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"If I only had a brain"

By Dave Snell

This often-quoted line from the 1939 movie, The Wizard of Oz, is part of a famous scene where a Scarecrow (played by Ray Bolger) sings to Dorothy (the young Judy Garland) about what he would do if he only had a brain. It is long past copyright protection so feel free to view it on the Internet (e.g., *http://www.youtube.com/watch?v=nauLgZISozs&noredirect=1*).

This issue is packed with brainy articles to get those neurons of yours firing away with ideas for exciting new actuarial applications of new techniques and tools that are now available.

We begin this set of offerings with an introduction to a neural networking technique called Naïve Bayesian Networks. Jeff Heaton has written an easy-to-follow example, "Bayesian Networks for Predictive Modeling," describing how to use simple conditional probability (remember our old pal Bayes, from your introductory actuarial exams?) enhanced by computer programs to infer an outcome from a collection of past events. He also included an Excel workbook as a model to enable you to substitute your own events and make your own inferences from them. After you enjoy his article, read about his books on neural networking and his free and open source engine, ENCOG, at his website *www.Heaton-Research.com* which is currently getting about 100,000 hits per month from the AI (artificial intelligence) community.

Predictive Modeling (PM) has become the rage lately, as Big Data seems to have saturated the media. Richard Xu gives a helpful overview of various PM techniques and their relative strengths and weaknesses. Quoting from Richard's article, you will learn about techniques for "maximizing the value of data to improve business processes and customer experiences." If you ever wondered whether to use linear regression or the generalized linear model (GLM), or decision trees or a CART (classification and regression tree), or perhaps a clustering model versus a support vector machine (SVM), see his article **Predictive Modeling** to better understand what makes sense for your applications and what indicators may suggest a different approach.

One of those approaches is Hidden Markov Models. Brian Grossmiller and Doug Norris teamed up to write "Hidden Markov Models and You," an article about how to utilize these less obvious (hidden?) extensions to the classic Markov Chain models you saw in study notes. Brian and Doug start with the basics of what is meant by a Hidden Markov Model (HMM) and then they put an HMM to work on a claims activity example. In the HMM it is important to figure out what state you are in currently, and what state you will be in after your transition matrix. If that state stuff doesn't make sense to you yet, then Toto, "We are not in Kansas anymore" *(http://www.youtube.com/watch?v=vQLNS3HWfCM)*. Read the article and these two wizards will explain what is behind the curtain in HMMs.

Prior to our next issue (December), we'll lose Clark Ramsey as our Chairperson, as he rolls off his three-year term on the council, and we'll miss his guidance a lot. His chairperson article, "Dark Side of the Moon," is another delightful combination of science, actuarial career advice and Pink Floyd. He describes the issue of navigating through too much or

too little data and the resultant challenges facing an actuary to maintain the integrity of pricing and reserving models; and somehow, Clark makes them all fit together. I appreciate his eclectic interests and I hope our next chairperson will be able to carry on this tune.

Scott McInturff continues the PM lesson with his cogent review of Nate Silver's best seller, *The Signal and the Noise: Why So Many Predictions Fail—But Some Don't.* Nate has had an amazing record of correctly predicting the past two presidential election outcomes on a state-by-state basis several months before the actual elections. He also gained fame and some fortune with his accurate baseball predictions. Scott has a knack for writing an engaging review; and after reading this one it seems nearly unthinkable to me that you won't want to rush out and get a copy of the book to read.

A question that naturally comes to mind after reading about these techniques is how actuaries have done in the PM arena. What is our track record? Ben Wolzenski gives us a recap of that with his summary of an actuarial set of predictions made more than a decade ago. It was quoted back then in the *Wall Street Journal*. In "Delphi Study 2000—Predictions for 2010 and 2050," Ben describes what we thought then, and how well we did (or didn't) predict the future of health care expenses, cause-specific death rates, employment and where actuaries will reside. Who could have imagined that the mean estimate of total life insurance in force in the United States a decade later would be spot on at $18.43 trillion! OK, that's after rounding to the nearest 0.01 trillion dollars; but it is still an amazing feat.

