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Algorithms or Human Judgment

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It was an eventful period of time during my recent encounter with dengue. I dragged my body to the clinic every step of the way the first time symptoms appeared — I was feeling weak, with a terrible headache, fever and low blood pressure. The doctor diagnosed it as a normal bout of cold which worsened, given that I had a cold over the past week.

The second time I visited another clinic hoping the diagnosis is right and to get a medical certificate. The wait was too long and I had fainting spells even while seated. The doctor on duty similarly diagnosed me as having a normal bout of cold which worsened, and wrote a doctor's memo to rule out dengue while I was ferried to the hospital.

After arriving at the hospital feeling all weary, the doctor from the hospital asked some questions, took the time to listen and ran some tests. With the information collected and the results of the tests, doctor came back with the accurate diagnosis of dengue.

Through these encounters, I began to wonder: "What does it take for a human to make an accurate diagnosis or decision through good judgment?"

One doctor focused on a historical event many years ago when I had a bout of cold which worsened into a case of pneumonia. Another doctor focused on my cold over the past week. And finally the last doctor which took into account more than just the two symptoms above. This last doctor also considered the huge incidence of dengue around my area and my medical tests results.

Based on the three different ways the doctors made their judgment and reached their decision, the former two doctors could have improved the accuracy of their decision by giving greater weight to what is happening now while giving a lower weight to what happened in the past. The second doctor could have considered the wider context to improve decision accuracy.

In light of this, can machine learning models make more accurate decisions in diagnosing medical conditions?

A predictive machine learning model based on Long Short-Term Memory (LSTM) could have prevented the first doctor's decision bias of giving a little too much weight to conditions of the past. The predictive model could be trained on a training set of quantitative health and diagnosis data for each patient over time. Subsequently, the hyperparameters of the predictive model could be tuned on a development set of health and diagnosis data for each patient, with greater weights for recent conditions.

To improve the predictive model's performance, we could have broadened the data set to include inputs from two temporal bag of words models. The first temporal bag of words model could contain words from qualitative diagnostic data over time. The second temporal bag of words model could contain words from news about what is happening in certain geographical areas over time. The output of both temporal bag of words models when fed into the LSTM model, could theoretically mimic the third doctor's accurate diagnosis for my dengue. This might have averted the second doctor's decision bias of not considering numerous other factors affecting the diagnosis.

By carefully thinking through the design of machine learning models, the volume and breadth data to acquire, and how we can link the output of one model as input to another model, machine learning models could be used in healthcare settings to more accurately diagnose a patient's medical condition as compared to humans.