# Actuaries Putting AI into Practice in General Insurance

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2024 TASK Actuarial Convention
Mombasa, Kenya

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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

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

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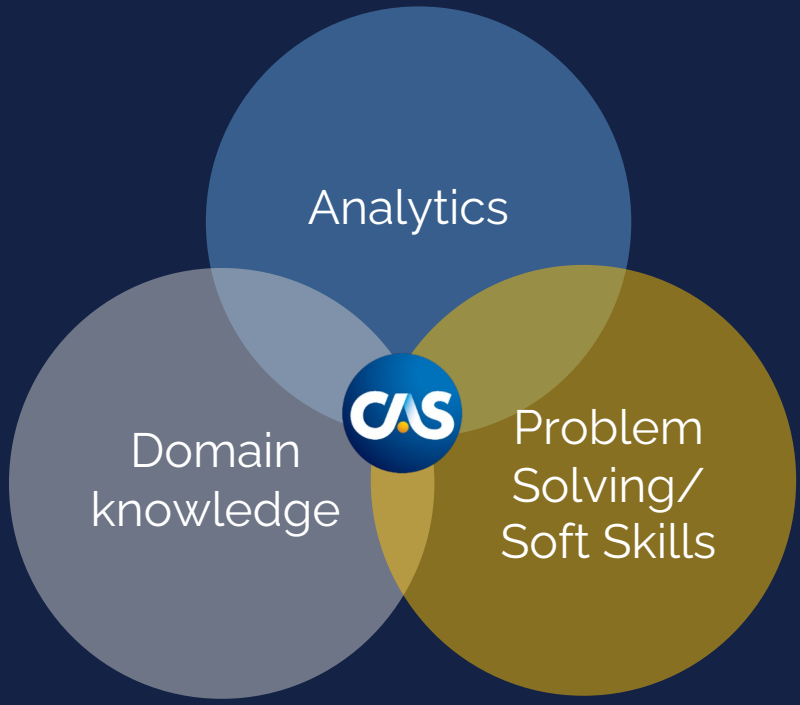
# General insurance thinking used in many areas

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

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# Real-World Applications by CAS Actuaries

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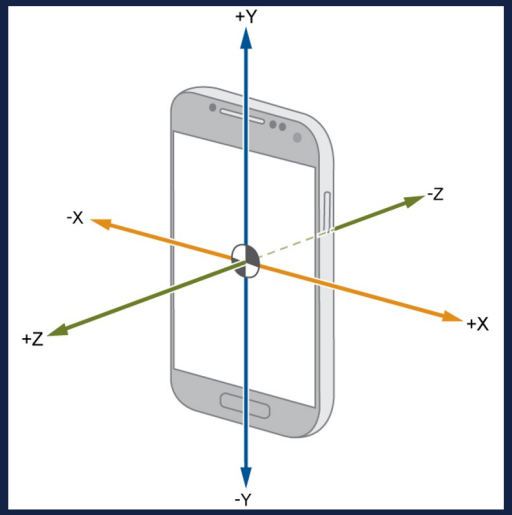
# Telematics from Mobile Phones: Advanced Modeling in Action



**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

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

## Production

### Analytical Solution

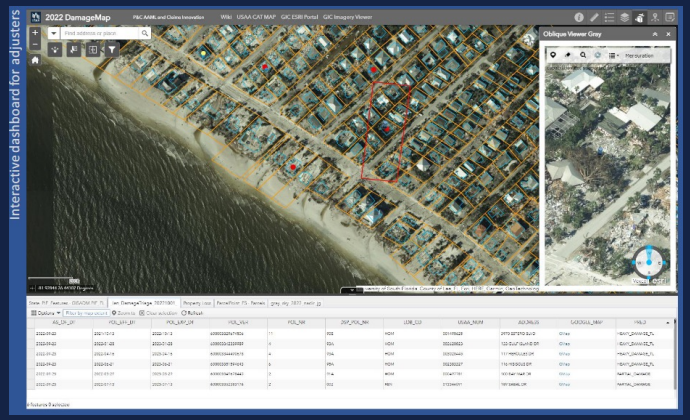
- During large scale wind and fire catastrophes, many members are impacted simultaneously - debris, flood, and evacuation orders often limit access for both member and USAA
- This solution incorporates aerial imagery, member parcel and building intelligence, and advanced computer vision to estimate the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

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# 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

