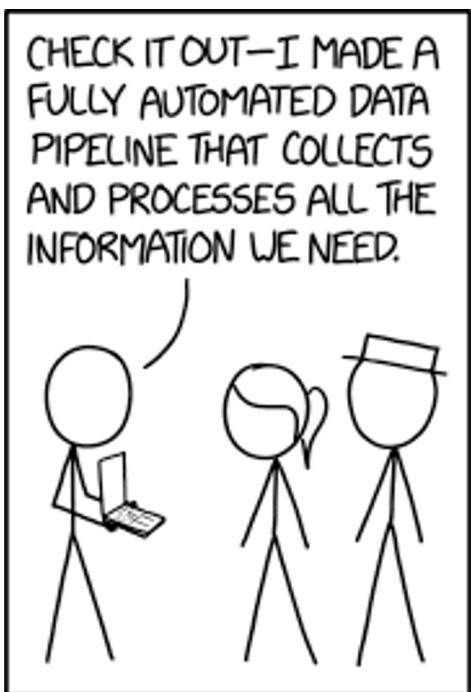


MLOps



Source: <https://xkcd.com/2054/>

“MLOps or ML Ops is a set of practices that aims to deploy and maintain machine learning models in production reliably and efficiently.”

- Wikipedia

What constitutes MLOps?

- Business Uses
 - Thinking about the product - problem, solution and iterations
- Data and governance
 - Building the models - data labeling, preprocessing, exploration, augmentation
 - Regulatory rules

What constitutes MLOps?

- Data Modeling
 - Setting up baselines, and evaluation metrics
 - Experiment tracking
 - Optimisation

Experiment Tracking

Saving all experiment related information that you care about for every experiment you run, for reproducibility, comparison and documentation.

Diabetes progression predictions

Experiment ID: 1 Artifact Location: /home/kass/Projects/mlruns/1

Search Runs: metrics.rmse < 1 and params.model = "tree" State: Active Search

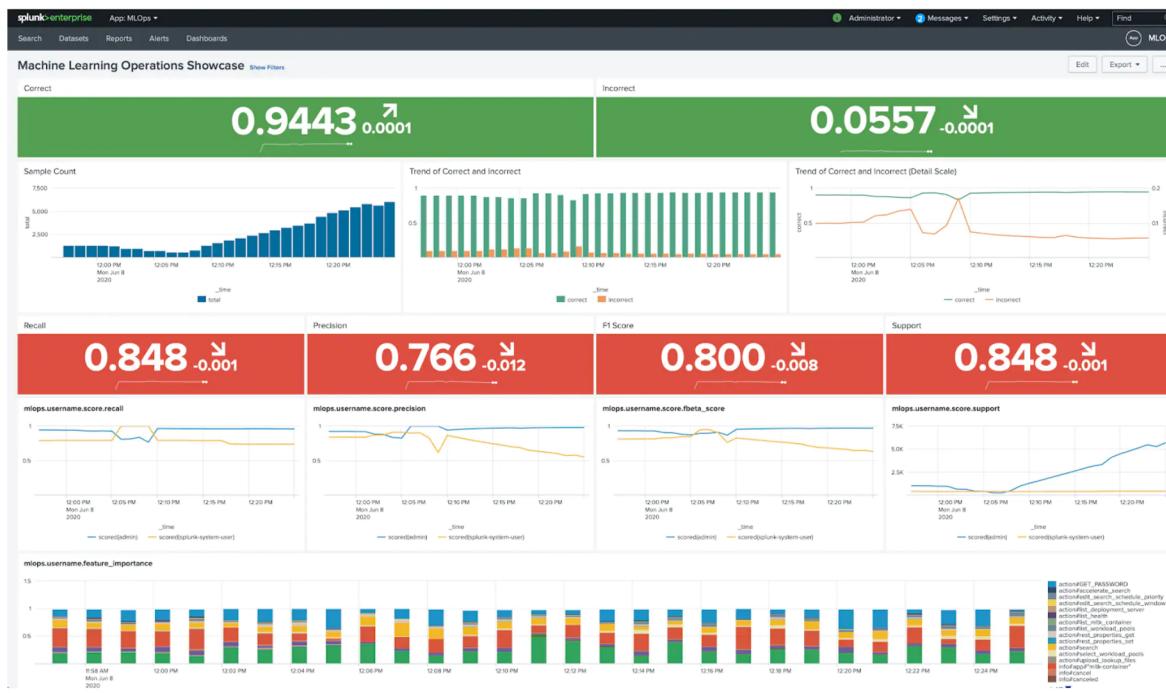
Filter Params: alpha, lr Filter Metrics: rmse, r2 Clear

