Can Insider Trading be Systematically Detected?

GAN Overview

Context

- Large body of literature attempting to identify insider trading with limited success

- Prior attempts use regressions / linear approaches

- New machine learning approaches untested

Aim vs. Challenges

Aim

- Develop a ML algorithm that can systematically detect insider trading

Challenges

- Finance literature has been unable to identify any observable features of insider trading

- Prosecuted IT cases are sparse → if you train a ML algorithm on the IT data then there isn't often any out of sample data to validate algorithm

- ML algorithms typically biased towards majority class

- Prosecuted IT cases represent a minimum bound → A successful model would identify all IT periods + some

How can we train a model to detect insider trading without the model ever observing insider trading?
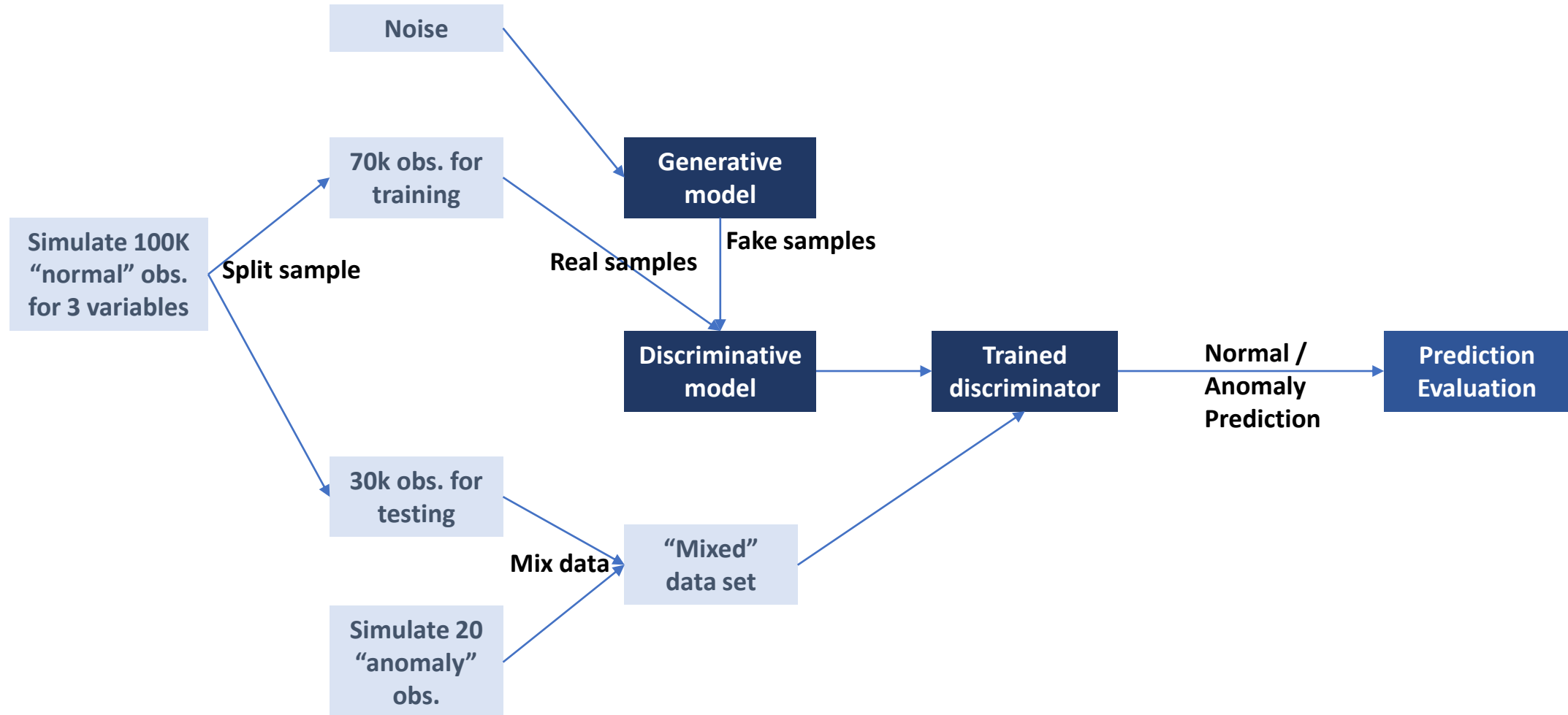
GANs provide a suitable framework

