AOF Mission and Vision Update

By Laura Wiland

In the spring newsletter, I outlined the need for the Actuary of the Future (AOF) Section to clarify its mission and vision. In this article, I plan to outline how we've done that as well as outline the other initiatives we are undertaking as a section council.

In March 2019, the AOF Section Council met for a face-to-face meeting in Chicago to discuss the current initiatives of the section and the future initiatives we wanted to undertake. We realized that the current AOF mission statement was primarily focused on welcoming new actuaries to the profession and making sure they are developing appropriately. We believed, as I outlined in my spring article, that welcoming actuaries to the profession is handled effectively by university outreach and candidate connect and that making sure actuaries are developing appropriately is handled effectively by the Society of Actuaries (SOA) Leadership and Development Section.

Furthermore, approximately 50 percent of our members are over the age of 40, and recent AOF member survey findings show that members have a significant interest in learning more about the issues and opportunities within the profession. Based on these demographics and survey findings, the AOF Council wants to spend more of its resources focusing on actuarial profession disruptors and informing our members about changes in the profession and the skills needed to stay relevant. We will continue to support and welcome new actuaries to the profession where it makes sense, but we want to put a majority of resources toward understanding and communicating how the profession is evolving.

- **Original mission statement:** We formed the Actuary of the Future Section to welcome new actuaries into the profession and to provide them with opportunities to stay current on actuarial employment trends, acquire cutting-edge skills, and gain business and leadership skills.

- **New mission statement:** The Actuary of the Future Section informs both credentialed and aspiring actuaries about the current and possible future state of the actuarial profession. We strive to provide a channel through which our members can learn about emerging technologies and evolving business environments that could reshape the roles of actuaries.

This new mission statement was approved by the SOA Board of Directors at the June 2019 Board meeting!

After developing our new mission statement and solidifying our vision for the section, we began designing initiatives to fulfill our mission and vision. The following initiatives were undertaken over the past few months and will continue to be refined in the coming months.

- **Hot topics email/committee update.** We developed our monthly hot topics email in 2018 as a way to help keep our members informed of various happenings that impact actuarial work. This year, we updated that monthly email to include section activities and volunteer opportunities to help with member engagement and understanding of the section benefits.

- **Actuarial disruption contest.** We developed the Disruptions to the Actuarial Profession contest to highlight SOA members' ideas about the future of the profession and how future actuaries can adapt to the disruptor. This contest ran from May 1 to Aug. 1.

- **LinkedIn group.** We created a LinkedIn group for AOF members and others interested in actuarial disruption to keep up to date on recent happenings and share ideas with others who have similar interests.

- **Podcast series.** We are working on developing a podcast series that highlights "a day in the life of an actuary." We hope to interview a diverse group of actuaries from different specialties, backgrounds, career paths, and so on, in an attempt to educate other actuaries about the various possibilities in this profession.

- **Webcast offerings.** We are working on developing two to four webcasts each year as a way to keep our members informed on topics of interest.

Another exciting change is the move to a fully digital, faster-to-market newsletter. Previously, our newsletters were printed and distributed twice a year, in May and November. Earlier this year, the SOA underwent an initiative to digitize the section newsletters so articles could be consumed easier electronically. Now, the AOF section is piloting a new initiative to bring you digital articles on a more-frequent basis (bi-monthly). Starting with this November issue of *Actuary of the Future*, the newsletter will be digitally published every other month, featuring articles that support our mission statement.

By the time this article is published, I will have handed over leadership of the AOF Section to Minyu Cao. Minyu has been a very active council member for the past two years, helping support various initiatives, and I'm excited to see where the section goes under her direction. Please reach out to any committee member or send an email to the AOF Section (*sections@soa.org*) if you have ideas on how the section can better serve its members. ■

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DISRUPTIONS TO THE ACTUARIAL PROFESSION CONTEST

The AOF Section is happy to announce the winners of the Disruptions to the Actuarial Profession Contest. This is the inaugural year of the contest, and we are proud to showcase SOA members' ideas about the future of the profession and how future actuaries can adapt to the disruptor. The winners were selected based on materiality, originality, practical significance, and overall quality. The first-place prize was awarded to the team of Tanen Clark, FSA, MAAA; Matthew Billas, FSA, MAAA; Sara Delach, FSA, MAAA; Veronica Kriesemint, FSA, CERA, MAAA; Justin McGetrick, FSA, CERA, MAAA; Joshua Miller, FSA, MAAA; Regis Murayi, FSA, MAAA; Caitlyn Prescott, FSA, MAAA; Lauren Scarlata, FSA, MAAA; Heather Sumler; and Stephen Wyszomierski, FSA, MAAA, for their video entry titled "Risking It All." Second place was awarded to Alan Gard, FSA, MAAA, for his essay entry titled "I Am Speed Change." Third place was awarded to Craig DeAlmeida, FSA, CERA, MAAA, for his essay entry titled "Share the Road." The AOF has featured these winners online at *https://www.soa.org/sections/actuary-of-future/.* We look forward to sponsoring this contest again in the future.

