



IAA
AAI

SECTION COLLOQUIUM 2019



THE MODERN ACTUARY - CHALLENGE • INFLUENCE • LEAD
ASTIN • IAAHS • IAALS • IACA • PBSS

2 - 5 April

2019

Cape Town
South Africa

CTICC

www.colloquium2019.org.za

Hosted by

ACTUARIAL
SOCIETY
OF SOUTH AFRICA





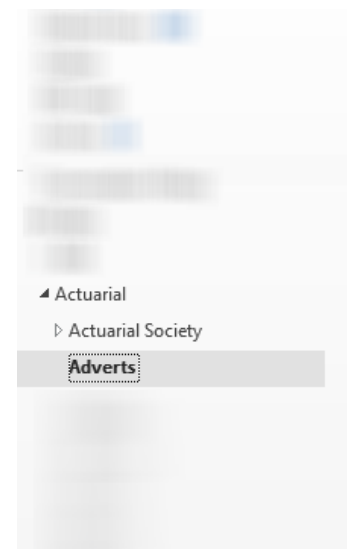
Future Actuary – Data scientist, coder, business leader, entrepreneur...

Louis Rossouw



What is happening to actuarial jobs?

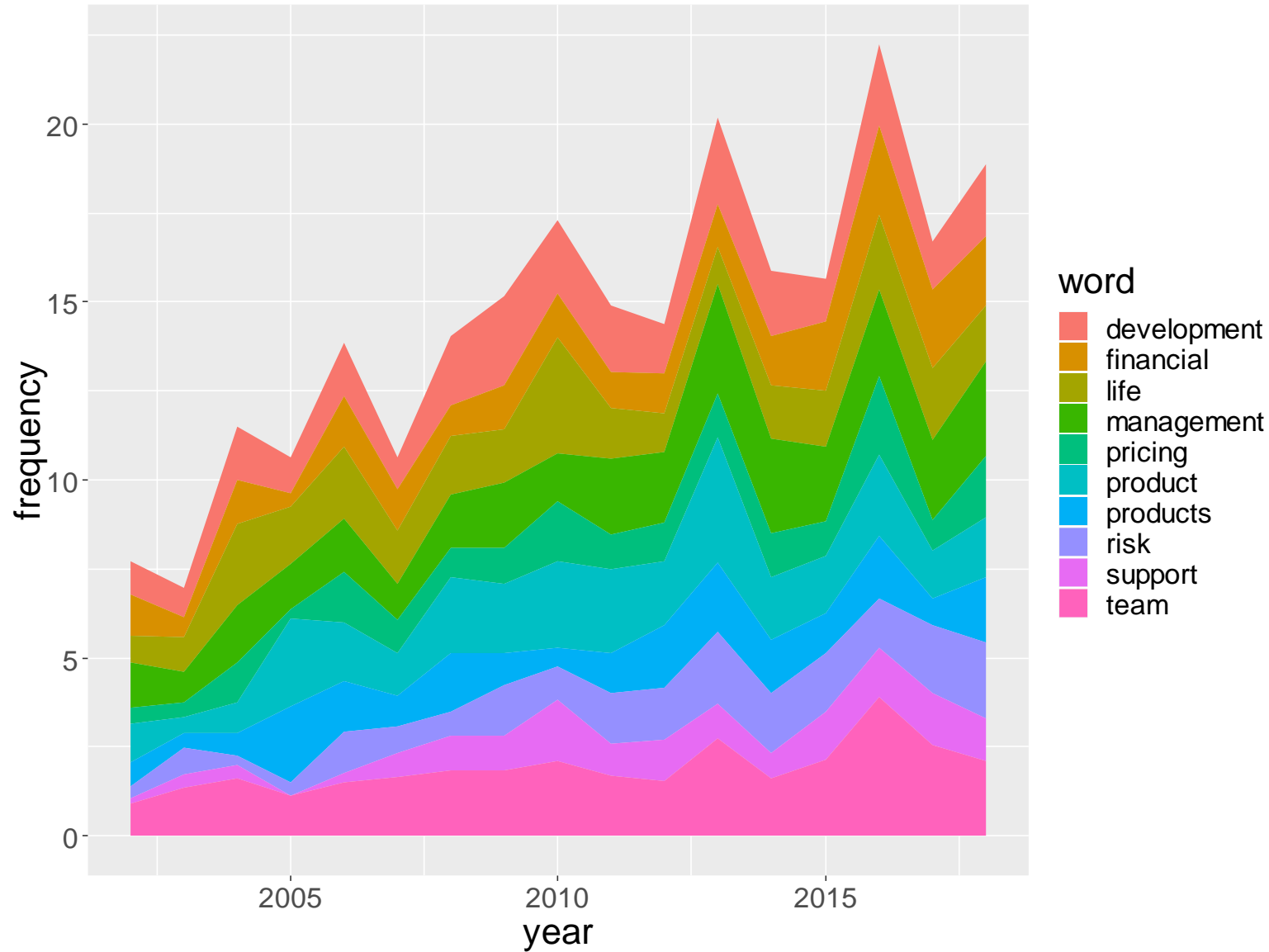
- Did some text mining of actuarial adverts
 - That I filed in my job advert folder
 - Mainly from Actuarial Society of South Africa
 - 2 years include Singapore Actuarial Society adverts
- Process
 - Removed numbers, punctuation and stop words
 - Lower case
 - Remove common words that didn't provide context
- Bag of words approach



