A Neural Network model to analyze how intervention of BMI would affect incidence of diabetes

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Overview of SAS Project

- Rising Health Care costs in US prompts need for change in Health Care Policy
- Assess healthcare costs associated with diabetes.
- Determine how to reduce diabetes incidence as a means of reducing healthcare costs.
- Enact measures to reduce risk of diabetes in at-risk population
- Proposed measure: reduce BMI by 10% in target population.
- Data Set: 43 parameters for 50,000+ individuals.

Overview of Diabetes

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Plan Summary

- Select set of most relevant parameters to use in analysis.
- Train and validate neural network with selected parameters.
- Observe how introducing the proposed measure affects the predicted incidence of diabetes.

Parameter Reduction

- Remove parameters that are likely caused or highly influenced by having diabetes (use literature to do this).
- Use correlation / covariance measures to weed out less influential parameters.
  - We used Partial Least Squares for this task.
- May also want to use other measures to determine relevance of parameters.

Overview

- expected rewards over a patient's lifetime
- QALYs
- costs to the third party payers

- Question: when to perform cystoscopy?
- Goal: tradeoff short-term "cost" of cystoscopy with long-term "cost" of early detection of bladder cancer.
- Criteria for making the decision is expected rewards.
- Decision maker does not have perfect information about a patient's health state

International Guidelines

- American Urological Association(AUA)suggests periodic follow-up cystoscopy for bladder cancer patients. However, no specific interval nor duration of follow-ip cystoscopy has been defined
- European Association of Urology(EAU) has specific follow-up guidelines for low rik, high risk, intermediate risk patients respectively.
- First International Consultation on Bladder Tumours(FICBT) has specific follow-up recommendations for low risk, high-grade Ta, and CIS patients respectively.
- National Comprehensive Cancer Network(NCCN) has two specific guidelines for low risk patients and intermediate or high risk patients respectively
- The recommended follow-up cystoscopy schedules proposed by

Specific Research Questions

- What's the best surveillance strategy with respect to cystoscopy frequency for various risk groups?

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- Is age a significant factor for the optimal surveillance strategy?

Methods

- simulation
- sampling of a Markov chain

Preliminary Results

Future Work

- Combining other non-invasive test methods(biomarkers, cytology) with cystoscopy, can we design a better surveillance strategy?