Institute and Faculty of Actuaries

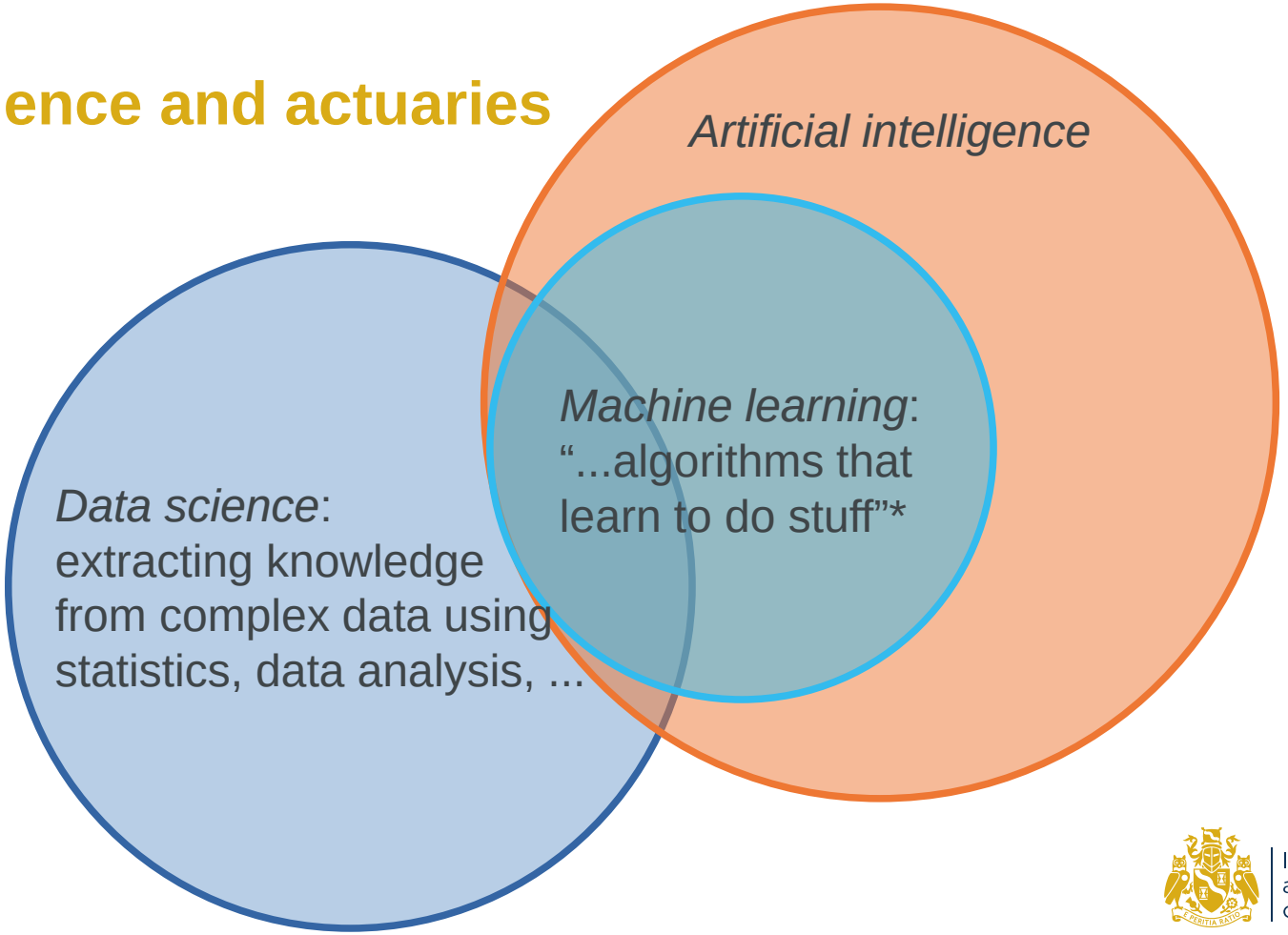
IFoA Certificate in Data Science – 1 year on:

7th April 2021

1. The relevance of data science for the actuarial profession
2. IFoA certificate in data science – 1 year on
3. IFoA next steps in data science
4. Q&A

Institute and Faculty of Actuaries

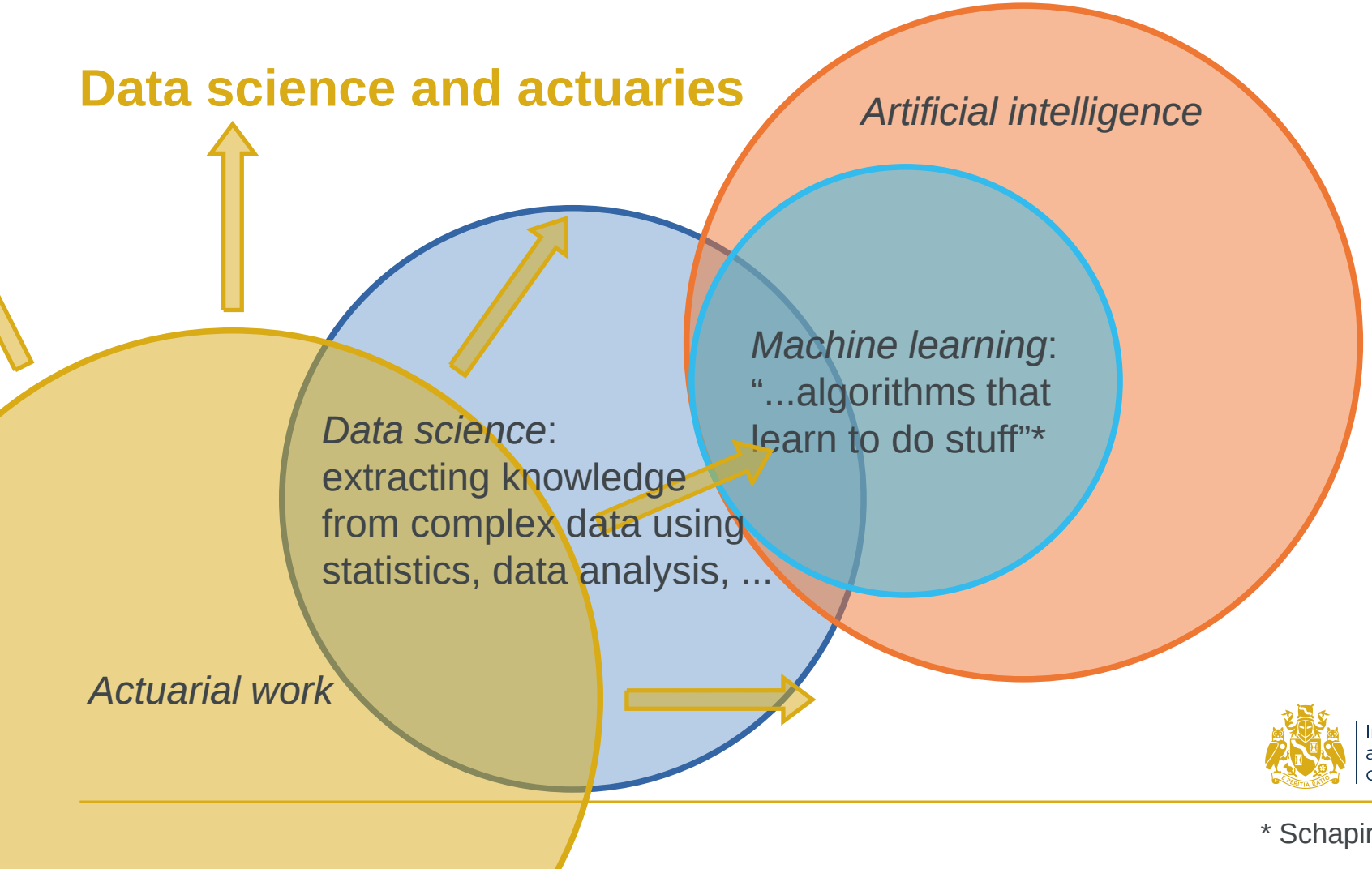
Data science and actuaries



Institute and Faculty of Actuaries

* Schapire (2008)