Python Libraries for Mortality Modeling

By Carlos Brioso

Python is the leading programming language for data science. Python programming is one skill that actuaries should acquire. It facilitates analytic work, and the available visualization tools help to communicate ideas. In this article, I use a traditional actuarial problem, mortality modeling, as an example.

Until now, R language has been the preferred tool for survival analysis since there are well-known packages, such as Survival and Survminer. Python packages, like Lifelines and Scikit-survival, are newer and powerful. Lifelines, originally developed by Shopify, is an implementation of survival analysis in Python. This library is built on top of Pandas, the most used library for data manipulation.

I will use the Old-Age Mortality Scania dataset for our analyses. This data consists of old-age life histories from Jan. 1, 1813, through Dec. 31, 1894. Only life histories above age 50 are considered. The information recorded in this dataset is shown in Figure 1.

Figure 1
Old-Age Mortality Scania Dataset

ID	Enter	Exit	Event	Birthdate	Sex	Parish	Ses	Immigrant	Duration
1	50	59.242	1	1781.454	male	1	lower	no	9.242
2	50	53.539	0	1821.350	male	1	lower	yes	3.539
...	...	...	...	...	...	...	...	...	...
4	50	51.280	0	1822.713	male	1	lower	yes	1.280
5	50	70.776	1	1813.547	female	1	lower	yes	20.776

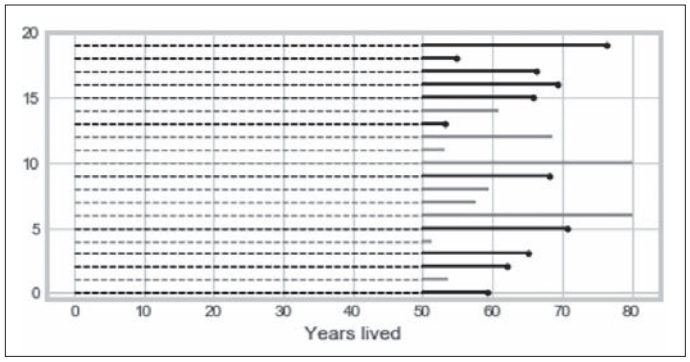
Data Dictionary

Enter: Start age for the interval.
Exit: Stop age for the interval.
Event: Indicator of death; equals TRUE if the person died at the end of the interval, FALSE otherwise.
Birthdate: Birthdate as a real number (i.e., "1765-06-27" is 1765.490).
Sex: Gender, a factor with levels male female.
Parish: One of five parishes in Scania, coded 1, 2, 3, 4, 5. Factor.
Ses: Socio-economic status at age 50, a factor with levels upper and lower.
Immigrant: a factor with levels no region and yes.

Source: Data from *https://www.rdocumentation.org/packages/eha/versions/2.6.0/topics/scania*

To understand the data, it is useful to visualize the events and censored observations. In Figure 2, the light lines represent people who have not died, while dark lines show people who died in the observation period.

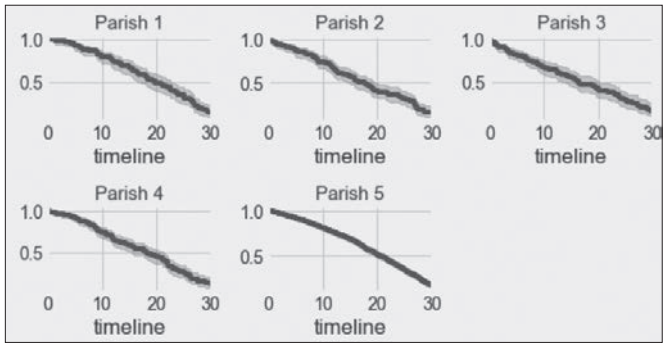
Figure 2
Events and Censored Observations



Source: Data from *https://www.rdocumentation.org/packages/eha/versions/2.6.0/topics/scania*

We can also plot the Kaplan-Meier estimator for the whole population or for specific subpopulations. Figure 3 shows survival curves for the five parishes in our dataset as well as their confidence intervals.

