A VISION FOR ACTUARIAL SCIENCE IN THE 21ST CENTURY: ACTUARIES AS DATA SCIENTISTS

California Actuarial Student Summit
Claudine Modlin, FCAS MAAA
May 24, 2019

25 DAYS, 2 HOURS AND A HANDFUL OF MINUTES ….

MY CAREER CHAPTERS

Chapter 1: Becoming

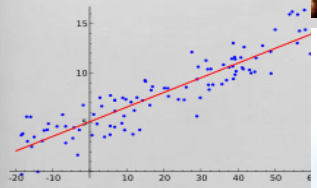
Chapter 2: The Joys of Getting Started

Chapter 3: Venturing Out

Chapter 4: Evangelist & Expert

Chapter 5: Leading Change

…Chapter 6??



CASUALTY ACTUARIAL SOCIETY (CAS)

- World's ***only*** actuarial organization focused exclusively on property and casualty risks
- 100+ year track record in training property/casualty actuaries
- More than 8,000 members worldwide, and growing
- Vibrant, growing community with deep and extensive resources to help CAS members, candidates, and students advance their careers; strong employer support

WHY P&C ACTUARIAL WORK?

#P&CInsuranceIsSexy

- Huge, established industry
- Varied products
- Dynamic risk
- Complex / constrained
- Data rich
- Evolving
- Work lifestyle

#WhyActuariesThrive

- Credibility
- Quantitative & operational knowledge
- Community of continuous learning
- Opportunities

WHERE ARE ACTUARIES

Core

- Reserving
- Pricing
- Capital adequacy
- Reinsurance / Catastrophe modeling

Growing

- Claims
- Underwriting
- Product Management
- Marketing
- Distribution/Sales
- Operations
- Strategy / Business transformation / New ventures

CAS MEMBERS MOVING OUTSIDE INSURANCE

- Uber
- Google
- Expedia
- Lowes
- General Motors
- United Technologies
- Hertz
- Citi Research

ACTUARIES AND DATA SCIENTISTS *(CLAUDINE'S VIEW!)*

What do we have in common? Use analytics (e.g., math and stats) to transform data into useful insights that solves problems

Where's the difference?

Actuaries

- Professionally trained to evaluate financial implications of risk and uncertainty
- Strong domain knowledge, trusted by business partners
- Most comfortable working with structured data

Data scientists

- Not domain specific (often partner with domain experts)
- Proficient programmers and data engineers (mine complex data - structured and unstructured data)
- Well-versed in computational / machine learning approaches

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- Well-versed in computational / machine learning approaches as well as visualizations

Can we be both?
What does that mean?

USE CASE #1: EVOLUTION OF P&C RATEMAKING

E (Premium) = E (Loss) + E (Expenses) + Target Profit

- Examine historical data to understand each of these components, making adjustments to project each one into the future
- If the equality does not hold, rates need to go up or down
- Also need to understand which risk attributes are driving the cost of claims (and their relative importance) so we can develop rates appropriate for individual risks.

The science of doing this is always evolving!

P&C RATEMAKING – PERSONAL AUTOMOBILE INSURANCE

Era	Risk characteristics	Methods
<1990s	Limited (e.g., driver age/sex/marital, type of car, geography)	Rudimentary, univariate
1990s	Introduce psychographic variables (e.g., credit)	Statistical, multivariate
>2000	More granular data (e.g., accidents/violations, car safety features) and new types of data – e.g., driving behavior	Statistical, augmented with machine learning

But data science is just getting started…

Meet Katie and Heidi

They have similar profiles in terms of drivers and cars

	Katie	Heidi
Zip code/address	604XX	604XX
Homeowners	Yes	Yes
Age	Adult	Adult
Gender	Female	Female
Household driving record	No convictions; No accidents	No convictions; 1 fender bender not submitted
Household status	Married, kids are good students	Married, kids are good students
Location	Garage at residence	Garage at residence
Number of eligible vehicles	3	3
Years licensed range	1—10+	2—10+
Age of oldest driver	40—55	40—55
Excluded driver	None	None
Financial responsibility	Yes, Pay in Full, EFT	Yes, Pay in Full, EFT
Persistency	7 years	5 years
Other pols	Home, small toys	Home, small toys
Vehicle type & mileage	2014 CT 200H; 30k	2015 Prius V; 20k
Vehicle ACV	$17,000	$18,000
Vehicle stability control	Yes	Yes
Basic safety systems	Airbags, anti-lock brakes, no motorized seat belts	Airbags, anti-lock brakes, no motorized seat belts
Coverage amounts	100/300, $1000 Ded, Rental/towing	100/300, $1000 Ded, Rental/towing
Annual mileage	10,000	10,000
Vehicle use	Pleasure	Pleasure

