

Invitation to a Course on Advanced Statistical Methods in Actuarial Data Science

23rd to 26th September 2020
live broadcast

Keynote Speakers: Dr. Jonas Hirz, Actuary AVÖ (Actuarial Association of Austria)
Consultant at Boston Consulting Group, Vienna
Chairperson of the Data Science working group of the AVÖ
Member of the Data Science/AI workstream of the Actuarial Association of Europe

Dr. Mario Hörig, Actuary DAV (German Association of Actuaries)
Partner at Oliver Wyman, Dusseldorf

Onnen Siems
Managing partner and co-founder
Meyerthole Siems Kohlruss actuarial consulting company, Cologne
Chairperson of the association VM4K e.V., Cologne

Carina Götzen, Actuary DAV (German Association of Actuaries)
Leading consultant
Meyerthole Siems Kohlruss actuarial consulting company, Cologne

Lecturers: Prof. Dr. Marcus Hudec
Faculty of Computer Science, Vienna University
Director of Data Technology, Vienna
Visiting professor at Salzburg University

Dr. Michael Schlögl, Actuary AVÖ (Actuarial Association of Austria)
Head Actuary and Actuarial Function Non-Life
Wiener Städtische Versicherung AG – Vienna Insurance Group, Vienna
Chairperson of the mathematical-statistical committee of the
Austrian Association of Insurance Companies
Visiting professor at Salzburg University

Andreas Missbauer, Actuary AVÖ (Actuarial Association of Austria)
Deputy Actuarial Function Non-Life
Wiener Städtische Versicherung AG – Vienna Insurance Group, Vienna
Visiting professor at Salzburg University

Dates: Wednesday, 23rd September 2020, 9.00 – 16.30
Thursday, 24th September 2020, 9.00 – 16.30
Friday, 25th September 2020, 9.00 – 16.30
Saturday, 26th September 2020, 9.00 – 12.15

Contents: Against the background of digital transformation and new technological possibilities, the insurance industry and especially actuaries are faced with the challenge of successfully integrating analytical procedures and methods of data science and artificial intelligence into existing business models or using them to contribute to the development of new innovative business models.

Data Science is a collective term for methods and approaches that are important in the transition to a data-centric company. The still young profession of a data scientist requires both a broad analytical-methodological basic knowledge from the fields of statistics and computer science as well as specific knowledge from the application domain in the insurance industry. Accordingly, in addition to teaching the necessary basic knowledge of multivariate statistics, machine learning, and artificial intelligence an emphasis is also placed on application scenarios in the insurance industry.

The keynote speeches by renowned experts will highlight the practical relevance of the topic in the insurance industry and the resulting strong pressure for change in the industry from different perspectives. Furthermore, concrete application examples will be presented, and the possible embedding of data science in the business model will be demonstrated.

The course covers all aspects of advanced statistical methods in insurance required to become a fully qualified actuary according to the education syllabus of the International Actuarial Association and the core syllabus of the Actuarial Association of Europe as well as according to the regulations of the Actuarial Association of Austria (AVÖ). The course also meets the requirements by the Austrian Financial Market Authority with respect to the (deputy) responsible actuary (§§ 114 – 116 Austrian Insurance Supervision Act as well as §§ 21d and 21e Austrian Pension Fund Act), the head of the actuarial function (§ 113 Austrian Insurance Supervision Act as well as § 21c Austrian Pension Fund Act), the head of the risk management function (§ 112 Austrian Insurance Supervision Act as well as § 21a Austrian Pension Fund Act) and other management, governance or key functions (§ 120 Austrian Insurance Supervision Act as well as § 21 Austrian Pension Fund Act). For continuing professional development (CPD) the course counts as 21 hours.

The course is designed not only for actuarial students, but also addresses experienced actuaries. The emphasis will be on a practical and data-oriented approach. A basic stochastic knowledge is sufficient. Please find the detailed programme on the following two pages.

Course fees: € 666 (incl. VAT).

Information: For further information, please contact Sarah Lederer (sarah.lederer@sbg.ac.at) by e-mail with your telephone number. Your questions will be answered as soon as possible.

Registration: Please send the attached registration form by e-mail (sarah.lederer@sbg.ac.at) or by post, and arrange for the amount to be transferred (at no cost to the recipient) to the following account before 4th September 2020:

Salzburg Institute of Actuarial Studies (SIAS)
IBAN: AT79 2040 4000 0001 2021 BIC: SBGSAT2S

Modalities: The lectures will be held as a live broadcast, participants will receive the necessary information in due course.

