



Actuaries Putting AI into Practice in General Insurance

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Agenda

- How P&C (General Insurance) Lends Itself to AI/ML Applications
- Real-World Applications by CAS Actuaries
- Four Futures for Actuaries in the Wake of AI
- CAS Actuaries Leading the Profession in Data Science and the Application of AI/ML to Insurance
- Ethical AI for Actuaries



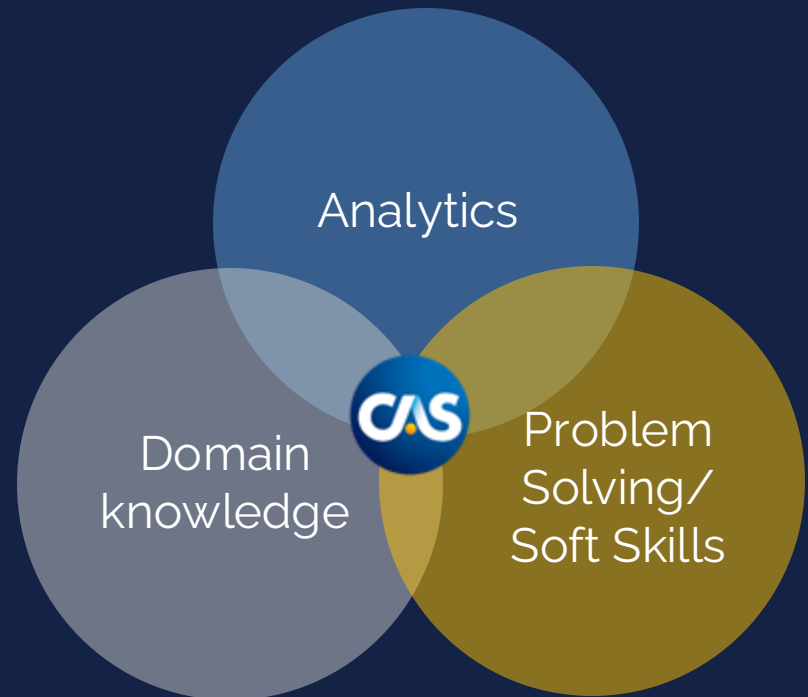


How P&C (General Insurance) Lends Itself to AI/ML Applications



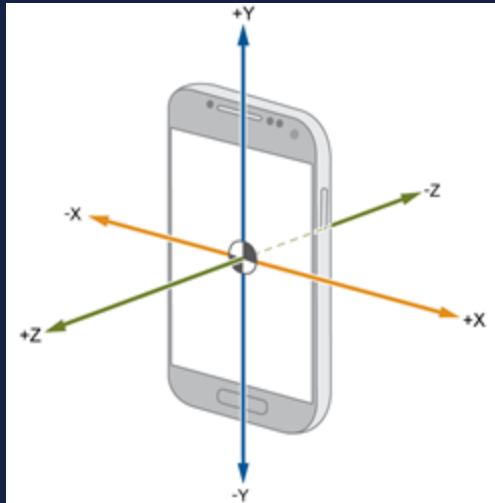
● General insurance thinking used in many areas

- How to Use Data
- Emerging risks
- Climate risk reporting
- Risk Mitigation
- Weather volatility & insurability
- Population & demographic shifts
- Automated vehicles
- Cyber liability and hacking





Telematics from Mobile Phones: Advanced Modeling in Action



Consumer Cost Savings

Gas optimization reduces costs,
pay-as-you-drive saves
infrequent drivers money



Driving Dashboard

View driving insights, see
opportunities to potentially
reduce risk and premium



Crash Detection and Support

Be able to reach help quickly if
you're in an accident



Accurate Insurance Premiums

Evaluate premiums based on more
accurate and unbiased factors,
including distracted or dangerous
driving





Real-World Applications by CAS Actuaries



● Aerial Imagery and Computer Vision Damage Estimation enables rapid claims servicing during catastrophes