Two drivers look alike on paper, so we price them similarly

Katie's 2016
Semi-annual Premium

$452

Age: Adult

Gender: Female

Zip code: 604XX

Heidi's 2016
Semi-annual Premium

$465

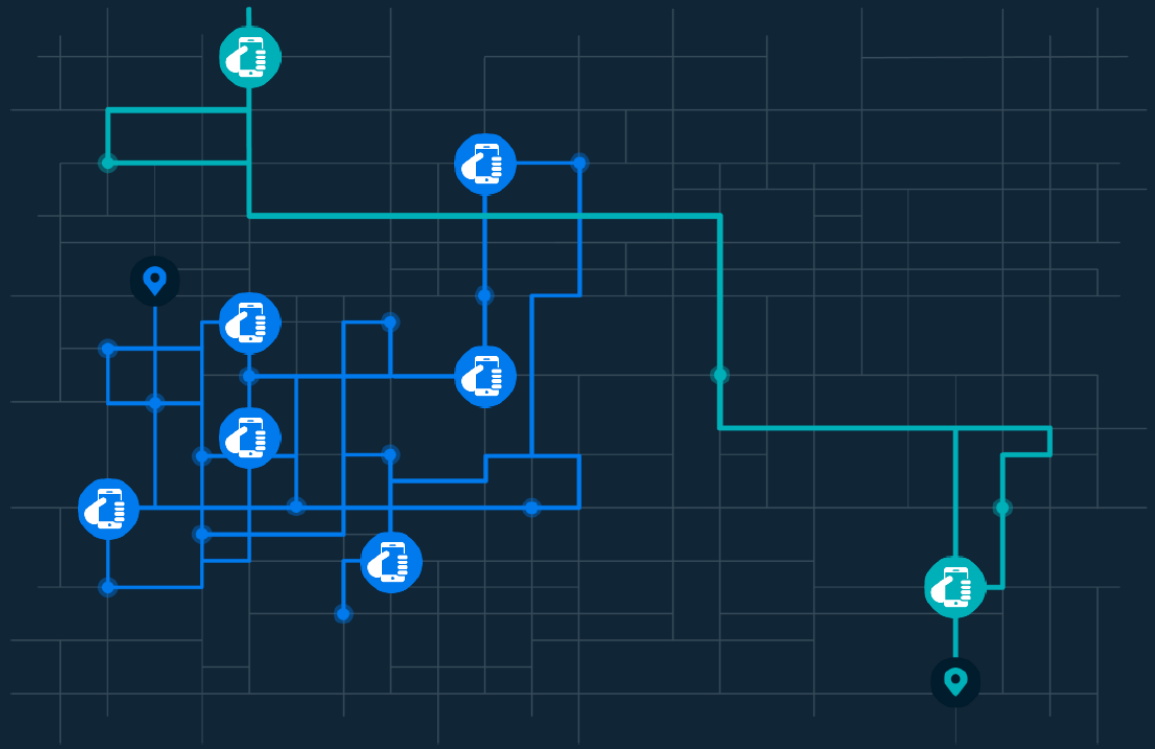
Age: Adult

Gender: Female

Zip code: 604XX

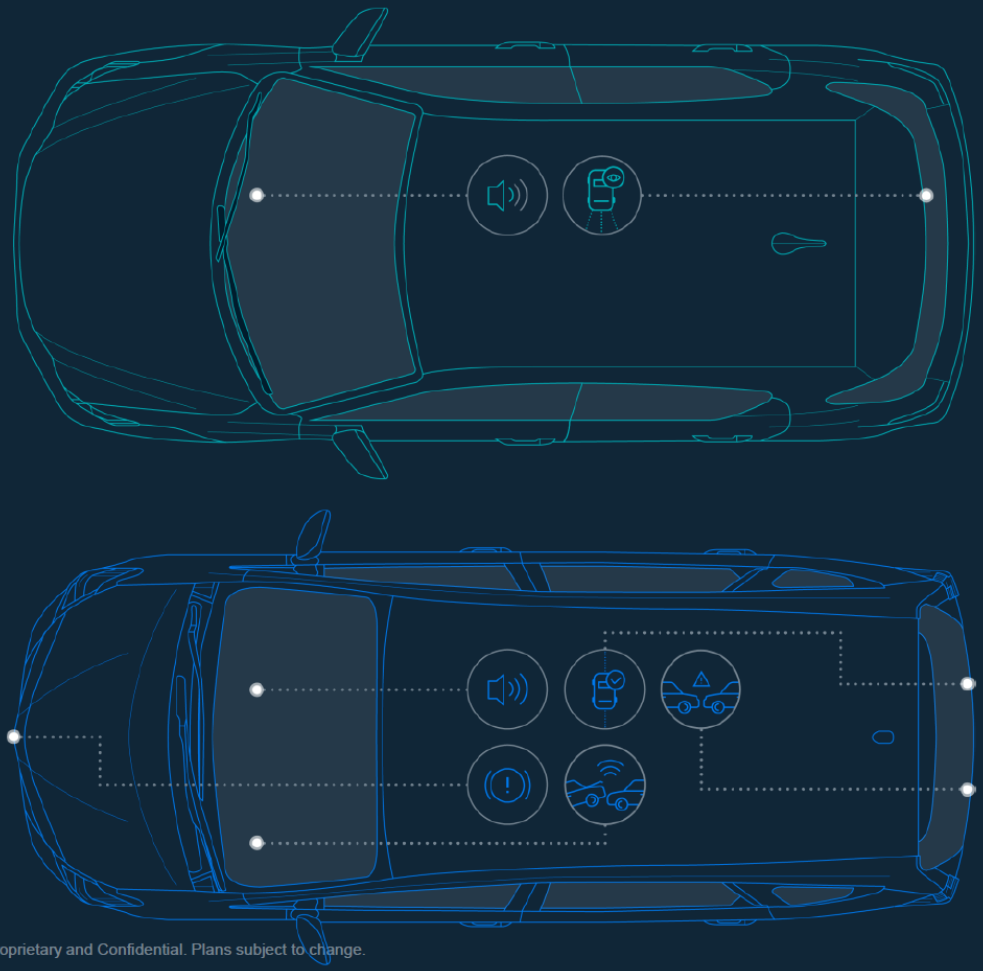
Telematics data gives us unprecedented insight into individual driving behavior…

	Katie	Heidi
Type of driving	Minimal, Highways	Daily, Suburban roads
Average number of trips/week	6	24
Average length of trip	32	8
Time of day	Off peak	Rush hours, school hours
Road type	Uncongested freeway	Local, busy, congested streets, parking lots
Driving condition	Cruise control + podcast	Noisy, distracting
Distracted driving	2 per trip	6 per trip