12 matching runs Compare Delete Download CSV

Date	User	Run Name	Source	Version	Parameters		Metrics		
					alpha	l1_ratio	mae	r2	rmse
2018-12-14 12:59:02	kass	train_diabetes.py	36cfce	0.07	0.3	66.44	0.063	78.73	
2018-12-14 12:58:55	kass	train_diabetes.py	36cfce	0.05	0.3	65.39	0.091	77.55	
2018-12-14 12:58:50	kass	train_diabetes.py	36cfce	0.05	0.2	65.81	0.079	78.03	
2018-12-14 12:58:45	kass	train_diabetes.py	36cfce	0.04	0.2	65.08	0.099	77.17	
2018-12-14 12:58:39	kass	train_diabetes.py	36cfce	0.03	0.2	64.07	0.128	75.93	
2018-12-14 12:58:34	kass	train_diabetes.py	36cfce	0.02	0.2	62.37	0.173	73.95	
2018-12-14 12:57:36	kass	train_diabetes.py	36cfce	0.05	0.9	56.97	0.296	68.23	
2018-12-14 12:57:31	kass	train_diabetes.py	36cfce	0.05	0.8	60.33	0.223	71.69	
2018-12-14 12:57:26	kass	train_diabetes.py	36cfce	0.05	0.7	62.2	0.177	73.77	
2018-12-14 12:57:21	kass	train_diabetes.py	36cfce	0.05	0.5	64.28	0.122	76.18	
2018-12-14 12:56:41	kass	train_diabetes.py	36cfce	0.03	0.4	62.93	0.159	74.58	
2018-12-14 12:53:42	kass	train_diabetes.py	36cfce	0.06	0.6	64.16	0.126	76.04	

What constitutes MLOps?

- Project Organization and Management
 - Packaging, Logging, Styling



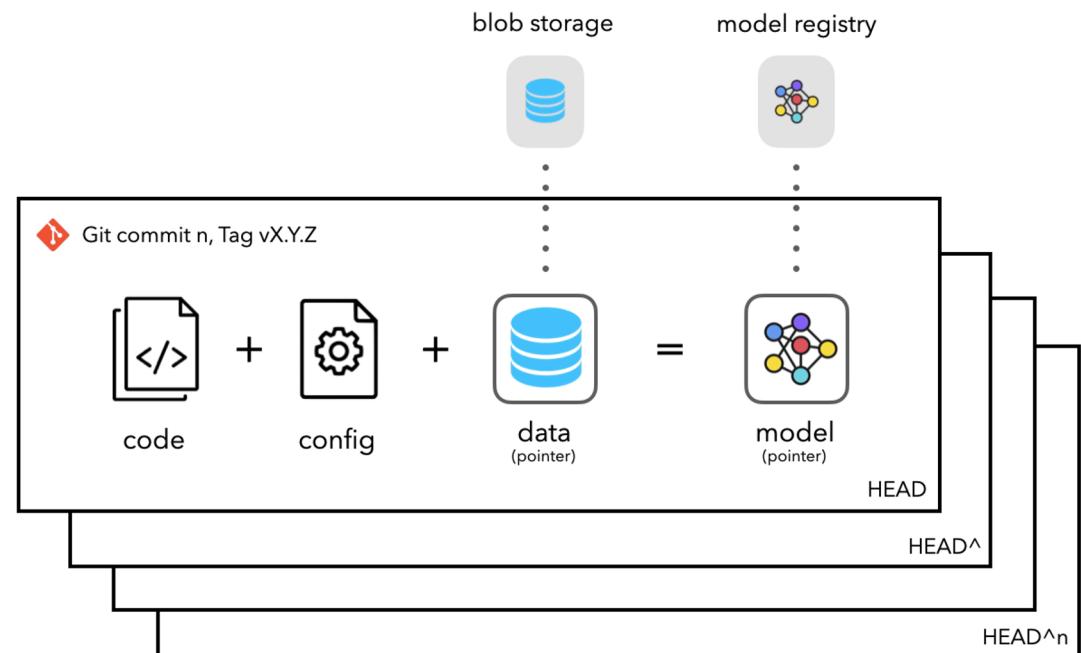
Source:
www.splunk.com

What constitutes MLOps?

