Intro to MLOps

Quickly Deploying Data & ML Solutions via the Cloud

Victor Geislinger

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Solutions?

- More focus on automation

- Iteratively improving
  - Rolling out
  - Working with SEs

What's Hardest about Data Science / Machine Learning?

Warning: Opinion Incoming...

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- Moving trend in DS/ML

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What's Hardest about Data Science / Machine Learning?

- Moving trend in DS/ML
- Reliance on understanding of fundamentals (what you've been working on!)
- AutoML
- Less time in developing algorithms

A Solution – MLOps: What is it?

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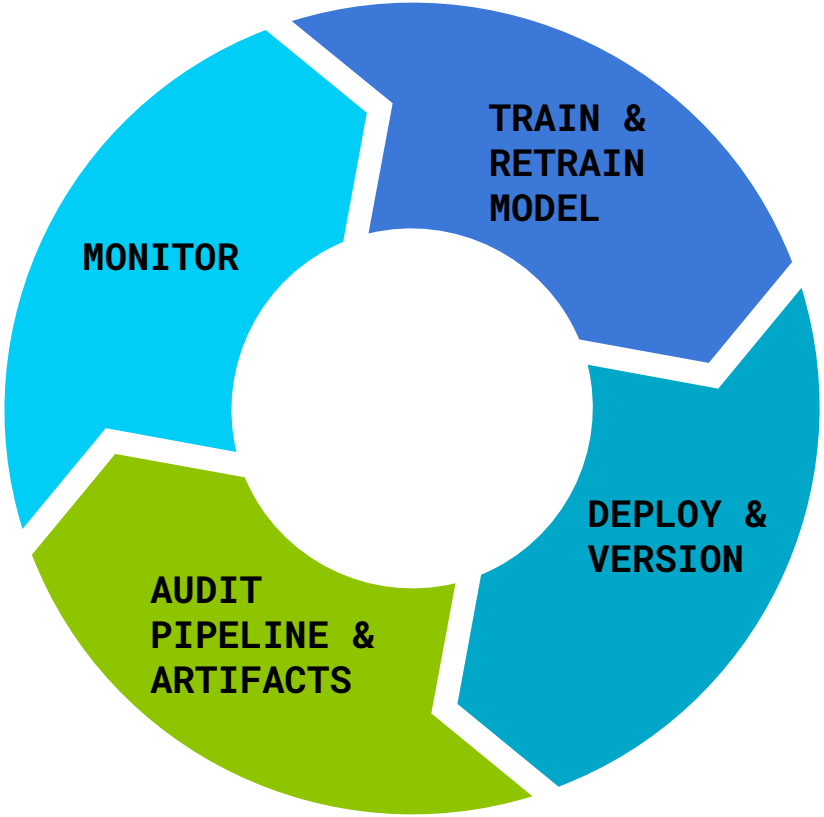
- Machine Learning Operations
  - (similar to DevOps)

Pictured: Performing “ML Operations”...

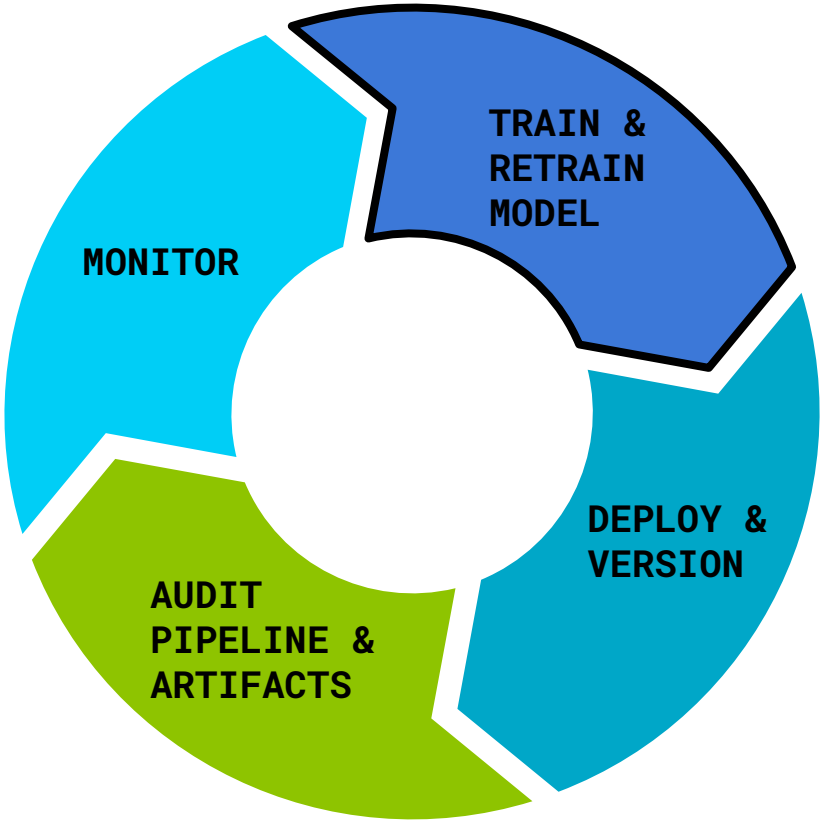
A Solution – MLOps: What is it?

