Building a Revenue Optimized Fraud Strategy

By: Dr. Yigit Yildirim

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The Email Risk Score Company

Agenda

- Introduction to AI
- Strengths & Drawbacks of AI
- Optimal Collaboration Between AI & Humans
- The Profit Optimizing Selective AI (POSAI)

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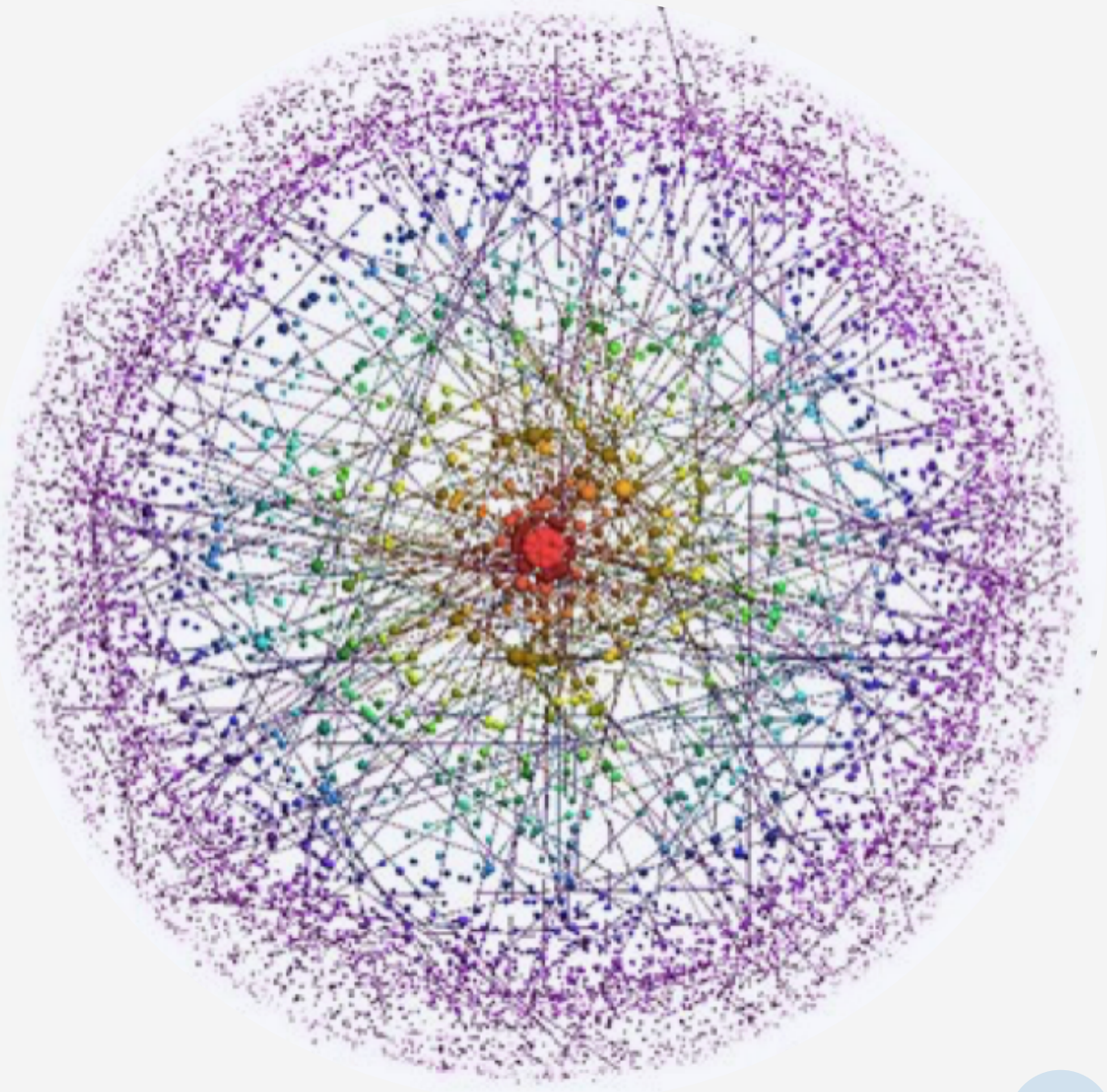
The Role of Machine Learning & AI

How much data can a human process?



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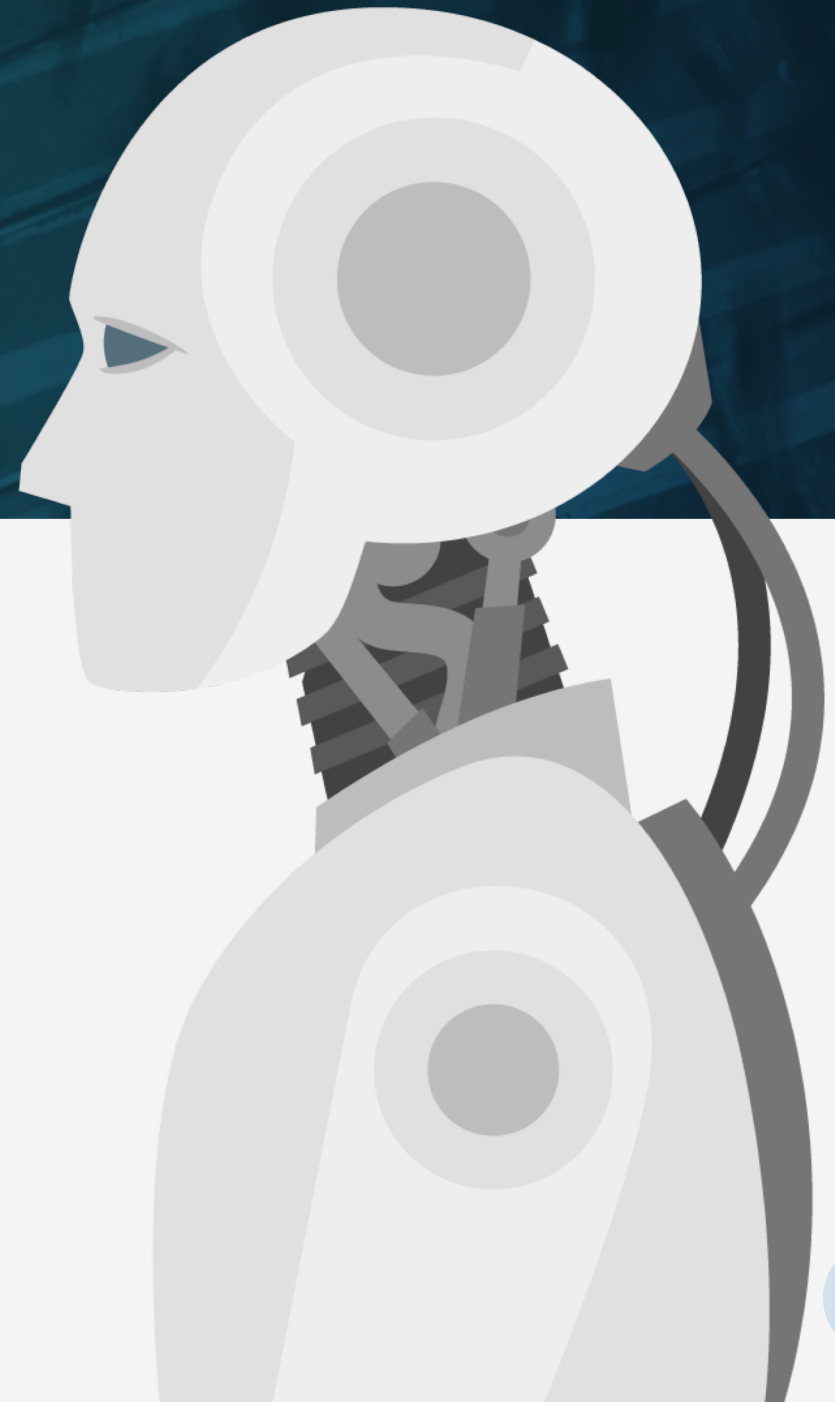
The Role of Machine Learning & AI