Production

Analytical Solution

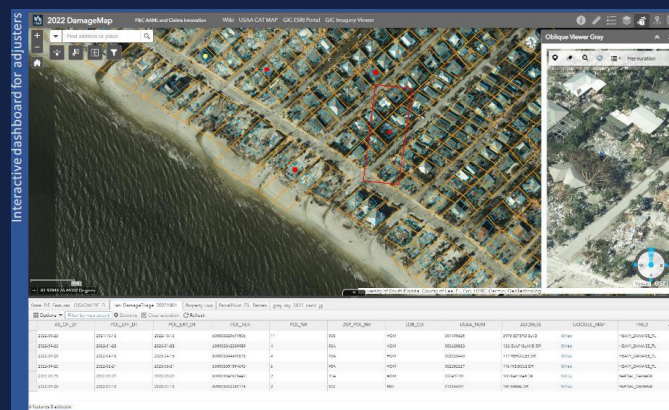
- During large scale wind and fire catastrophes, many members are impacted simultaneously - debris, flood, and evacuation orders often limit access for both member and USAA
- This solution incorporates aerial imagery, member parcel and building intelligence, and advanced computer vision to estimate the level of damage to members property

Benefits

- Allows members to receive specialized loss settlement for severe loss by a virtual adjuster; payouts occur within hours
- Provides rapid triage of a damage area for field adjuster deployment and claim resolution time

2022 Examples

- Marshal Fire in Superior, CO. 79 of 85 total losses were settled with this system.
- Hurricane Ian, FL - CV system evaluated 26,000 members in under an hour, identifying all total losses





Aerial Imagery and Computer Vision helps ensure adequate and appropriate coverage for homeowners

In Development

Analytical Solution

- Over time, the accuracy of dwelling characteristics can change due to home additions, and home improvements
- Created the ability identify home characteristics and identify changes to structural characteristics of a home from high-resolution aerial imagery over time

Benefits

- Unfortunately, in our busy lives there are situations where we make improvements to our home and do not notify USAA
- This solution benefits members by notifying them when a change is detected, providing an opportunity to ensure their full property is insured in case of a loss

Prior Image



Current Image



Exterior Home Characteristics:

- Solar
- Shed
- In-law Suite
- Detached Garage
- Pools
- Decks
- Additional stories

Structural Footprint Change:

- Carport
- Patio/ Porch
- Additional Living Space



USAA Classification Public



Leverage voice analytics to determine if Insurance Professionals (IPs) are meeting member's needs and delivering need-based product/service options

In Development

Sentence Transformer – converting language into numbers

Analytical Solution

- Series of models that identify when IPs achieve the pillars of Mission Accomplishment on voice calls
 - Champion for the member by handling requested business
 - Provide empathetic and exceptional service
 - Deliver needs-based options and ask for the business

Benefits

- Ability to evaluate calls and determine how we are serving members – increased efficiency and coverage since managers will not need to listen to calls
- Data can be used to identify areas for improvement which can be incorporated into coaching and training – increasing IP performance
- Positive improvements to member satisfaction scores

o encode the text followed by a call to the pad method to get a padded encoding. [1282/1282 06:08, Epoch 2/2]

Epoch	Training Loss	Validation Loss	Accuracy
1	0.859300	0.381968	0.907458
2	0.350400	0.327269	0.913706

```

text = "Thank you so much for our service."
classifier(text)

[{'label': 'n', 'score': 0.6534417867660522}]

text = "Oh, that's great, congrats with the new car."
classifier(text)

[{'label': 'c', 'score': 0.8699425458908081}]
    
```