- Machine Learning Operations
  - (similar to DevOps)
- Methods to incorporate the ML lifecycle
  - (move faster into production/usefulness)

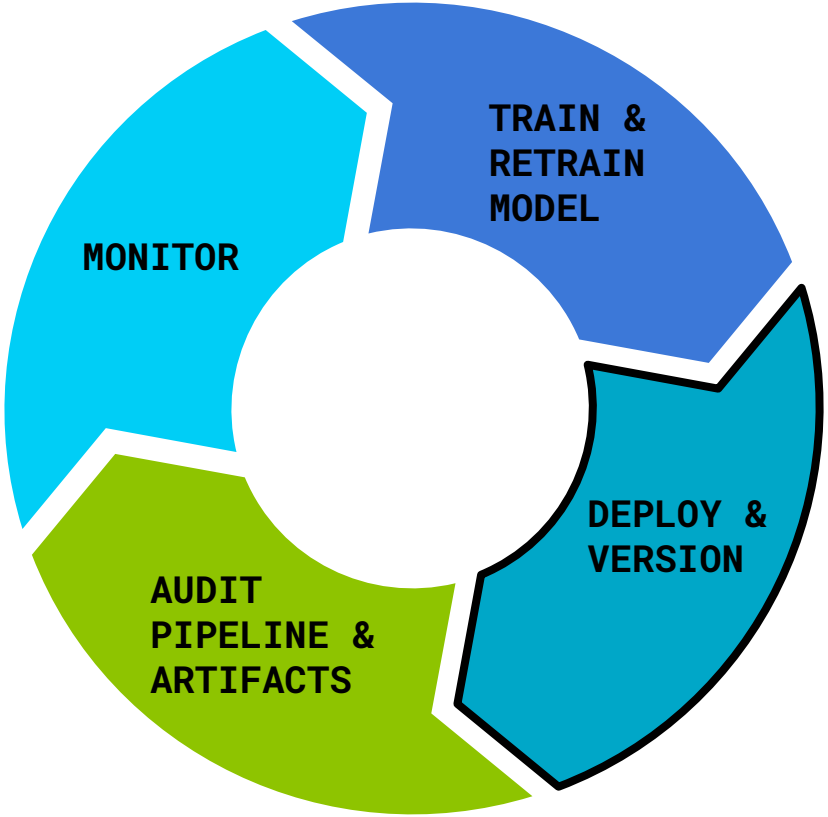
Pictured: Performing “ML Operations”...



