Mini Project

Virtual AI Clinician – Generative AI for Accurate Medical Diagnosis

SDG:GOAL-3:Ensure healthy lives and promote well-being for all at all ages

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Project Overview:

A scalable, AI-powered virtual clinician that leverages Large Language Models (LLMs) to simulate real doctor-patient interactions, diagnose over 900+ common conditions, and provide accurate triage recommendations with 98% accuracy. It is designed to assist patients with non-emergency symptoms through a human-like AI avatar interface.

Problem Statement

- Overloaded healthcare systems with rising outpatient traffic
- Limited access to doctors in rural and low-resource areas
- Inconsistent triaging due to human error and time constraints
- High costs for primary-level consultations
- Existing tools lack real-time, personalized, and clinically sound interactions

Solution

A Virtual AI Clinician that:

- Listens to symptoms and asks follow-up questions
- Uses LLMs for clinical reasoning
- Provides evidence-based advice instantly
- Delivers safe, empathetic interaction via a human-like avatar

Uniqueness of the Solution:

- Avatar interface for trust and engagement
- Clinical safety layer to prevent unsafe advice
- Counterfactual logic to minimize errors
- Trained on medical literature for high accuracy

Target Customers:

- Hospitals & Clinics (AI triage assistant)
- Public Health Agencies (mass healthcare deployment)
- Telemedicine Platforms (integrated AI consult module)
- Insurance Companies (preliminary claims triage)
- Health Startups (chatbot-based care delivery)
- Pharmacies (walk-in advisory kiosks)

Tech Stack:

- Frontend: React.js with Unity3D/WebGL for interactive avatar and patient UI.
- Backend: Node.js or Python (Flask/FastAPI) for API, logic, and routing.
- Deployment: AWS/GCP, Docker, and PostgreSQL/MongoDB for scalable hosting and data.

