Detecting a Person's Chronic Kidney Disease Based on Lab Results from Blood and Urine Tests

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Pendahuluan

Chronic Kidney Disease (CKD) is a significant health issue that affects millions of people worldwide. Early detection and diagnosis are crucial for effective management and treatment of the disease. Traditional methods for diagnosing CKD can be time-consuming and require extensive medical expertise. With advancements in machine learning and artificial intelligence, it's now possible to leverage these technologies to assist in the early detection of CKD based on lab results from blood and urine tests.

This project aims to develop a medical application that can pre-diagnose CKD using a combination of K-Nearest Neighbors (KNN) algorithm and fuzzy logic. The application will analyze lab results, specifically blood and urine test parameters, to identify potential CKD cases. This tool can serve as an aid for medical professionals, providing them with a quick and reliable preliminary diagnosis.

Steps to Combine KNN and Fuzzy Logic
1. Pre-process the Data: Prepare your dataset as previously described (handling missing values, normalization, etc.).
2. Apply KNN: Use KNN to classify or predict based on the dataset.
3. Define Fuzzy Sets: Create fuzzy sets for the features and outputs. This includes defining membership functions (e.g., triangular, trapezoidal, or Gaussian).
4. Fuzzify the KNN Output: Convert the crisp output of KNN into fuzzy values based on the defined fuzzy sets.
5. Apply Fuzzy Rules: Use fuzzy inference rules to combine the fuzzy inputs and determine the final output.
6. Defuzzify: Convert the fuzzy output back into a crisp value if necessary.

Dataset
https://www.kaggle.com/datasets/mansoordaku/ckdisease

Teknologi yang Digunakan
- Bahasa Pemrograman:
  Python: Chosen for its simplicity and the extensive range of libraries available for data analysis and machine learning.

- Framework:

Scikit-learn: This library will be used for implementing the KNN algorithm and other machine learning processes.

- SciKit-Fuzzy: A library for implementing fuzzy logic systems in Python, which will be used to handle uncertainties and imprecise data in lab results.

- Plotting Library
Matplotlib: For data visualization, to help in understanding the dataset and the results.

- Alat Pengembangan
  - Jupyter Notebook: For interactive development and data analysis.
  - Pandas: For data manipulation and analysis.
  - NumPy: For numerical operations.
  - Streamlit: for UI and Visualization

Ekspektasi Hasil

The expected outcome of this project is a functional medical application capable of:

1. **Data Input**: Accepting lab results from blood and urine tests.
2. **Data Preprocessing**: Cleaning and normalizing the data for accurate analysis.
3. **Disease Detection**: Using the KNN algorithm and fuzzy logic to analyze the input data and provide a preliminary diagnosis indicating whether the patient is likely to have CKD.
4. **User Interface**: A user-friendly interface where users can input their lab results and get the diagnosis. The interface will also provide visual representations of the data and the results.