CMPT 733 Big Data Science - Template for Capstone Project Idea

Machine learning based surveillance system using transfer learning for rare diseases

Description

Algorithm based surveillance system for Infection Prevention and Control (IPAC) can benefit Providence Health Care by establishing better association between patient-derived health data with outcomes of interest, such as reducing hospital acquired infection. Currently main challenge for algorithm development is access to adequate training data, especially for rate cases such as CLABSI (central line-associated bloodstream infection). Without sufficient quantities of data, the underlying model cannot differentiate useful patterns from noise and, as a result, may underperform. This initial training data burden limits the widespread, out-of-the-box, use of machine learning–based risk scoring systems. In this project, Providence Health Care wants to explore how to implement a statistical transfer learning technique, which uses a large "source" data set to drastically reduce the amount of data needed to perform well on a "target" site for which training data are scarce.

Datasets

MIMIC-III (**M**edical **I**nformation **M**art for **I**ntensive **C**are III) is a large, freely-available database comprising de-identified health-related data associated with over forty thousand patients who stayed in critical care units of the Beth Israel Deaconess Medical Center between 2001 and 2012. The database includes information such as demographics, vital sign measurements made at the bedside (~1 data point per hour), laboratory test results, procedures, medications, caregiver notes, imaging reports, and mortality (both in and out of hospital). MIMIC- III can be used as a large "source" data. Wherever appropriate, "target" data, which is localized and is hospital specific, may be provided de-identified as part of training for transfer learning.

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