Job advert sent by ASSA on behalf of: FMI, A division of Bidvest Life	
Actuarial Society Of South Africa Job Advert - Old Mutual [External] Job advert sent by ASSA on behalf of: Old Mutual	2018/03/26
Actuarial Society Of South Africa Job Advert - Old Mutual [External] Job advert sent by ASSA on behalf of: Old Mutual	2018/03/26
Actuarial Society Of South Africa Job Advert - Discovery Holdings [External] Job advert sent by ASSA on behalf of: Discovery Holdings	2018/03/22
Actuarial Society Of South Africa Job Advert - Sanlam [External] Job advert sent by ASSA on behalf of: Sanlam	2018/03/20
Actuarial Society Of South Africa Job Advert - Hollard Insurance [External] Job advert sent by ASSA on behalf of: Hollard Insurance	2018/03/20
Actuarial Society Of South Africa	

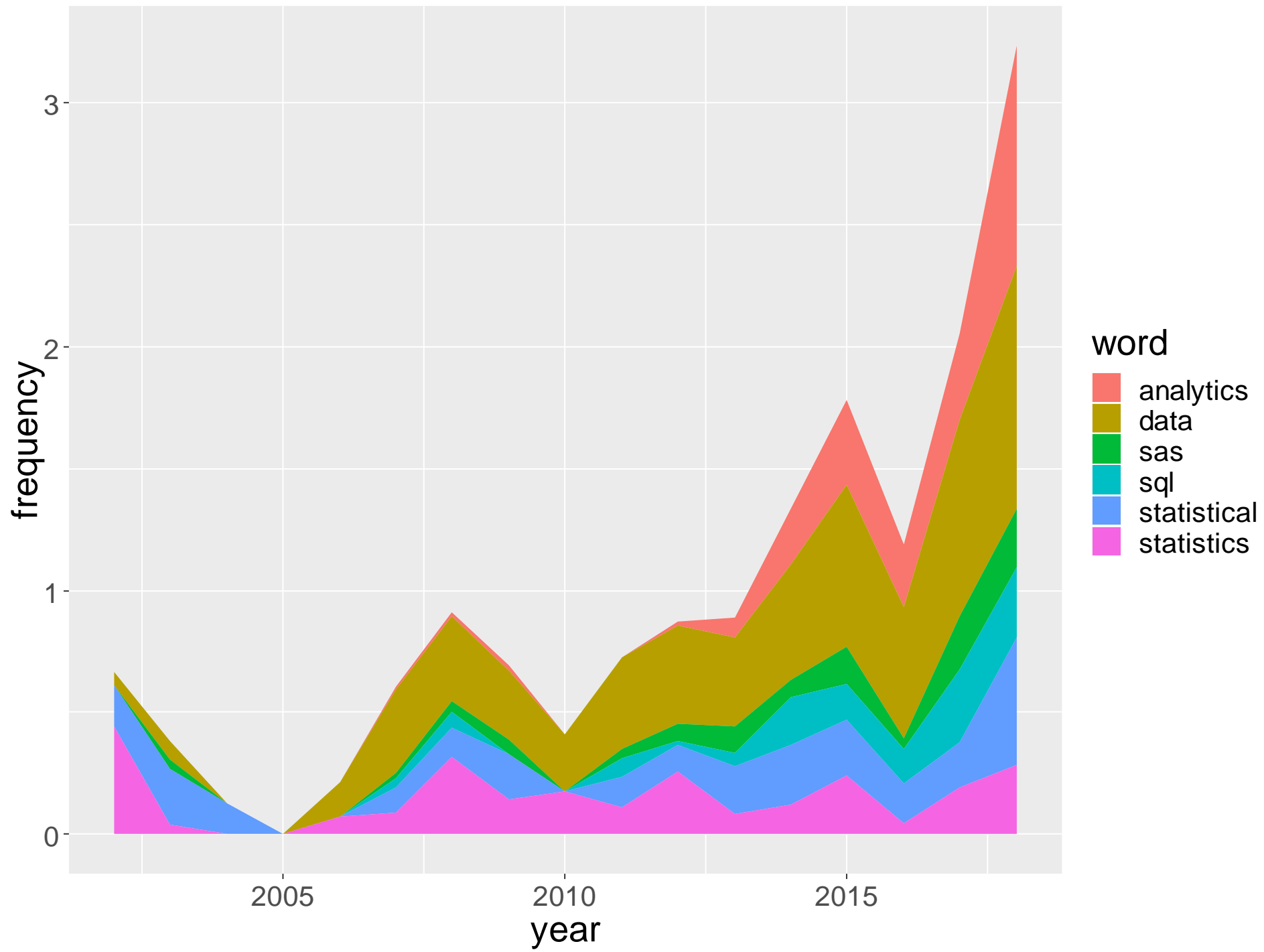


Bag of words



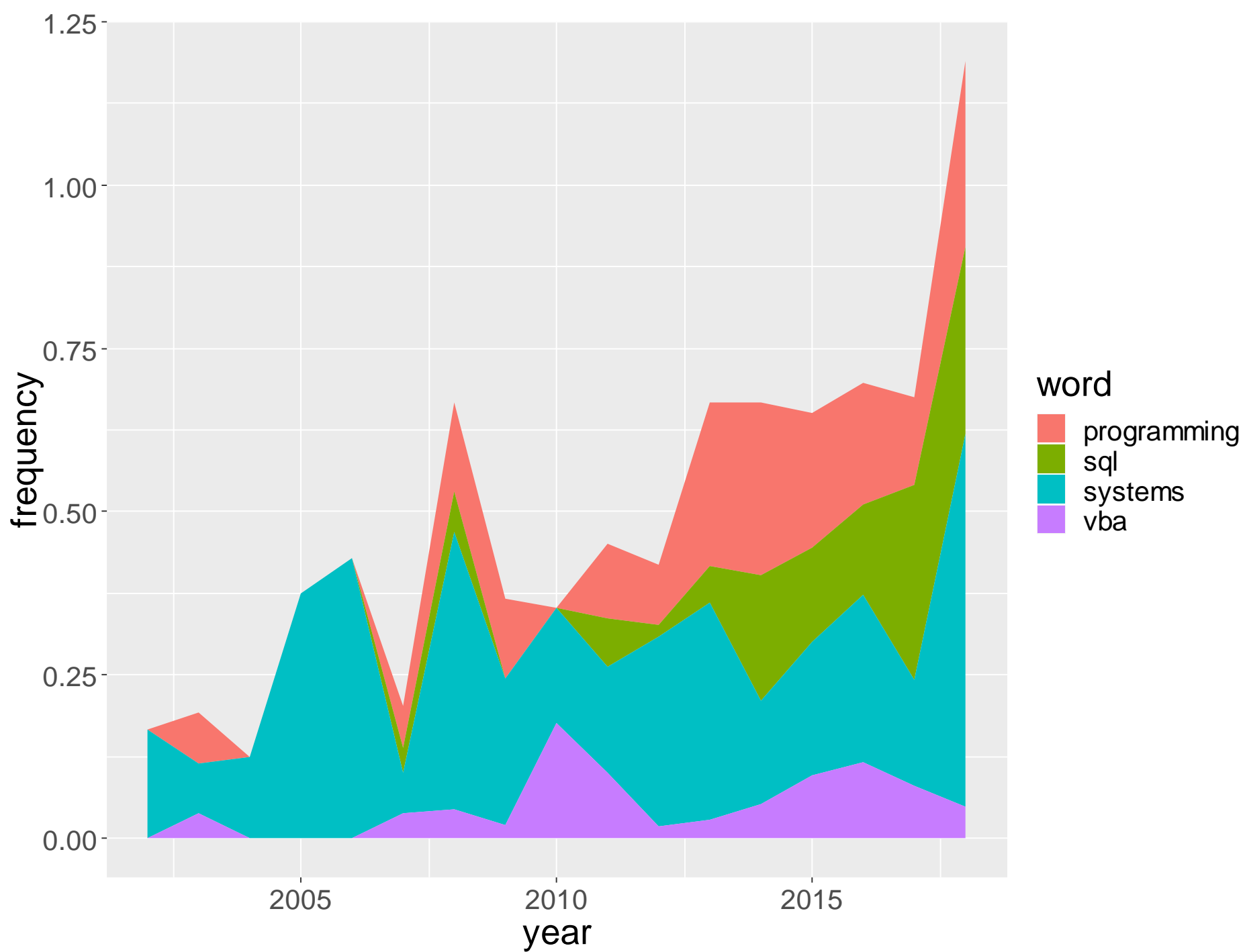


Data Science



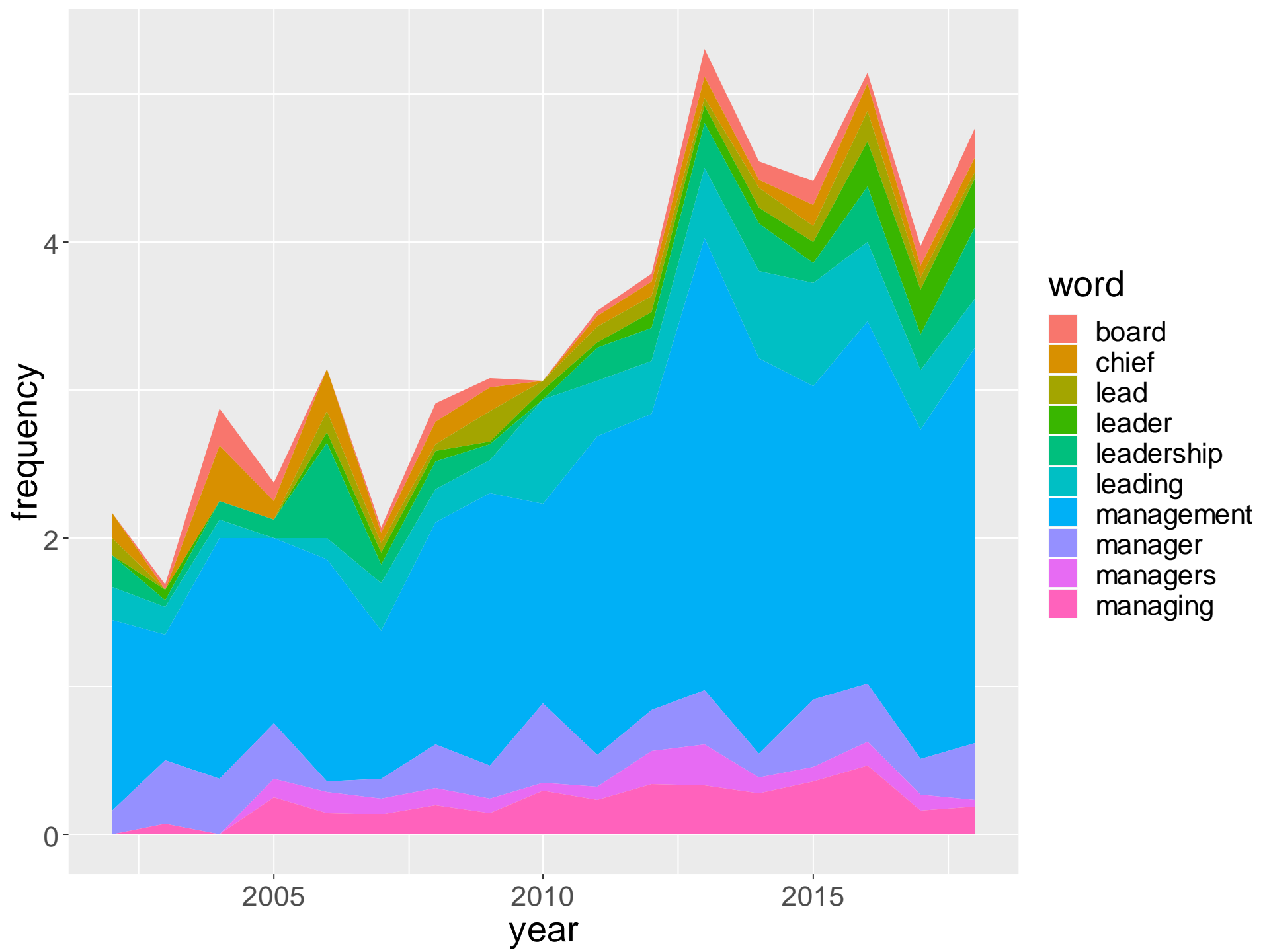


Coding / Programming



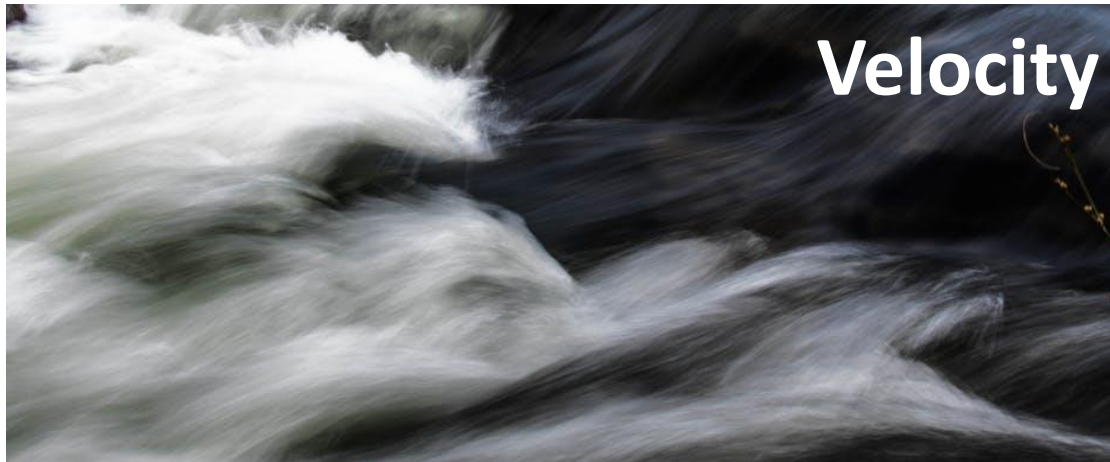


Leadership



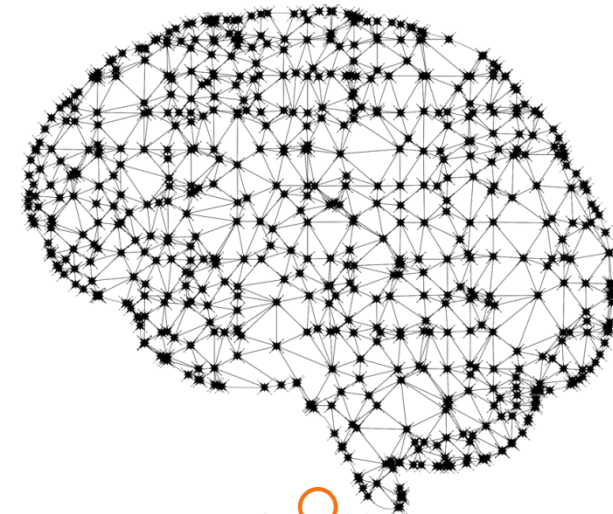