- Humans are unable to process ”big data” and characterize the complex relationships (high-frequency algorithmic trading & fraud detection)
- Human expertise does not exist (navigating on Mars)
- Humans are unable to explain their expertise (speech recognition)
- Solution changes in time (routing on a computer network)
- Solution needs to be adapted to particular cases (user biometrics)
- Many more cases.

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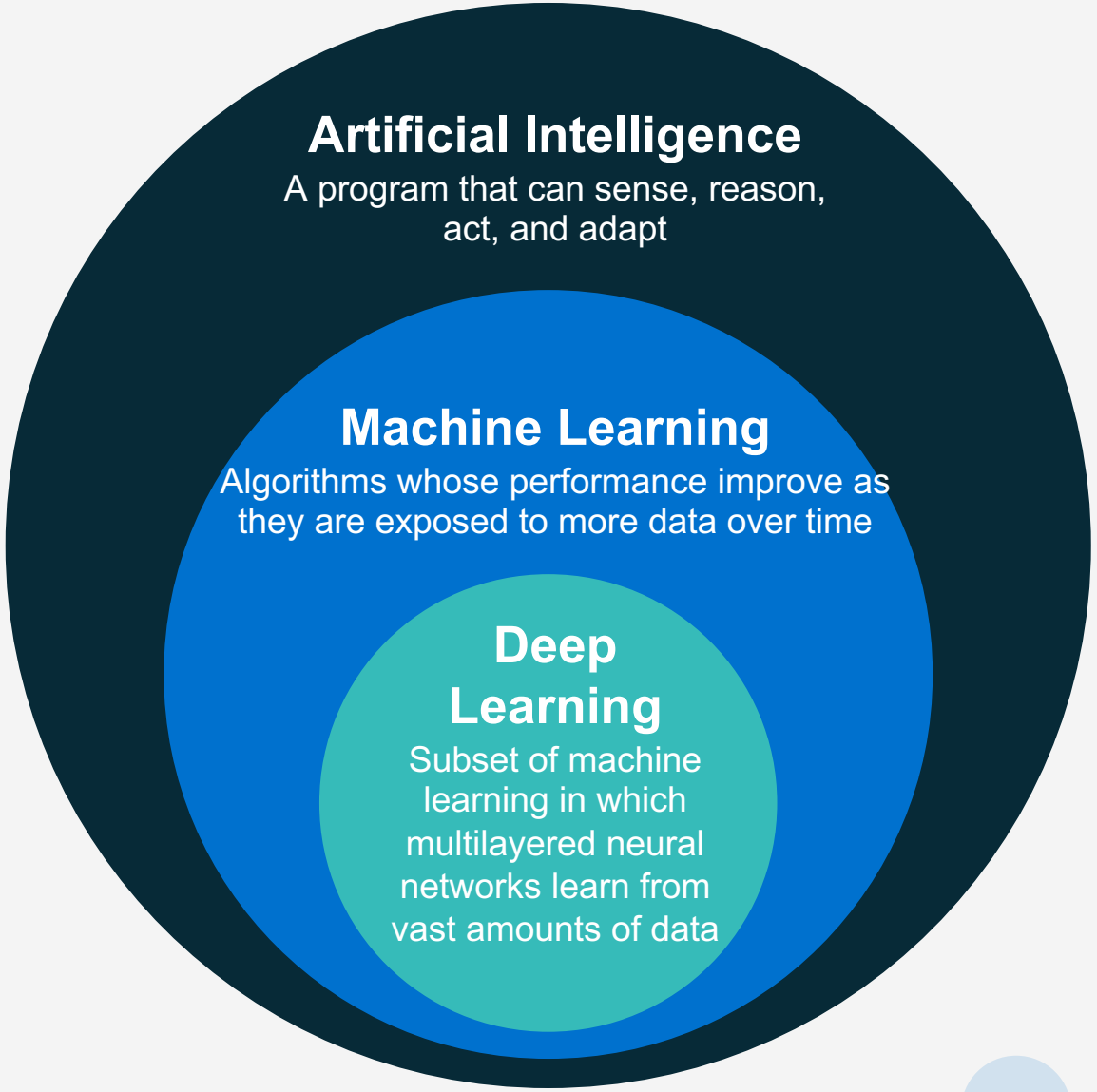
AI, ML, DL, DM, KDD, & other sexy names



