



SOCIETY OF ACTUARIES

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# Embrace the Future—But Beware the Smug

By Dave Snell

When I mention *Back to the Future*, most readers will remember some favorite scenes from the movie. It was a refreshing comedy where a teenage boy, Marty (Michael J. Fox), travels back in time and meets his parents as teenagers. The movie came to mind after reading Alberto Abalo's excellent article, "The Future Ain't What It Used to Be," where he mentions his heightened appreciation, as a new parent, for life insurance. I also had flashbacks to the birth of our first child ... and my associated purchase (like Alberto's) of my first life insurance policy. As he aptly summarized, we have a lot to be proud of in the Forecasting & Futurism (F&F) Section. One source of pride is that we are providing some state-of-the-art actuarial tools and techniques in our session presentations and our newsletter articles. Some of them are from other disciplines, and the jargon can make it more difficult to comprehend without specialized knowledge outside our usual actuarial education. Another reason for pride is that we are striving to make these topics readable and understandable and to show how they can help you.

That's one reason *Back to the Future* was popular. It took a difficult concept, such as time travel, and brought to light thought-provoking ideas (like what happens if you interfere with the courtship of your parents) that built upon the notions of many years ago. H.G. Wells published his science fiction novella, *The Time Machine*, in 1895; but *Back to the Future* added whimsical examples that gave the idea more appeal to an audience nearly a century later. Likewise, this issue is packed with new ideas that have origins from decades ago or even longer; but it provides new extensions, examples or insights that make them more relevant to your toolkit today.

Artificial society modeling goes back to at least 1996, when Robert Axtell wrote about Sugarscape; and the idea behind Sugarscape goes back even further—to Thomas Schelling's "Models of Segregation," written in 1969. Yet, for many years, Sugarscape was treated more like a recreational exercise. Ben Wolzenski, last year, modified the Sugarscape model to investigate insurance sales. This year, in his article



"A Return Visit to the Sugarscape," he revisits the use of agent-based modeling and investigates the impact on life insurance sales from factors such as increased unemployment, deferred household formation and increased productivity. It's a good read, where Ben explains what results he expected, how the results differed from what he expected, and the insights he gained from an analysis of the differences. He also discusses some interesting concepts such as "wasted productivity," which I found intriguing.

Markov models date back to 1906, and hidden Markov models (HMMs) to 1960, yet Brian Grossmiller and Doug Norris have given them new life and actuarial applicability in "Hidden Markov Models and You, Part Two" (a continuation of their HMM article in our July 2013 issue) quantifying the likely health claims that a particular individual will have over the next 24 months. It's a long article, and, frankly, I recommend that you download the Excel workbook they supplied (link shown in the article) and utilize it to better follow along as you read it. Additionally, you may wish to reread part one of their HMM article, "Hidden Mar-

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kov Models and You,” in the July 2013 issue of *Forecasting and Futurism Newsletter*. They also supply some R code for you. HMMs are an extension of Markov processes, which are currently on the actuarial syllabus. They allow you to infer the matrix of state transitions when it is not known. This is a powerful technique that you may be able to apply to many modeling situations where your data is affected by external conditions.

NeuroEvolution of Augmenting Topologies (NEAT) sounds brand new; but they were first described in 2002 as a variant of neural network theory, which goes back to the 1940s. Recent research on human brains suggests that the neocortex employs a very efficient neural network that can allow you to recognize a friend’s face in under half a second even when she has a new hairstyle, makeup, contact lenses and she is not looking directly at you. Conversely, standard, if-then logic approaches that are based on many pre-defined rule-sets give disappointing results even with a supercomputer. The better recognition systems now use neural nets; but these are not intuitive to create. Jeff Heaton, in “A NEAT Approach to Neural Network Structure,” explains to us what NEAT networks are, and how they address some of the drawbacks of more conventional neural networks, such as the tedium of setting appropriate weights for the connections. These advance the toolset we have for quick pattern recognition and classification problems.

A rapidly growing area of classification and regression techniques is that of predictive modeling (PM). Actuaries have made models for decades with the intent of predicting the financial impact of future risks; but the advent of big data is forcing us to make better use of our advanced statistical training. We think this is so germane to the actuarial profession that with this issue we are adding an ongoing PM column. Richard Xu starts us out with a strategy for success with PM in his article, “Modeling Process.” In clear diagrams and associated explanations, he gives us a five-step process to help ensure that we maintain focus on the business problem we set out to solve, and that we have a clear path to solutions that show not just correlation between variables, but, more importantly, causal relationships. Quoting

from Richard’s article, “Statistical modeling is potentially a double-edged sword. If applied correctly, it is a very powerful and effective tool to discover knowledge in data, but in the wrong hands it can also be misused and generate absurd results.”