re-label	conversation_id	pretty_transcript	label	score
s	ac3501d47fa04162	I'm, so sorry to hear about that Sir is everybody okay.	s	0.791589
s	23aba25f58b0479b	Ram so sorry to hear that I'll be happy to get you transferred over to roadside assistance I do have to pull you.	s	0.789897
s	4f1f1c365f0145aa	Oh, my gosh I'm so sorry.	s	0.793224
s	9e8c0x1217e4f14	Oh My God. This is so terrible I had it here saved.	s	0.716318
s	095a40d348c2498a	Oh, My Gosh, Oh that stinks it does it stinks.	s	0.74549
s	8b465b070ba14ecc	Oh, Ashley I'm, so sorry.	s	0.791256
n	808b53727bea450d	Okay, Alright, so you just went through that.	s	0.715035
n	ba780c5c7c7a487b	And what I'm so sorry.	s	0.780242
s	38f7ae12d7e34195	I'm sorry, she made a decision to do that gosh.	s	0.747715
s	b948842f0163463c	Okay, well, that's unfortunate like you said uh.	s	0.577184
s	1b8887676b7540a5	Ah Okay, I'm so sorry.	s	0.794186
s	2b6e98137b784221	So I'm. So sorry are you safe do you feel are you in a.	s	0.788876
n	6e9da3a134c0c794	Oh I'm, So sorry go ahead please.	s	0.513325
s	41058f4b86640ec	No I'm sorry, you went through that because really they should've removed this vehicle.	s	0.774337
s	72a9922d9b3e4ebd	[redacted-number] My God are you okay.	s	0.75587
s	ax315fa59a04597	I'm, sorry to hear that happened to you like that.	s	0.793953
s	2b1f6f68d3242978	Alright, I'm, sorry about the news on that.	s	0.795218
s	8b7d6c748d9ac2b	[redacted-number] and I'm, so sorry to hear that I know pneumonia is one of those it it's terrible.	s	0.791384
s	3b68f9e9b7b4200	Sorry that you're dealing with this totaled vehicle I hope that it all gets resolved for you soon okay.	s	0.785467
s	2b6e98137b784221	Okay, Alright, let me get you right over okay, I'm, so sorry about that and be careful.	s	0.503282
s	bd63176c00c94c9d	I mean, I'm so sorry.	s	0.791465
s	29fcaab216b046c7	I'm, so sorry about that.	s	0.791859
s	55728b6d5498486c	Oh this poor guy.	s	0.731861



USAA Classification Public



Four Futures for Actuaries in the Wake of AI



Actuaries in an AI World: Four Futures

Adjustment to actuarial roles



Impact to actuarial roles

Names borrowed from [Jim Weiss' article](#) in the Actuarial Review, a CAS bi-monthly



● Doomsday



Arguments For:

1. Routine automatable work:
e.g. rate or reserve reviews, or
predictive model refreshes
2. AI is better than actuaries at
finding data
3. If we've created it, it's out there
4. AutoGPT: self-correcting, self-
learning, can decompose tasks



What Does This Look Like?

First, AI starts taking mundane tasks, including data gathering.

Hallucination is solved for regulated industries.

Next, we train AI on more complex actuarial work, and it learns from the large body of existing work (4, 5).

Finally, a few actuaries may be needed for work that absolutely cannot be performed by AI.



● Judgement Day



Arguments For:

Doomsday plus:

1. AI is widespread and accelerating
 - issues outpace our ability to manage them
2. Bias is an unsolved problem
3. Many regulations (e.g. AI Act) specify principles that are hard to put in practice

What Does This Look Like?

First, adoption and use are too attractive for us to go slowly

Regulations, testing, and auditing AI fall behind advancing sophistication.

Experts are needed to think about bias and consequences of AI.

Actuaries, who are used to making technical work meet regulations, evolve to fill the gap of managing and detecting issues.



● Groundhog Day



Arguments For:

1. Good actuaries have originality, negotiation, and persuasion.
2. Employers are still investing in actuarial exams, training, and leadership development
3. Humans are unpredictable
4. AI start-ups, even famous ones are outspending their revenues

What Does This Look Like?

Similar to DFA, the blockchain, interest in AI will peak, then it will reach a new norm.

Actuaries will integrate new technology, possibly via exams or via education, but AI will not displace large amounts of jobs.

In particular, the use of AI will become commonplace the same way we use current tools, but the applicability will be limited in scope.



● Training Day



Arguments For:

1. “Doomsday lite”: many jobs are doable via AI, but some aren’t
2. There are professionals who specialize in prompt engineering, RAGs, and tuning
3. AI start-ups, even famous ones are outspending their revenues - we could be reaching a peak
4. Again, humans are unpredictable

What Does This Look Like?

Actuaries begin adopting AI to help with low-risk, automatable tasks.

As AI continues to develop, actuarial judgment will determine whether or not new methods are applicable.

Actuaries will continue to balancing stakeholder needs, including regulators.

In order to perform this job task, the actuary of the future will need to understand enough about AI and its power and limitations.





