

Universidade Federal de Alfenas
Programa de Pós-graduação em Estatística Aplicada e Biometria
English Proficiency Exam - 2019/1

Registration number: _____

Read the text carefully and answer the questions. Don't forget, you must answer only in Portuguese! Answers in English will not be considered.

Reference: Princeton University, Engineering School. "Machine learning could reduce testing, improve treatment for intensive care patients." ScienceDaily, 22 January 2019. www.sciencedaily.com/releases/2019/01/190122142853.htm.

Machine learning could reduce testing, improve treatment for intensive care patients

Doctors in intensive care units face a continual dilemma: Every blood test they order could yield critical information, but also adds costs and risks for patients. To address this challenge, researchers from Princeton University are developing a computational approach to help clinicians more effectively monitor patients' conditions and make decisions about the best opportunities to order lab tests for specific patients.

Using data from more than 6,000 patients, graduate students Li-Fang Cheng and Niranjani Prasad worked with Associate Professor of Computer Science Barbara Engelhardt to design a system that could both reduce the frequency of tests and improve the timing of critical treatments. The team presented their results on Jan. 6 at the Pacific Symposium on Biocomputing in Hawaii.

The analysis focused on four blood tests measuring lactate, creatinine, blood urea nitrogen and white blood cells. These indicators are used to diagnose two dangerous problems for ICU patients: kidney failure or a systemic infection called sepsis. [...]

The researchers worked with the MIMIC III database, which includes detailed records of 58,000 critical care admissions at Beth Israel Deaconess Medical Center in Boston. For the study, the researchers selected a subset of 6,060 records of adults who stayed in the ICU for between one and 20 days and had measurements for common vital signs and lab tests.

The team's algorithm uses a "reward function" that encourages a test order based on how informative the test is at a given time. That is, there is greater reward in administering a test if there is a higher probability that a patient's state is significantly different from the last measurement, and if the test result is likely to suggest a clinical intervention such as initiating antibiotics or assisting breathing through mechanical ventilation. At the same time, the function adds a penalty for the test's monetary cost and risk to the patient. They noted that, depending on the situation, a clinician could decide to prioritize one of these components over others.

Question 1: What is the doctors' dilemma? _____

Question 2: What the Princeton's computational approach is about? _____

Question 3: Who are the two graduate students and the associate professor responsible for the computational system? _____

Question 4: Where and when did they present their results? _____

Question 5: What are the blood tests they focused on? _____

Question 6: What dangerous problems those tests are able to diagnose? _____

Question 7: The researchers ~~work~~ ^{work} with what database? _____

Question 8: Describe the data subset selected by them for the study. _____

Question 9: Explain the reward approach of the algorithm. _____

Question 10: Explain the penalty approach of the algorithm. _____
