



Virtual Care Assistant

FROM HOME

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Problem Statement

MOTIVATION

Implicit Health Cues

Patients often report their condition using everyday, non-medical language, which may contain subtle or indirect hints about their clinical state.

For example, a phrase like "I feel a little tired lately" might point to poor blood sugar control, while "I get short of breath when I climb stairs" could indicate underlying cardiac deterioration.

Example

Patient messages such as:

"My blood sugar is always high."

"I get abdominal pain after eating fatty food."

may hint at chronic conditions such as diabetes or gallbladder dysfunction without explicitly naming them

Application

There is a clear need for a system that can detect and understand these implicit signals, in order to:

Extract medically-relevant information

Generate structured summaries

Trigger alerts or provide real-time recommendations especially in the context of home hospitalization, where no clinician is physically present.

NLP TASK

Challenge:

Interpreting Informal and Imprecise Language

Patients rarely use clinical terminology. They say "My heart is racing" instead of "tachycardia", or "My sugar is high" instead of "hyperglycemia".

Additional contextual cues-such as duration ("this has been going on for three days") or family history ("my father died of a heart attack")-must be understood in context.

Input

A short, free-text report written or spoken by the patient (e.g., a chat message or transcribed audio).

Output

Closed-world version:

Identify symptoms and conditions from a predefined list (e.g., chronic diseases, red-flag complaints)

Example:

"Burning pain in my lower right belly" → possible appendicitis

NLP Tasks Involved:

Named Entity Recognition (NER) for symptom extraction

Symptom normalization and semantic parsing

Text classification (risk level / triage)

Natural language generation (recommendation)



Training and Test Data

“Symptom-Based Disease Labeling Dataset” (Kaggle, by krish0202)

- Free-text symptom reports paired with disease labels
- Used for training NLP models to extract and classify symptoms

“Health Monitoring System Dataset” (Kaggle, by nraobommela)

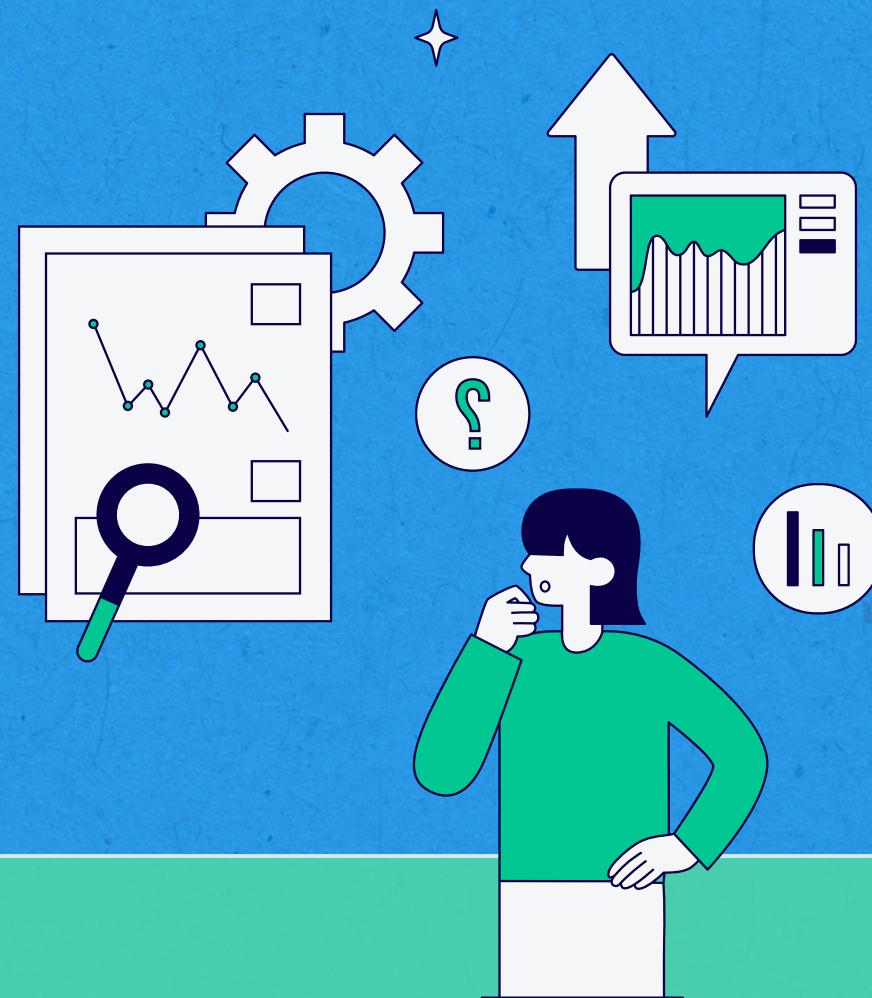
- Simulated wearable sensor data (heart rate, blood pressure, temperature, battery level)
- Used to monitor vital signs in a home hospitalization context

Data Integration:

- Combine textual reports with sensor readings to train and validate our Virtual Care Assistant
- Supports tasks such as symptom extraction, triage prediction, and real-time recommendations

LLM Integration:

- Use a large language model to interpret patient-reported symptom text
- Extract, normalize, and classify symptoms from natural language
- Improve triage decisions by combining text with sensor data
- Generate clear, personalized real-time recommendations for patients



Evaluation

Closed-World Metrics

Classification Metrics (Symptom Extraction / Triage)

- Precision, Recall, F1
- Measures how accurately we detect known symptoms or classify patients into risk categories

Baseline

- Simple rule-based or keyword-matching approach to identify symptoms from a predefined list



Open-World Metrics

Text Generation & Recommendation Quality

- Metrics: ROUGE / BLEU or LLM-based evaluation
- Evaluates clarity, correctness, and helpfulness of generated recommendations (e.g., advice messages)

Baseline

- Simple, template-based text or naive prompting that does not adapt to patient context



PROMPT 1

"Analyze the following patient self-report and extract the mentioned symptoms.
Return in JSON format with fields:
symptom name, severity
(mild/moderate/severe), and
duration (if mentioned).
Patient says:
I've been having some chest pain
and shortness of breath when
climbing stairs. It's been getting
worse over the last few days. I'm
concerned."



PROMPT 2

"Based on the patient's symptoms and vitals, provide a short recommendation message for the patient.
Be clear and avoid medical jargon.
Use second person ('you').
Symptoms: nausea, abdominal pain (moderate)
Vitals: Temp 38.4°C, BP 130/80
Context: Patient is at home, part of a home hospitalization program."



PROMPT 3

"Analyze the following patient report and sensor data. Generate a structured clinical summary, assign a triage level, and provide a short recommendation.
Be concise and avoid medical jargon in the recommendation.
Patient: 68-year-old female with a history of heart disease
Patient says: I'm experiencing strong chest pain and shortness of breath.'
Vitals: Heart rate: 110 bpm, Blood pressure: 150/95, Temperature: 38.2°C, Oxygen saturation: 92%"

Thank you for listening!