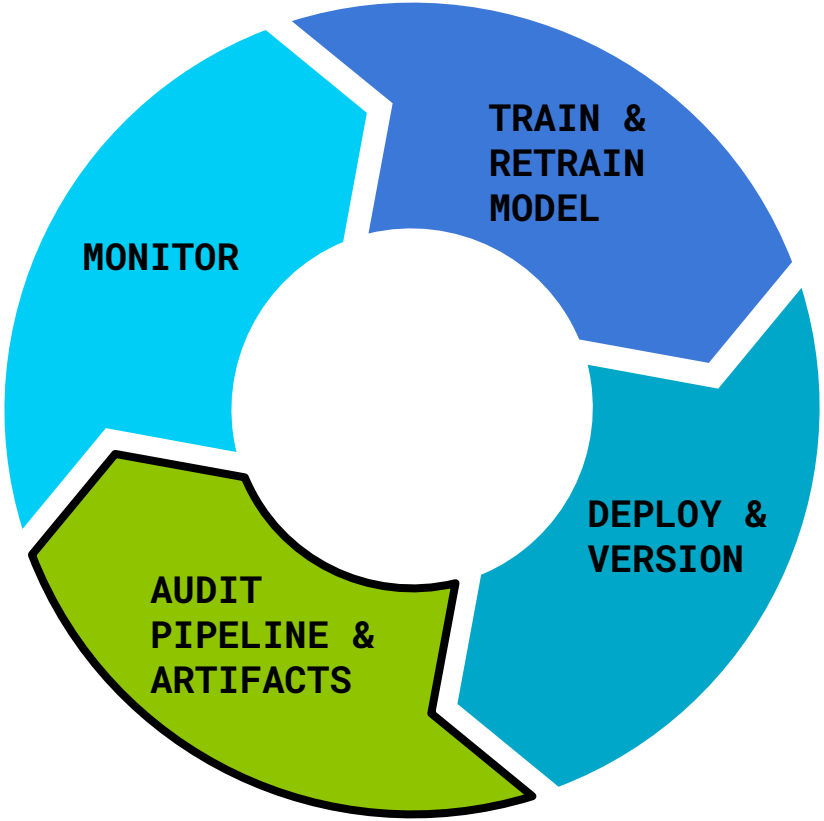
MLOps Feedback Loop



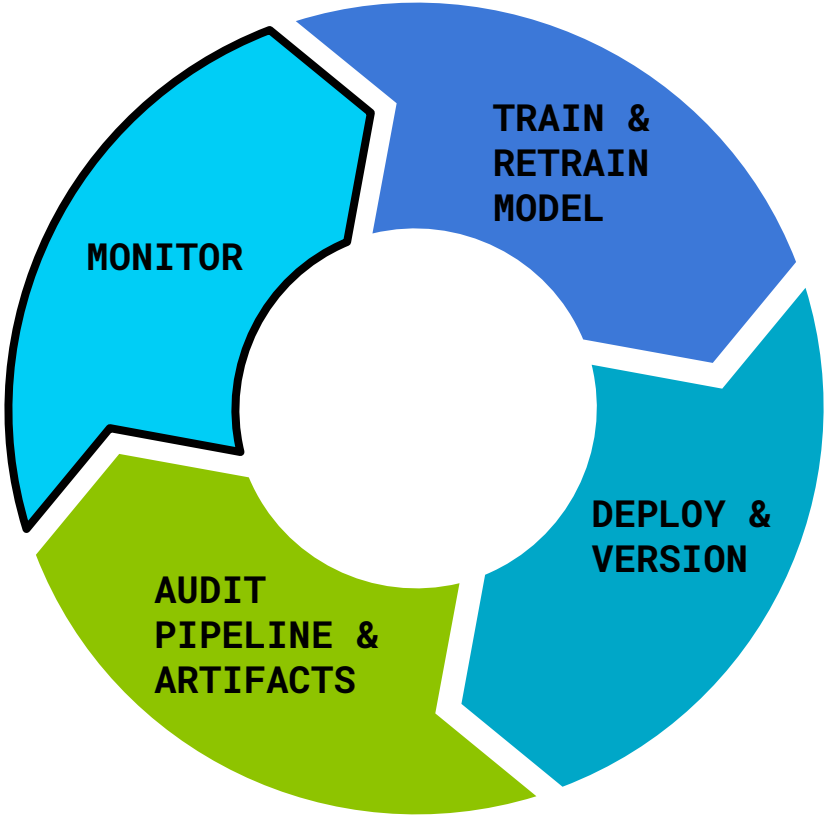
- Data can change
- People can change
- Reusable & automatic pipelines help



- Continuous Delivery (CD)
- Automated steps (infrastructure too!)
- Minimal friction to deploy new models



- Problems in accuracy, bias, & security arise
- Identify where they occur
- Useful for continuous improvement



- Data drift!
- Prevents accuracy issues

Let’s Learn By Doing!

