Annals of Actuarial Science (2021), **15**, pp. 205–206
doi:10.1017/S174849952100018X

Institute and Faculty of Actuaries

Editorial

It is our great pleasure to introduce the special issue of the *Annals of Actuarial Science* on Insurance Data Science. The theme of this issue grew out of the rapid and transformative developments in our field, with the increased use of computational statistics, machine learning and artificial intelligence models in insurance applications. While the special issue has been associated with the 2nd Insurance Data Science Conference, held in June 2019 at ETH Zurich, we are pleased that the submissions we received were from a wider and very distinguished pool of authors.

Artificial intelligence methods, particularly deep neural networks, are being increasingly and extensively deployed in different areas of actuarial science. Richman (2021a, 2021b) offers a wide-ranging review, spanning areas from mortality modelling to claims reserving and telematics. Fernandez-Arjona (2021) shows how neural networks can be used to construct proxy models in the context of risk neutral pricing of variable annuities. Zhu and Wüthrich (2021) combine unsupervised learning techniques with a pre-trained convolutional neural network used for image processing, to cluster driving styles.

A particular focus of cutting-edge statistical methods has been the modelling of mortality. Peters *et al.* (2021) study persistence and long-term memory of mortality data, linking these properties to fractional Brownian motion and multifractality. Huynh and Ludkovski (2021) deploy Gaussian processes to model longevity in multiple populations, in this way explicitly capturing the cross-population dependence. Richman and Wüthrich (2021) also deal with multi-population mortality modelling, extending the Lee-Carter model and using neural networks to select an optimal model structure.

In the context of insurance operations, computational statistics and machine learning give us tools for modelling policyholder behaviour and claims development. Hu *et al.* (2021a) use the spatial characteristics of life insurance policyholders to predict lapses by integrating census demographics with companies' own data. Kwasa and Jones (2021) apply machine learning to non-life insurance reserving, developing a support vector regression approach, with a kernel function that preserves the statistical features of the loss data.

Finally, we are pleased to introduce, through this special issue, the expansion of the scope of the *Annals of Actuarial Science* to include contributions to actuarial and statistical software. As open-source software has become crucial to our research and to applications of statistical models in practice, we are pleased to acknowledge academics' multifaceted contributions in that domain. Tseung *et al.* (2021) developed the julia package, LRMoE, which enables the flexible modelling of insurance loss frequencies and severities using the Logit-weighted Reduced Mixture-of-Experts model. Within the same theme, Hu *et al.* (2021b) introduce the mvClaim package in R, which focuses on frameworks for multivariate insurance claim severity modelling, specifically mixtures of experts with bivariate gamma distributions and finite mixtures of copula regressions. Finally, Pesenti *et al.* (2021) present the R package SWIM, which implements a sensitivity analysis approach that allows users to produce stressed versions of their simulation models, without requiring additional model runs or full model specifications.

The production of this special issue was a result of a substantial collective effort and we are proud of the result. We thank all authors for their contributions to this special issue and the referees who, with their thoughtful reviews, have supported us in upholding the *Annals*' rigorous standards.

Katrien Antonio, *Guest Editor*
KU Leuven

Christophe Dutang, *Guest Editor*
Université Paris Dauphine

Andreas Tsanakas, *Editor-in-Chief*
City, University of London

References

Fernandez-Arjona, L. (2021). A neural network model for solvency calculations in life insurance. *Annals of Actuarial Science*, **15**(2), 259–275.

Hu, S., O'Hagan, A., Sweeney, J. & Ghahramani, M. (2021a). A spatial machine learning model for analyzing customers' lapse behaviour in life insurance. *Annals of Actuarial Science*, **15**(2), 367–393.

Hu, S., Brendan Murphy, T. & O'Hagan, A. (2021b). `mvClaim`: an R package for multivariate general insurance claims severity modelling. *Annals of Actuarial Science*, **15**(2), 441–457.

Huynh, N. & Ludkovski, M. (2021). Multi-output Gaussian processes for multi-population longevity modelling. *Annals of Actuarial Science*, **15**(2), 318–345.

Kwasa, S. & Jones, D. (2021). A practical support vector regression algorithm and kernel function for attritional general insurance loss estimation. *Annals of Actuarial Science*, **15**(2), 394–418.

Peters, G.W., Yan, H. & Chan, J. (2021). Statistical features of persistence and long memory in mortality data. *Annals of Actuarial Science*, **15**(2), 291–317.

Pesenti, S.M., Bettini, A., Millossovich, P. & Tsanakas, A. (2021). Scenario Weights for Importance Measurement (SWIM) – an R package for sensitivity analysis. *Annals of Actuarial Science*, **15**(2), 458–483.

Richman, R. (2021a). AI in actuarial science – a review of recent advances – part 1. *Annals of Actuarial Science*, **15**(2), 207–229.

Richman, R. (2021b). AI in actuarial science – a review of recent advances – part 2. *Annals of Actuarial Science*, **15**(2), 230–258.

Richman, R. & Wüthrich, M.V. (2021). A neural network extension of the lee-carter model to multiple populations. *Annals of Actuarial Science*, **15**(2), 346–366.

Tseung, S.C., Badescu, A.L., Fung, T.C. & Sheldon Lin, X. (2021). LRMoE.jl: a software package for insurance loss modelling using mixture of experts regression model. *Annals of Actuarial Science*, **15**(2), 419–440.

Zhu, R. & Wüthrich, M.V. (2021). Clustering driving styles via image processing. *Annals of Actuarial Science*, **15**(2), 276–290.

https://doi.org/10.1017/S174849952100018X Published online by Cambridge University Press