Data science and actuaries



Institute and Faculty of Actuaries

* Schapire (2008)

risks

MDPI

Article

DeepTriangle: A Deep Learning Approach to Loss Reserving

Kevin Kuo

Kasa AI, 3040 78th Ave SE #1271, Mercer Island, WA 98040, USA; kevin@kasa.ai

Received: 15 August 2019; Accepted: 12 September 2019; Published: 16 September 2019

check for updates

Abstract: We propose a novel approach for loss reserving based on deep neural networks. The approach allows for joint modeling of paid losses and claims outstanding, and incorporation of heterogeneous inputs. We validate the models on loss reserving data across lines of business, and show that they improve on the predictive accuracy of existing stochastic methods. The models require minimal feature engineering and expert input, and can be automated to produce forecasts more frequently than manual workflows.

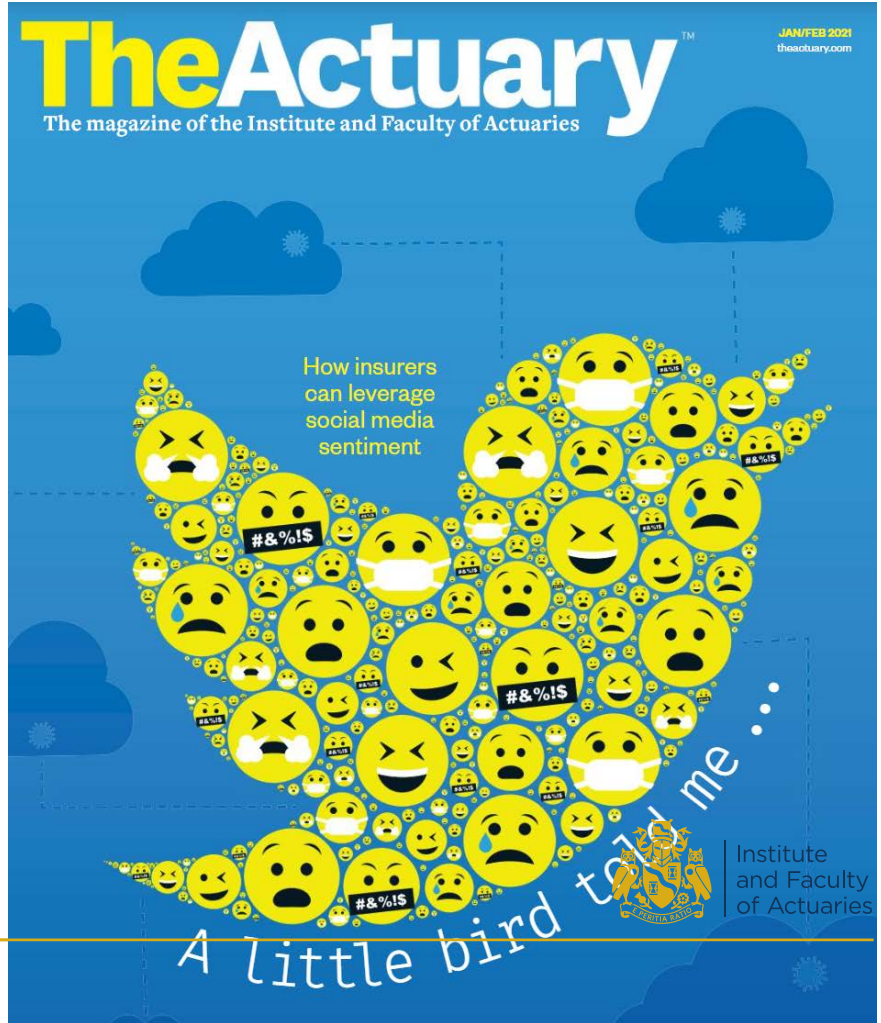
Keywords: loss reserving; machine learning; neural networks

1. Introduction

In the loss reserving exercise for property and casualty insurers, actuaries are concerned with forecasting future payments due to claims. Accurately estimating these payments is important from the perspectives of various stakeholders in the insurance industry. For the management of the insurer, the estimates of unpaid claims inform decisions in underwriting, pricing, and strategy. For the investors, loss reserves, and transactions related to them, are essential components in the balance sheet and income statement of the insurer. In addition, for the regulators, accurate loss reserves are needed to appropriately understand the financial soundness of the insurer.

