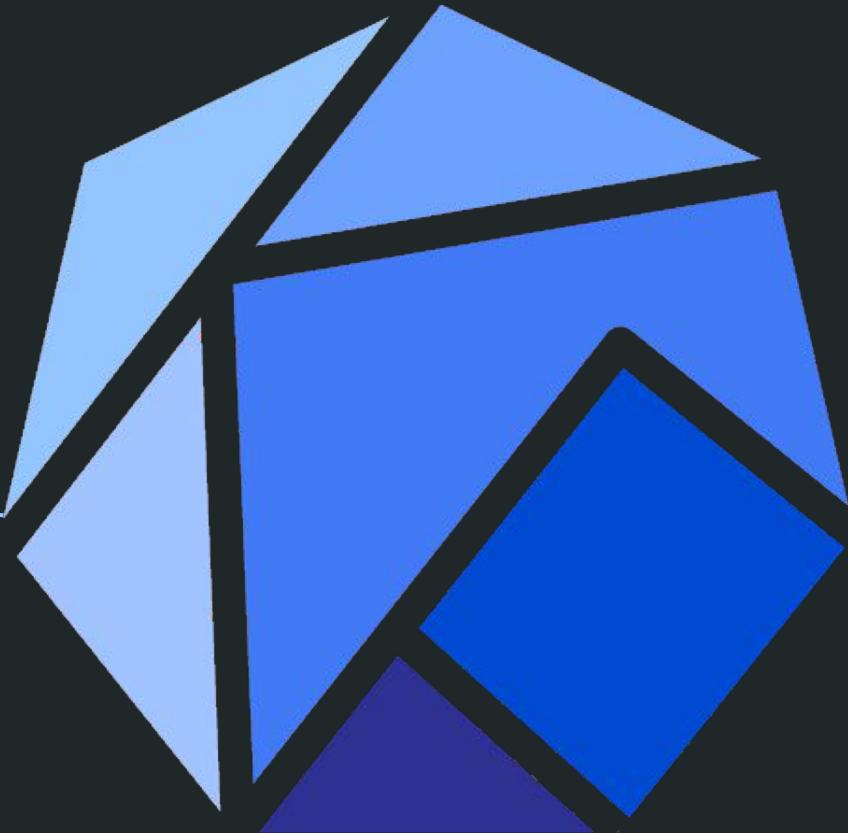


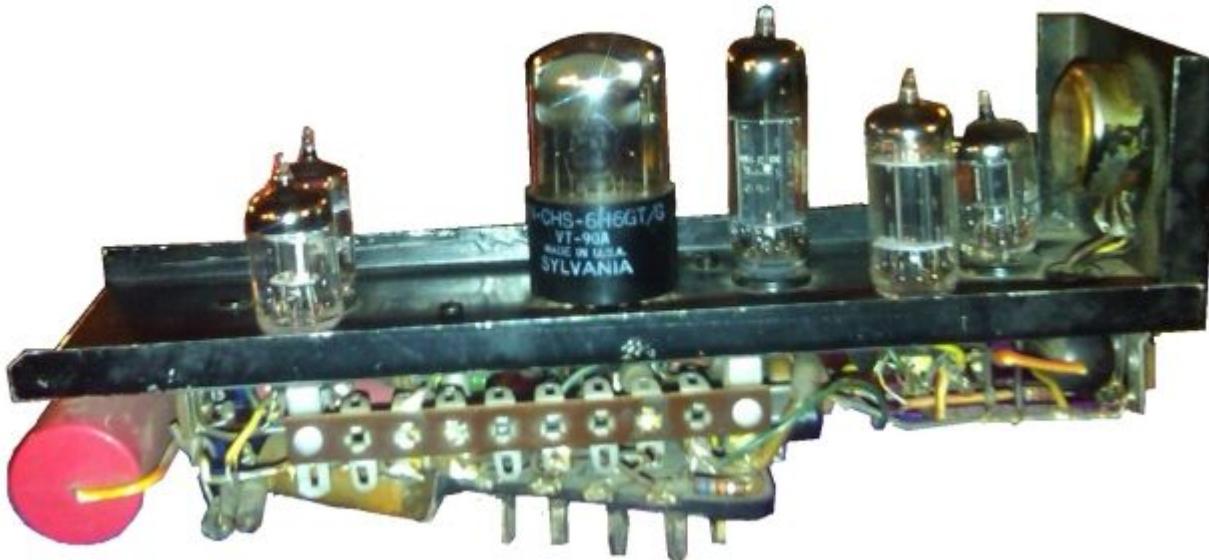
CNCF Webinar

Taming Your AI/ML Workloads with Kubeflow

The Journey to Version 1.0

David Aronchick (Microsoft) - @aronchick
Elvira Dzhuraeva (Cisco) - @elvirafortune
Johnu George (Cisco) - @johnugeorge