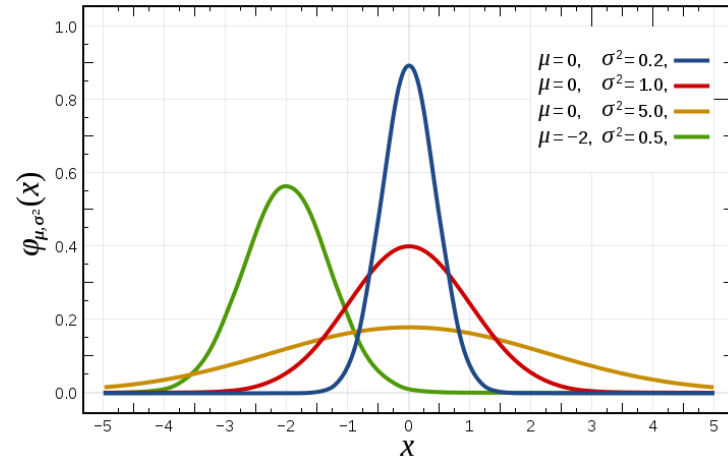


Four V's of Data



Statistics and Machine Learning

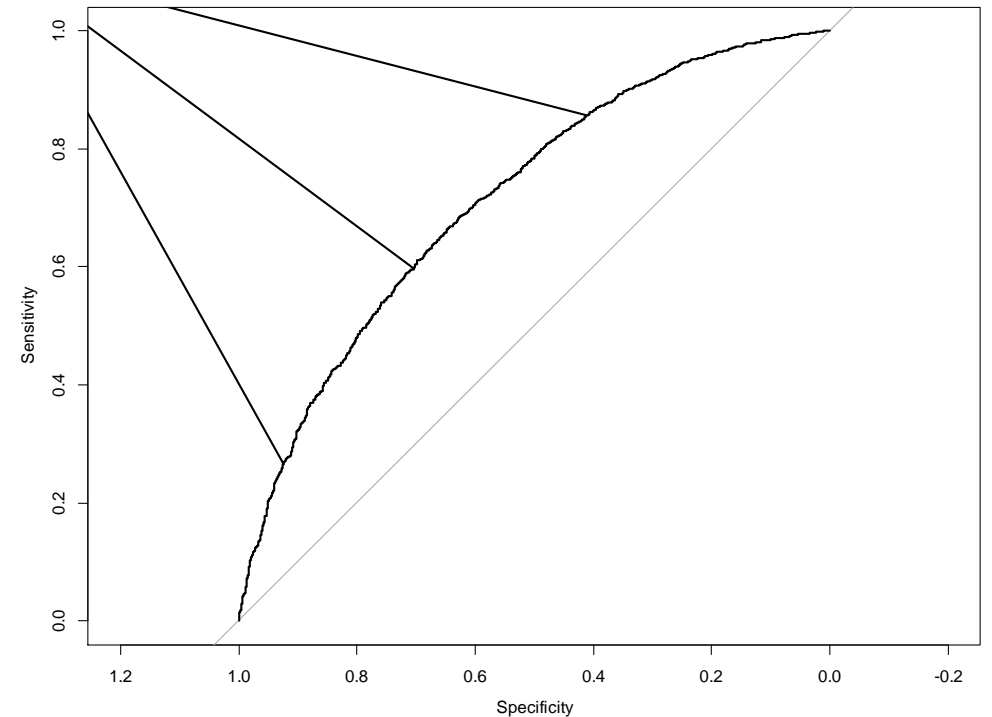
- **Statistical Models**
 - Generalised Linear Models
 - General Additive Models
 - Penalised Regressions
- **Machine Learning**
 - Decision Trees
 - Random Forreast
 - Gradient Boosting
 - (Deep) Neural Networks