There can be time lags both for reporting of claims, where the insurer is not notified of a loss until long after it has occurred, and for final development of claims, where payments continue long after the loss has been reported. Also, the amounts of claims are uncertain before they have fully developed. These factors contribute to the difficulty of the loss reserving problem, for which extensive literature exists and active research is being done. We refer the reader to England and Verrall (2002) for a survey of the problem and existing techniques.

Deep learning has garnered increasing interest in recent years due to successful applications in many fields (LeCun et al. 2015) and has recently made its way into the loss reserving literature. Wüthrich (2018b) augments the traditional chain ladder method with neural networks to incorporate claims features, Gabrielli and Wüthrich (2018) use neural networks to syntheisze claims data, and Gabrielli et al. (2018) and Gabrielli (2019) embed classical parametric loss reserving models



moneybox

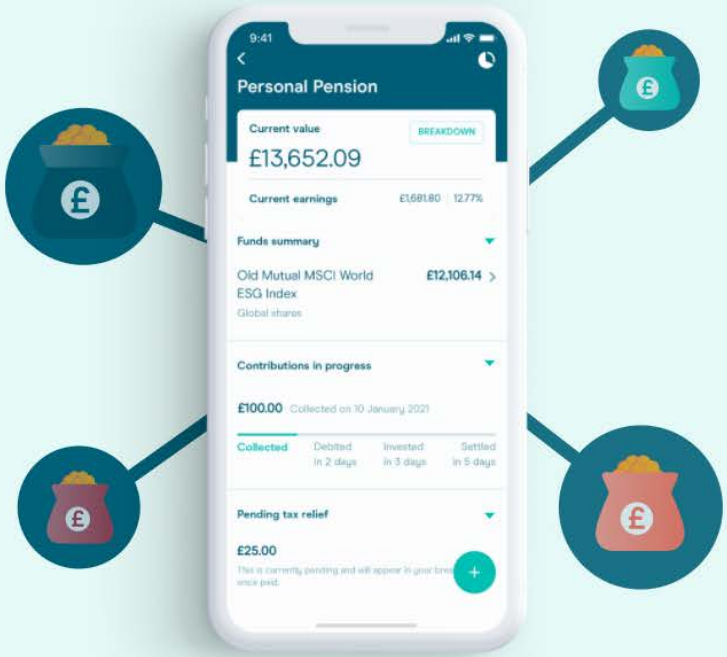
Pensions made easy

Combine your old pensions

Bring together your old pensions into one easy-to-use Personal Pension. **Our team of pension detectives and range of tools help you track down lost pots** – even if you don't know the name of your old provider or policy number.

Save your way

Set up a weekly deposit, switch on a monthly payday boost or make one-off deposits whenever you like. You can even round up your daily purchases to the nearest pound and save for retirement on the go.



Get free government top-ups

Save towards your retirement and **get free money from the government as a 25% top up in your Moneybox Pension.** Find out more about pension tax relief.

Track your progress

Track your investment performance at any time and see your pension alongside your other Moneybox accounts – all in our award-winning app.

Institute and Faculty of Actuaries

https://www.moneyboxapp.com/pension

Different actuaries, different objectives

Technical role…

Manager…

Certificate holder…

Institute and Faculty of Actuaries

> Programming as a profession is only moderately interesting. … You're much better off using code as your secret weapon in another profession. …. People who can code…are respected and can do amazing things to advance those disciplines.

