CoronaGrade

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1. Project Description

The topic of our group's project mainly concerns Corona Virus detection using probabilistic reasoning. We have decided to create a web application to help us achieve this purpose. In brief, our web application functions as a form in which users can answer several questions that relate to the known Corona Virus symptoms. Using the input provided by the users, an algorithm is used to calculate the probability of the user being infected by the virus. The result will be displayed to the user after the process has reached its halt condition. The specification of the inputs and outputs of our application can be viewed in the table below:

Input	Output
User's response to Yes/No/Not sure and Multiple-Choice questions.	*The user's probability of being diagnosed with Corona Virus.*

2. Project Scope

The scope of our project consists of various elements such as:

1. Variables: Whether the user has a fever or not, whether the user has a cold or not, the cities the user has visited in the past month, etc.
2. Domain: The probability of the user being infected by the virus (0 – 100%).
3. Constraints: The causalities between each question because of the "Not sure" option. The causalities we considered can be seen below.
    a. If the user has a fever, then there is a certain probability that the user is also getting cold.
    b. If the passenger has been to China, there is a certain probability that he is getting a fever, and it is larger than if the passenger is coming from anywhere else.
    c. If the user is feeling fatigued, then there is a certain probability that the user is also experiencing shortness of breath.
    d. If the user has a fever, then there is a certain probability that the user is also feeling fatigued.
    e. If the user has a cold, then there is a certain probability that the user is also feeling fatigued.
4. Platform: Web Application.
5. Function: Our application considers responses to several questions from the user and it calculates the probability of the user being infected by the virus.

3. Methodology

3.1. Fundamental Theories and Concepts

The AI technique of our project is Probabilistic Reasoning. This technique utilizes probability theory to systematically represent knowledge and uncertainties using a probabilistic agent. A probabilistic agent will store information as a collection of probability values and answers queries in terms of probability values (which represents how much an agent "believes" that a query is true).

In our project, the agent will store the differing user inputs as probability values and calculates the level of "belief" that the previously mentioned user is infected by the Corona virus.

3.2. Implemented AI Techniques

The algorithm that we will be using in our project is the Inference by Enumeration algorithm. This algorithm basically explains that any conditional probability can be computed by summing terms from the full joint distribution. Therefore, a query can be answered using a Bayesian network by computing sums of products of conditional probabilities from the network. The enumeration algorithm can, however, be improved substantially by eliminating repeated calculations. The idea is simple: do the calculation once and save the results for later use. This is a form of dynamic programming and is called Variable Elimination. The combination of these two will help us in computing the final value of how likely the user of our project is infected by the Corona Virus.

We will use the *Python* programming language as well as the *Django* framework to create the web application.

4. Relevant Applications

There are other applications that use probabilistic reasoning. A popular example that is similar to our project is an application called **Ada**. Ada asks simple, relevant questions and compares your answers to thousands of similar cases to help you find possible explanations for your symptoms. Ada's core system connects medical knowledge with intelligent technology. The Medical Library shares patient-friendly medical information created to help you better understand and manage your health. The app combines artificial intelligence (AI) with expertise from actual doctors to help people understand and manage their health.