- Testing
 - Code, Data, Models
- Reproducibility
 - Git
 - Versioning
 - Docker

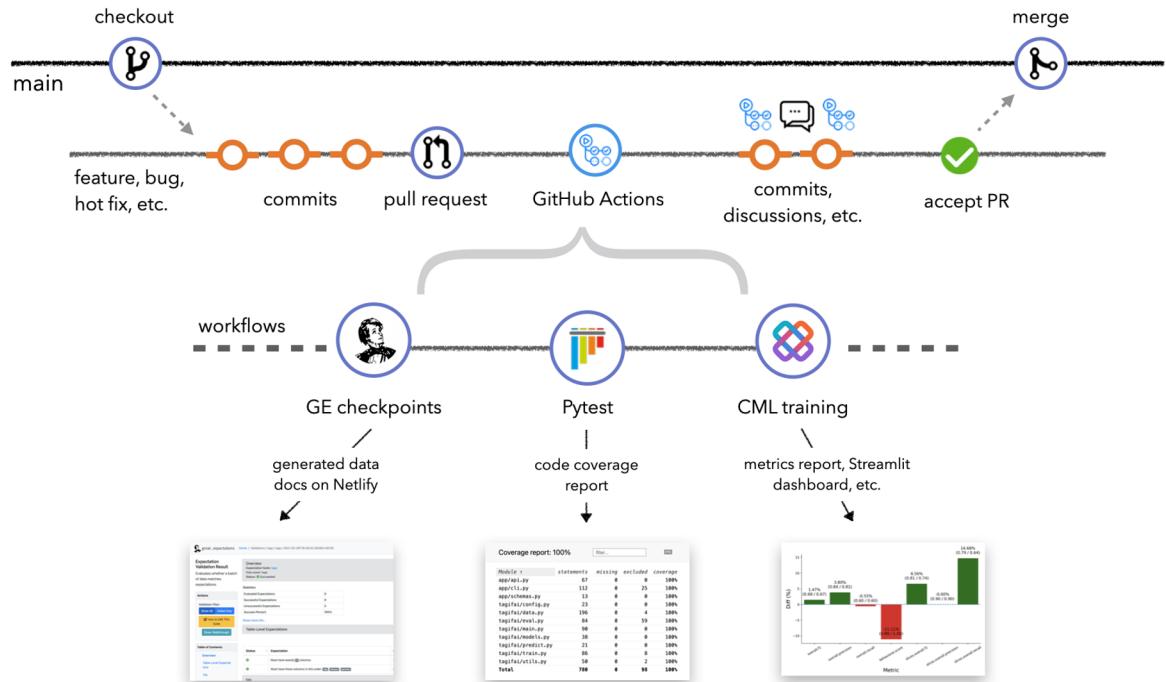
Versioning

- Code versioning
- Data Versioning
 - [DVC](#)
- Model Versioning



What Constitutes MLOps?

- Production
 - CI/CD
 - Infrastructure
 - Monitoring



CI/CD

 All checks have passed

2 successful checks

  documentation / build-docs (pull_request) Successful in 2m [Details](#)

  testing / test-code (pull_request) Successful in 3m [Details](#)

 This branch has no conflicts with the base branch
Merging can be performed automatically.

[Merge pull request](#) ▾ You can also [open this in GitHub Desktop](#) or view [command line instructions](#).