Zed Shaw, Learn Python the Hard Way

Institute and Faculty of Actuaries

Office for Statistics Regulation

Reproducible Analytical Pipelines

Overcoming barriers to adoption

March 2021

- Programming and code management skills are essential for modern statistical analysis
- Not only a change in tools – a cultural change to the way that analysis is carried out
- £90m–150m p.a. efficiency savings across UK government (£9k per report)

Institute and Faculty of Actuaries

https://osr.statisticsauthority.gov.uk/publication/reproducible-analytical-pipelines-overcoming-barriers-to-adoption/

Actuaries…

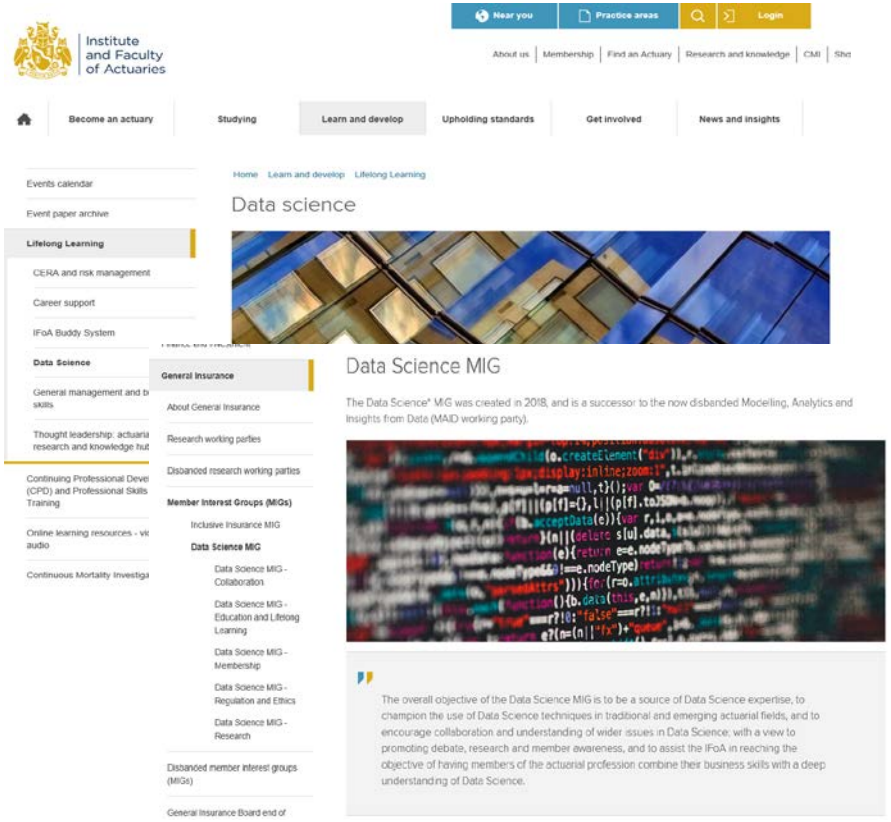
…must remain relevant in the future – a key part of this is understanding our role regarding data science

…need to keep up-to-date with the language, concepts and techniques used in data science, due to the increasing importance of data science in all the areas that actuaries work in

…have to develop a better understanding of data science to avoid diminishing their relevance and employability

Institute and Faculty of Actuaries

IFoA data science – the journey so far



The Actuary as a Data Scientist

What, how and why?