Programme

Session 1	daily	9.00 – 10.30
Session 2	daily	10.45 – 12.15
Session 3	daily	13.15 – 14.45
Session 4	daily	15.00 – 16.30

Wednesday, 23rd September 2020

1 **Theoretical foundations of regression analysis I** (*Marcus Hudec*)

First, a general basic understanding of linear regression is given. This will be extended by diagnostic techniques to check the validity of modelling assumptions, the presentation of concepts to evaluate the quality of regression models, and the extraction of prediction intervals from the models.

2 **Theoretical foundations of regression analysis II** (*Marcus Hudec*)

Various extensions of the linear model are presented. In particular, the modelling of nonlinear relationships and the extension towards generalized linear models are discussed. Shrinkage models (regularized regression such as Ridge and LASSO) as well as robust models are treated.

3 **Methods of classification** (*Marcus Hudec*)

Classical methods of classification are the main topic: logistic regression as well as various methods of discriminant analysis and the naive Bayesian approach. Furthermore, the concept of support vector machines is explained.

4 **Methods of unsupervised learning** (*Marcus Hudec*)

On the one hand, methods for the derivation of association rules, which are applied in cross- and up-selling, are presented. On the other hand, an overview of methods of cluster analysis (hierarchical procedures, partitioning procedures as well as probabilistic approaches) for the segmentation of data sets is given.

Thursday, 24th September 2020

1 **Basic concepts of artificial intelligence** (*Marcus Hudec*)

In addition to the theoretical discussion of basic techniques around neural networks and deep learning, there will be a discussion under the motto "AI - Hype or real?" where AI research really stands today. Finally, an overview of methods in the context of the central challenge "Interpretable AI" will follow.

2 **Principles and methods in life, health, and non-life insurance** (*Michael Schlögl and Andreas Missbauer*)

The insurance principle, smoothing of raw data, tariff structures, and techniques are discussed.

3 **Experience rating and credibility models** (*Michael Schlögl*)

Basics of experience rating and credibility theory as well as Bayesian credibility are taught. The Bühlmann model and the Bühlmann-Straub model are demonstrated using simple examples.

4 **Bootstrapping and stochastic reserving** (*Andreas Missbauer*)

The implementation of stochastic loss reserving by means of bootstrapping in the context of IFRS 17 and Solvency II is discussed. A concrete example (implemented in R) based on freely available real data is presented.

Friday, 25th September 2020

1 **Overview on data science methods in actuarial practice** (*Jonas Hirz*)

This keynote will focus on the demystification of data science in the actuarial context (terminology, data scientist vs. actuary, evolution of our profession), on use cases in the insurance industry (examples along the value chain) and on the future of data science and the role of the actuary (customer of the future, insurtechs, tech giants, international developments).

2 **Deep learning techniques** (*Mario Hörig*)

Neural networks and their applications in insurance risk management will be presented with examples and case studies (proxy modelling, dimension reduction/clustering, multidimensional real-world simulation of market risk factors).

3 **Scoring of telematics data in motor insurance** (*Onnen Siems and Carina Götzen*)

Telematics data such as time-dependent acceleration and geolocation values are recorded during car rides at high frequency, thus generating very large amounts of data (Big Data), which by far exceed the data volumes usually used for setting up a tariff. Promising applications such as principal component analysis and heatmaps in combination with generalized linear models are presented.

4 **Generalized linear models and clustering for tariff calculations** (*Andreas Missbauer*)

Presentation of a practical example of motor insurance pricing using a multiplicative generalized linear model (implemented in R) on the basis of freely available real data and of an application of clustering using the example of regional pricing in accident insurance.

Saturday, 26th September 2020

1 **Further data science applications in the insurance industry** (*Michael Schlögl*)

Simulation of bonus-malus systems (short summary from the course "Fundamental Statistical Methods in Actuarial Data Science"), market comparison of bonus-malus systems, campaign optimization, sales reporting, stochastic simulation in life insurance.

2 **Algorithm-based supervised learning** (*Marcus Hudec*)

Starting with simple tree procedures, random forests as well as methods of bagging and boosting are explained on the basis of concrete application examples. A discussion of the frequently used algorithms k-nearest neighbors and collaborative filtering rounds off the topic.