CAS Actuaries Leading the Profession in Data Science and the Application of AI/ML to Insurance



Student Focus

CAS credential examinations cover cutting-edge topics and modeling techniques that prepare students for the present and future, including:

1. Introduction to Credibility
2. Linear Mixed Models
3. Statistical Learning
4. Time Series with Constant Variance
5. Advanced Ratemaking
6. Predictive Analytics (PCPA) requirement



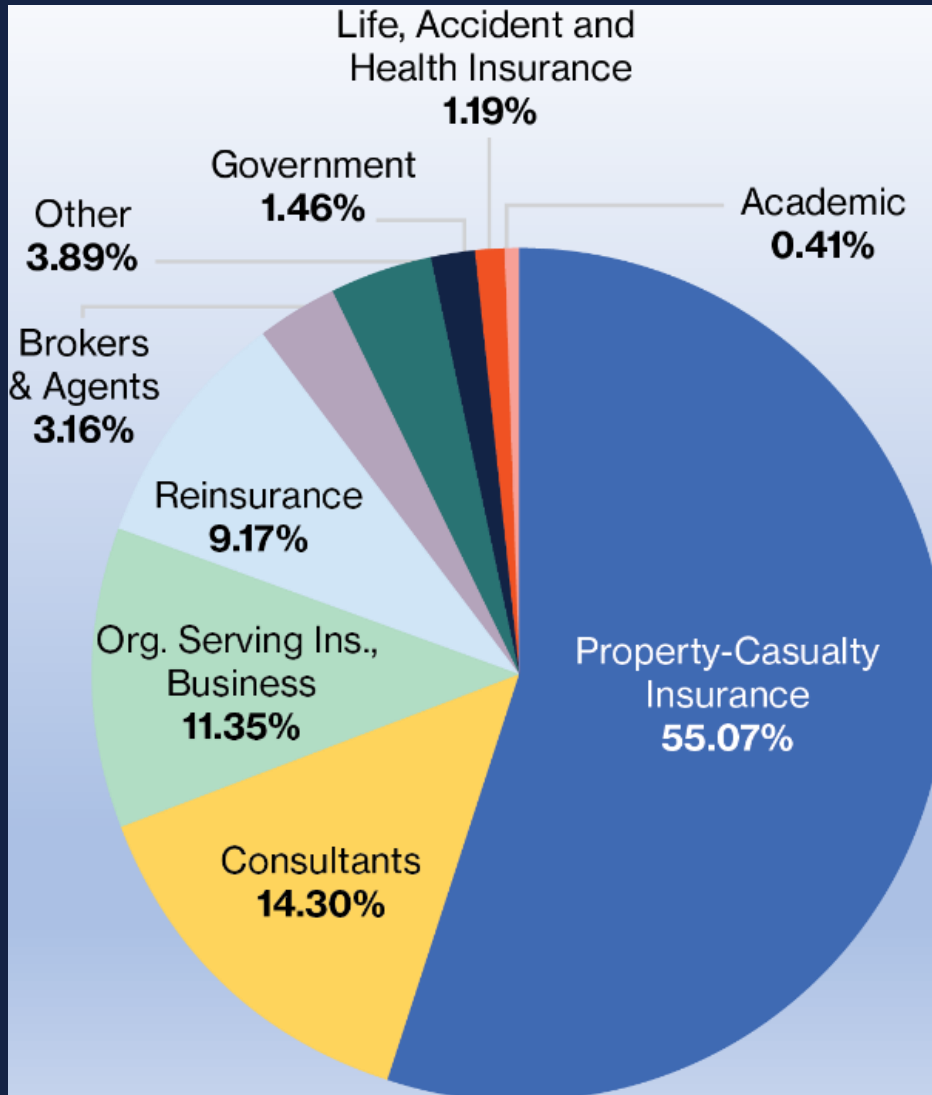
● New Predictive Analytics Requirement

The latest addition to the credentialing pathway features a hands-on modeling project using a real-world general insurance business case:

- Incorporates machine learning algorithms and statistical models to help user identify trends, make accurate predictions, and optimize decision making processes.
- Provides candidates with access to a wide range of data sources and analytical tools, including historical data sets and advanced visualization tools.
- Enables candidates to gain a more comprehensive understanding of the factors that influence risk and to develop more effective strategies for managing it.