GitHub Actions - Enabling CI

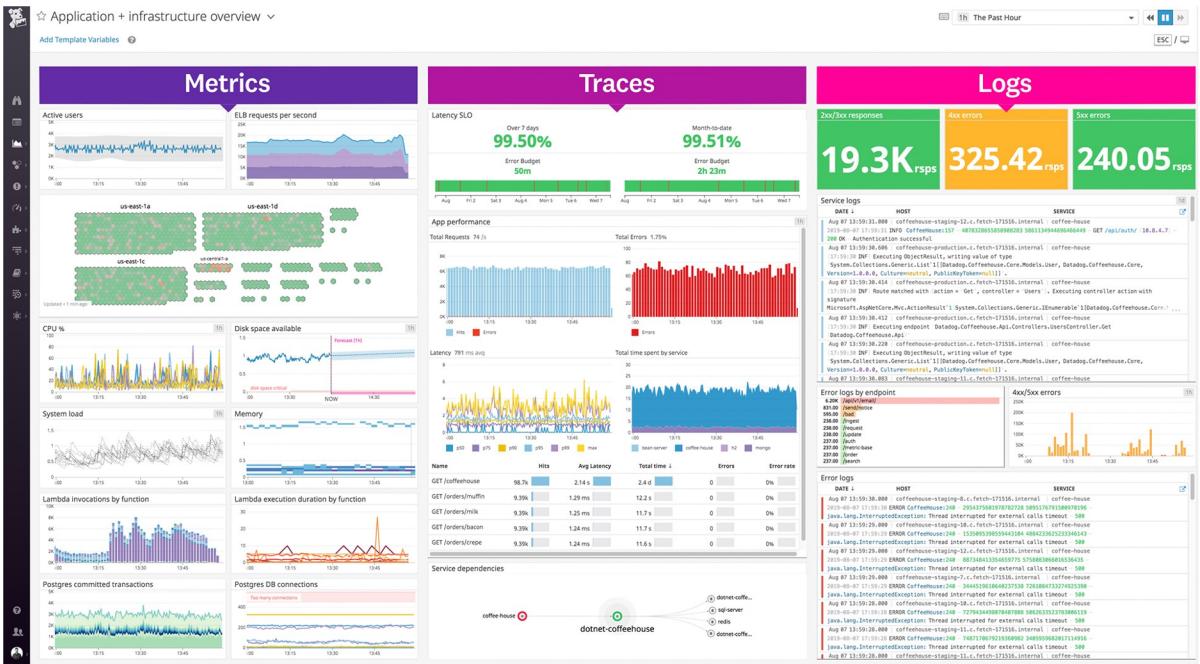
Infrastructure

- Serving
 - Batch Serving
 - Real time Serving
 - Online/Offline learning



Monitoring

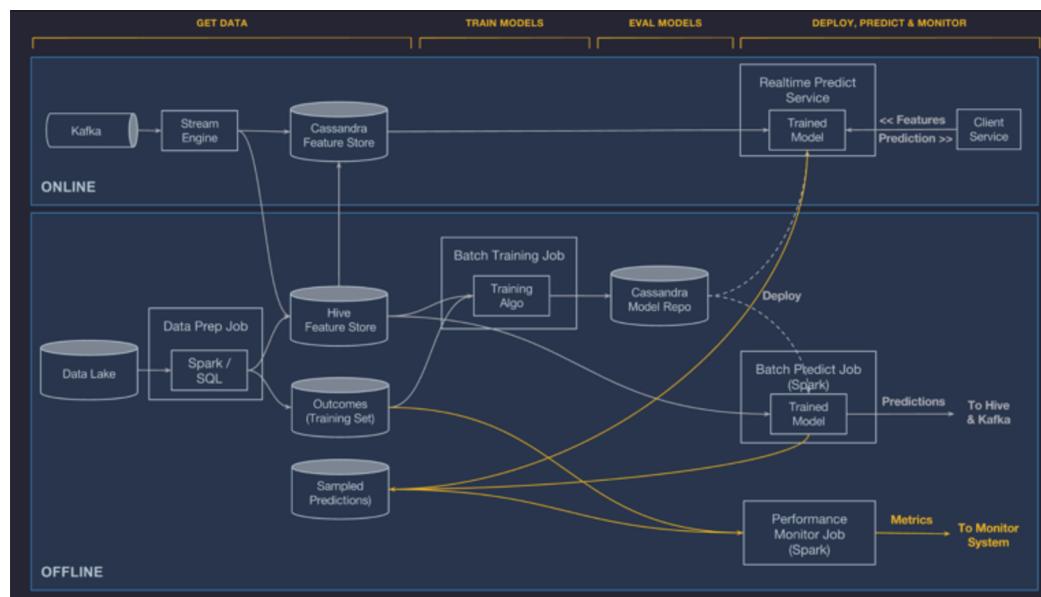
- Performance Monitoring
- Data Monitoring