Data as your Expert

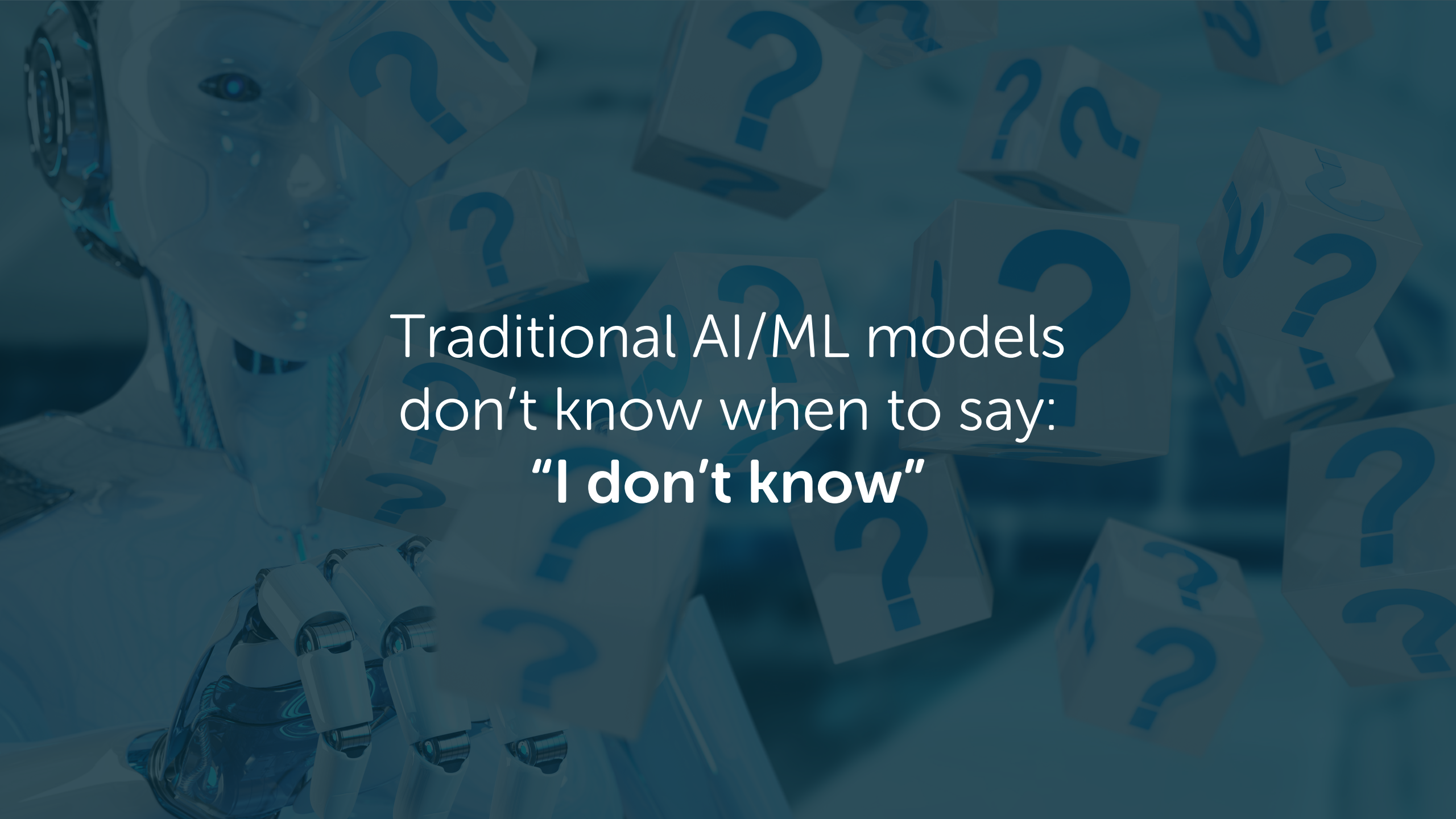
Data is massive.

Using AI, we create complex knowledge from the data itself.

Knowledge scarce.

AI Use-Cases

- Fraud Detection
- Self-Driving Cars
- Digital Assistants
- Chat Bots
- Recommender Systems
- Medical Diagnosis
- Robotics
- Software testing
- Possibly everything else


Traditional AI/ML models
don’t know when to say:
“I don’t know”

Limitations of Traditional AI & Machine Learning

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Limitations of Traditional AI & Machine Learning

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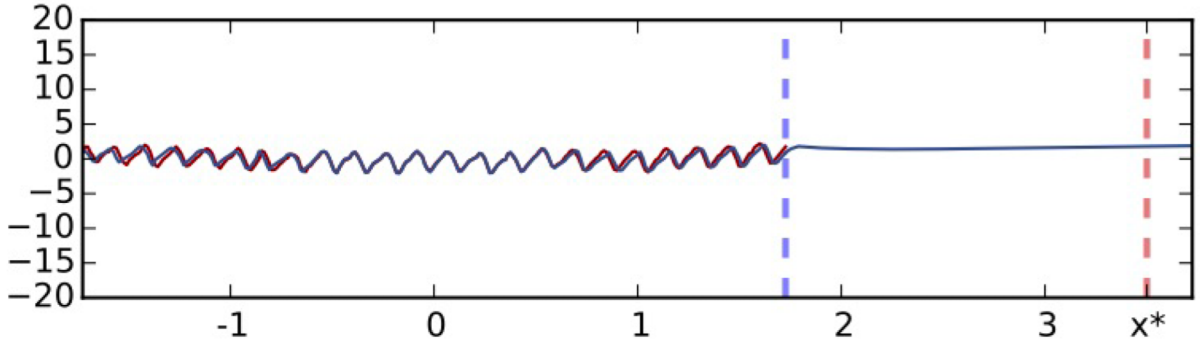
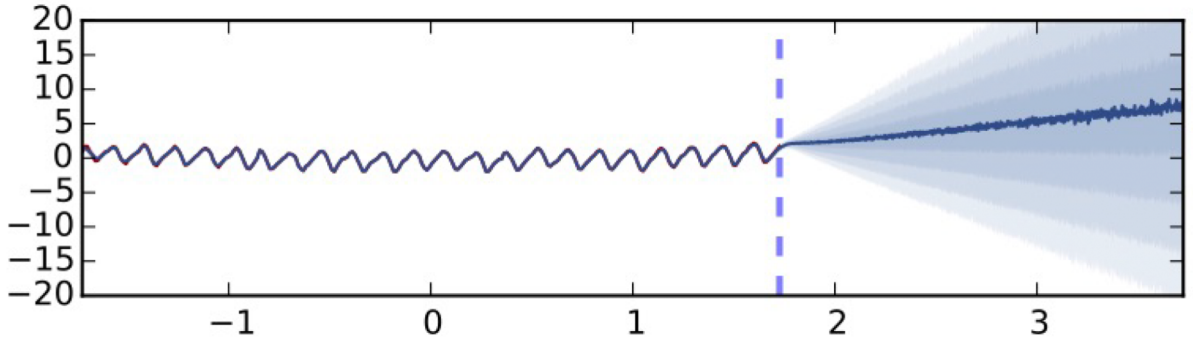
Use Bayesian Techniques

What would be the CO2 concentration level in Mauna Loa, Hawaii, in 20 years' time?