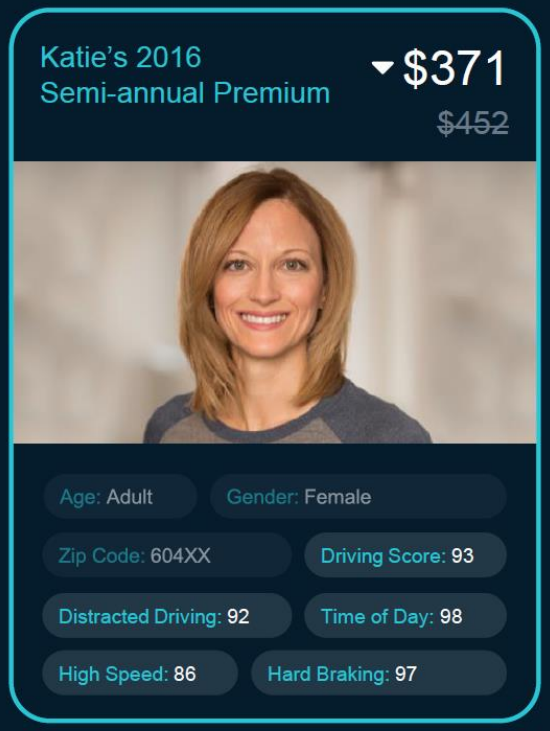


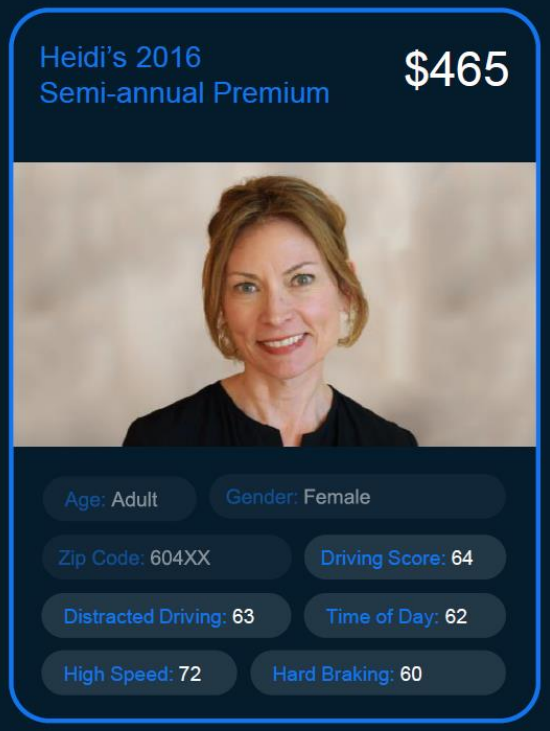
… and vehicle features in use

	Katie	Heidi
ADAS	Rear view camera	Pre-Collision Safety System Adaptive Cruise Control Post Collision Safety System Stolen Vehicle
Inactive systems	None	Safety System Lane Departure Warning Adaptive Cruise Control
Radio volume	Soft	Loud



