Building Fraud Detection Services for Business

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About me

- **Lead Data Scientist at Klarna** driving efforts for fraud prevention in Klarna core products in key EU and AP markets.
- 7 years experience in Fintech.

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Motivation

- **Fraud prevention is a never-ending race against an intelligent adversary.**
- **New payment products open the door to new fraud attacks.**
- **One can not win, one can only give up and walk away or keep fighting.**

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Agenda

1. What is fraud?
2. Problem space definition in fraud detection
3. Challenges in fraud modeling
4. Challenges in fraud monitoring
5. Conclusion

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What is fraud?

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What is fraud?

Types of fraud:

- Stolen Card Fraud
- Account Takeover
- Identity Theft & Synthetic Identities
- First-Party Fraud (Friendly fraud)
- Collusion Attacks

Key questions:

1. What types of fraud are you dealing with?
2. What fraud type causes the most losses?
3. What types of fraud can you actually mitigate?

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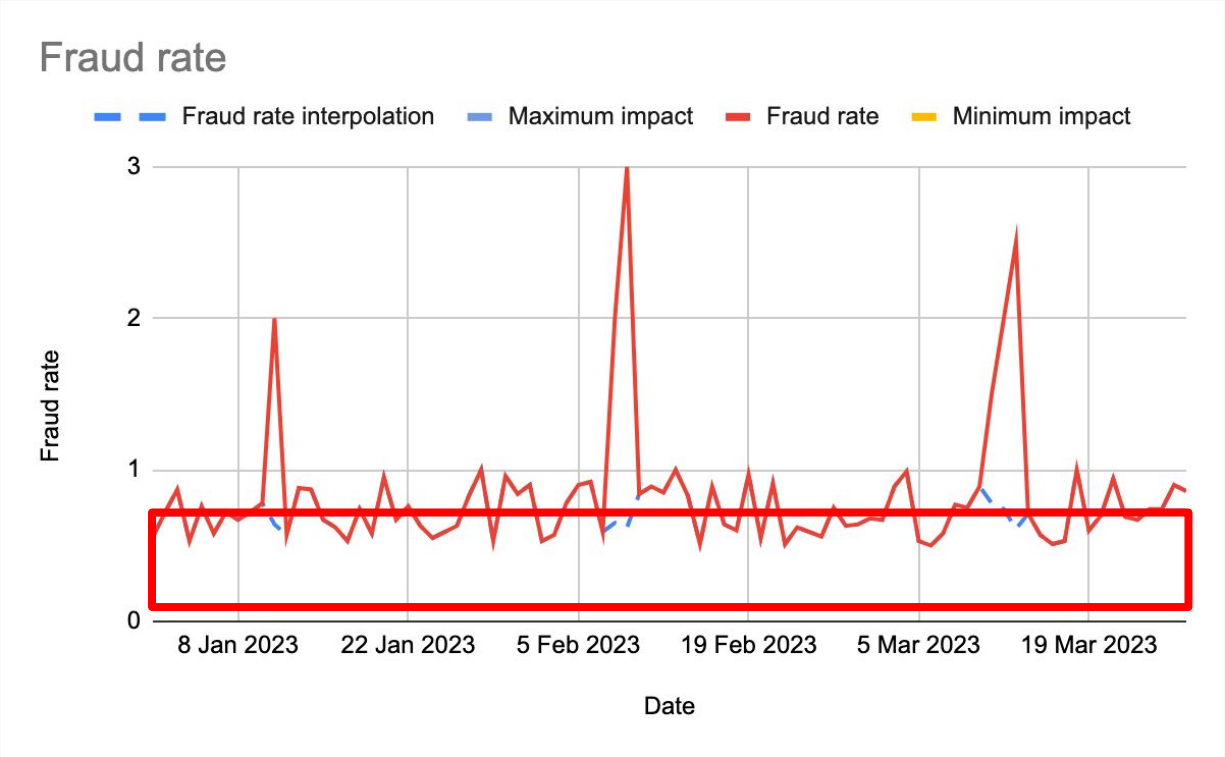
Problem space definition

Business rationale & Estimated impact



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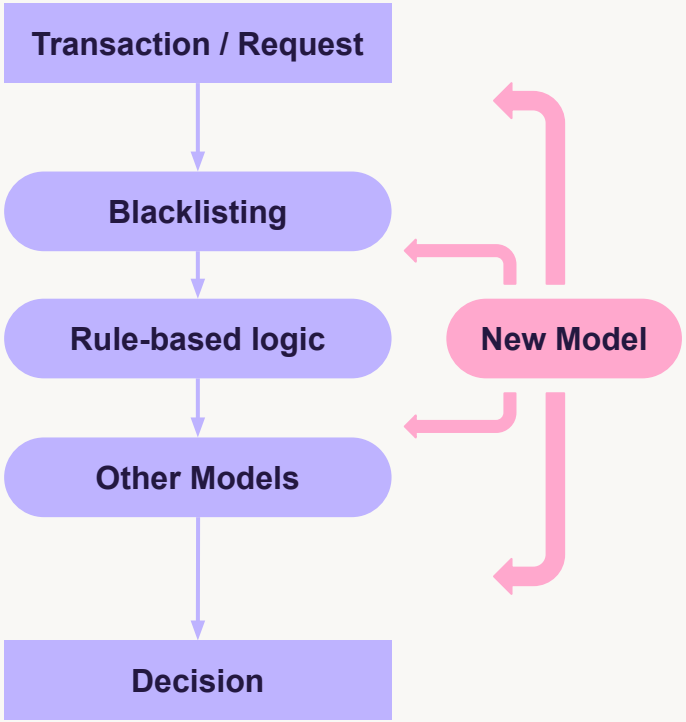
System design constraints



