2019 Fall Meeting

Intergalactic Machine Learning Tips From the Secret UFO Files in Roswell, New Mexico

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Bob Crompton, FSA, MAAA
Vice President, ARC Ga

SEAC | Southeastern Actuaries Conference
Being Part of Something that Counts

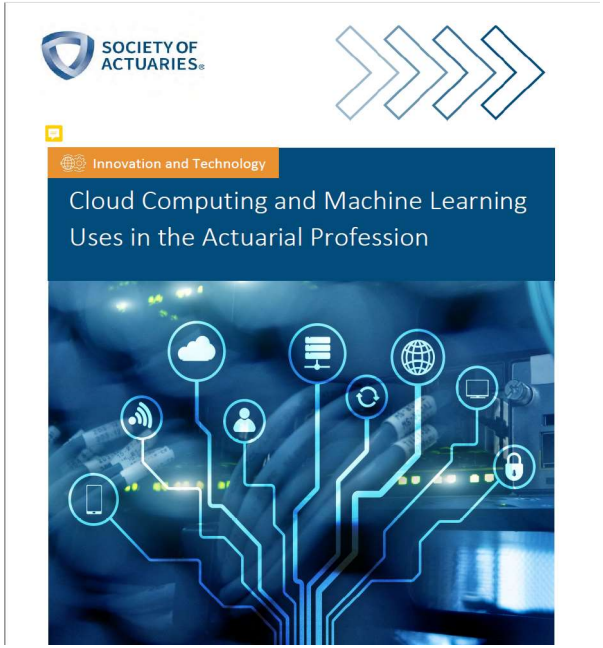
EXECUTIVE SUMMARY

- ML currently being used for Life & Health actuarial work on limited basis
- There is some interest in ML for P/C ratemaking & reserving, but no specific cases were surfaced
- Most insurance ML applications seem to be in these areas:
  - Underwriting
  - Customer retention
  - Sales
  - Claims management

Martin Snow

Actuary With Expertise in AI, Machine Learning & Predictive Analytics

SOA/Milliman Report



Machine Learning – What Is It?

A subfield of artificial intelligence concerned with allowing machines, programs, or algorithms to learn and improve from data.

- SOA/Milliman Report

Machine Learning – What Is It?

The field of Machine Learning seeks to answer the question, "How can we build computer systems that **automatically improve with experience**, and what are the fundamental laws that govern all learning processes?".

- Carnegie Mellon University

CASE STUDY 1: Individual Risk Scoring / Large Health Insurer

- **Clustered Random Forest Algorithm**
- **Based on Historical Costs**
  - **Monthly cost records**
  - **> 100,000 members**

CASE STUDY 2: Early Duration Lapse Rate Analysis / Life Insurer

- Algorithm not specified
- Added additional parameters to standard actuarial analysis
  - More robust estimates
  - A/E ratios MUCH closer to unity

CASE STUDY 3: Claim Fraud Detection / Large Health Care Consulting Firm

- **Algorithm not specified**
- **Based on combining unsupervised models with semi- and fully-supervised models**

Potential Near Term Uses of Machine Learning

- **Auto insurance pricing based on telematics**
- **Health insurance pricing based on biometrics**
- **Loss reserving based on Individual Claims**
- **Mortality forecasting for Life/Annuity biz**

Machine Learning vs. Human Learning

Machine Learning

- Mediated by code
- Digital

Human Learning

- Mediated by sense experience
- Analog

Machine Learning vs. Human Learning

How People Learn

- Rote memorization
- Analogies
- Generalizations & creation of conceptual hierarchies
- Historical comparisons
- Consideration of potential cause & effect chains
- Formalized thinking (for example, mathematical proofs)

How Machine-Learning Learns

- **Correlations**

What Do We Mean By "Learning?" 4 Levels of Complexity

1. Given a model, determine the "best" parameters
2. Determine the "best" sort of model for the problem
3. Re-state the problem to a higher level of abstraction – ie, make it more general
4. Re-frame the problem by approaching it with an entirely new set of references & background assumptions, ie, paradigm shift

Machine Learning – Potential Improvements

Implement Code Self-Modification

- Use a human-like approach: cut & paste from web, or send a "code plz" request to Stack Overflow

Machine Learning – Potential Improvements

Add Analog Input – Biologic Sensors

- Adds potential to think continuously as well as discretely
- Science fiction-y

Machine Learning – Potential Improvements

Formal Language Programming

- Formal language is a highly structured way to unambiguously describe things.
  - Possibly describe analog experience
  - LEAN software - used for mathematical proofs.