



Institute  
and Faculty  
of Actuaries

# Delivering Value from Unstructured Data with Machine Learning

Tony Ward, Machine Learning Solutions



# Unstructured data and the 80% Rule

LOSS  
ADJUSTER  
NOTES

SOCIAL

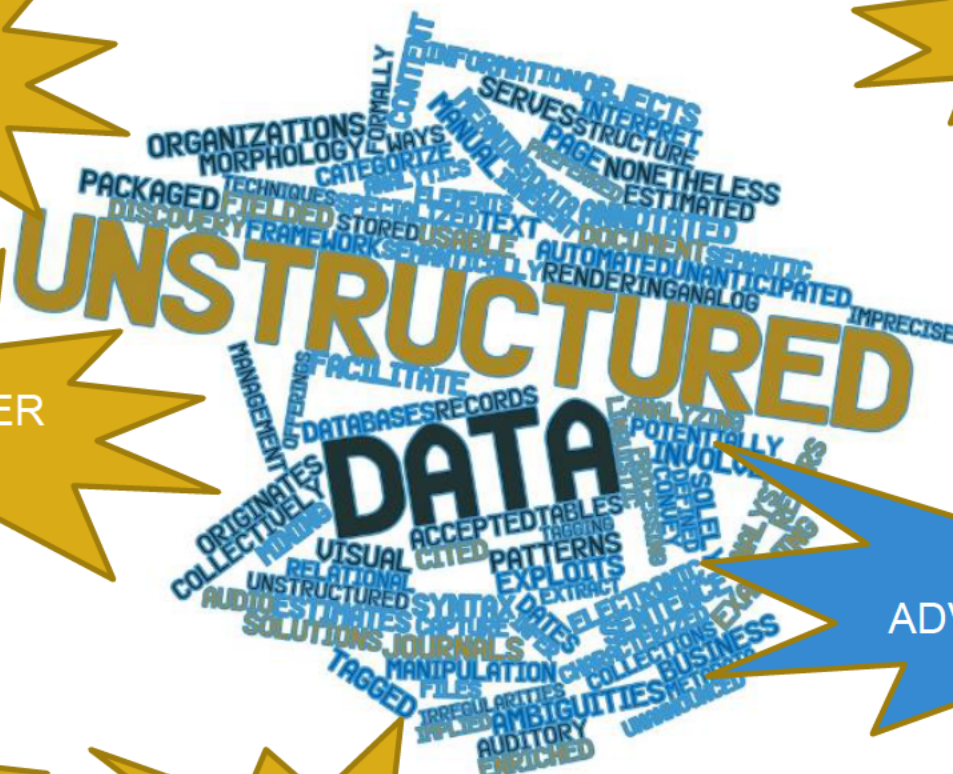
WEB  
PAGES

UNDERWRITER  
NOTES

JOB  
ADVERTISEMENTS

EMAILS

RISK  
REPORTS



# Motivating Example



- Web Scraped 18,000 Jobs from [www.theactuaryjobs.com](http://www.theactuaryjobs.com)
- Structured Data
  - Sector
  - Experience
- Unstructured Data
  - Job Title
  - Job Description

# Job 1

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[www.theactuary.com](#)

Global insurance company with Lloyds syndicate is looking to hire a pricing actuary reporting directly into the Group pricing actuary you will have experience of pricing and be looking to lead a small team based in London. The business covers a variety of lines of business including marine, aviation, energy, property and liability. You will work closely with the underwriters, present to senior management and underwriters and own and manage rate adequacy and rate movement MI for international specialty lines of business. Above and beyond your pricing skills you must be able to demonstrate leadership qualities and have excellent communication skills.

## Head of International Pricing

Recruiter	
Location	London
Salary	Circa £130K
Posted	17 Jun 2015
Closes	17 Jul 2015
Ref	ZB375
Sector	<a href="#">General insurance</a>
Experience	<a href="#">Nearly qual (11+ exams), Qualified</a>
Contract Type	<a href="#">Permanent</a>
Hours	<a href="#">Full Time</a>



# Job 2

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Our client, an investment consultancy, is looking to hire a research analyst.

You will work on investment manager research projects. Working closely with the investment consulting team, you will conduct research on multi-asset fund managers and equity fund managers. Candidates are expected to have experience in researching investment managers and in interest in financial markets and funds. You must be a good team player with good communication skills and be able to present to the investment committee. Our client offers study support (e.g. CFA or actuarial qualifications)

## Research Analyst

Recruiter	
Location	London
Salary	£35k - 40k + bonus + benefits
Posted	18 May 2015
Closes	18 Jun 2015
Ref	Research Analyst
Sector	Investment, Management consultancy, Pensions
Experience	Graduate/post-graduate, Nearly qual (11+ exams), Other, Part qual (1-10 exams)
Contract Type	Permanent
Hours	Full Time

# It's tough

- Can't read all 18,000 job descriptions
- Delivering insight from this kind of data is hard
- We need a new set of techniques

# Today we will

- Apply a machine learning technique called Topic Modelling to the Job Description.
- Visualise this model interactively
- Gain insight into the different types of Actuary (Number 26 will shock you!)
- Test how well this model generalises to new data

# How to handle unstructured data

- Turn the unstructured data into a structured tabular form (a Document Term Matrix).