Request status
accepted
sent to review
pending
rejected

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Challenges in fraud modeling

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Data collection

1. Scarcity of representative data points
2. Fraud maturity period
3. Deep dive into data provenance
4. False positive problem

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Modeling

1. Overfitting
2. Imbalance problem
3. Cold-start problem

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Compliance review

1. Explainability
2. Ethics
3. Bias

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Challenges in
fraud monitoring

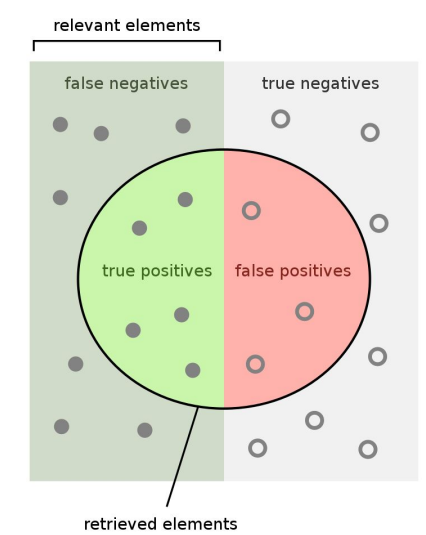
Challenge #1

Problem: always observe only one part of the entire picture

- Unknown ground truth for rejections
- Prevent people from buying and lose money

Solutions: allow an estimated risk and use proxy metrics

- Accept some dubious transactions in order to learn whether they are indeed fraudulent or not
- Make optimal use of manual review resources
- Hard reject vs. soft reject



https://en.wikipedia.org/wiki/Precision_and_recall

Challenge #2

Problem: delayed feedback

- There is no immediate fraud rate to monitor
- Model performance metrics like precision and recall are not real-time

Solutions: monitor what is available and observable

- Acceptance rate, reject rate
- Understand the response lag

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Challenge #3

Problem: constantly changing environment & fraud phenomena

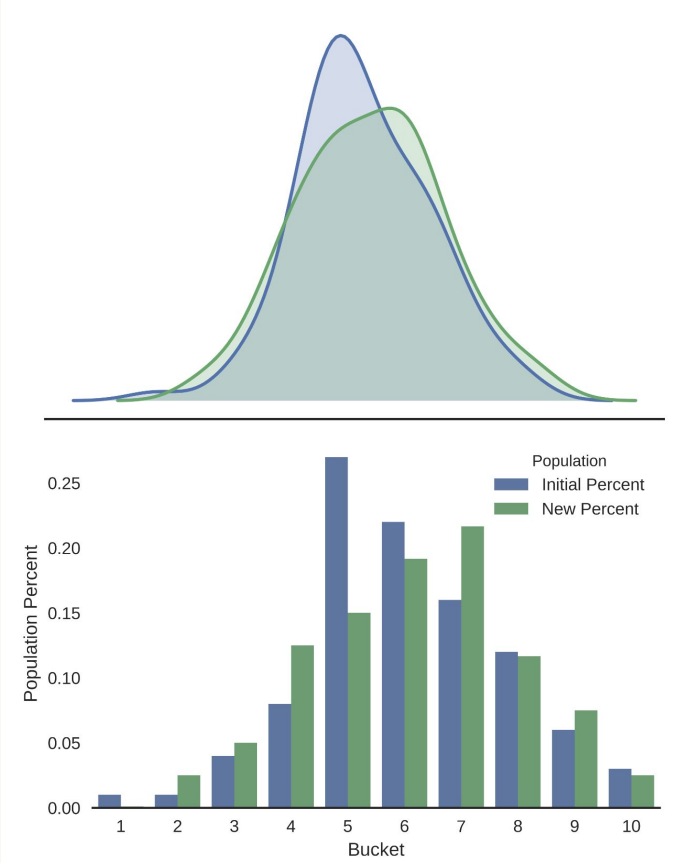
- There are many reasons for model drift

Solutions: monitor model input along with model output

- Population Stability Index (PSI)

$$PSI = \sum \left(\left(Actual\% - Expected\% \right) \times ln\left(\frac{Actual\%}{Expected\%} \right) \right)$$

  - PSI < 0.1: no significant population change
  - PSI < 0.2: moderate population change
  - PSI >= 0.2: significant population change



https://mwburke.github.io/data%20science/2018/04/29/population-stability-index.html

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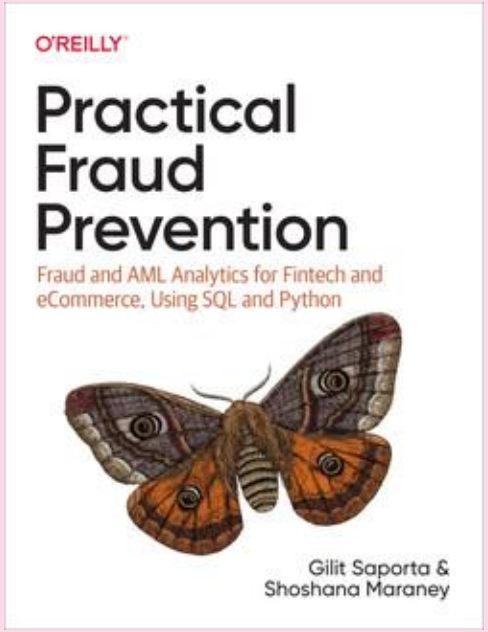
Further Reference



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Takeaways

- Set up the right **impact estimation**
- Learn about **data provenance**
- Model carefully: expect overfitting, deal with balancing, stay compliant
- A low observed fraud rate in production can occur at the cost of **false positives**
- **Delay in system response** to current decisions
- Monitor the model output and input

Thank you!

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