A Logistic Regression Approach to CoIL Challenge 2000

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Abstract

A logistic regression based solution to the CoIL Challenge 2000 is described. The challenge consists of correctly identifying potential customers for an insurance product, and describing their characteristics.

Keywords: CoIL Challenge, Logistic Regression

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Introduction

Businesses use data science to extract insights from data. It has many practical business applications. Identifying households to include in a marketing campaign is one application. One example using real world data is the Computational Intelligence and Learning (CoIL) Challenge. The CoIL Challenge competition was held from March 17 to May 8 in 2000. The challenge is to:

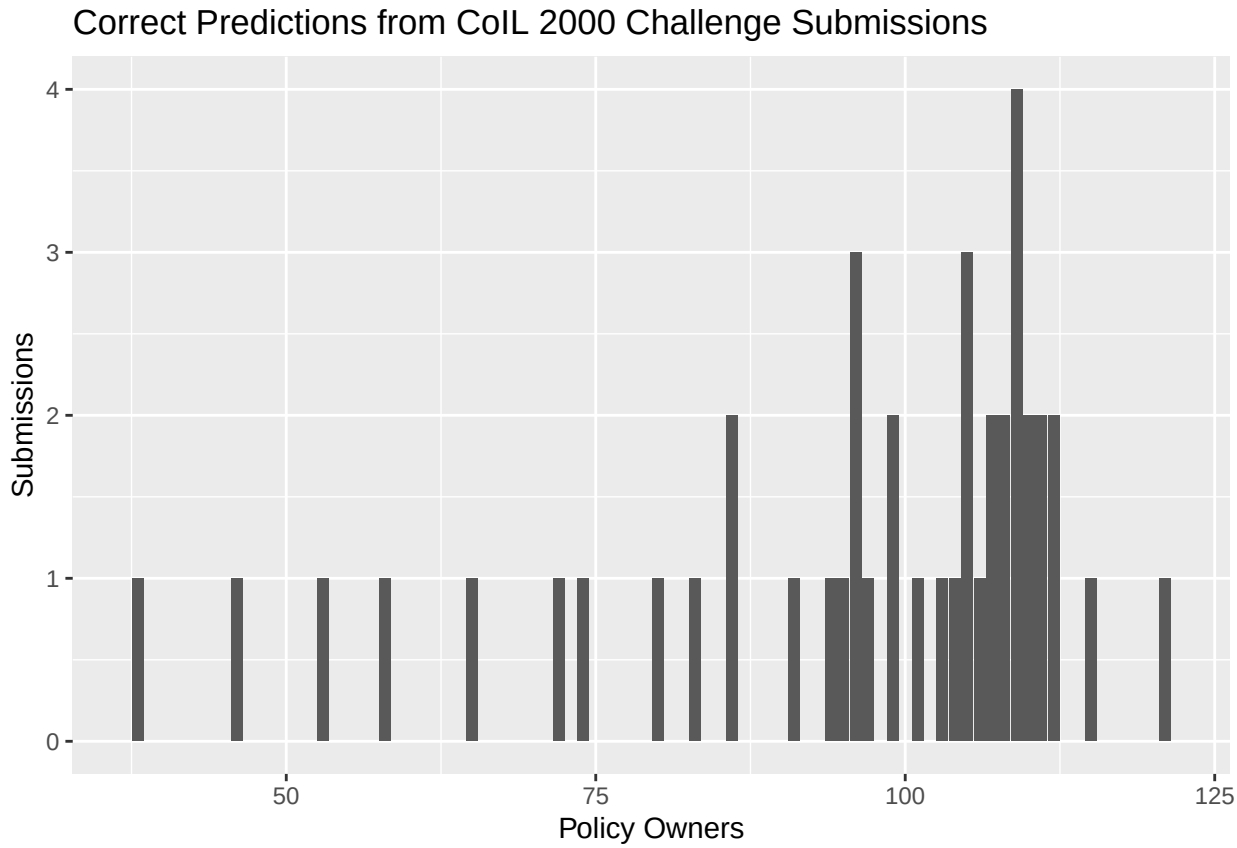
1. Identify potential customers for an insurance policy; and
2. Provide a description of this customer base.