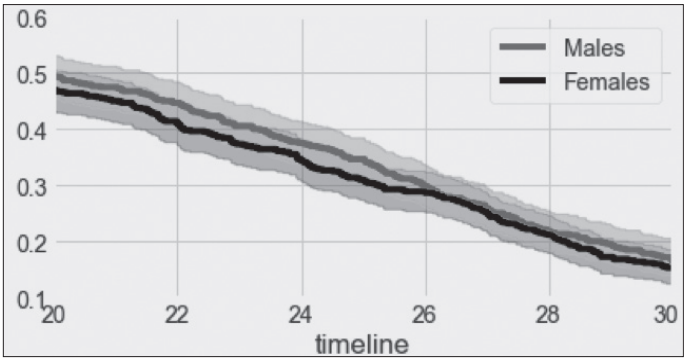
Figure 3
Survival by Parish



Source: Data from *https://www.rdocumentation.org/packages/eha/versions/2.6.0/topics/scania*

We may be also interested in looking at survival curves of two different groups in one plot. For example, we can plot the survival curve by gender for times 20 to 30 (see Figure 4). We observe that the survival of men is higher than for women, but this difference becomes less significant over time. However, there is a significant overlap between the confidence intervals of these curves.

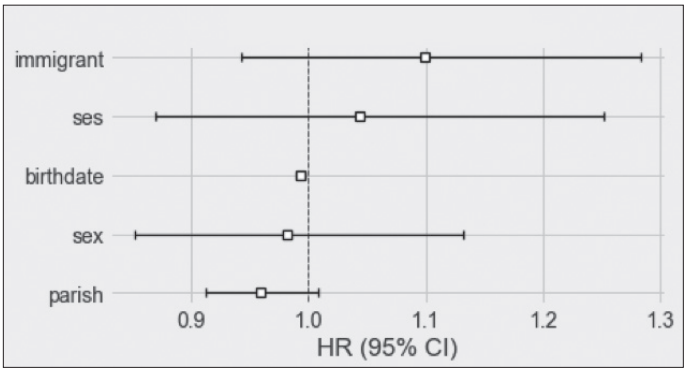
Figure 4
Lifespans by Gender



Source: Data from *https://www.rdocumentation.org/packages/eha/versions/2.6.0/topics/scania*

After performing univariate analysis, we may be interested in multivariate analysis. The most traditional multivariate regression for survival data is the Cox's Proportional Hazard (PH) Model. In this model, the log hazard of an individual is a linear function of static covariates and a population-level baseline hazard that changes over time. Figure 5 shows the values of the PH coefficients and their confidence intervals.

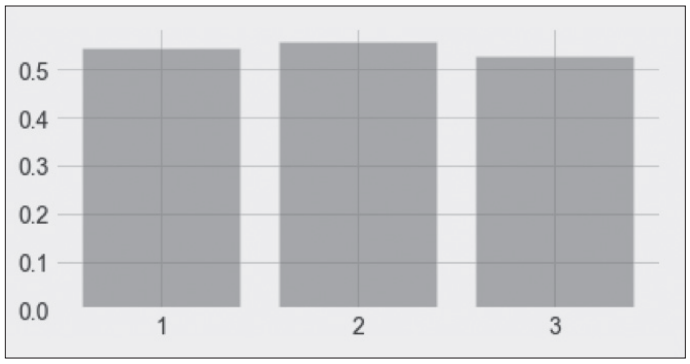
Figure 5
Cox PH Coefficient



Source: Data from *https://www.rdocumentation.org/packages/eha/versions/2.6.0/topics/scania*

Lifelines also offers functions to perform cross-validation. Cross-validation is one of the most important techniques to validate the stability of model performance. In Figure 6, we observe that the Concordance-Index, the global index for validating the predictive ability of a survival model (the higher the better), is stable across the (three) cross-validation samples.

Figure 6
Concordance Index for Three-fold Cross-Validation



Source: Data from *https://www.rdocumentation.org/packages/eha/versions/2.6.0/topics/scania*

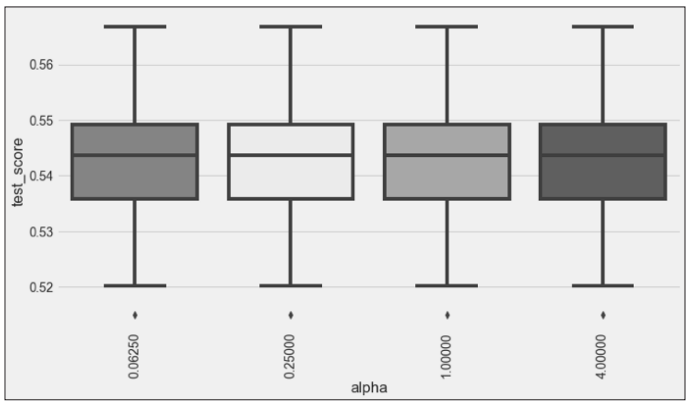
Lifelines offers several parametric and nonparametric models: Aalen Additive, Cox Time Varying, Cox PH, Weibull Accelerated Failure Time (AFT), Log-Normal AFT, Log-Logistic AFT, and Piecewise Exponential Regression. However, Lifelines does not offer the more recent machine learning algorithms.