The Oracle of Delphi takes us back to the eighth century B.C., and she might have been one of the first members of the F&F Section; but perhaps since the SOA did not exist back then, the Delphi method did not get much traction until its rebirth in 1944 for the Army Air Corps and then its more formal development in 1959 by the RAND think tank. The basic idea is that group opinions can be more accurate than individual opinions, and the Delphi approach facilitates the gathering of the collective wisdom without the biasing effect of hierarchical individual relationships. F&F has been a leader in the use of Delphi studies, and in this issue we discuss two of the more recent ones: Ben Wolzenski describes a joint F&F and Long Term Care (LTC) Section study in “Land This Plane—A Delphi Study about Long-Term Care in the United States” that garnered more than 100 pages of ideas from the diverse panel of 50 experts. Somewhat surprising to me, the overwhelming majority (95 percent) felt the need for an active government role to address the LTC issues and “promote the general welfare.” The article title is from the code name for the study. “Land This Plane” denoted the lofty objective, which was “to create a vision for how America ought to deal with the impending long-term care crisis.”

Our second Delphi article is a reprint (with permission) of an article by Paula Hodges, from the Product Development (PD) Section newsletter, *Product Matters!* In yet another outreach from our section, a joint study with the PD Section, F&F Council members Ben Wolzenski and Alberto Abalo, along with Paula Hodges, of the PD Section, conducted a real-time Delphi session at the 2013 Life & Annuity Symposium. Paula describes this session showing “how additional information and the anonymity of the experts influenced changes in the ultimate consensus of the group” in her article “Delphi Study in Real Time—Life & Annuity Products and Product Development.”

The concept of genetic algorithms dates back to 1954 when Nils Aall Barricelli first began to simulate evolution on a computer; but the first book on genetic algorithms was by John Holland, in 1975. Of course, nature has been utilizing them since the beginnings of life as we know it. Unfortunately, that resulted in a lot of genetic jargon baggage in previous presentations (including my own) on genetic algorithms to solve insurance problems. In my article, “Genetic Algorithms Revisited—A Simplification and a Free Tool for Excel Users,” I attempt to demystify them by breaking away from all the intimidating biological terms and just showing how they can be understood as simple processes. My goal is to teach how to make a genetic algorithm (for those who wish to know) and how to use one even if you don’t care how the innards work. I created a general purpose Excel add-in that allows you to use genetic algorithms to solve some types of problems not easily solved by other methods.

Many thanks are due to Alberto Abalo and Doug Norris, our contest judges for the F&F genetic algorithm contest. They give us a succinct but highly informative summary of the contest results in “And the Winner Is ...” where they announce the winning entry: “Diagnosing Breast Tumor Malignancy with a Genetic Algorithm and RBF Network.”

Jeff Heaton was our winner, and he was awarded the prize, a new iPad, at the F&F breakfast meeting in San Diego during our SOA annual meeting. His entry impressed the judges as an excellent example of an actuarial application of genetic algorithms to help predict breast cancer. We are including his entry descriptive write-up in this issue. Jeff also includes a link to his program, in C# (pronounced see sharp), to solve this type of problem. In the coming issues, we hope to have more machine-learning articles from Jeff. We are happy to have him as an associate (non-actuary) member of F&F.

Throughout this introduction to the current issue I make note of the value-added benefit of the spreadsheets our authors have provided for you. Yet, we have included an article from an auditing firm: “Are Spreadsheets Sabotaging Your Accuracy?” by Steve Epner; and he seems to believe that “the continued use of spreadsheets to manage mission-critical functions is an unacceptable risk for 21<sup>st</sup> century firms.”

Why would we include this seemingly contrarian view?

Let me explain by quickly recapping an episode of *South Park* (season 10, episode 2) titled “Smug Alert”:

Stan sings the praises of hybrid cars and the whole town decides to drive them. The most popular model is the Toyota Pious (Toyota Prius). Ranger McFriendly points out that even though hydrocarbon emission levels are down, the town now has a more serious problem—that the Pious owners (the owners, not the cars) emit “self-satisfied garbage” that has polluted the air far worse than smog. This environmental disaster is called “smug.”

I have to confess. I drive a Prius; and it does tend to foster smug. It’s a challenge to keep it under control. In F&F, we are touting a bunch of new technologies and techniques from the collection of complexity sciences that sometimes seem to diminish the value of techniques you learned in preparation for the actuarial exams. In some cases we are even directing you to spreadsheets (as well as other nontraditional tools and computer languages, such as R, that your IT area probably does not support). We promote these inferential, mostly inductive, methods as additional arrows for your quiver of tools. Personally, I think that spreadsheets can have a valid role in mission-critical applications for insurance companies; but that we have to be responsible in our usage of them.

The articles in this issue are to help you understand, explain, and to some extent sell your companies on the benefits of these newer technologies and techniques. In some respects, they are slick and new and look superior to “old” ways, just as the DeLorean time machine in *Back to the Future* may have looked superior to the H.G. Wells version. However, sometimes they can unknowingly attract smug. When I need to bring home 4 foot by 8 foot plywood sheets for my construction projects, I drive our old van, not the Prius. Embrace the future; but beware the smug! ▼



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