Monday 5 November 09:00 - 17:30
Staple Inn Hall, London

Institute and Faculty of Actuaries

IFoA Certificate in Data Science

The IFoA launched the Certificate in April 2020

3 cohorts – April 20, Sept 20, January 21 so far

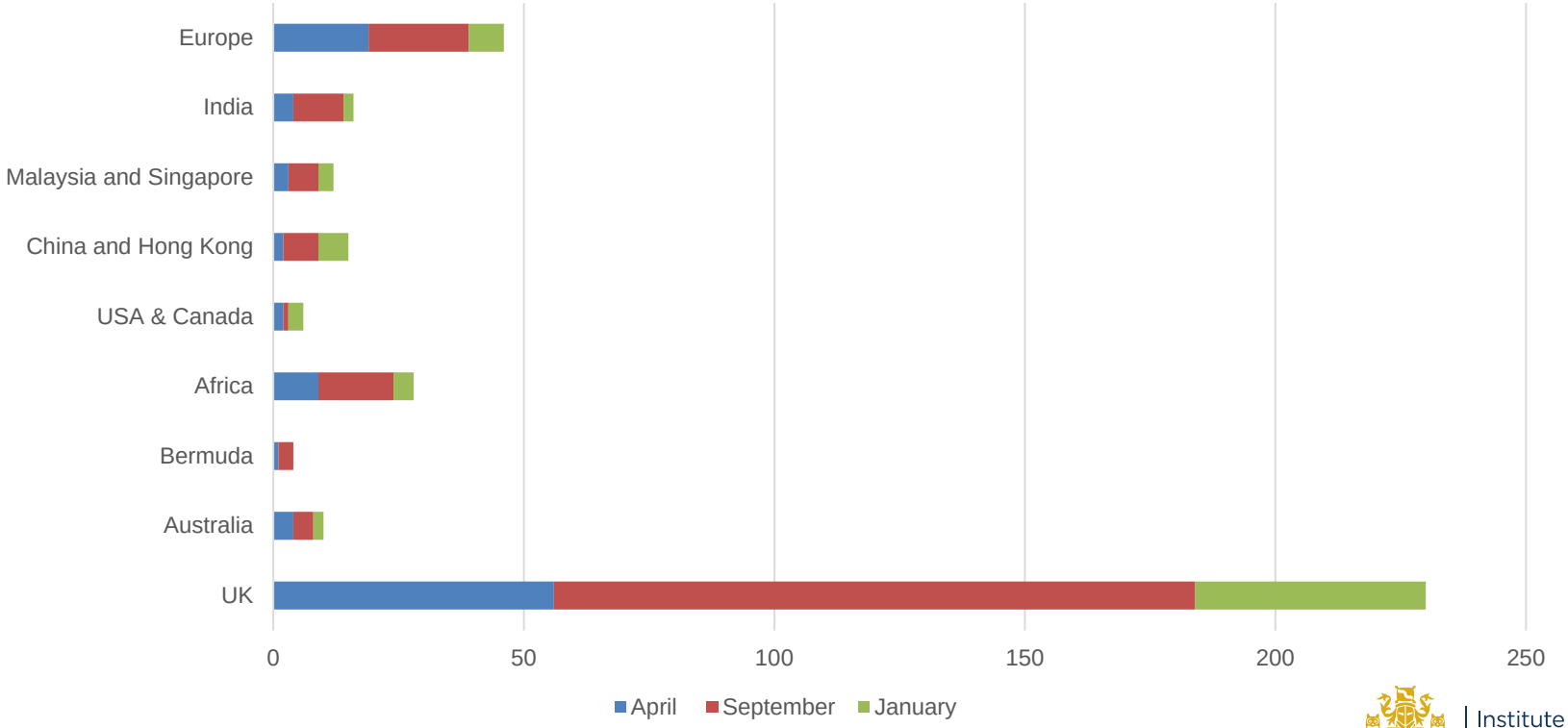
c400 members have completed the Certificate