Scikit-survival is a Python module for survival analysis built on top of Scikit-learn, the most popular library for training machine learning models. Therefore, one can perform survival analysis while utilizing the Scikit-learn utilities for preprocessing and doing cross-validation. Scikit-survival supports the following models: Survival Support Vector Machine, Gradient Boosting Survival Analysis, Cox PH Model and Cox PH Model with elastic net penalty. In addition, this library implements additional model metrics: Concordance Index for right-censored data based on inverse probability of censoring weights and cumulative/dynamic Area Under Curve for right-censored time-to-event data.

Training machine learning models require finding a set of parameters that optimize their performance (hyperparameter optimization). One can use Scikit-learn functions to achieve that.

For example, for the Survival Support Vector Machine Model (see Figure 7), the alpha parameter needs to be optimized. We used the Grid Search Cross-Validation technique and estimated the optimal alpha parameter (0.0625, corresponding to a Concordance Index of 0.542).

Figure 7
Concordance Index—Alpha Selection



Source: Data from *https://www.rdocumentation.org/packages/eha/versions/2.6.0/topics/scania*

One additional package to consider is DeepSurv (by Jared Katzman), which implements a deep learning generalization of the Cox PH Model.

The choice of the appropriate models and methods is not a trivial problem. The example used in this article does not help to appreciate the differences in performance among the models at our disposal because of the small sample size and the limited number of covariates. If we have a larger dataset with more covariates, our analysis will become more complex and iterative; let's use Python to simplify this challenging but interesting work. ■

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Passing the Torch: An Interview With Doug French

By Yuan Yuan

Doug French, FSA, MAAA, FCA, FIAA, is the managing principal of the Insurance and Actuarial Advisory Services practice of Ernst & Young LLP's Financial Services Organization. He has spent almost 35 years in actuarial consulting. Prior to joining Ernst & Young LLP, he was a principal and global practice director of a major actuarial consulting firm. Doug has worked on engagements in the U.S., Mexico, Australia, Canada and the U.K. Doug is a co-author of the Institute of Actuaries of Australia's sessional paper "Margin on Services Reporting: The Financial Implications," which was the institute's 1993 Parker Prize winner. In 2018, Doug received the Society of Actuaries (SOA) Distinguished Service Award for significant contributions to the actuarial profession. He can be contacted at *doug.french@ey.com*.

In this issue, *Actuary of the Future* editor Yuan Yuan invites Doug to share his experiences and views on the actuarial profession.

Yuan Yuan (YY): How did you get where you are now? Can you briefly run us through your career history?

Doug French (DF): I was a pure math major at UT Austin. When I was done with my undergraduate work, I had a decision to make: I could continue in mathematics, go to graduate school, or get a job. I wasn't too thrilled with the idea of getting a Ph.D. in Mathematics, as it most likely meant a career in academia. I basically had no money to go to law school or grad school, so I needed to get a job. People suggested that I look into actuarial science, because in those days you didn't need an actuarial science degree to get hired. I had a couple of interviews and was hired by a large life insurance company in Houston, Texas, in product development.

I worked in the industry for two years and decided I really wanted to get into consulting. I interviewed with a large actuarial consulting firm and was hired with only four exams in its Jacksonville, Florida, office. I worked there for about 15 years. While there, I also worked in London and Sydney, and I opened an office in Melbourne, Australia. I then came back to the U.S. to run the New York office.

In 1999, I came to EY to build the actuarial practice. I have always enjoyed consulting because I loved the client contact and competitive atmosphere. In October, I will hit my 20-year milestone with EY.

YY: As an industry leader, you have been involved in a broad span of client projects and industry changes. What do you enjoy the most about the actuarial career?

DF: What I like most is that you are able to use the rigor of mathematics to help people solve industry or company problems. If you look at actuarial science, the math is not terribly difficult. It is more about the challenges that wrap around math, which is basically business consulting. If you look at the profession, it is very different from 35 years ago. There used to be a lot of manual calculating and checking. Now it is all about solving corporate problems. Going forward, the actuarial profession needs to maintain its healthy appetite and respect for mathemat-

ics, but it also has to have a respect for technology. If we respect technology and mathematics, we can enhance our profession.