Job Title	Analyst	Actuari	Head	International	Pricing	Research	Retail
Head of International Pricing			1	1	1		
Research Analyst	1					1	
Pricing Actuary - Retail		1			1		1

- Do this for the “Job Description”
- Now we can Visualise the most frequent terms



and you will be the  
 for experience this with  
 actuarial team their work risk looking please contact  
 have life career background london  
 management insurance support reporting  
 working understanding investment support reporting  
 who discuss into all including client work other range  
 development financial strong lead agency seeking across market  
 candidate modelling are within skills they our excellent knowledge  
 commercial team. price senior opportunity role new communication  
 business has exposure actuaries  
 capital qualified  
 pricing your  
 will







# Other tricks

- Remove Most Frequent Words
- Remove Very Infrequent Words
- Convert to Lower Case
- Remove Punctuation
- Remove Numbers
- Replace Synonyms
  - Handsome: Hunk, Heart-Throb, Prince Charming

# Topic Modelling is..

- Probably my favourite ML technique

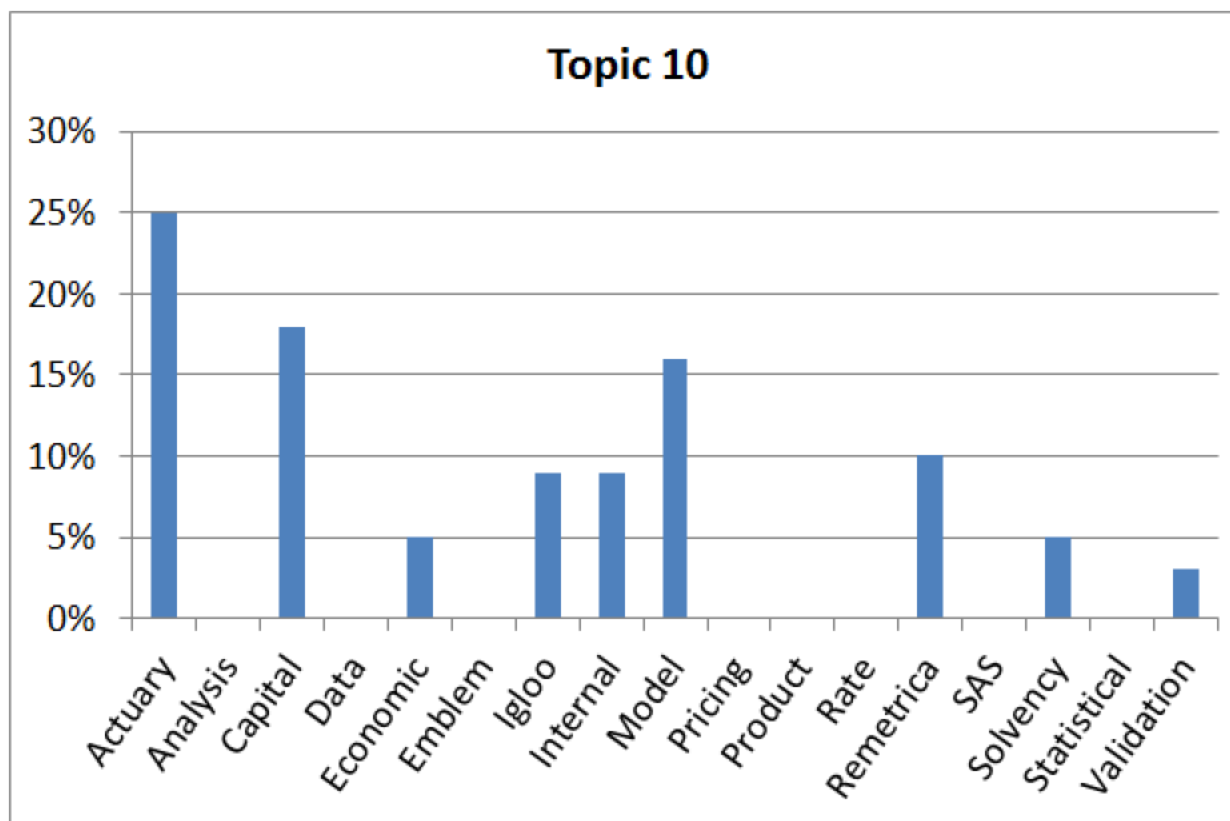


# What is a topic?

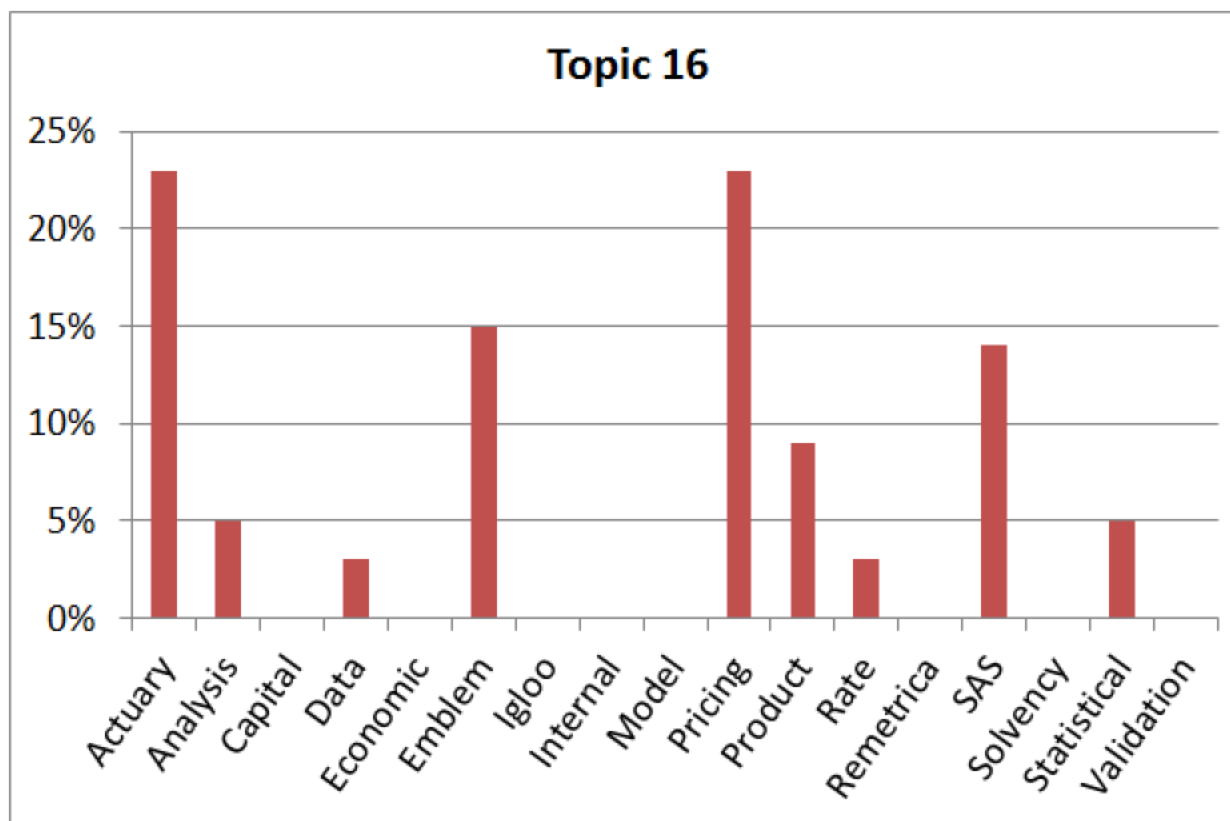
- A topic is a probability distribution