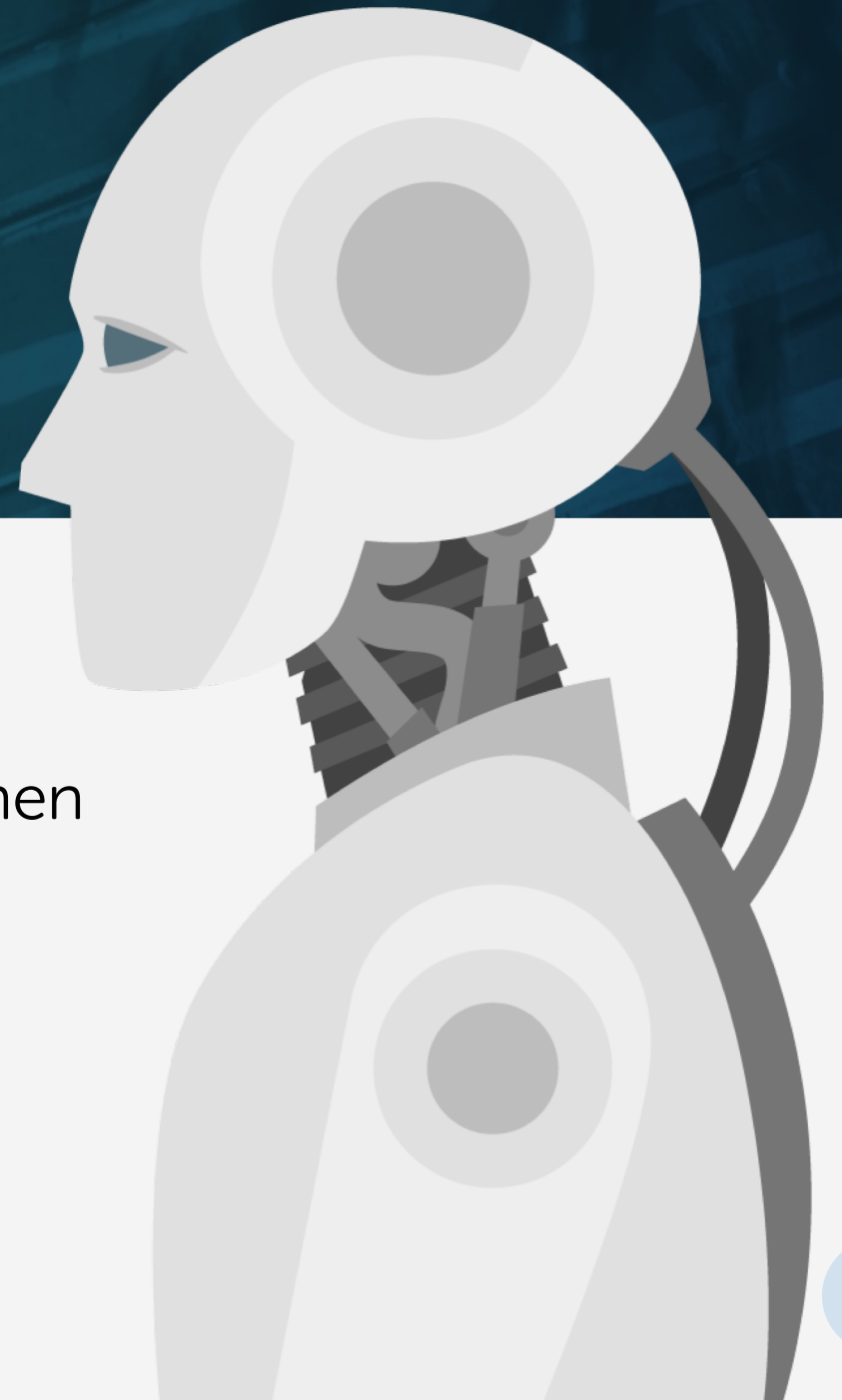
Conventional



Bayesian



Limitations of Traditional AI & Machine Learning



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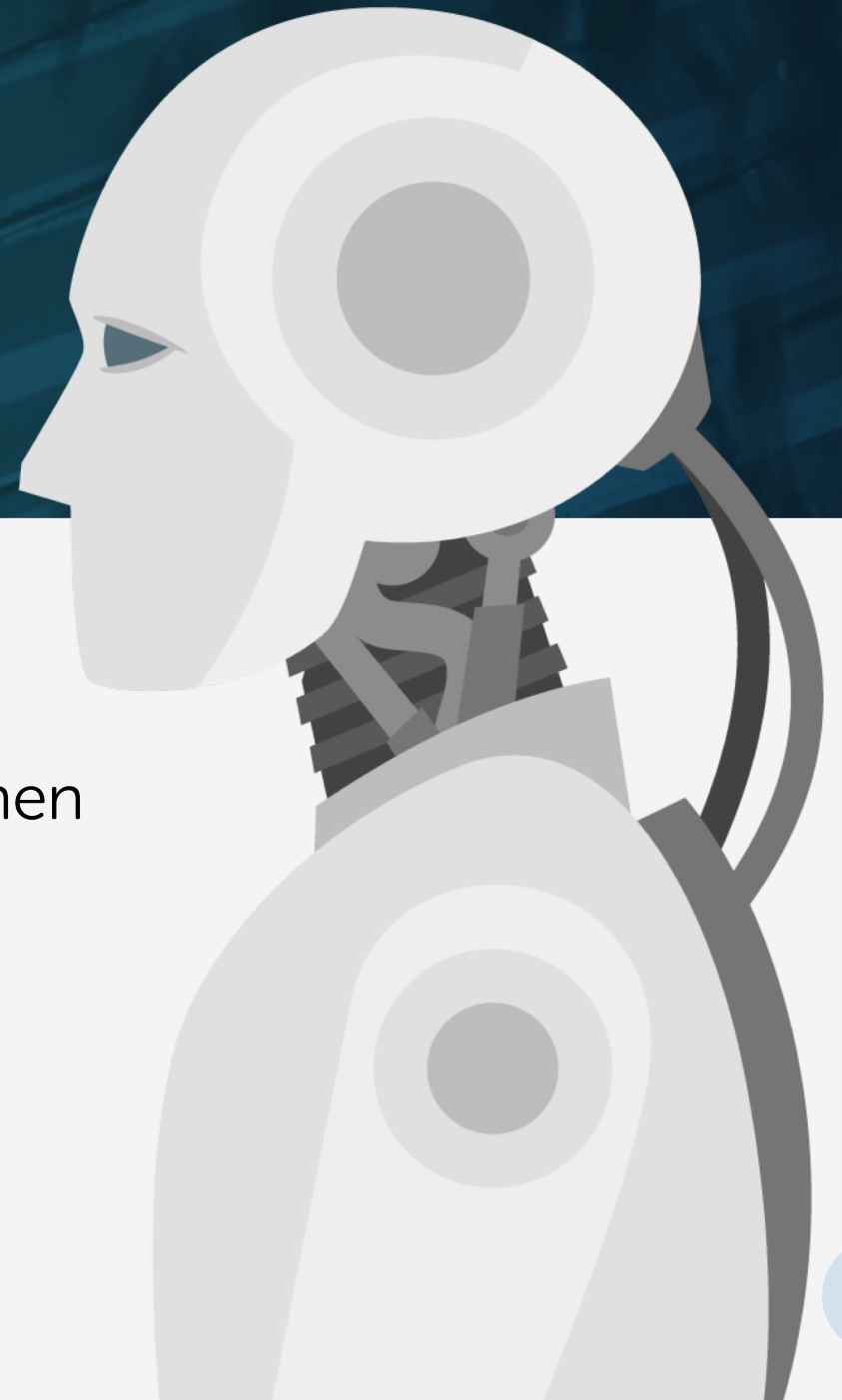
Limitations of Traditional AI & Machine Learning