Approach

Requirement Analysis with healthcare experts

Architecture Design based on 4-layer AI pipeline

LLM Integration with clinical fine-tuning

Iterative Testing with clinical reviewers

Avatar & UI Design for empathetic user experience

Launch & Feedback Loop for continuous refinement

Key Features

Diagnosis of 918+ conditions

Natural conversation flow with clarifying questions

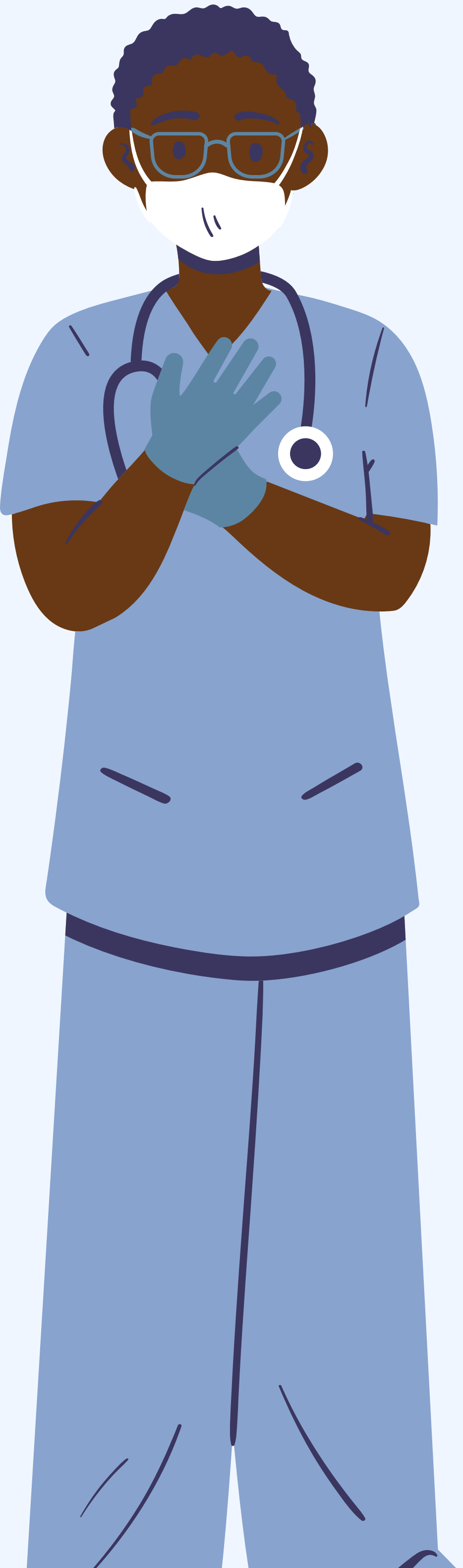
Humanized avatar interface

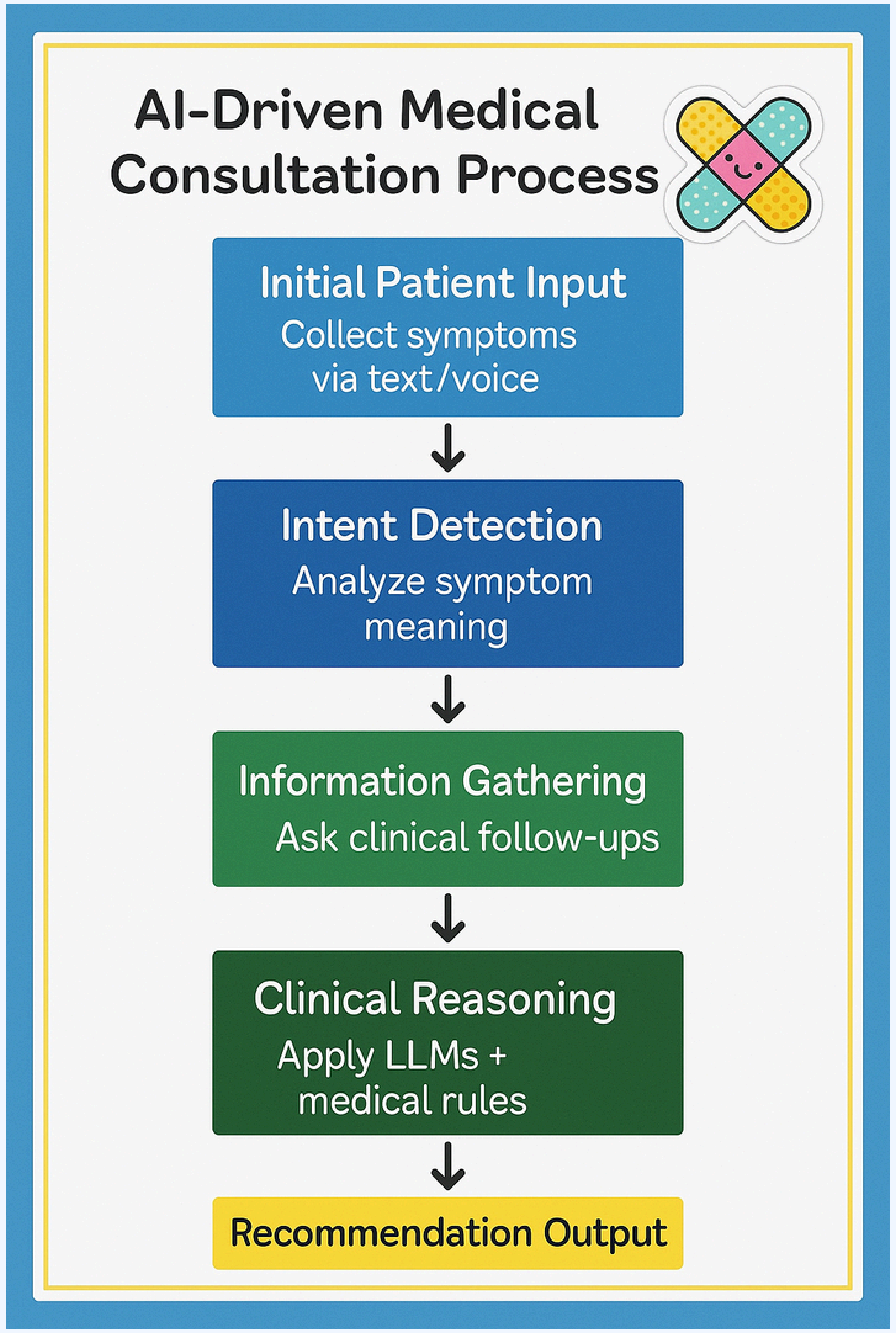
Clinical safety and compliance checks

Multilingual and scalable across regions

Data logging for continuous improvement

Architecture Diagram:





