NSIEX+RS 2025
NEGERI SEMBILAN INTERNATIONAL EXPOSITION

HARMONY IN PROGRESS:

INTEGRATING SCIENCE, TECHNOLOGY, AND SOCIAL INNOVATION FOR SUSTAINABLE DEVELOPMENT GOALS

e-Book of Extended Abstract
Negeri Sembilan International (NSIEx) & Research Symposium
2025

NSIEX+RS 2025
NEGERI SEMBILAN INTERNATIONAL EXPOSITION

PST017 - MEDIRANK: A LIGHTWEIGHT, WEB-BASED PRE-SCREENING TOOL USING EUCLIDEAN DISTANCE SIMILARITY

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ABSTRACT

MediRank is a web-based pre-screening diagnosis support tool designed to assist healthcare providers in rapidly identifying probable diseases based on patient symptoms and basic clinical parameters. Targeted for use in primary care and rural settings, where laboratory resources and specialist access may be limited, MediRank enables early case prioritisation and informed referral decisions. The system applies Euclidean Distance-based similarity analysis to compare a patient's symptom profile — including temperature, platelet count, white blood cell count, and selected clinical indicators — against a database of confirmed cases. The algorithm calculates the degree of similarity for each disease in the dataset, generating a ranked list of possible conditions from most to least likely. This process allows healthcare workers to quickly narrow down differential diagnoses before proceeding with confirmatory tests. MediRank's novelty lies in its lightweight, explainable, and real-time analysis framework. Built with Python and deployed using Streamlit, the tool runs directly in a web browser without installation, requires minimal computational resources, and produces transparent outputs that include similarity scores, ranked diagnoses, and visual comparisons. The integrated PDF export function enables instant documentation for patient records or referral purposes. As a pre-screening tool, MediRank is not intended to replace medical judgment but to support early triaging, improve diagnostic efficiency, and provide educational value for medical students learning about case similarity analysis. Its dataset-agnostic design allows adaptation to multiple medical domains, and future developments will explore weighted similarity measures, hybrid algorithms, and integration with electronic health record (EHR) systems.

Keywords – Euclidean distance, diagnosis support, similarity analysis, healthcare AI, medical ranking

INTRODUCTION

Accurate and timely diagnosis is crucial for effective healthcare, yet primary care and rural settings often face time constraints, limited specialist access, and inadequate technology. These challenges contribute to diagnostic errors, affecting about 5% of outpatient encounters globally (Nia et al., 2023), and are more pronounced in resource-limited environments where decisions often rely on experience rather than structured data (Ahmed et al., 2023).

AI-based decision support systems, including machine learning and neural networks, have shown promise in improving diagnostic accuracy (Orji et al., 2023). However, they often require large datasets, significant computational resources, and lack transparency, which can limit clinician trust (Fukuzawa et al., 2024). In contrast, Euclidean Distance-based similarity analysis offers a simple, interpretable, and computationally efficient.

OBJECTIVE

To develop a lightweight, web-based diagnosis support tool that applies a new mathematical model based on Euclidean Distance similarity analysis to compare patient symptoms with historical cases, generate a ranked list of possible conditions, and ensure the system is accessible, transparent, and adaptable for diverse healthcare settings.

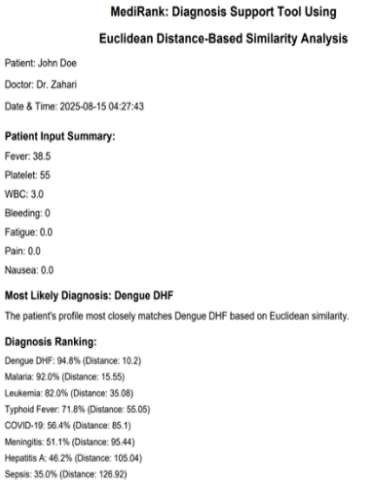
DESCRIPTION OF THE PROJECT

MediRank is a web-based pre-screening diagnosis support tool designed to help healthcare providers identify probable conditions from patient symptoms and clinical parameters. Built in Python with Pandas and NumPy, and deployed via Streamlit, it provides real-time browser access without installation, making it ideal for low-resource settings.

The system offers key features including: interactive input for symptoms and vitals (Figure 1), Euclidean Distance-based ranking of similar cases, instant results with similarity scores, historical case comparison, and portability for use on any internet-enabled device. The workflow begins with data entry, where patient details are encoded numerically. The Euclidean Distance formula compares the new case with stored records, ranking conditions from most to least similar. The PDF output (Figure 2) includes the patient summary, top diagnosis, and ranked list of possible conditions. To aid interpretation, MediRank includes visual analytics (Figure 3), with a similarity score chart and radar plot comparing the patient profile to the top diagnosis. These visualisations help in quick triaging and make results more explainable for both clinicians and patients.

In clinical use, MediRank supports early diagnosis and referral decisions; in education, it aids students in learning case similarity analysis. Its dataset-agnostic design allows adaptation to multiple medical fields.

Figure 1: MediRank input interface



MediRank: Diagnosis Support Tool Using Euclidean Distance-Based Similarity Analysis

Patient: John Doe

Doctor: Dr. Zahari

Date & Time: 2025-08-15 04:27:43

Patient Input Summary:

Fever: 38.5

Platelet: 55

WBC: 3.0

Bleeding: 0

Fatigue: 0.0

Pain: 0.0

Nausea: 0.0

Most Likely Diagnosis: Dengue DHF

The patient's profile most closely matches Dengue DHF based on Euclidean similarity.

Diagnosis Ranking:

Dengue DHF: 94.8% (Distance: 10.2)
Malaria: 92.0% (Distance: 15.55)
Leukemia: 82.0% (Distance: 35.08)
Typhoid Fever: 71.8% (Distance: 55.05)
COVID-19: 56.4% (Distance: 85.1)
Meningitis: 51.1% (Distance: 95.44)
Hepatitis A: 46.2% (Distance: 105.04)
Sepsis: 35.0% (Distance: 126.92)

Figure 2: PDF diagnostic output.

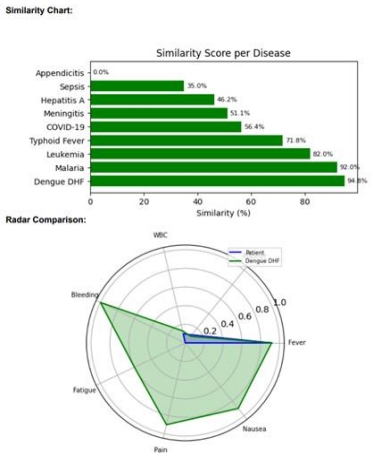


Figure 3: Similarity score and radar chart.

NOVELTY

MediRank is a real-time, browser-based diagnosis support tool using newly developed mathematical model for Euclidean Distance similarity for fast, explainable results. Unlike complex AI models, it is lightweight, resource-efficient, and adaptable to multiple medical datasets. It is transparent, accessible, and supports both clinical use and medical training, making it ideal for resource-limited settings.

CONCLUSION

MediRank applies Euclidean Distance-based similarity analysis in a lightweight, web-based tool that delivers fast, explainable diagnostic suggestions. Its user-friendly design and low resource requirements make it ideal for primary care, rural clinics, and medical education. Transparent similarity scores foster trust, while its dataset-agnostic design allows use across multiple specialties. Future work will explore additional similarity measures, weighted parameters, and electronic health record (EHR) systems integration to further enhance its clinical value.

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