- We can train GANs to learn a representation of ordinary market data

- The trained model can then flag abnormal data

- We want to observe whether abnormal data flagged by the trained model matches prosecuted cases of IT
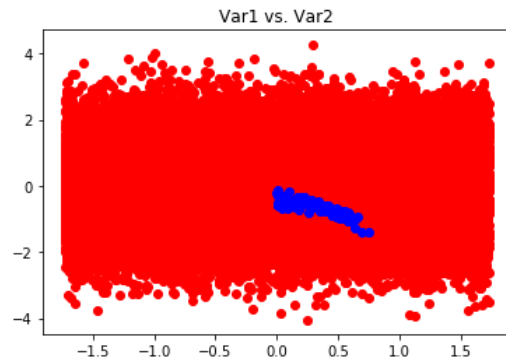
Standard GAN framework
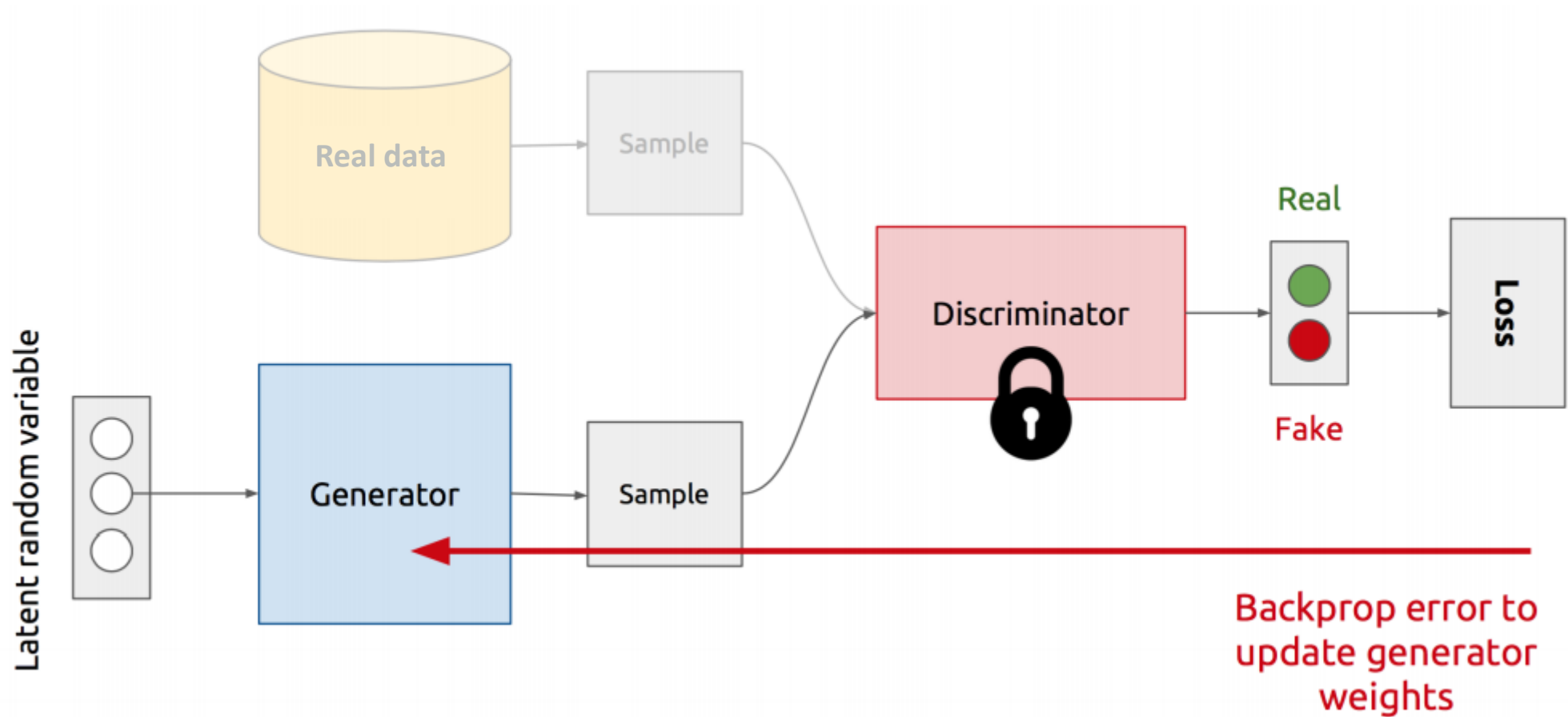
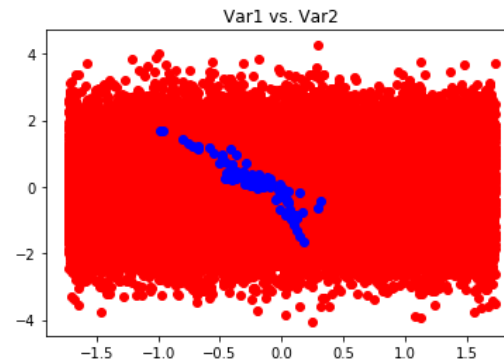# An example workflow with simulated data
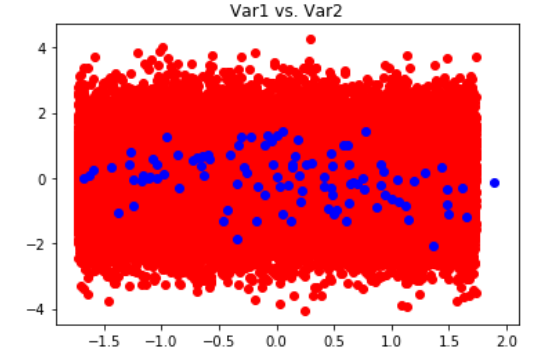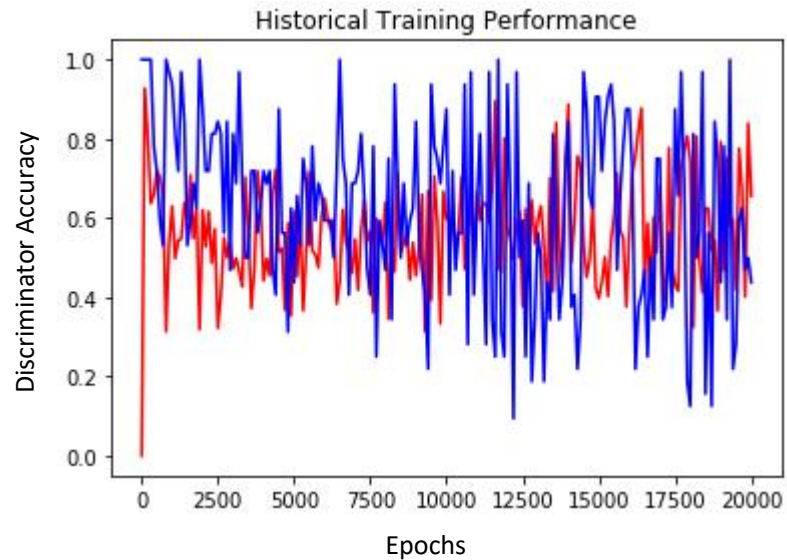
Example training progress

Adversarial game & performance

Historical Training Performance

Deployment Performance

Normal Accuracy: 100%

Anomaly Accuracy: 95%

How can we improve upon the GAN framework?

✔ **Standard** | Vanilla GAN | Point-in-time observations, no context

✔ ✔ **Good** | RNN GAN | Sequence of observations, short-term context only

✔ ✔ ✔ **Best** | LSTM GAN | Sequence of observations, short and long-term context