Title	Year	Algorithm /Model	Metrices	Merits	Demerits	Dataset
ADDAEIL: Anomaly Detection with Drift-Aware Ensemble-Based Incremental Learning	2025	Ensemble incremental learner with drift awareness	AUROC, F1, detection latency	Adapts to concept drift; unsupervised streaming	Computational overhead; needs tuning	3 synthetic + 2 real world time-series streams
From Variability to Stability: Advancing RecSys Benchmarking Practices	2024	Collaborative filtering (11 CF methods compared)	Precision@k, Recall@k, NDCG, HR, MRR, coverage, diversity	Evaluated across 30 datasets; robust benchmarking	CF only; no neural methods tested	30 public recommendation datasets (incl. two new ones)
Systematic review of ML methods in software testing	2024	Supervised, unsupervised, RL, hybrid ML methods	Accuracy, precision, recall, F1, MSE	Comprehensive taxonomy; discusses merits/de-merits	Not empirical experiments; summarizes others	40 studies from 2018–2024 databases

Bias in ML: A Literature Review (construction domain)	2024	XGBoost, LightGBM, others	Accuracy, fairness metrics	Identified suitable estimators per domain	Focused domain (construction); limited generalization	Construction regression datasets
Automated peer review system: AutoRev	2025	Graph-based LLM extractive review	Review quality metrics (e.g. coherence, relevance); improves ~58%	Outperforms LLM baselines; reduces token overload	Needs full paper input; black-box graph extraction	Papers + peer-review data from OpenReview
Automatic Evaluation Metrics for AI-Generated Scientific Research	2025	Citation-count prediction and review-score models	Correlation of predicted vs actual citations; score accuracy	Title+abstract model > LLM proxy reviewers	Still below human level; limited features	OpenReview corpus (~hundreds of papers)
Deep learning models for heart disease prediction	2024	CNN, LSTM, hybrid DL models	Accuracy, AUC, sensitivity, specificity	Surveys strengths/weaknesses; dataset variation	Many studies non-comparable; small datasets	Medical heart disease datasets (multiple sources)

Systematic review ML & student performance prediction	2020	SVM, RF, ensemble, ANN, GA-based DT	Accuracy, precision, recall, F1, ROC AUC, MSE	Highlights algorithm comparative performance; key gaps	Older (2020); limited newer methods	Multiple student datasets (academic, VLE log data)
METRIC-framework for assessing data quality for trustworthy AI	2024	Meta-analysis of data issues in ML	Quality dimensions (accuracy, completeness, balance)	Identifies key data-quality threats; tool-agnostic	Not algorithm-specific; no performance metrics	Studies across non-life science datasets
Literature review of ML methods in building performance evaluation	2024	Machine learning vs statistical models (e.g. RF, SVR vs linear models)	RMSE, MAE, R^2	ML outperforms statistical models in many cases; benchmarking framework	Domain-specific; fewer deep models	Building performance datasets (energy use, HVAC logs)
A Systematic Literature Review of Novelty Detection in Data Streams: Challenges and Opportunities	2024	Survey of novelty/concept drift methods: unsupervised, ensembles, clustering, GNN	Not applicable (survey)	Comprehensive taxonomy; up-to-date on online novelty detection	No experiments / no metrics	Reviewed many real & synthetic streams

Time to Retrain? Detecting Concept Drifts in Machine Learning Systems (CDSeer)	2024	CDSeer: model-agnostic drift detector using semi-supervised performance estimation	Precision, Recall, label cost reduction	High precision, low labeling (<1%), model-agnostic	Internal industrial proprietary data; limited public reproducibility	8 diverse datasets + industrial deployment
A Neighbor-Searching Discrepancy-based Drift Detection Scheme for Learning Evolving Data	2024	Discrepancy-based statistic detecting real concept drift via neighborhood boundary change	Detection accuracy, trend direction	Ignores virtual drift; robust across distributions; indicates direction	Computational cost; needs boundary statistic tuning	Synthetic and real-world datasets (11 experiments)
On Metafeatures' Ability of Implicit Concept Identification	2024	Analysis of 160+ metafeatures on their ability to detect concept shifts	Identification accuracy per metafeature	Identifies 17 highly informative metafeatures; theory-driven	No full end-to-end system; feature-analysis only	Synthetic, semi-synthetic, real streams
Scalable Concept Drift Adaptation for Stream Data Mining	2024	Online adaptation using minimum enclosing ball + dynamic updates	Classification accuracy, adaptation latency	Scalable, ensemble-style, online; open access	Domain specificity; requires hyperparam tuning	Stream benchmarks used in data-mining context

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Thank you