In total 147 participants registered and 43 submitted solutions (Putten, Ruiter, & Someren, 2000). In this paper we set out to complete the first part of the COIL Challenge. **SUMARISE FINDINGS?**

Literature Review

Participants used a variety of approaches in formulating their submissions including: Boosted Decision Tree (McKone & Stenger, 2000), Classification and Regressio Tree (CART) (Simmonds, 2000), Classification Trees with Bagging (White & Liu, 2000), C4.5 (Rickets, 2000; Seewald, 2000), Evolutionary Algorithm (Koudijs, 2000), Fuzzy Classifier (János Abonyi, 2000; Kaymak & Setnes, 2000), Genetic Algorithms and Hill-climbers (Carter, 2000), Inductive Learning by Logic Minimization (ILLM) (Gamberger, 2000; Šmuc, 2000), Instance Based Reasoning (iBARET) (Mikšovský & Klema, 2000), K-Means (Vesanto & Sinkkonen, 2000), KXEN (Bera & Lamy, 2000), LOGIT (Doornik & Moyle, 2000), Mask Perceptron with Boosting (Leckie & Ferra, 2000), Midos Algorithm (Krogel, 2000), N-Tuple Classifier (Jorgensen & Linneberg, 2000), Naïve Bayes (Elkan, 2000;

Kontkanen, 2000), Neural Networks(Brierley, 2000; Crocoll, 2000; Kim & Street, 2000; Shtovba & Mashnitskiy, 2000), Phase Intervals and Genetic Algorithms (Shtovba, 2000), Scoring System (Lewandowski, 2000), Support Vector Machines(Keerthi & Ong, 2000), and XCS (Greenyer, 2000).



The maximum number of policyowners that could be found was 238. The submissions identified 95 policy owners on average. The winning model (Elkan, 2000) identified 121 policy owners. Random selection results in identifying 42 policy owners. The standard benchmark tests result in 94 (k-nearest neighbor), 102 (naïve bayes), 105 (neural networks) and 118 (linear) policy owners. (Putten et al., 2000).

Methodology

Experimentation and Results

Discussion and Conclusions

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Appendices

R statistical programming code.

```
# CoIL Challenge Source Code
library(tidyverse)
# Download the data sets from UCI if they are not present
url <- "https://archive.ics.uci.edu/ml/machine-learning-databases/tic-mld/"
files <- c("ticdata2000.txt", "ticeval2000.txt", "tictgts2000.txt")
for (file_name in files) {
  file_path <- paste0("data/", file_name)
  file_url <- paste0(url, file_name)
  if (!file.exists(file_path)) {
    message(paste("Downloading", file_name))
    download.file(file_url, file_path)
  }
}
# Read in the data
df <- read.delim("data/ticdata2000.txt", header = FALSE)
names(df) <- c("MOSTYPE", "MAANTHUI", "MGEMOMV", "MGEMLEEF", "MOSHOOFD",
               "MGODRK", "MGODPR", "MGODOV", "MGODGE", "MRELGE", "MRELSA",
               "MRELOV", "MFALLEEN", "MFGEKIND", "MFWEKIND", "MOPLHOOG",
               "MOPLMIDD", "MOPLLAAG", "MBERHOOG", "MBERZELF", "MBERBOER",
               "MBERMIDD", "MBERARBG", "MBERARBO", "MSKA", "MSKB1", "MSKB2",
               "MSKC", "MSKD", "MHHUUR", "MHKOOP", "MAUT1", "MAUT2", "MAUT0",
               "MZFONDS", "MZPART", "MINKM30", "MINK3045", "MINK4575",
               "MINK7512", "MINK123M", "MINKGEM", "MKOOPKLA", "PWAPART",
               "PWABEDR", "PWALAND", "PPERSAUT", "PBESAUT", "PMOTSCO",
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                "PVRAAUT",  "PAANHANG", "PTRACTOR", "PWERKT", "PBROM", "PLEVEN",
                "PPERSONG", "PGEZONG", "PWAOREG", "PBRAND", "PZEILPL",
                "PPLEZIER", "PFIETS", "PINBOED", "PBYSTAND", "AWAPART",
                "AWABEDR", "AWALAND", "APERSAUT", "ABESAUT", "AMOTSCO",
                "AVRAAUT", "AAANHANG", "ATRACTOR", "AWERKT", "ABROM", "ALEVEN",
                "APERSONG", "AGEZONG", "AWAOREG",  "ABRAND", "AZEILPL",
                "APLEZIER", "AFIETS", "AINBOED", "ABYSTAND", "CARAVAN")
eval <- read.delim("data/ticeval2000.txt", header = FALSE)
temp <- read.delim("data/tictgts2000.txt", header = FALSE)
eval$CARAVAN <- temp$V1
names(eval) <- names(df)
```