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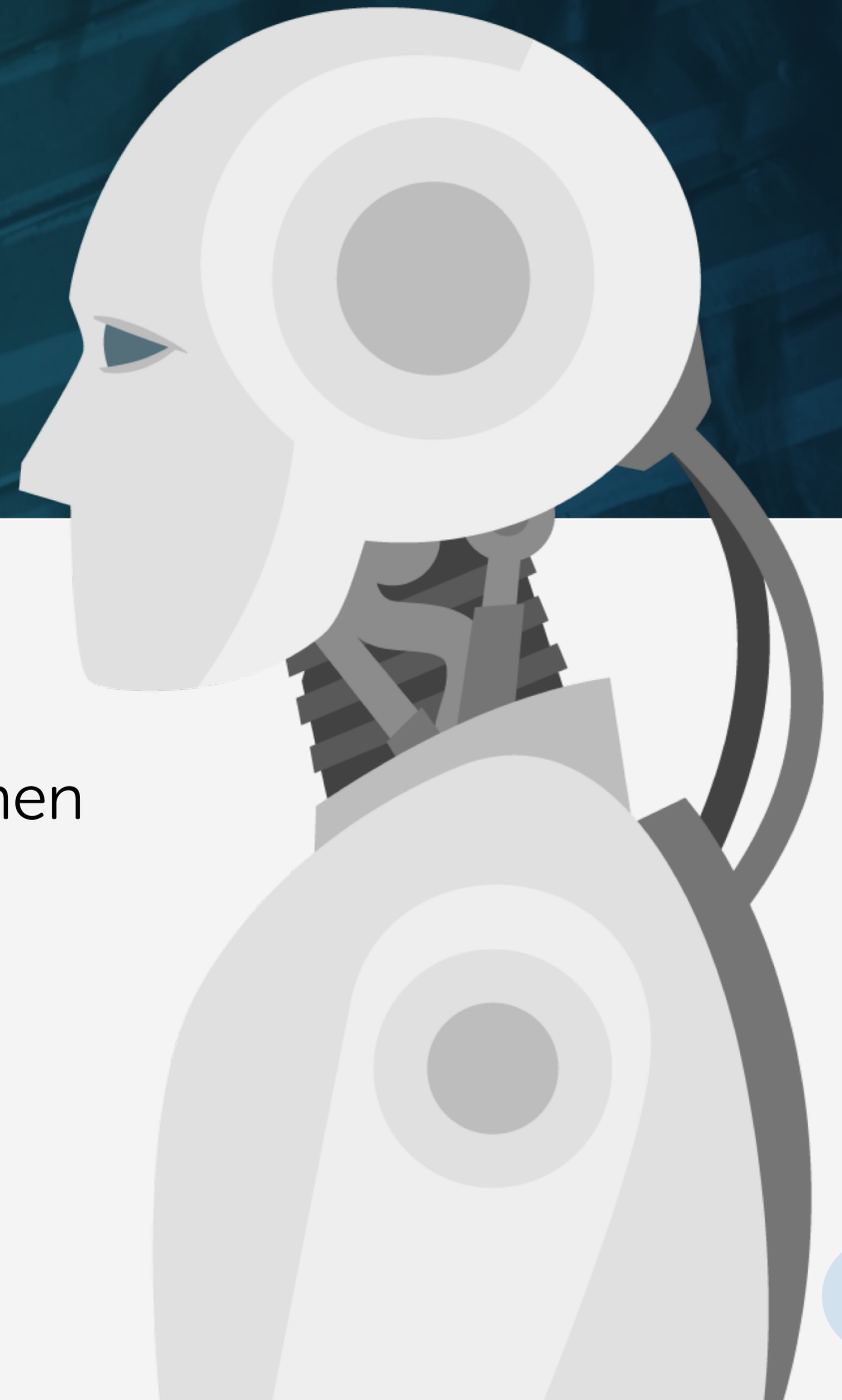
Limitations of Traditional AI & Machine Learning



1. Traditional AI/ML models don't know when to say: **"I don't know"**: Use Bayesian techniques to quantify uncertainty
2. Traditional AI/ML models are **not cost-sensitive**

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Traditional AI - Labels

	Legitimate	Fraudulent
Approve	0	1
Decline	1	0

Challenges merchants face

when developing a fraud management strategy:

- Authentication and identification - too much means losing customers, too little means losing money
- True cost of fraud - $1 of fraud is never just $1
  - Have to factor in processing fees, merchandise, payroll to resolve the issue, shipping/restocking costs
- Overhead costs - employing a team, partnership, software, and implementation costs

Cost-Sensitive Labels

	Legitimate	Fraudulent
Approve	Earn Profit	Suffer from fraud costs
Decline	Lose customer	No loss/No profit

Cost-Sensitive Decision w/ Manual Review

	Legitimate	Fraudulent
Approve	Earn Profit	Suffer from fraud costs
Review	Pay for the manual review costs but not suffer from the customer loss	Pay for the manual review costs but not suffer from the fraud loss
Decline	Customer insult: Loss of customer's business	No loss

Holistic view of Fraud Management

So, AI should optimize for:

- Profit!
- It should consider ALL costs from a fraud management perspective:

$$profit = Earnings\ from\ legitimate\ orders - cost\ of\ uncaught\ fraud - friction\ costs - manual\ review\ costs$$

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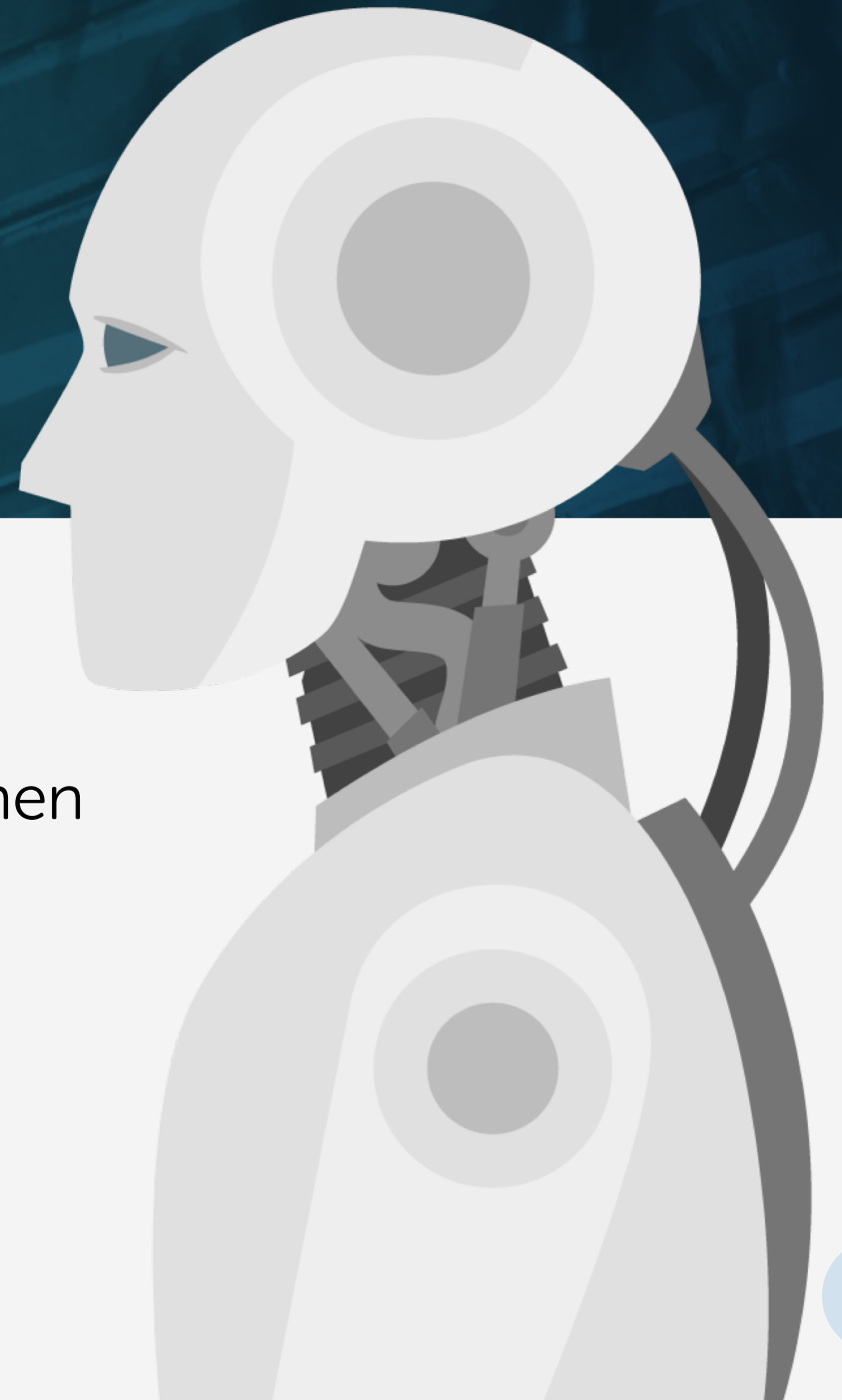
Limitations of Traditional AI & Machine Learning