# Example



# Another Example



# Mixtures are allowed

Seeking a part qualified or qualified non-life actuary with knowledge of Emblem and SAS to drive innovative project work within our client's growing pricing team. An outstanding opportunity to develop your career within this market-leader. Please contact us to discuss this vacancy or for an informal discussion regarding your career goals. We are very happy to perform bespoke research on your behalf.

# Mixtures are allowed

Seeking a qualified actuary with detailed experience of GI, actuarial & risk modelling software to provide modelling solutions to prospective clients. You will provide actuarial, business and technical input to RFPs and client proposals, based on an in-depth understanding of regulatory requirements and ERM solutions. An unrivalled opportunity to develop the strategic vision of this market-leader. Please contact us to discuss this vacancy or for an informal discussion regarding your career goals. We are very happy to perform bespoke research on your behalf.

# Topic Model Output

Term	Topic 1	Topic 2
Actuary	25%	23%
Analysis	0%	5%
Capital	18%	0%
Data	0%	3%
Economic	5%	0%
Emblem	0%	15%
Igloo	9%	0%
Internal	9%	0%
Model	16%	0%
Pricing	0%	23%
Product	0%	9%
Rate	0%	3%
Remetrica	10%	0%
SAS	0%	14%
Solvency	5%	0%
Statistical	0%	5%
Validation	3%	0%





# Live Demo.....



# Validation

# Putting this into Production



# Application 1: New Perils



# Application 2: Underwriter Notes





# Application 3: Social Data



# Application 4: Over to you....

Thank you!

Tony Ward

[www.machinelearningsolutions.co.uk](http://www.machinelearningsolutions.co.uk)