That Delphi study was reviewed and judged after a decade; but you have the opportunity to gain fame and fortune (OK, an iPad) this year! Simply enter our genetic algorithm contest and submit the entry that best solves a problem of an actuarial nature. This contribution to the profession will be rewarded (or at least announced, if the winner is not present) at the 2013 SOA Annual Meeting in San Diego. Read the contest announcement by Alberto Abalo, "Forecasting & Futurism 3rd Annual iPad Contest—Build a Genetic Algorithm" and enter to win the appreciation and adoration of your peers (plus, did I mention you get an iPad?). Brian

Grossmiller and I will try to incorporate some ideas from the entries in our workshops on genetic algorithms at that same meeting.

Delphi studies are now used by many actuaries; but several other professions are using similar and supplementary techniques and there is no shortage of predictions about the future. Jon Deuchler summarizes an excellent report by the National Intelligence Council (NIC): "Global Trends 2030: Alternative Worlds." The NIC is a coalition of 17 agencies and organizations within the Executive Branch of the U.S. government and is a kind of clearinghouse of gathered intelligence. Jon distills more than 130 pages (see the full report at *www.dni.gov/nic/globaltrends*) of predictions and scenarios to an amusing and irascible summary that compelled me to at least skim the full report.

Ah, but lest we forget, there is more to the art and science of PM than just computers and numbers! Those carbon unit humans don't always follow the rules we cast in silicon. David Wheeler, a recent graduate who majored in Behavioral Economics, reminds us of that in "Behavioral Economics: Implications for Actuarial Science and Enterprise Risk Management," in which he leads us through some exercises with surprising results. As David writes, "Behavioral Economics is emerging as the leading decision science for economics, psychology, sociology, biology and neuroscience." We make a lot of best estimate assumptions in our actuarial models; and we need to do this with eyes wide open to the ways that humans differ from logical sequential cyborgs.

Some actuaries are willing to open their eyes and their minds to nonconventional thought patterns; and nowhere is that more evident than in the Actuarial Speculative Fiction contest. This is an annual event that F&F (Forecasting & Futurism) cosponsors (with the Technology and the Actuary of the Future sections) and this year's entries were even more creative than usual. I was privileged to be one of the judges and I have to admit that we had a tough time voting on just one winner. Mike Lindstrom describes the winning entry in "The Weight of Certainty—Selected Stories of Steve Mathys—The 10th Speculative Fiction Contest Forecasting and Futurism Section Prize Winner." Mike describes his inter-

view with Steve Mathys, who has been writing stories for several years and first entered our speculative fiction contest in 2003. His winning entry, "Calibration," "describes a day in the life of Stuart, a businessman in Capitol City. Stuart subscribes to the services of a company called Precision Dynamics, which provides a list of custom probabilities in regards to a series of today's personal events submitted by the customer the night before." It's a thought-provoking read.

It is very helpful, in fact necessary at times, to step out of our immediate frame of reference and view our modeling efforts from a different perspective. One of the perspectives we sometimes don't appreciate enough until a calamity or an audit (or perhaps both) occurs is that of controls. Spreadsheets are ubiquitous in actuarial work and Darrick Fulton, a professional auditor, gives us some horror stories of what can happen as a result of errors in a spreadsheet; and he provides some expert guidance on ways to avoid these problems. His article, "Spreadsheet Controls … How to Prevent a Fire" has an amusing lead into the idea of what to do when your car … or your spreadsheet catches fire; and how simple and logical maintenance can avoid these problems.

Finally, I started out with the desire of the Scarecrow in The *Wizard of Oz* to have a brain. I had the thrill recently of holding a human brain in my hand; and I want to share my excitement about that in "I Held a Human Brain!" This article is about some alternative sources of learning available for free or at low cost if you wish to round out your F&F education about machine learning, artificial neural networks, genetic algorithms and the millennia of biological advances we draw from when we use these techniques.

I am going to close this issue's introduction with a shameless advertisement that seems in order here. Several people have been asking how to get these F&F newsletters. I tell them that after a month or so, each issue is posted to the SOA website; but if they want to see it on a timely basis, all they have to do is join our section as either a member (SOA members) or an affiliate member (anyone else). If any of your friends want to see these hot articles before the herd, they can do so for a mere $25 per year—and additionally be eligible for our iPad contests and lots of other member benefits. Quoting the television ad on drugs, "a brain is a terrible thing to waste." Utilize your opportunity for an upgrade today at F&F. ▼

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