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

*In Development*

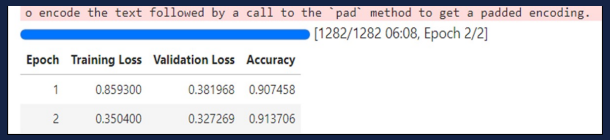
## Analytical Solution

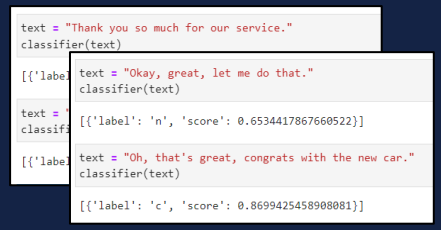
- Series of models that identify when IPs achieve the pillars of Mission Accomplishment on voice calls
  - Champion for the member by handling requested business
  - Provide empathetic and exceptional service
  - Deliver needs-based options and ask for the business

## 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

Sentence Transformer – converting language into numbers




| re-label | conversation_id | pretty_transcript | label | score |
|---|---|---|---|---|
| s | ac35b1d47fa04162 | I'm, so sorry to hear about that Sir is everybody okay. | s | 0.791589 |
| s | 23aba25f5840475b | Rami so sorry to hear that I'll be happy to get you transferred over to roadside assistance I do have to pull your. | s | 0.789897 |
| s | 4ff1fe28d7d145aa | Oh, my gosh I'm so sorry. | s | 0.793214 |
| s | 9e8c0c01217e4f14 | 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 | 8b465b070ba14eec | Oh, Ashley I'm, so sorry. | s | 0.791256 |
| n | 808a5372fbea450d | Okay, Alright, so you just went through that. | s | 0.715035 |
| n | ba786e5c2e7c4876 | And what I'm so sorry. | s | 0.786342 |
| 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 uhm. | s | 0.577184 |
| s | 1b888767b67540a5 | Ah Okay, I'm so sorry. | s | 0.794186 |
| s | 2b6e98437b784221 | So I'm. So sorry are you safe do you feel are you in a. | s | 0.788876 |
| n | de9da3a194c47bf | Oh I'm. So sorry go ahead please. | s | 0.513325 |
| s | 410fd8f4bb640ec | No I'm sorry, you went through that because really they should've removed this vehicle. | s | 0.774337 |
| s | 72a9922a9b3e4ebd | [redacted-number] My God are you okay. | s | 0.75587 |
| s | a5315fa659a04597 | I'm, sorry to hear that happened to you like that. | s | 0.793953 |
| s | 2b1ffefddd324978 | Alright, I'm, sorry about the news on that. | s | 0.795218 |
| s | 8b7b66748b9a4c2b | [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 | 3b68f69e9b7b4200 | Sorry that you're dealing with this totaled vehicle I hope that it all gets resolved for you soon okay. | s | 0.785467 |
| s | 2b6e98437b784221 | Okay, Alright, let me get you right over okay, I'm, so sorry about that and be careful. | s | 0.503282 |
| s | bdc6376c00c94c9d | I mean, I'm so sorry. | s | 0.79145 |
| s | 29faaa8216db46c7 | I'm, so sorry about that. | s | 0.791859 |
| s | 55728e605498486c | Oh this poor guy. | s | 0.731863 |

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# Four Futures for Actuaries in the Wake of AI

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# 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

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# 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.

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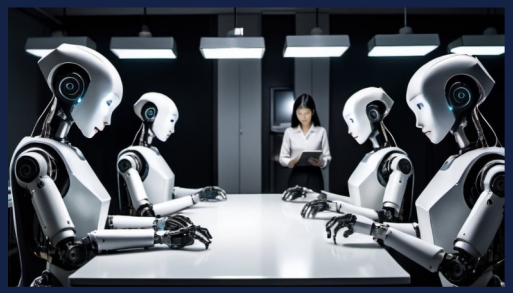
# Judgement Day



## 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.

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# 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 unpredicatable
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.

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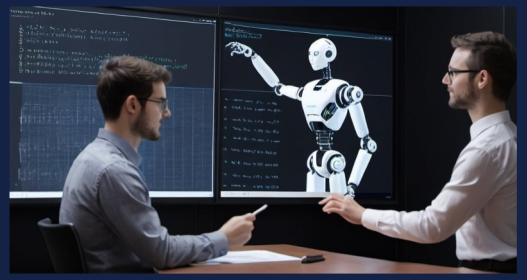
# Training Day



## 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 unpredicatable

## 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.

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

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# 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

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# 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.

