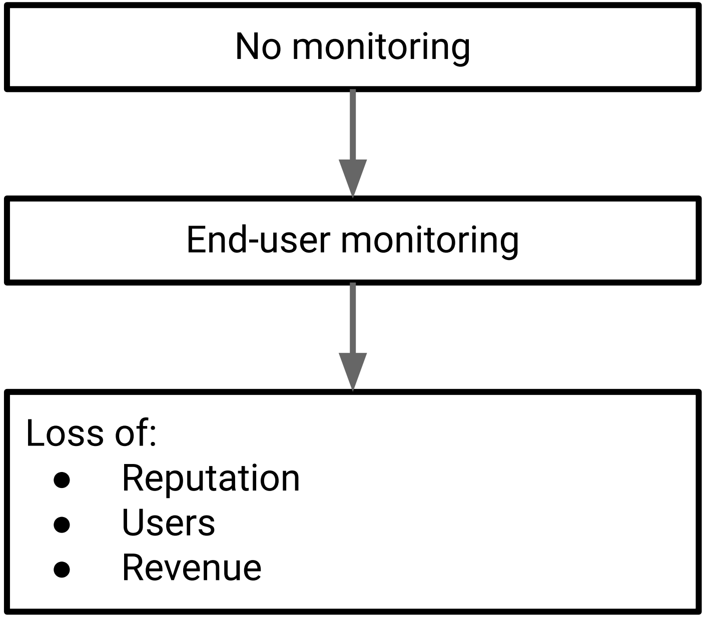
Data Drift Monitoring for ML Projects

Alex Kim @alex000kim

Introduction

- Why monitor?
- Application monitoring vs ML monitoring
- Common causes of model and data drift
- What to monitor?

Why monitor?



No monitoring

End-user monitoring

Loss of:

- Reputation
- Users
- Revenue

Application monitoring vs ML monitoring

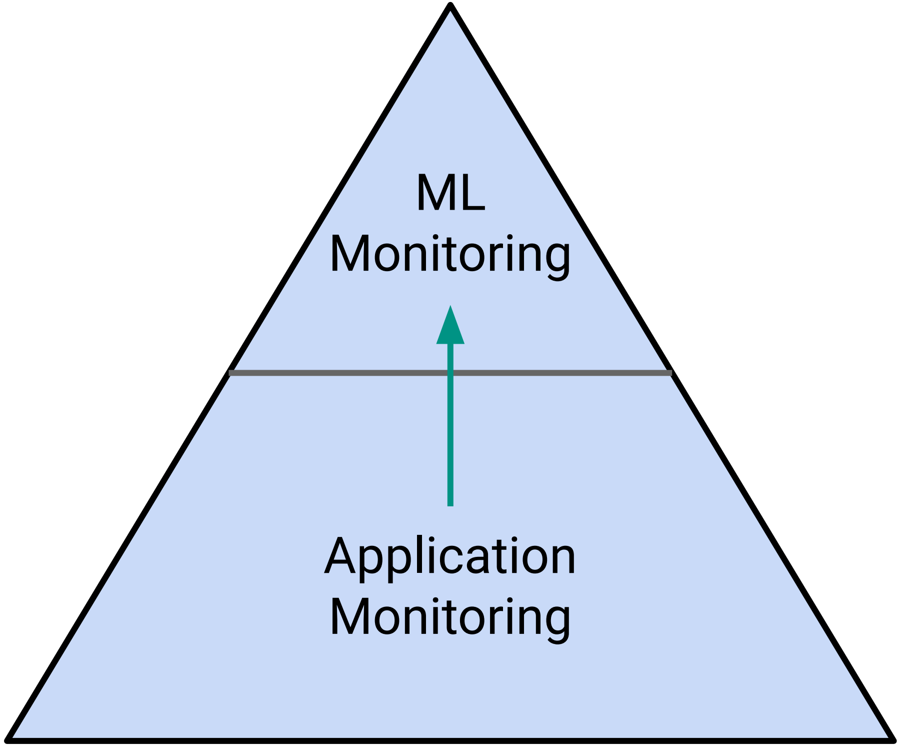
Application monitoring:

- Latency
- Response error rate
- CPU
- RAM
- Disk space

ML monitoring:

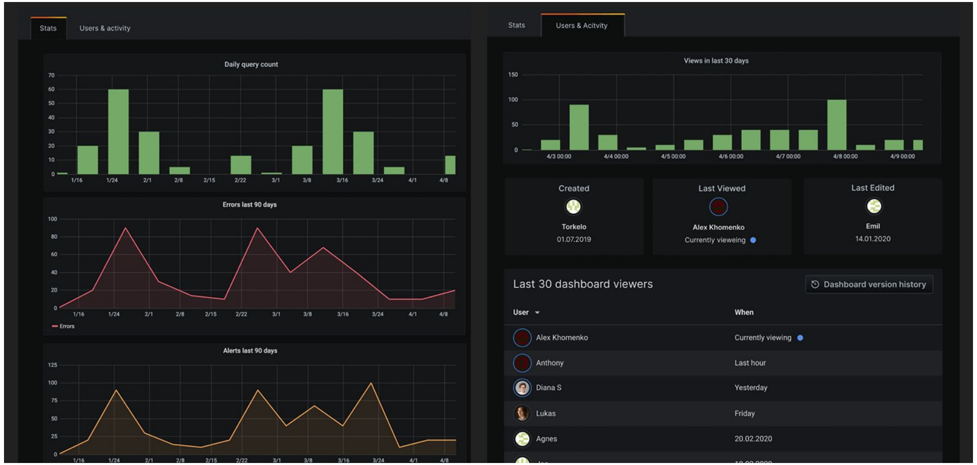
- Model performance metrics
- Data drift
- Concept drift