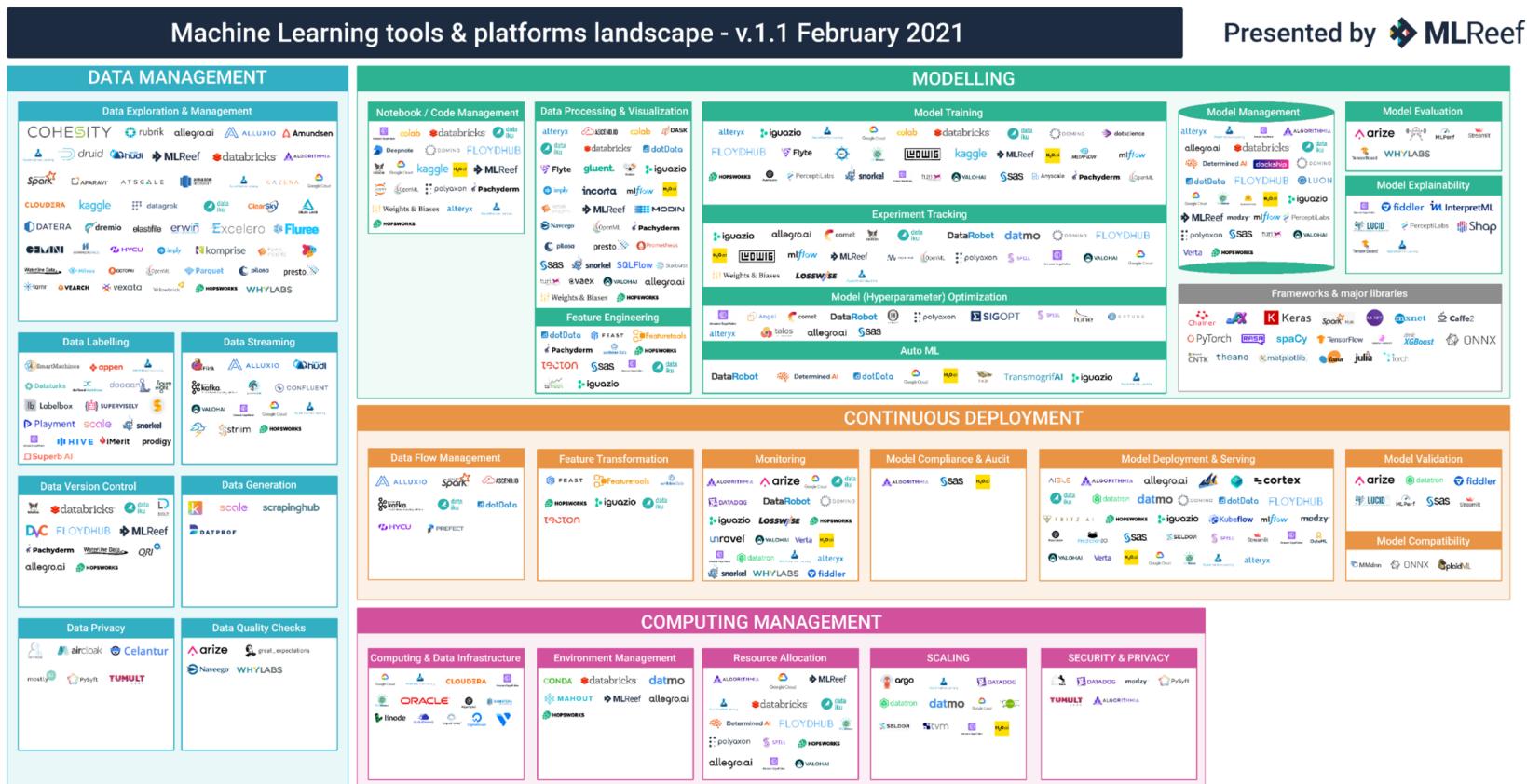
Datadog

How do companies ensure that these practises are followed?

- Michelangelo
 - Solving problems at Uber



Where do I start?



Source: <https://about.mlreef.com/blog/global-mlops-and-ml-tools-landscape/>

Where do I start?

- <https://madewithml.com/>
- <https://ml-ops.org/>
- <https://huyenchip.com/mlops/>