# 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)

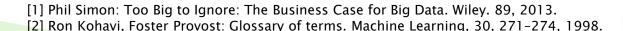
Dr. Tan Choo Jun, Dr Teoh Ping Chow School of Science and Technology



- 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



- 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.





- 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\*\*.

<sup>\*\*</sup> 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.

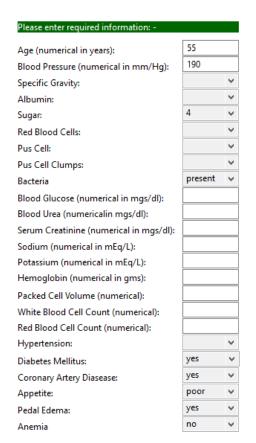


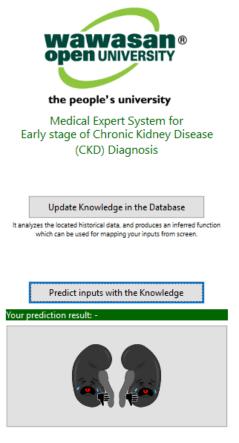
- In artificial intelligence context, an Expert System (ES) is a computer system that emulates the decision-making ability of a human expert.
- ESs are designed to solve complex problems by reasoning about knowledge, represented primarily as <u>if-then rules</u> rather than through conventional procedural code.

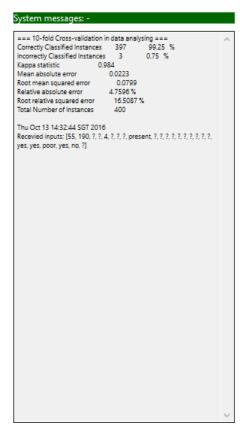


#### Early stage of Chronic Kidney Disease (CKD)

III A Machine Learning-based System by School of Science and Technology (SST), Wawasan Open University (WOU): Version 1.1.0.20161013







CKD depicts conditions that damage kidneys and decrease their ability to keep our health by doing the jobs listed [1].



 $\times$ 

- 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



- 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 <u>optional</u>. 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 show the output of the said data predicting and knowledge updating processes



➤ 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.

