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.
Medical Expert System (MES)

- 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.