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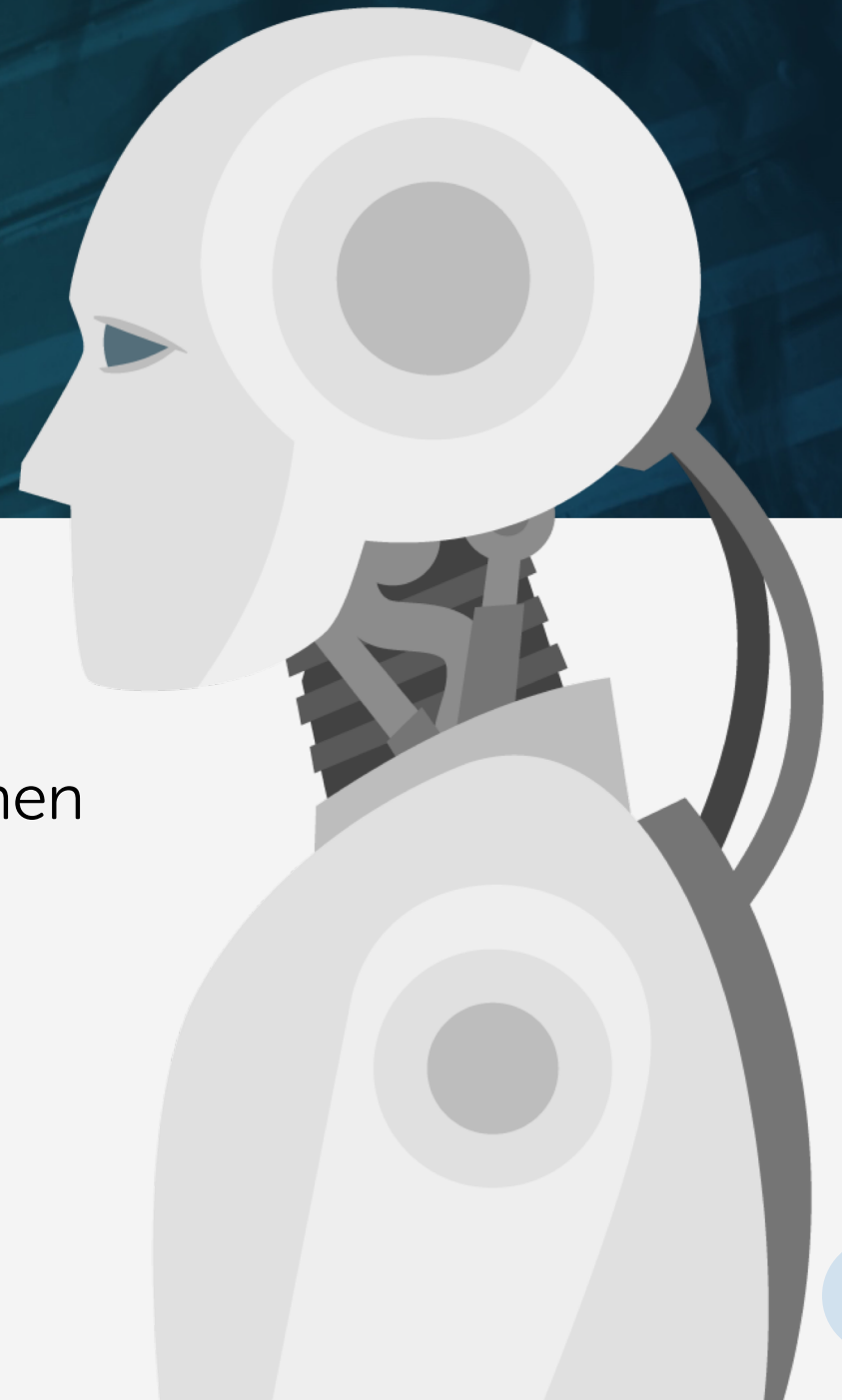

1. Traditional AI/ML models don't know when to say: **"I don't know"**: Use Bayesian techniques to quantify uncertainty
2. Traditional AI/ML models are **not cost-sensitive**: Modify traditional objective functions to profit-optimized ones

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The Role of Humans

DON'T REPLACE HUMAN EXPERTISE, ENHANCE IT

- Use networked data that is analyzed by a sophisticated AI system to make humans more efficient and more profitable
- Run a smaller but efficient human team using the right network data and AI when to uncertainty and/or costs are high

