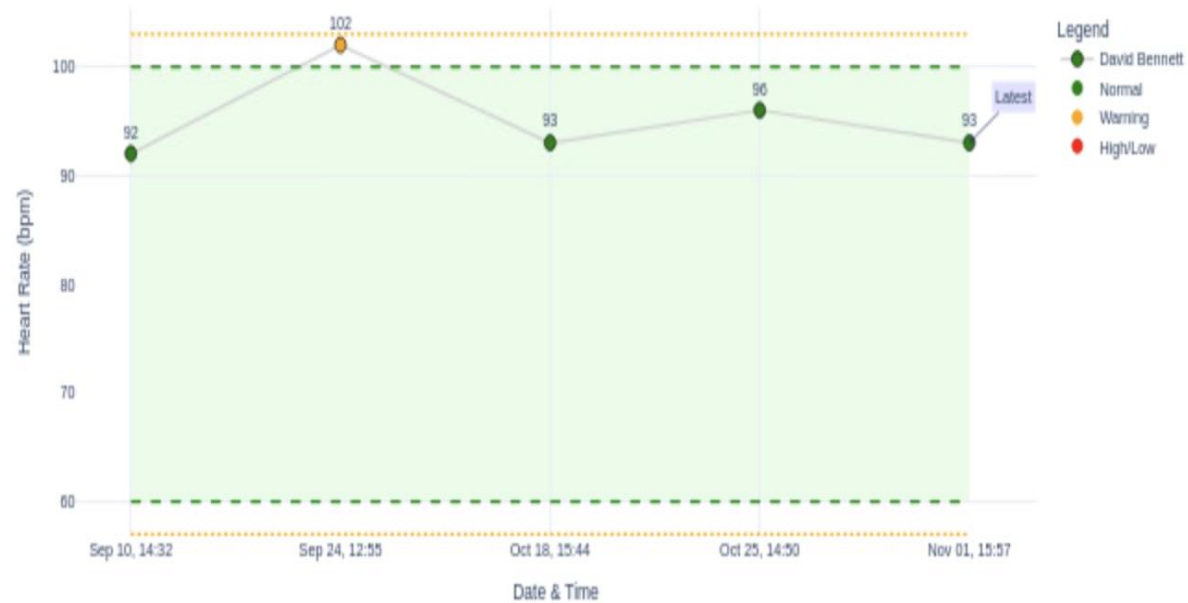
Patient set to David Bennett. What would you like to know?

You: How's his Pulse?

Summary:

No heart_rate data available for David Bennett.

Heart Rate Over Time — David Bennett



You can ask a follow-up or type another question.

You: exit

Goodbye!

Chat Session:

- User Query: How's the patient's Heart Rate?



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Future Directions

- Expand to labs, medications
- Deploy web-based GUI
- Integrate with hospital workflows
- Continuous model fine-tuning

THANK YOU!

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