Actuaries should be well placed...

- Understanding the construction of the data
- Weaknesses & strengths of techniques
- Evaluating of models
- Ensuring business goals are met





Why is programming & the related tools important?

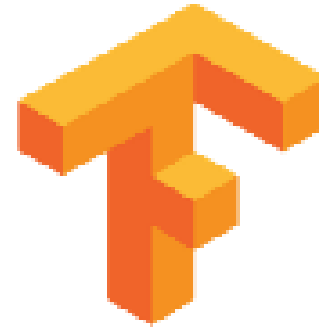
- Automation
- Standing on the shoulders of giants
- Documentation
- Tracking
- Testing
- Reproducibility





Standing on the shoulder of giants

- Open source allows one to leverage other's work





Standing on the shoulder of giants

(and everyone's a giant)

- R packages

- actuar – loss distributions, credibility theory
- demography – lifetable calculations, Lee-Carter modelling etc.
- lifecontingencies – life tables and actuarial tables
- ChainLadder – claims reserving
- StMoMo – stochastic mortality modelling

- Python

- lifelib – “An open-source library of life actuarial models written in Python”
- pyliferisk – “a python library for life actuarial calculations, simple, powerful and easy-to-use.”

- And many more...





Documenting (complex) models/code



```
def get_spreadsheet_cols(file_loc, print_cols=False):  
    """Gets and prints the spreadsheet's header columns  
  
    Parameters  
    -----  
    file_loc : str  
        The file location of the spreadsheet  
    print_cols : bool, optional  
        A flag used to print the columns to the console (default is  
        False)  
  
    Returns  
    -----  
    list  
        a list of strings used that are the header columns  
    """"  
  
    file_data = pd.read_excel(file_loc)  
    col_headers = list(file_data.columns.values)
```

```
#' Add together two numbers.  
#'  
#' @param x A number.  
#' @param y A number.  
#' @return The sum of \code{x} and \code{y}.  
#' @examples  
#' add(1, 1)  
#' add(10, 1)  
add <- function(x, y) {  
  x + y  
}
```



roxygen2



MkDocs



Automated Testing

- Available in most languages
- Ensure codes produces expected output on test cases
- Repeat test on parts of the code
- Stops bugs from being (re)introduced
- Create tests for new bugs

```
def test_calc_age(self):  
    data_date = date(2017, 10, 27)  
    life_assured = Life_Assured()  
    life_assured.calc_age()  
    assert not life_assured.age_last  
    life_assured.date_of_birth = date(2010, 10, 26)  
    life_assured.calc_age()  
    assert life_assured.age_last == 7
```



Tracking code

- Track changes to code with comments
- “Time machine ability”
- Multiple versions / branches
- Enables collaboration by multiple parties
 - Multiple people working independently on same code
 - Tracks who changed what
 - Merge changes
 - Resolve conflicting changes
- Enables open collaboration



git



Changes History master (all commits) | ↻

Subject	Author
HEAD -> refs/heads/master make a function word_area_plot	Louis Rossouw <lrossouw@genre.com>
exclude discovery	Louis Rossouw <lrossouw@genre.com>
Output graphs over time.	Louis Rossouw <lrossouw@genre.com>
formatting	Louis Rossouw <lrossouw@genre.com>
Output various word clouds.	Louis Rossouw <lrossouw@genre.com>
update word cloud function to save to jpg	Louis Rossouw <lrossouw@genre.com>
Remove old code	Louis Rossouw <lrossouw@genre.com>

