CS294-082: Experimental Design for Machine Learning on Multimedia Data
Fall 2019

Homework 2

To be discussed: September 20th, 2019

1) Tables

a) How many states can n boolean variables assume?
b) How many functions can be built from n boolean variables to a binary label?
c) How many functions can be built from n boolean variables to a k-class labeling?
d) Assume an arbitrary table with m columns and n rows. How many different binary labelings can be created for that table?
e) Assume a table with m columns and n rows, each cell has an information content if q bits. How many different tables are there?

2) Discuss: Why is it problematic to assume the existence of real numbers in a machine learner?

3) Draw the smallest (arrow and circle) finite state machine for the following functions.

a) Two boolean variable NOR.
b) Three boolean variable equality.
c) Two boolean variable AND or two boolean variable OR depending on an input parameter.

4) Partitioning

a) How many subsets can be created from a set of n elements?
b) Explain how creating subsets is the same as binary labeling.
c) Assume you have n m-dimensional points in a coordinate system. How many binary labelings can you generate for these points?
d) How many k-class labelings can you generate for the points in c)?