Where CAS Actuaries Work



- Waymo
- Airbnb
- CyberCube
- Google
- DataRobot
- Extend
- CYENCE
- Doordash
- Just
- Root
- Insurance
- Hotels.com
- Lemonade
- SURE.
- Cambridge
- Mobile
- Telematics
- Hertz
- Uber
- Expedia
- Zendrive
- Hippo
- HiRoad
- Mindstronglft
- Moter
- Technologies
- Slice
- Next Insurance
- Pie
- Tesla
- OpenMRS
- Jamstack
- GoHenry
- Backbase



● How the CAS is preparing actuaries for future AI advancements

Continuing education & professional development opportunities

- 2024 Virtual Predictive Analytics Bootcamp
- The CAS Machine Learning Working Party
- Webinars including special topics in GLM, Reserving with Machine Learning, Ratemaking using Auction Theory, Latent Dirichlet Allocation (LDA) Topic Modeling in Python, and Large Language Models and Applications
- Online courses such as Introduction to Predictive Modeling, P&C Artificial Intelligence bundle
- AI Fast Track series coming this fall!

Research

- Call for Essays: Exploring the Intersection of Actuarial Science and Artificial Intelligence
- Call for Monographs – Big Data, Machine Learning and Beyond



● Join Us in Exploring AI

Are you passionate about artificial intelligence and eager to contribute?

The CAS and iCAS are looking for volunteers interested in joining future AI initiatives and discussions.

Your expertise can make a significant impact on our work and the broader field of actuarial science, data science and catastrophe risk management.

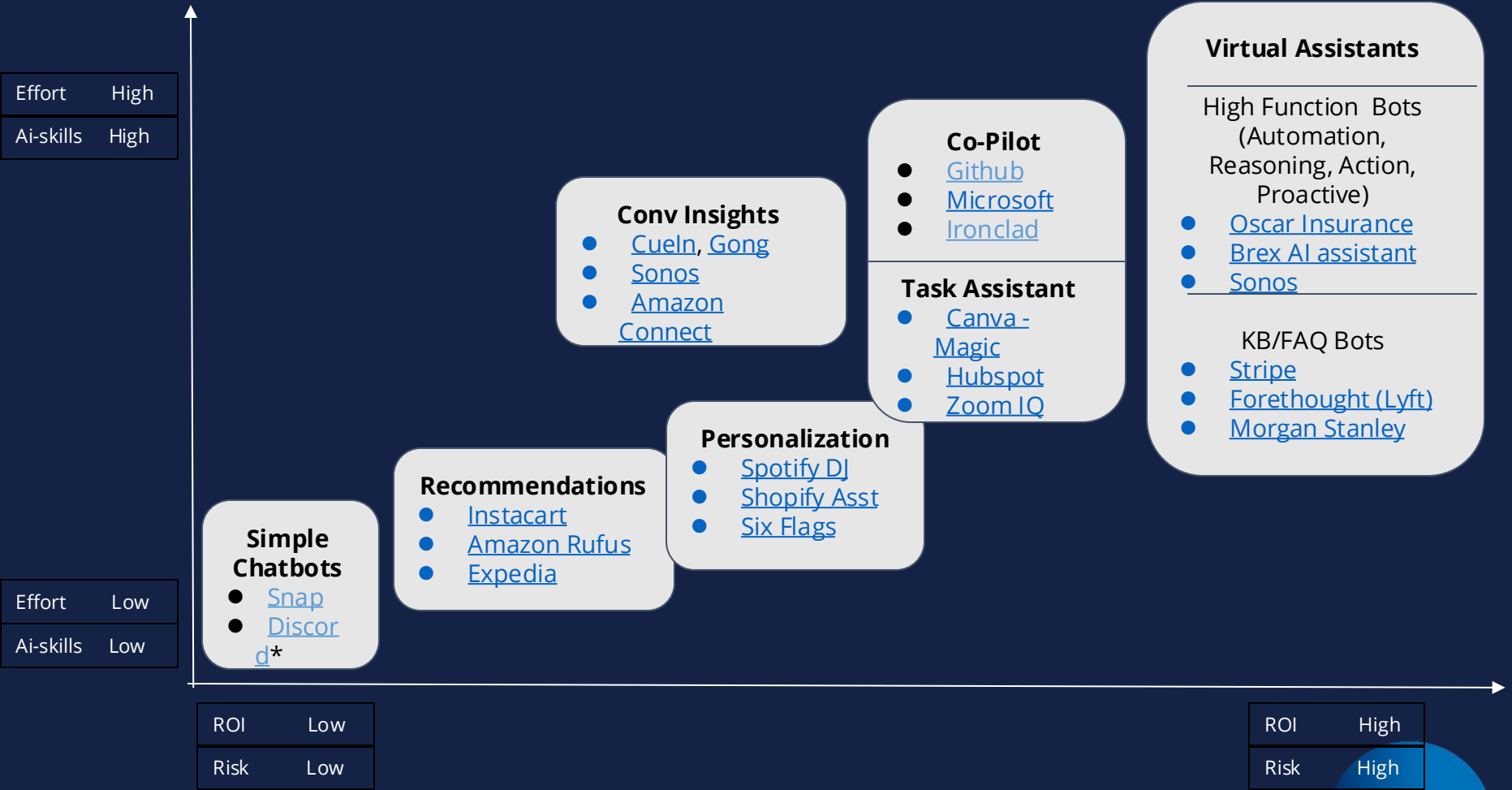
Interested volunteers, please email us at
info@thecasinstitute.org
to learn more and get involved.