Commits 1-18 of 18

```
109 m <- as.matrix(dtm)
109 110 m1 <- as.matrix(dtm1)
110 111 m2 <- as.matrix(dtm2)
111 112 m3 <- as.matrix(dtm3)
112 113
114 m <- m[, order(-colSums(m))]
113 115 m1 <- m1[, order(-colSums(m1))]
114 116 m2 <- m2[, order(-colSums(m2))]
115 117 m3 <- m3[, order(-colSums(m3))]
@@ -120,7 +122,7 @@ top_words <-
120 122 colnames(top_words) <- c("2002-2010", "2011-2015", "2015-2018")
121 123 write.csv(top_words, file = "top_words.csv", row.names = FALSE)
122 124
123 # tabulate word freq per advert for each calendar year
125 # tabulate word frequency per advert for each calendar year
124 126 freq_terms <- findFreqTerms(dtm, lowfreq = 25)
125 127 doc_years <- unlist(meta(corpus, tag = "year"))
126 128 word_freq <- foreach(year = 2002:2018, .combine = rbind) %do% {
@@ -166,3 +168,107 @@ foreach(year = 2002:2018) %do% create_word_cloud(
166 168 ),
167 169 filename = paste("corpus_", year, ".jpg", sep = "")
168 170 )
171
172 # other outputs
173 word_freq_melt <- melt(word_freq)
174 head(word_freq_melt)
```



Reproducible results

- A programmed solution can be repeated
- Tools to ensure consistent results
 - Tracking the right versions of packages
 - Over time
 - Different PCs



CONDA



Why is programming & the related tools important?