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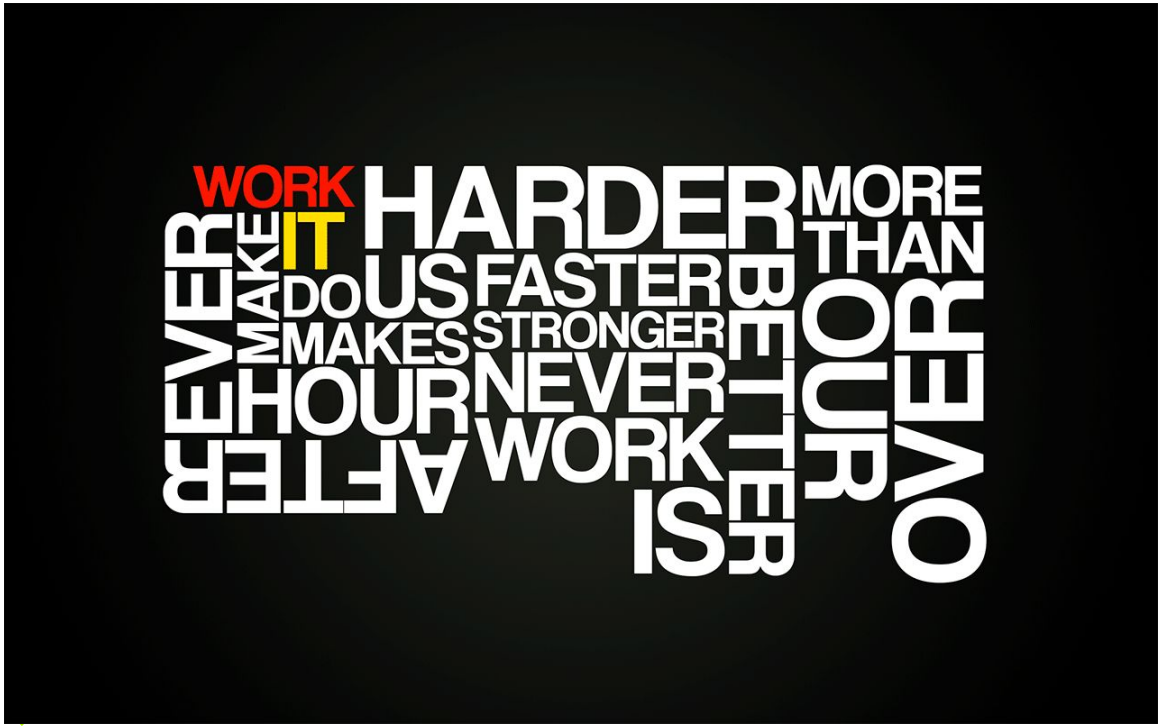
- How do I get data? Difficult?
- Think of CD/ improvement

Continuous Deployment / Continuous Improvement



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- Proof of concept (MVP)
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- Work w/SE? Build our own solution?
  - Cost of maintenance?
- Evaluation, Monitoring, etc.

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- Do we have a “special” use case
  - How flexible is this?
  - How inflexible is it?
  - Issues? Fixes?

Looking for Data

- We'll use this:

[UCI Machine Learning Repository: SMS Spam Collection Data Set]

Simple Model

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- What if a simple solutions *is* the solution?!
    - (Story time)
-

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- Does it have “spammy” words (free, win, etc.)

Checking Out Code!

We'll look at this repo:

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Let's go to a notebook!

Revisit for Modularization

- Focus on separating out the parts

- Allows us to make *different* UI or allow an interface we don’t know (prescribed from other team)

Checking Out Code!

Let’s get modularize!

Back to some code!!

Revisit for UI

I am but a lowly data scientist;

I don't know much about them UI design...