Application monitoring vs ML monitoring



Application Monitoring Tools

- **Instrumentation & metrics**: statsd, prometheus, etc.
- **Event logging & tracing**: logstash, splunk, etc.
- **Dashboards**: grafana, kibana, graphite, etc.



Created
Torkelo
01.07.2019

Last Viewed
Alex Khomenko
Currently vieweing ●

Last Edited
Emil
14.01.2020

Last 30 dashboard viewers

User ▾	When
Alex Khomenko	Currently viewing ●
Anthony	Last hour
Diana S	Yesterday
Lukas	Friday
Agnes	20.02.2020

Image source: https://grafana.com/static/img/screenshots/Modal_usage_insights.png

ML Monitoring Tools

- Alibi Detect
- Arize AI
- Evidently AI
- WhyLabs
- Fiddler

Image source: https://grafana.com/static/img/screenshots/Modal_usage_insights.png

Causes of data drift

- changes data source (e.g. ℃ vs ℉, broken sensor)
- data preprocessing pipeline (e.g. variable scaling, data imputation)
- market conditions lead to changes in user behaviour (e.g. change in disposable income, consumer preferences)
- regulations change user behaviour (e.g. GDPR)
- upstream system or company policy (e.g. change in UI, opt-out vs opt-in data collection)

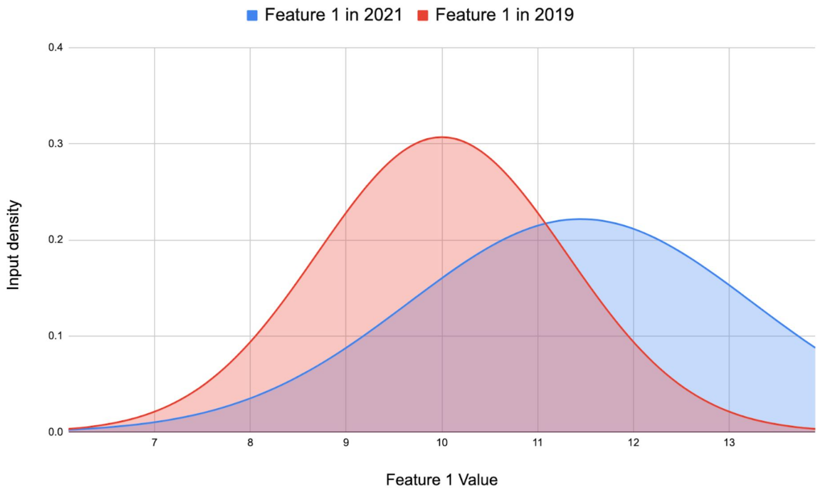
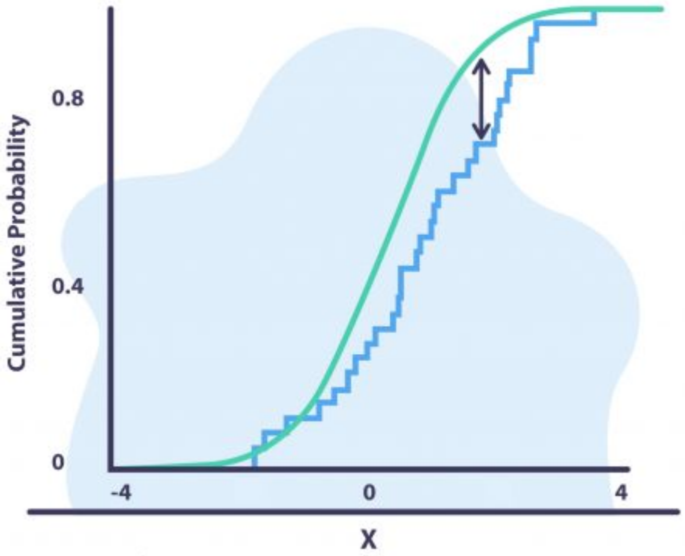


Image source: https://www.picsellia.com/post/what-is-data-drift-and-how-to-detect-it-with-mlops

What to monitor?

- Model performance on new data
- Input data summary stats (% missing, min/max, etc)
- Data distribution
- Statistical distances between training data and new data
  (e.g. Chi-Squared, Kolmogorov-Smirnov)



Kolmogorov-Smirnov Test

Image source: https://www.aporia.com/blog/concept-drift-detection-methods/

Practice time!