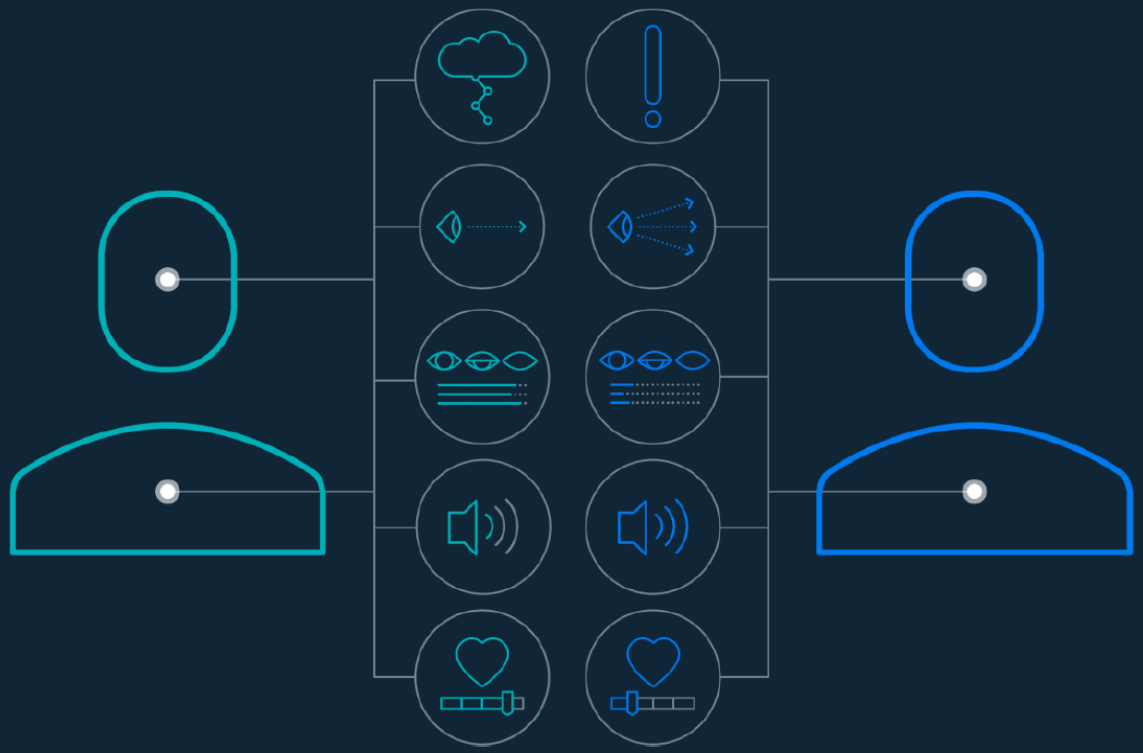
Things aren't always as they appear





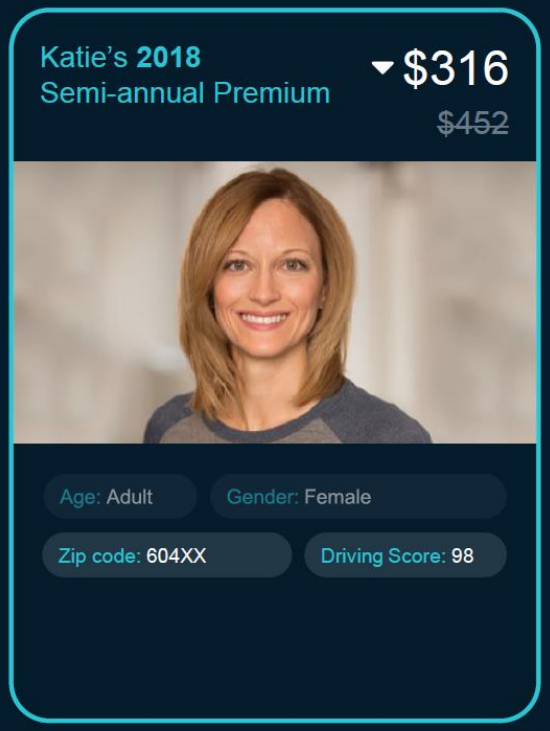
Biometrics can revolutionize how we understand drivers

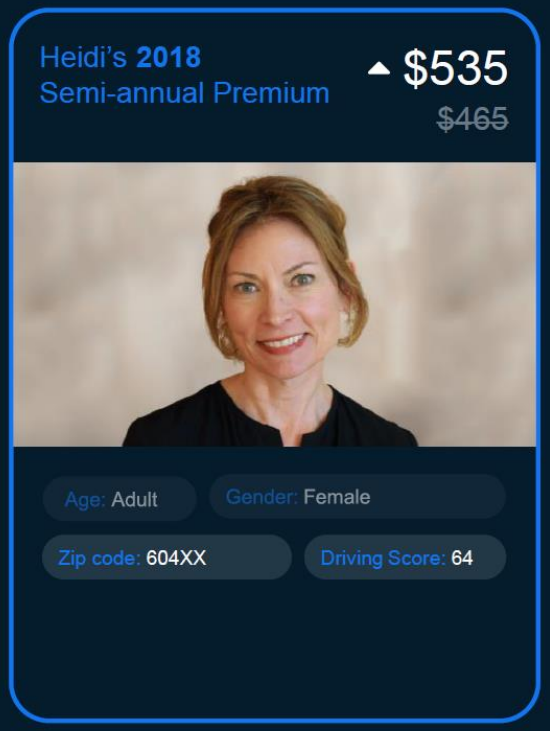
	Katie	Heidi
Brainwaves	Less attentive	Very alert
Eye movement & gaze	Nav to street	All around the vehicle
Blinking	Excessive	Normal
Heart rate	High	Normal
Voice modulation	Quiet	Noisy
Blood alcohol content	—	—
Medical devices	—	—
Sensor data (Rideshare)	—	—



As mobility behaviors change, so does individualized risk

Predicting future losses requires an understanding of how drivers act–both at time of quote and renewal





What next?