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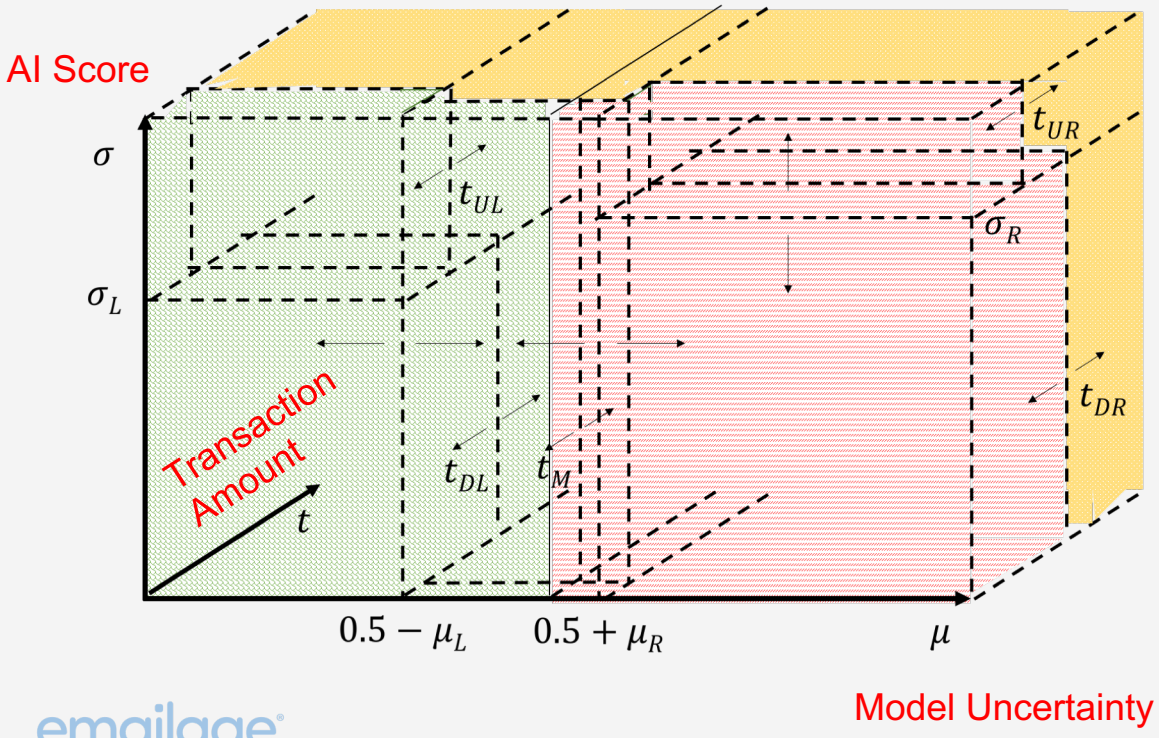
Putting it all together – Profit-Optimizing Selective Classifier (POSAI)

Determine which transactions to approve, decline, or manually review to optimize profits



$$\underset{\substack{\mu_L,\mu_R,\sigma_L,\sigma_R,\\ t_{DL},t_{UL},t_M,t_{DR},t_{UR}}}{\text{maximize}} \; \omega_{tp}\Big(\sum_{i=1}^{n}\sum_{j=1}^{3} p_{ij}(1-y_i)t_i + \sum_{i=1}^{n} r_i(1-y_i)t_i\Big) + \omega_{tn}\Big(\sum_{i=1}^{n}\sum_{j=1}^{3} n_{ij}y_i t_i + \sum_{i=1}^{n} r_i y_i t_i\Big) - \omega_{fn}\Big(\sum_{i=1}^{n}\sum_{j=1}^{3} n_{ij}(1-y_i)t_i\Big) - \omega_{fp}\Big(\sum_{i=1}^{n}\sum_{j=1}^{3} p_{ij}y_i t_i\Big) - c\sum_{i=1}^{m} r_i$$

$$\mu_R - \epsilon + MR_i \geq \mu_i - 0.5 \geq \mu_R - M(1-R_i), \forall i$$
$$M(1-L_i) - \mu_L \geq \mu_i - 0.5 \geq \epsilon - \mu_L - ML_i, \forall i$$
$$\sigma_L + M(1-D_{L_i}) \geq \sigma_i \geq \sigma_L + \epsilon - MD_{L_i}, \forall i$$
$$\sigma_R + M(1-D_{R_i}) \geq \sigma_i \geq \sigma_R + \epsilon - MD_{R_i}, \forall i$$
$$0.5 + \epsilon + MQ_i \geq \mu_i \geq 0.5 + M(Q_i - 1), \forall i$$
$$t_{DL} + M(1-S_{DL_i}) \geq t_i \geq t_{DL} + \epsilon - S_{DL_i}, \forall i$$
$$t_{UL} + M(1-S_{UL_i}) \geq t_i \geq t_{UL} + \epsilon - S_{UL_i}, \forall i$$
$$t_M + M(1-S_{M_i}) \geq t_i \geq t_M + \epsilon - S_{M_i}, \forall i$$
$$t_{DR} + M(1-S_{DR_i}) \geq t_i \geq t_{DR} + \epsilon - S_{DR_i}, \forall i$$
$$t_{UR} + M(1-S_{UR_i}) \geq t_i \geq t_{UR} + \epsilon - S_{UR_i}, \forall i$$

$$D_{L_i} + L_i + S_{DL_i} \geq 3p_{i1}, \forall i$$
$$D_{L_i} + L_i + S_{DL_i} - 2 \leq 3p_{i1}, \forall i$$
$$(1-D_{L_i}) + L_i + S_{DL_i} \geq 3p_{i2}, \forall i$$
$$(1-D_{L_i}) + L_i + S_{DL_i} - 2 \leq 3p_{i2}, \forall i$$
$$D_{R_i} + R_i + S_{DR_i} \geq 3n_{i1}, \forall i$$
$$D_{R_i} + R_i + S_{DR_i} - 2 \leq 3n_{i1}, \forall i$$
$$(1-D_{R_i}) + R_i + S_{DR_i} \geq 3n_{i2}, \forall i$$
$$(1-D_{R_i}) + R_i + S_{DR_i} - 2 \leq 3n_{i2}, \forall i$$
$$(1-L_i) + (1-R_i) + S_{M_i} + (1-Q_i) \geq 4p_{i3}, \forall i$$
$$(1-L_i) + (1-R_i) + S_{M_i} + (1-Q_i) - 3 \leq 4p_{i3}, \forall i$$
$$(1-L_i) + (1-R_i) + S_{M_i} + Q_i \geq 4n_{i3}, \forall i$$
$$(1-L_i) + (1-R_i) + S_{M_i} + Q_i - 3 \leq 4n_{i3}, \forall i$$
$$\sum_{j=1}^{3}[p_{ij}] + \sum_{j=1}^{3}[n_{ij}] + r_i = 1, \forall i$$
$$\forall p_{ij}, r_i, n_{ij}, R_i, L_i, D_{L_i}, D_{R_i}, S_{DL_i}, S_{UL_i}, S_{M_i}, S_{DR_i}, S_{UR_i} \in \{0,1\}$$
$$\forall i \in \{1...m\}, and \;\; \mu_L, \mu_R, \sigma_L, \sigma_R \in \mathbb{R}$$