- Victor Geislinger (everyday)

Revisit for UI

- We’ll use Streamlit (Flask-based)

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Revisit for UI

- We'll use Streamlit (Flask-based)
  - It's "so hot"
  - Pretty easy to use with low-learning curve

- Flask might be better to make a simple API
  - Streamlit is arguably prettier and we're doing a presentation. Sooo…

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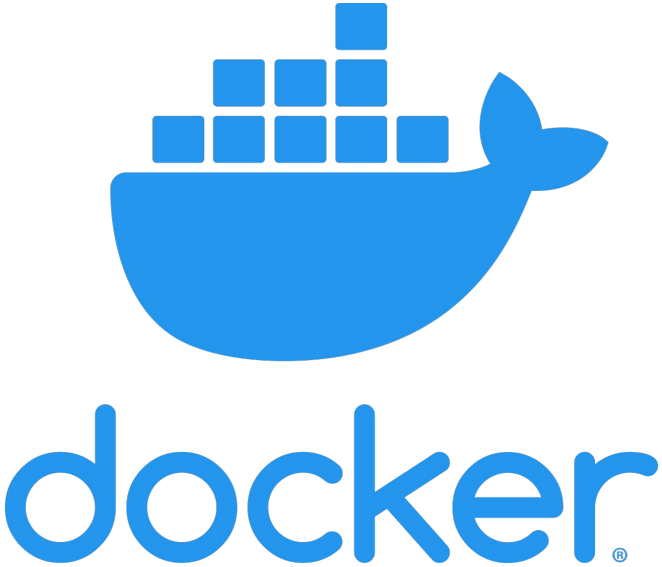
Back to some code!!

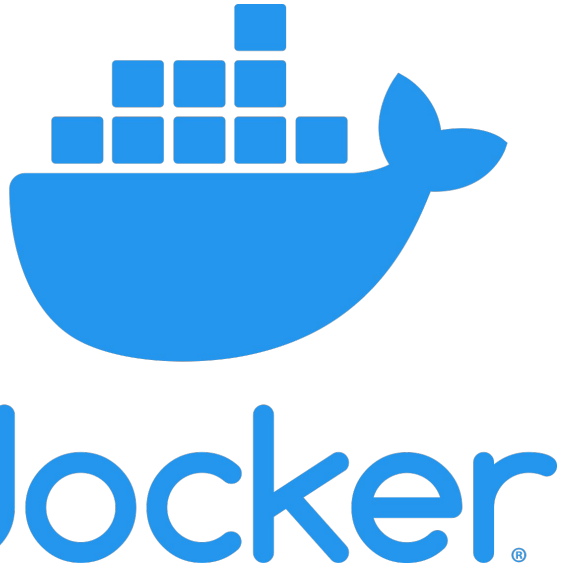
Gotta make it pretty for our stakeholders!

Docker-ize It!



Docker-ize It!

- Allows to “package” up a working environment (called a “container”)
- Makes deploying a lot easier/simpler
- Used a lot by software engineers



Checking Out Code!

Let’s make a Dockerfile and container-ize our code!

Cloud Deployment: Serverless

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- Deploy to the “cloud”

- Past: Manage a server to run our code
- Future: “Serverless”
  - Run code only when needed
  - Easier to implement/rollout versions

Checking Out Code!

We'll use Google Cloud Platform (GCP)

Specifically using "Cloud Run" that uses Docker images

(But there are countless of different methods!)

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  - Can be a “signal”
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- How you update model depends on use case
  - Emergency:
    - Stop everything; rollback to working version
  - Signal new model:
    - auto-rollout
  - Signal drift: investigate

Other Considerations

- Data & Concept Drift
- Monitoring & Logging
- CI / CD
- Tools
    - GitHub Action
    - GCP Vertex AI
    - AWS Sagemaker

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- Learn CLI
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- Learn to modularize your code!
  - Python files, Classes, packages, etc.
- Docker (see above points)
- Cloud - especially serverless!

Further Reading

- Practical MLOps
  - Focus on ideas
- Building Machine Learning Pipelines
  - How to automate model lifecycles
- Data Science at the Command Line
  - Useful way to introduce CLI
  - Free online
- Building Machine Learning Powered Applications
  - More about ideas and some use cases

Other books

- Build a Career in Data Science
- Hands-On ML w/ Scikit-Learn ,.. (2nd Ed).
- Python Data Science Handbook
- Machine Learning Design Patterns

THANKS!

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