Welcome to you
Living DNA
SAMPLING KIT


Tax
W-2
Copy 2 to be filed with em
APRIL
1040
Department of the Treasury - I
U.S. Individual
Label

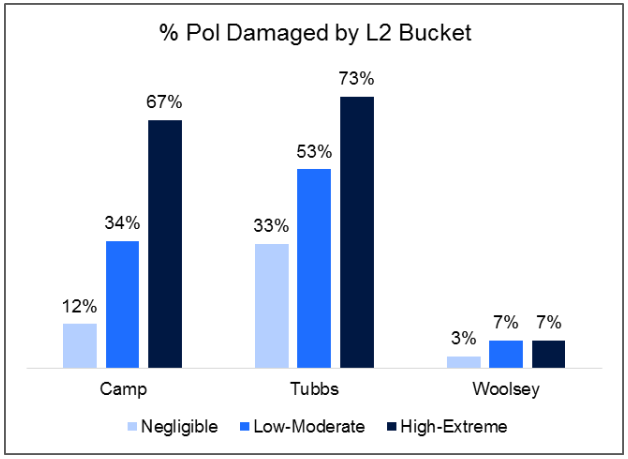

You Tube

ACTUARIAL SCIENCE AND/OR DATA SCIENCE?

- Well-defined problem relating to estimation of financial consequences of **risk** and uncertainty
- Data **starts off as "big data"** (millions of customers and hundreds of predictors) and eventually **becomes "Big Data"** (disparate sources of data, including streaming data) that requires unique skills/tools to manage
- Implementation of findings requires **knowledge of insurance ratemaking** – regulation, public policy, customer/agent expectations, systems implications
- Opportunities for actuaries in **behavioral science** (how to "nudge" the driving behavior you want) and **algorithmic auditing** (avoiding "weapons of math destruction")

USE CASE #2: WILDFIRE PREDICTION

- **Context:** two catastrophic wildfire years (2017-2018) - $24B industry losses
- **Problem to solve:** reduce exposure to wildfire loss through surgical identification of which properties are most at risk
- **Approach:** imagery / AI / machine learning / probabilistic score = improved underwriting & pricing
- **Considerations**
  - Data robustness
  - Statistical (predictive power)
  - Acceptance (regulators, agents, customers)
  - Deployment
  - Cost benefit



WHAT ELSE CAN ACTUARIES AS DATA SCIENTISTS ADDRESS?

- **Mine text** to better understand which claims are most likely to increase in complexity (resulting in better claims experience and more stable reserves)
- **Analyze IoT data** (smart homes, wearables) to understand the impact on risk and customer engagement
- **Leverage web clickstream and call center data** to identify customer pain points that lead to lower retention
- **Analyze which agent behaviors** have the biggest drain on premium and profitability
- Study **which customers are influencers** of other customers to help develop programs to have those influencers help you out

……. and many others

CONCLUDING THOUGHTS ...

- Actuaries have a great history of solving problems using quantitative discipline and business acumen in the field of risk
- The set of problems where our skills apply is growing – both in and outside insurance - and the solutions are often fueled by advances in data and technology
- Tackling these problems require additional skills that we can either obtain or learn how to harness (in others)
- Most important is to position yourself as a critical thinker!

And a few other bits of info….

INTERNSHIPS

What you get

- Exposure to business problems & current approaches
- Opportunities to learn and interact with professionals
- Participate in research, analysis, execution, ideation/design

What employer gets

- Labor
- Fresh perspective
- Assess future talent - see how you learn, think, perform, communicate, interact

- Example summer intern projects
  - Research connected home and IoT offerings
  - Driverless technology loss experience & feature identification
  - Loss experience by customer's distance to agency
  - Web scraping public data sources relevant to insurance underwriting

join online today at **CASstudentcentral.org**

WHAT IS THE CAS INSTITUTE (ICAS)?

- Subsidiary of the Casualty Actuarial Society
- Provides specialist credentials and resources for quantitative professionals in selected areas, such as:

Predictive Analytics / Data Science

Quantitative Reinsurance Analysis

Capital Modeling / ORSA analysis

Catastrophe Risk Management

Other analytics and quantitative specialties

DATA SCIENCE CREDENTIAL

Certified Specialist in Predictive Analytics (CSPA)

Curriculum covers:

- Property and Casualty Insurance Fundamentals
- Data Concepts and Visualization
- Predictive Modeling Methods and Techniques
- Ethics and Professionalism
- Hands-on case study project

QUESTIONS

For interest in career opportunities at Farmers, register here to access open roles and stay connected:

https://jobs.farmersinsurance.com/stay-connected