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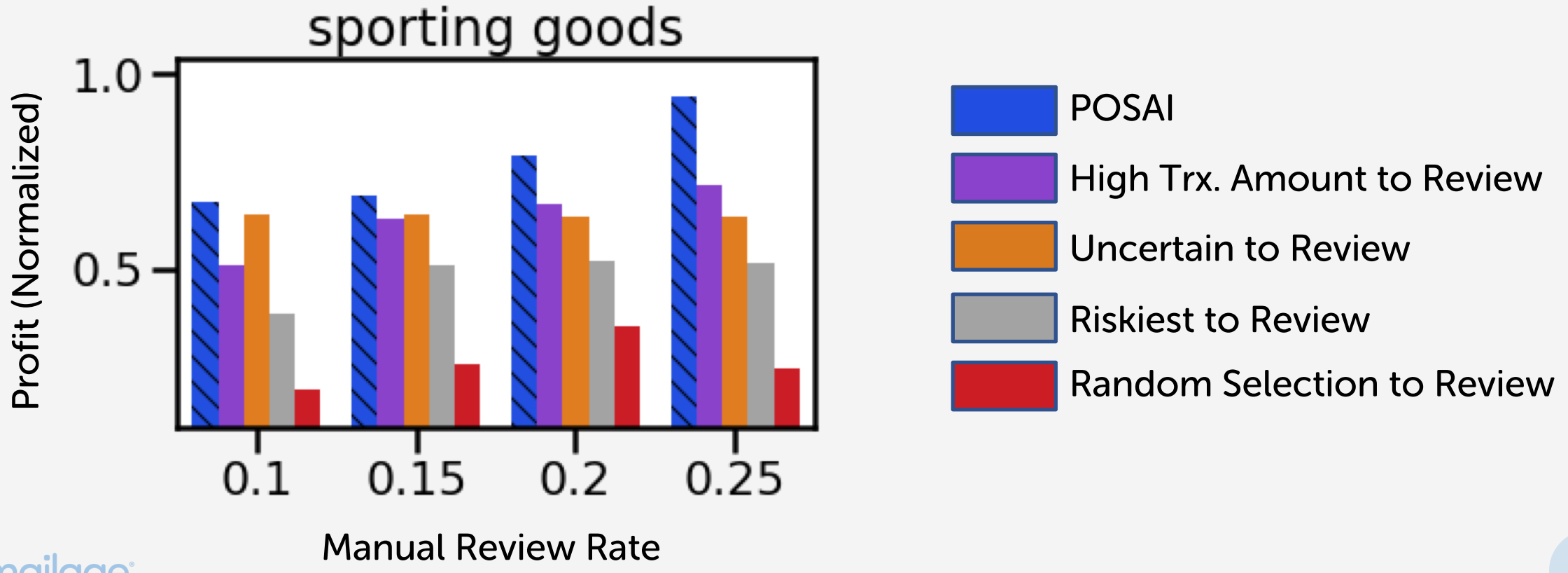
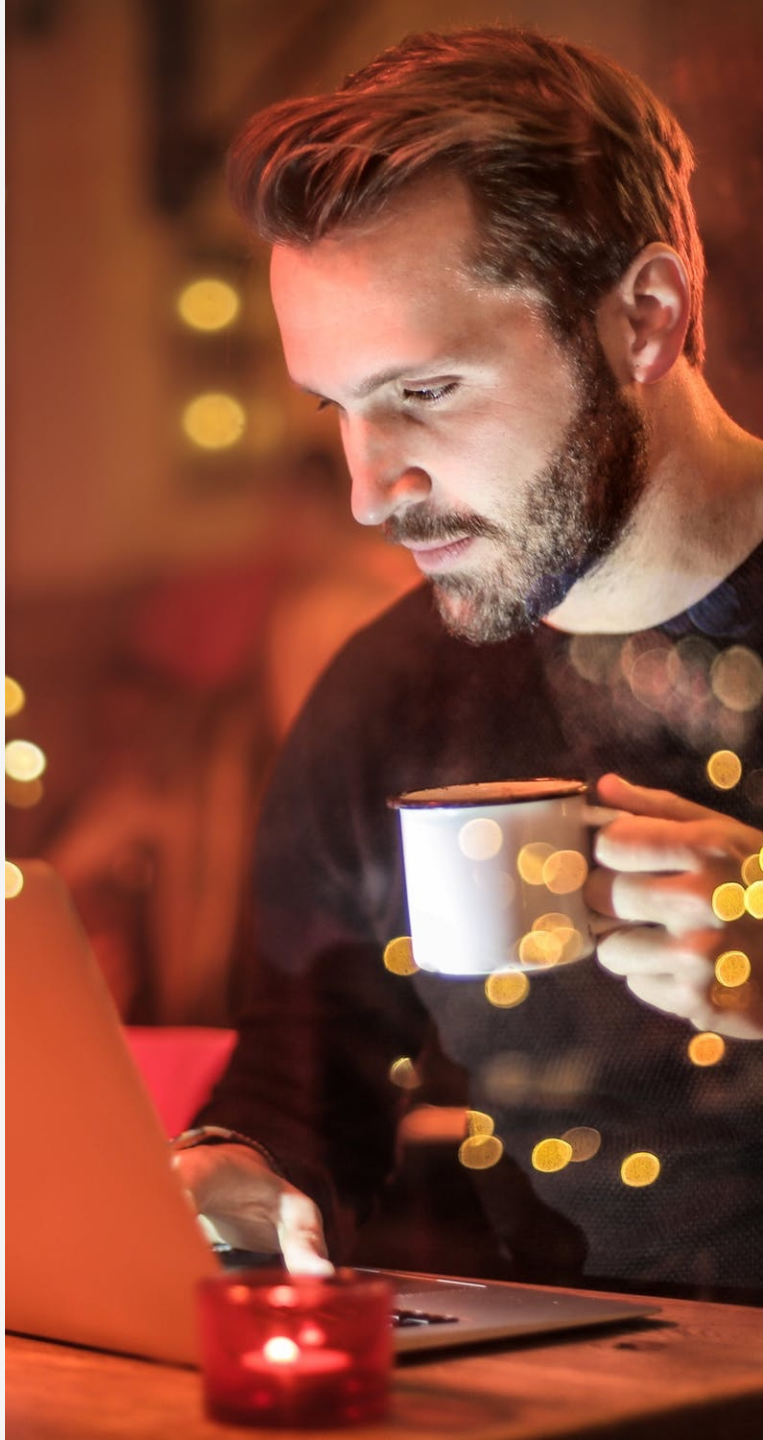
Profit-Optimizing Selective AI (POSAI): Case Study



Solutions for merchants -
easy ways to make a dramatic impact:

- Boost fraud detection accuracy
  - The right partnerships and software
    - Backed by a global network consortium - the more data your solution has, the more fraud it will stop
    - Utilize sophisticated AI-based solutions to catch complicated fraud patterns
    - Teach your AI to say “I don’t know”
- Holistic view of fraud prevention
  - Combine AI score, uncertainty, and financial considerations to make optimal decisions that maximize profits
- Treat fraud prevention as an “approval engine”
  - Instead of stopping transactions, the focus should be on approving more, faster.



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Your Human Team

- Don’t make them use the same data points as AI: remember AI is better than humans at processing a lot of data points
- Equip fraud analysts with specialized tools that bring more data points at the expense of cost and time and let them conduct an investigation

In Conclusion

- Fraud is an inevitable part of doing business, but the cost does not have to be inevitably high
- Fraud prevention doesn't have to be a loss center, organizations can use it to approve more transactions while boosting revenue
- The right fraud solution will use global fraud data sourced from multiple industries to cut losses
- Maximize the efficiency of your human teams to reduce overhead
- Make fraud prevention a revenue driver

Who We Are

Emailage is a global leader in helping companies reduce online fraud. Powered by our best-in-class predictive risk intelligence, key partnerships, proprietary data and machine-learning technology.

We help companies fight back against fraudsters, scale into new markets and focus on what matters: growing business.

Contact Us

emailage.com | contact@emailage.com | 480-634-8437