Medical expert system for early stage of chronic kidney disease (CKD)

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Medical Expert System for Early stage of Chronic Kidney Disease (CKD)

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Background of Work

- Raw data is meaningless: require techniques to extract information from it
  - **Data**: records facts
  - **Information**: presents patterns underlying the data

- Example: Medical report records numerous of raw data
Background of Work

- Machine learning (ML) is the subfield of computer science that gives computers the ability to learn without being explicitly programmed [1].

- It explores the study and construction of algorithms that can learn from and make predictions on data [2], e.g. algorithms overcome following strictly static program instructions by making data-driven predictions or decisions, through building a model from sample inputs.

Background of Work

- ML evolved from the study of pattern recognition and computational learning theory in artificial intelligence.

- It is sometimes conflated with data mining, where the latter subfield focuses more on exploratory data analysis and is known as unsupervised learning**.

** Unsupervised learning is the machine learning task of inferring a function to describe hidden structure from unlabeled data. Since the examples given to the learner are unlabeled, there is no error or reward signal to evaluate a potential solution – this distinguishes unsupervised learning from supervised learning and reinforcement learning.
In artificial intelligence context, an Expert System (ES) is a computer system that emulates the decision-making ability of a human expert.

ESs are designed to solve complex problems by reasoning about knowledge, represented primarily as if-then rules rather than through conventional procedural code.
CKD depicts conditions that damage kidneys and decrease their ability to keep our health by doing the jobs listed [1].

Medical Expert System (MES)

- MES Research Context (Scope of Study):
  - CKD described by many know and unknown facts (also named as *features* in the context of ML)

- Research Problem:
  - Selection of known facts that cause CKD

- Research Data:
  - Many laboratory results and test outcomes

- Research Outcomes:
  - Prediction based on selected *features* from user
Medical Expert System (MES)

- MES learned from a set of historical data (obtained from a hospital), and able to make prediction based on user inputs on the screen.

- It emulates the decision-making ability of an medical expert in hospital in the absence of any medical representative.
All data entries are optional. ML algorithm will handle those blank inputs as the missing data in prediction process.

Data fields show samples of laboratory results and test outcomes from a medical report.

**Predict Input:** Click on the button after completing data entries.

**Update Knowledge:** Click on the button after altering historical data for the system.

**System Messages:** It shows the output of the said data predicting and knowledge updating processes.
Medical Expert System (MES)

- On the screenshot, 99.25% shows the three (3) correctness of Machine Learning updating its knowledge based on the given historical data.

Note that only 3 out of 400 records were wrongly predicted in the testing environment.