YY: How about consulting? What do you enjoy the most about being an actuarial consultant?

DF: The best part is the client contact and work. If you don't like, or don't have a passion for, serving clients or seeing folks be successful because of your advice, then you shouldn't be in consulting.

The second-greatest aspect of consulting is that it is a bit entrepreneurial and similar to running a business. Every day we need to sell a piece of work, we need to think entrepreneurially, we need to think about the next step in the profession and the industry, and we need to force ourselves to stay on top of intellectual capital development. If you look at what is needed to succeed in consulting, it's being a bit of a renaissance person. You need business acumen skills, intellectual capital development and teamwork to win in the market. Our people are not doing the same thing every day; they need to be nimble and flexible. While they are working on projects, they also need to be thinking about speaking at the next actuarial conference, and we also need to keep up with the industries that we serve. Being an actuarial consultant forces you to learn and to grow continuously, because you've got to cover all your bases to be successful.

YY: What do you think contributes the most to your successes? And how should every aspiring actuary develop these skills/traits?

DF: First of all, you have to have a passion for what you do every day, whether it is in industry or in consulting. I just really, really like my job. I work with great people and have great clients.

Everybody obtains success from a different career route. For me, I wanted to be a partner in a consulting firm. I had some very good mentors who showed me what success looked like in consulting. I basically decided that I would never say no to an assignment. When somebody wanted me to go do something or get on a project team, I went ahead and did that. That can sometimes put pressure on you, but I felt that if you didn't do that, you might get passed up and miss opportunities.

The next thing I learned from my mentors was that leadership mattered. To move up the ranks, whether you're managing two actuarial students or 80 consultants on a project, you need to step up and be a leader. It's extremely important that people feel they've got good leadership around them and that leadership has their back. Leadership comes through whether you're doing work, selling work or proposing work. It is that confidence that your people and clients look for.

Finally, I was very lucky to do international secondments early on in my career. There is nothing better than being able to work in another country and learn a different industry and culture. I think an international secondment is a great way to accelerate your career.

YY: What are some changes that are imminent within the profession, and how do you see these changes impacting the profession? How do you think we should prepare for these changes?

DF: The actuarial profession is at a crossroads. It has managed to control supply and demand through an exam system, and that has resulted in prosperous and lucrative careers for those who can get through the exams and become qualified. What puts this profession on alert is technology, machine learning and automation. As a profession, we need to continue to stay on the high ground regarding intellectual capital development and thought leadership. If not, a lot of our jobs can be replaced by technology or others.

I think there could be a few paths for this profession. One is to keep doing what we are doing today, but you can paint a scenario where the number of actuaries declines over time because technology takes some of the jobs away. For example, there may not be the same need for the same number of actuaries to maintain a balance sheet. Then the profession is faced with these questions: Do we get into other functions within industries we already serve? Do we serve other industries going forward? This obviously creates a whole new set of issues, because other industries don't necessarily recognize and understand the credentials of an actuary.

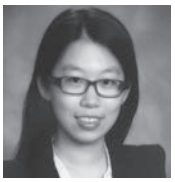
If we don't get into other industries, we might have a shrinking profession. If we are willing to shrink as a profession, it creates a whole new set of issues around attractiveness of the profession. The top-quartile actuaries are always going to be prosperous; it is the other folks we need to worry about. SOA is doing a strategic study on the profession, and I welcome that, because now is the time to look at supply and demand and what technology can do to our jobs, and it is time to reset our strategy to maintain the position of this profession around the world.

We can also continue to work as an integrated team. I think the pure actuarial play is probably getting harder and harder to pull off strategically. Problems today are more complex and require many skill sets to solve. We cannot ignore what is happening in technology. I am on the Advisory Council of the College of Natural Sciences at UT Austin. The way Ph.D. students work in mathematics today is different from the way it was 30 years ago; they have to collaborate with other disciplines and use and respect technology in their profession. If mathematicians have changed the way they work, certainly the actuarial profession can change the way we work. Why would we be any different?

YY: What recommendations would you make to the upcoming generation of actuaries?

DF: There is no single right path to success. You need to have your purpose and a reason to get out of bed every morning.

Obviously, you need passion and intellectual curiosity in order to succeed in this profession. Also, you should be flexible and try different things. This profession is still going strong and offers great opportunities for people. If you give it energy, it is going to give you a return on that energy. ■



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