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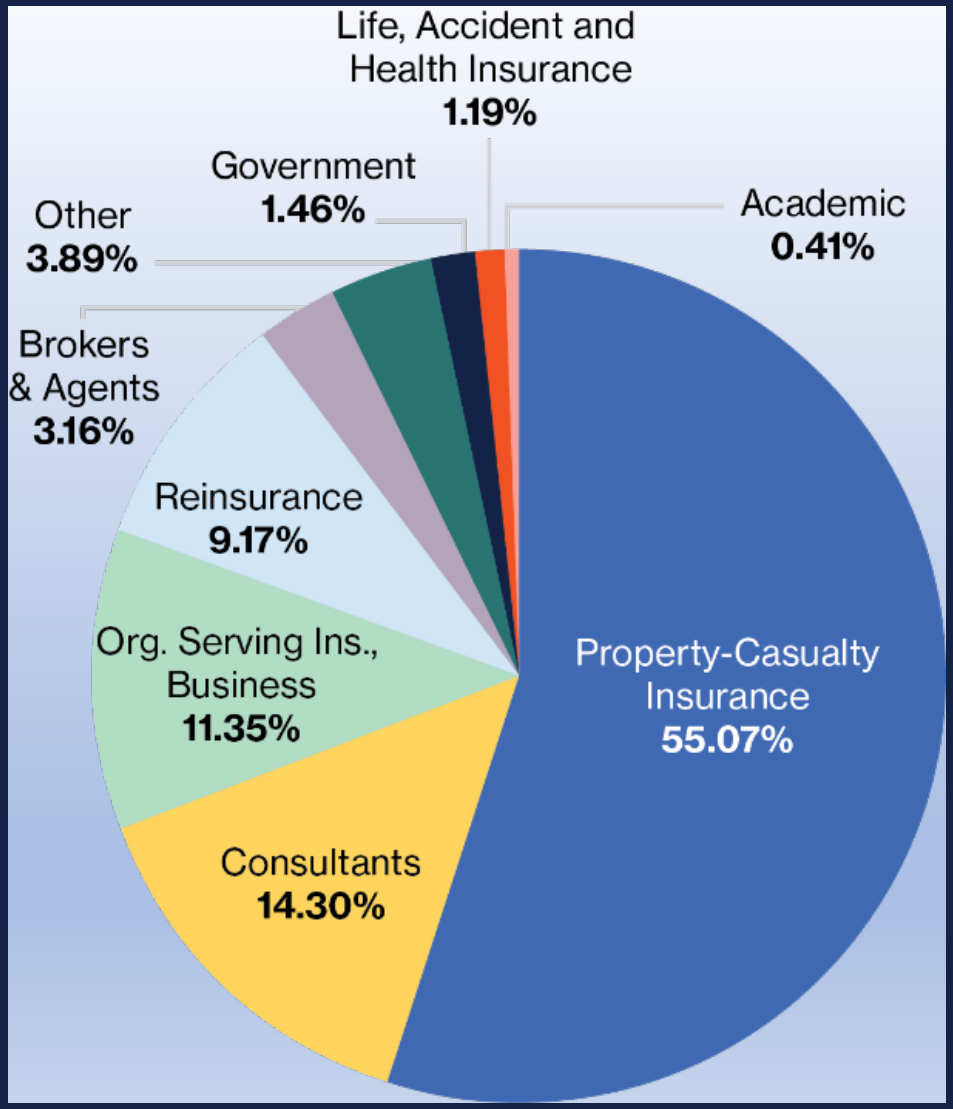
# Where CAS Actuaries Work




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

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# 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

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# 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.**

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# CAS Affiliate Membership

Join our global community of experts in General Insurance!

**Benefits include:**

- ✓ **Subscriptions to Actuarial Review, Variance, and the CAS Weekly Bulletin**
- ✓ **Access to member rates for CAS meetings and webinars**
- ✓ **Networking opportunities**
- ✓ **And more!**