- Efficiency
- Rapid innovation
- Reduces risk

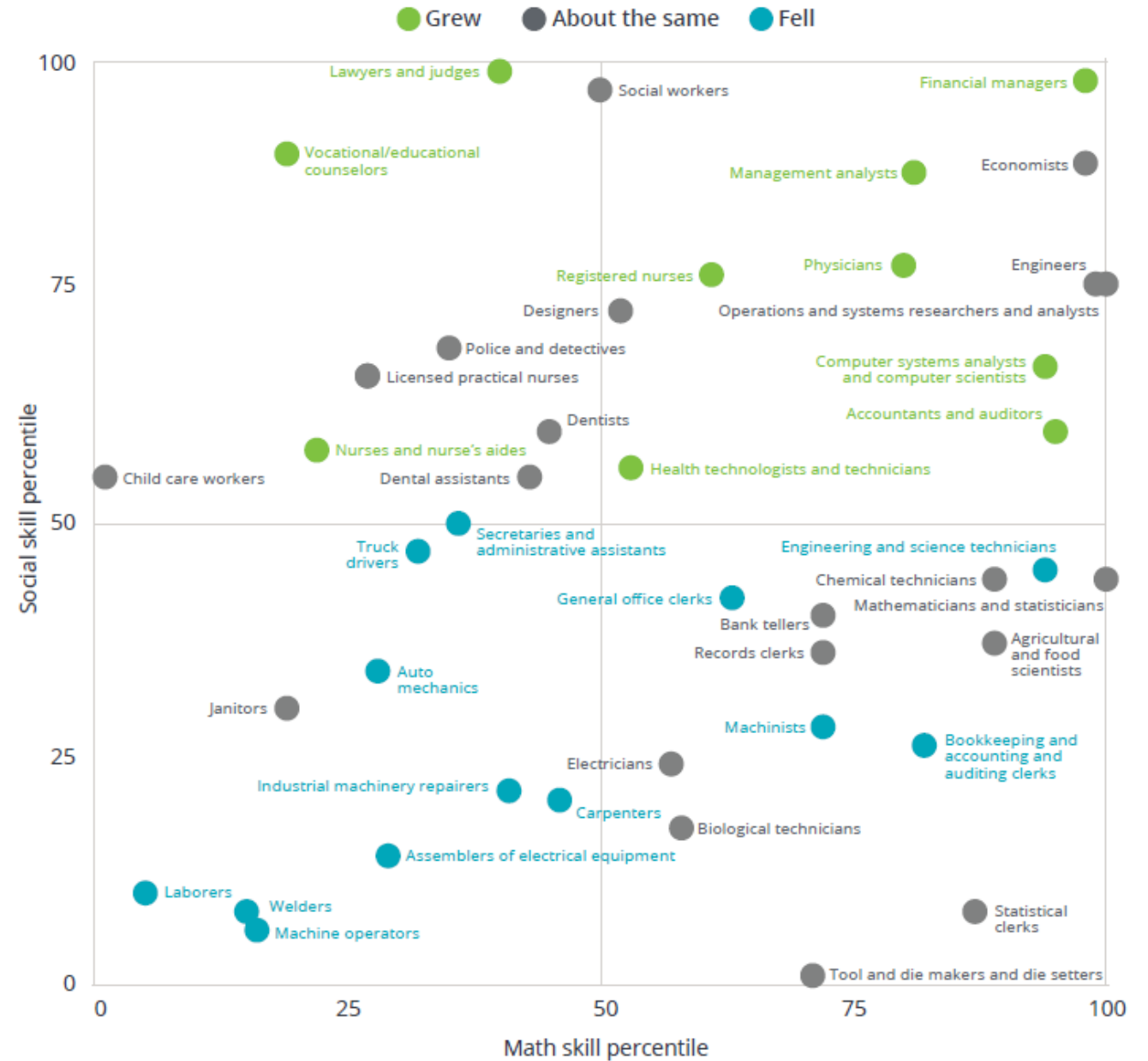




STEAM not just STEM

Jobs with both technical and soft skills will grow in future

Figure 1. Which jobs require social skills?
Change in share of jobs, 1980–2012



Source: David Deming, Harvard University.



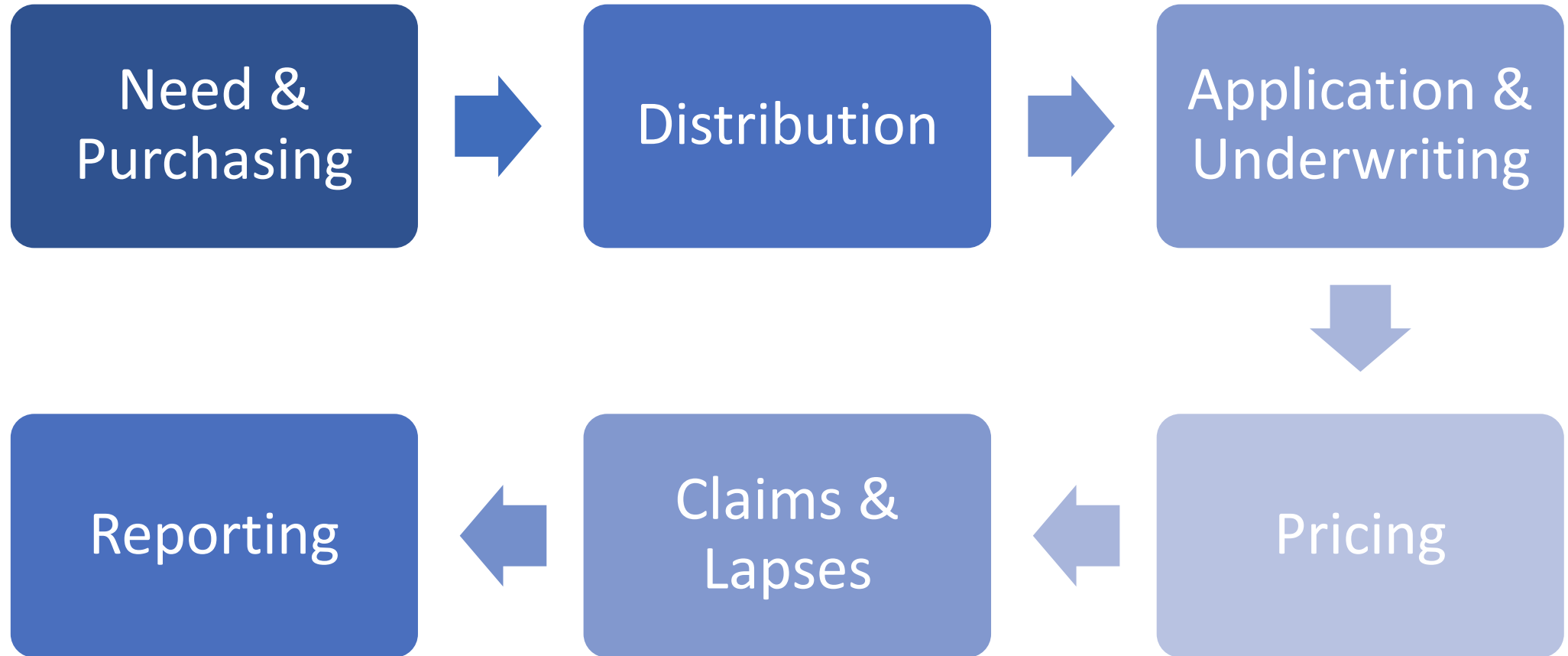
InsurTech

- Continuing technological innovation
- Will change nature of many industries
- Success will be measured by ability to innovate
- Or, partner successfully for innovation





Where to apply all this in life insurance?





A modern life actuary?

- Leading role in life insurance
- Future focussed
- Core technical knowledge
- Continuous learning
- Adopting best practices
- Data driven
- Technical work of high standard
- Innovating and seeking innovation
- Solving real customer and business problems
- Managing risk
- Collaborative





Thank you!



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Thank You!

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