Split broadly 55% Fellow / 45% Associate & Student

Institute and Faculty of Actuaries

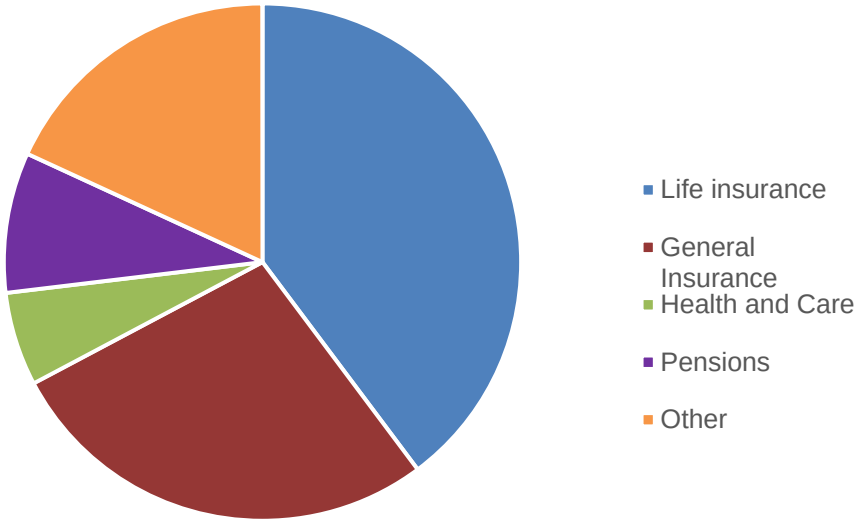
Icons by Freepik from Flaticon

Certificate in Data Science – Attendees by Country



Institute and Faculty of Actuaries

Certificate in Data Science – Attendees by Practice Area



Notes

- Split based on attendees for April 20 / Sept 20 cohorts
- Other – Finance, Investment, Banking, Education, Insurtech, IT, Risk etc

Institute and Faculty of Actuaries

IFoA certificate in data science – structure

- Certificate sits outside the IFoA's current fellowship qualification
- Certificate is delivered by a third party – Southampton Data Science Academy (SDSA) and jointly accredited by the IFoA and SDSA
- 100% online
- Assessed via three assignments – no exam
- Each cohort runs for 10 weeks
- The initial target audience is all members:
  - assumes a basic knowledge of statistics
  - no minimum requirement for R / Python

Southampton Data Science Academy
Presented by the Web Science Institute at the University of Southampton

Institute and Faculty of Actuaries

IFoA certificate in data science – content

1. **Core data science content**
   - Introduction to data science and techniques
   - Application of data science techniques to solve real world problems
   - Data visualisation and communication
   - Machine learning and Artificial Intelligence techniques
   - Hands-on experience of some of the tools used widely in data science (e.g. Python, Tableau)

2. **Application of data science in traditional and non-traditional areas of actuarial practice**
   - c. 15–20 case studies
   - Practical / regulatory / professionalism / ethical

Institute and Faculty of Actuaries

What members did next after completing the Certificate

- **Josephine Robertson - Health & Care / Risk Actuary**
- **Sam Blanchard - part qualified Systems Actuary**
- **Charchit Agrawal - Chief Actuary for a GI insurer in Malaysia**

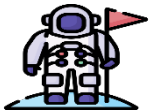
Institute and Faculty of Actuaries

Q&A

IFoA - next steps in Data Science

Affiliates

Ethical use of data science



Pioneers

Further educational options (next slide)

Institute and Faculty of Actuaries

Icons by Freepik from Flaticon

IFoA - next steps in data science education

- Feedback from Certificate - one size does not fit all
- Wide range of options available (see next slide).
- Developments in Associateship / Fellowship syllabi
- IFoA considering launching addition to the certificate involving more practical data science application in an actuarial context
- Considering SP0 equivalent = Certificate in DS + Practical DS

Institute and Faculty of Actuaries

Data science educational options

	Time	Cost	Educational benefit	Examples
Internet Magazines Books	Low	Low	• Can target learning to own requirements • Keep up-to-date • Low investment • Educational benefit?	• Articles • Webinars • Seminars • YouTube
Short targeted courses	< 1 month	Low	• Useful for targeted learning e.g. Python / Tableau etc • Generic	• Coursera • EdX • Udemy
Medium length courses	8 – 10 weeks	Medium	• Good starting point to cover a wide range of aspects of data science	• IFoA certificate in data science
Practical application	Low / medium	Low / medium	• Significant benefit being able to apply skills/group work • Programming skills needed	• Hackathon • Work projects • Next version of IFoA certificate
MSc / PhD	1 – 4 years (full time)	High	• Significant time / money investment needed	• Newcastle • Heriot Watt