Ethical AI for Actuaries



Real World AI



● Real World Concerns



Am I fooling myself?

Am I being used to fool you?

Are you fooling me?



● How Can We Address Fairness?

Fairness Enforcement: Two ends of the spectrum

1. Omission



Fairness through “unawareness” - Model is ok, for example, if prohibited rating variables are not used.

Considerations

- Prohibited variables are not explicitly used in the model
- Adverse Consumer Outcomes may still exist with Omission intentionally or unintentionally through other variables or red-lining



● How Can We Address Fairness?

Fairness Enforcement: Two ends of the spectrum

Considerations

- The risk of “hidden” or unintended use of a variable is completely eliminated through Equal (average) Rates
- However, this could create massive subsidies which have other adverse outcomes

2. Equal Rates



Demographic Parity - For example, the overall average premium across the demographic must be the same.

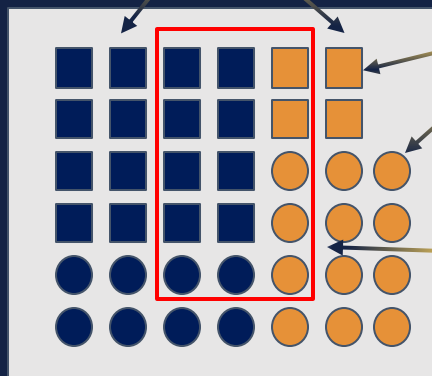


How Can We Address Fairness?

3. Equalized Odds¹

Prediction is equally accurate for all demographics.

Blue / Gold represent different demographics



A square  represents a risky driver

A circle  represents a safe driver

The **red rectangle** represents the model's prediction of risky drivers.

Illustration of Equalized Odds: The model correctly identifies $\frac{1}{2}$ of risky **Blue** and $\frac{1}{2}$ of risky **Gold** drivers. Also, the model incorrectly captures $\frac{1}{4}$ of safe **Blue** and $\frac{1}{4}$ of safe **Gold** drivers and mis-identifies them as risky.

¹ References:

1. [Equality of Opportunity in Supervised Learning](#), Hardt, Price, Srebro, 2016, NIPS
2. [A Reductions Approach to Fair Classification](#), Agarwal, Beygelzimer, Dudik, Langford, Wallach, 2018, PMLR
3. [METHODS FOR QUANTIFYING DISCRIMINATORY EFFECTS ON PROTECTED CLASSES IN INSURANCE](#), Mosley, Weman, 2022, CAS



● Is the model accurate, validation methods, testing?

Is the model predictive?

- Cross-validation

Was there model “parsimony”?

- Complex models need more data than simple ones
- Testing, validation, and on-going monitoring becomes harder for more complex models



● Key Takeaways

- **Innovating Insurance:** Harnessing AI/ML to transform pricing, claims, and operations for a smarter future.
- **Real-World Impact:** Pioneering solutions like advancements leveraging aerial imagery, computer vision, and voice analytics
- **Empowering Actuaries:** Preparing for a dynamic future where AI augments our expertise and enhances decision-making.
- **Leading with Data:** CAS champions cutting-edge predictive analytics and advanced modeling techniques.
- **Future-Ready:** Embracing continuous learning and adaptation to thrive in the evolving landscape of insurance.
- **Ethical Excellence:** Committing to fairness, transparency, and integrity in all AI applications.

Fun Fact: Generative AI was used to brainstorm the outline for this presentation.



 **Questions?**



Thank you



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