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# Ethical AI for Actuaries

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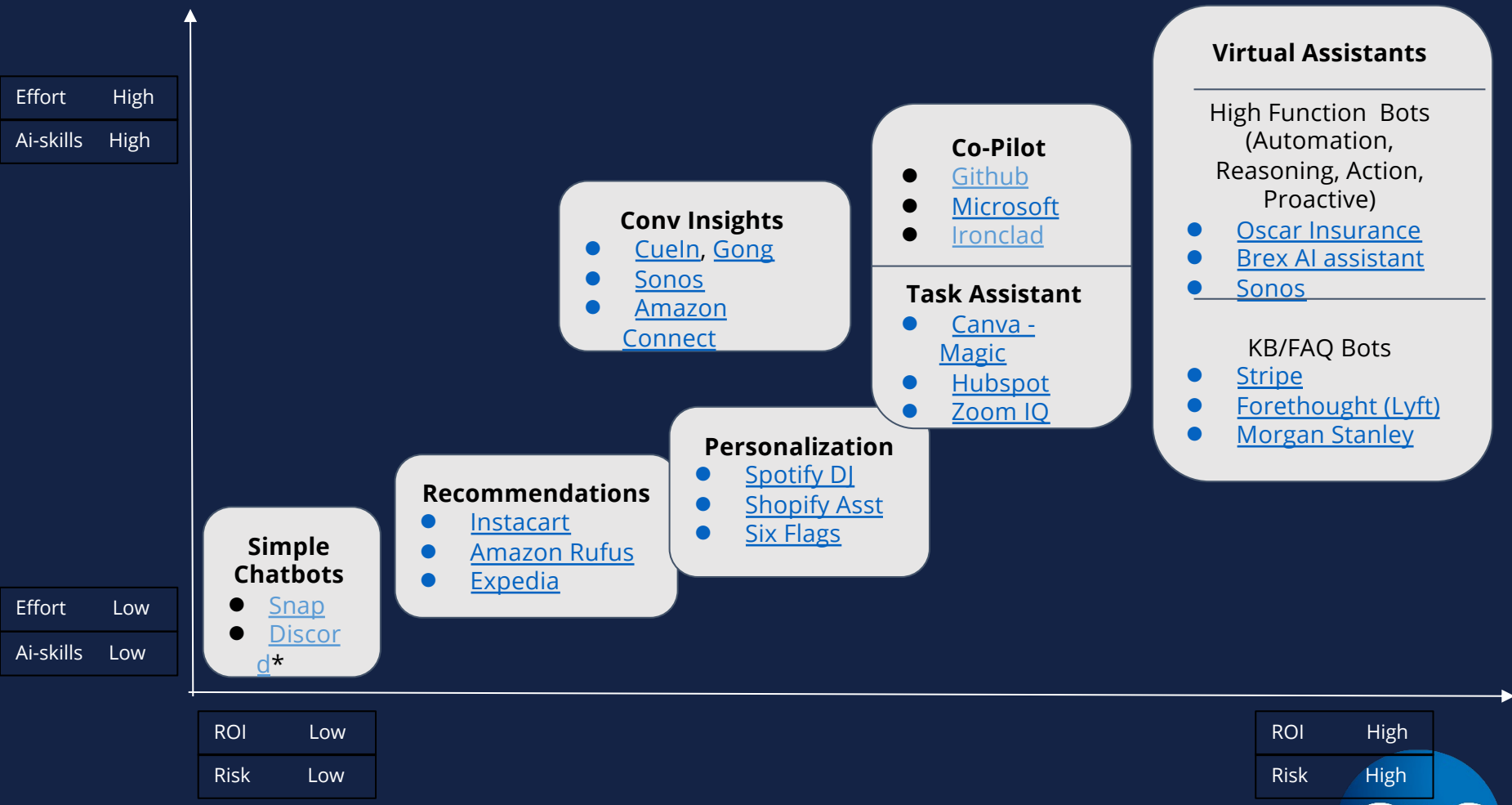
# Real World AI

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# Real World Concerns

Am I fooling myself?

Am I being used to fool you?

Are you fooling me?

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# 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

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# 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 the same.

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# How Can We Address Fairness?

## 3. Equalized Odds[1]

Prediction is equally accurate for all demographics.

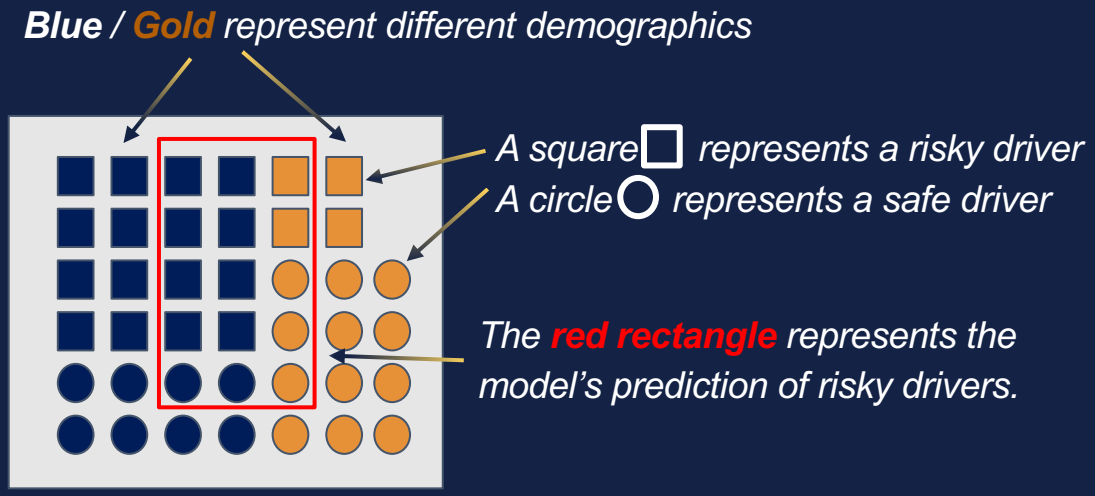


*Illustration of Equalized Odds*: The model correctly identifies ½ of risky **Blue** and ½ of risky **Gold** drivers. Also, the model incorrectly captures ¼ of safe **Blue** and ¼ of safe **Gold** drivers and mis-identifies them as risky.

[1] References:


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


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# 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

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# 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.

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# Questions?

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# Thank you

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