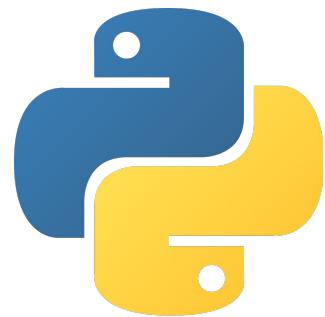




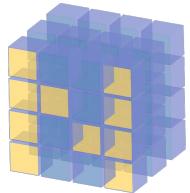
SNARC Maze Solver
Minsky / Edmonds
(1951)



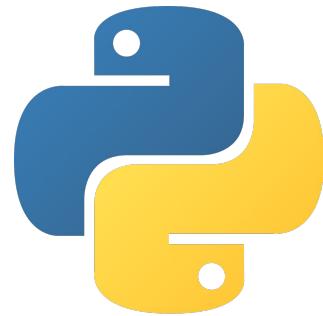
2000



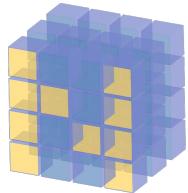
2006



NumPy

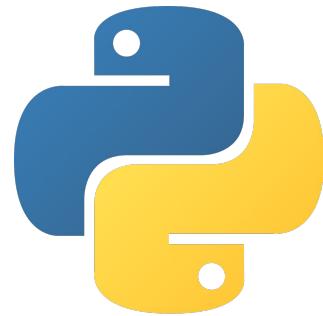


2007

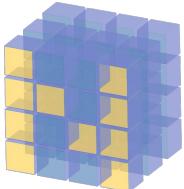


NumPy

theano

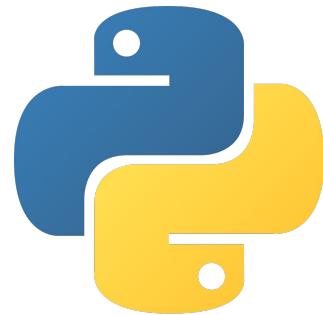


2008



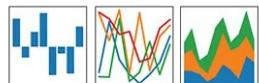
NumPy

theano

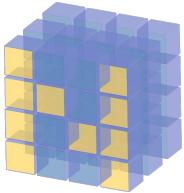


pandas

$$y_{it} = \beta' x_{it} + \mu_i + \epsilon_{it}$$

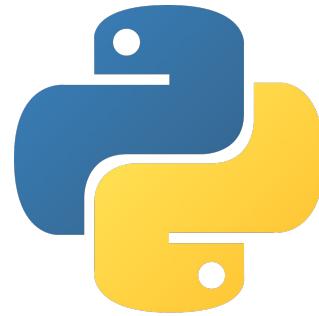


2010



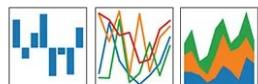
NumPy

theano

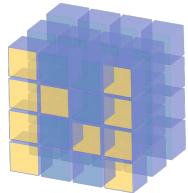


pandas

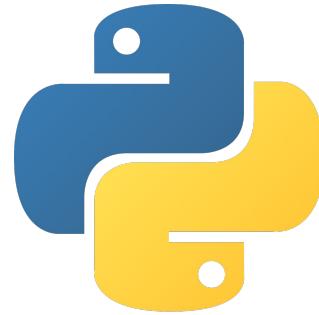
$$y_{it} = \beta' x_{it} + \mu_i + \epsilon_{it}$$



2013



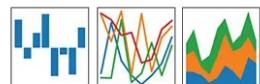
NumPy



theano

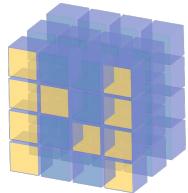
pandas

$$y_{it} = \beta' x_{it} + \mu_i + \epsilon_{it}$$



Caffe

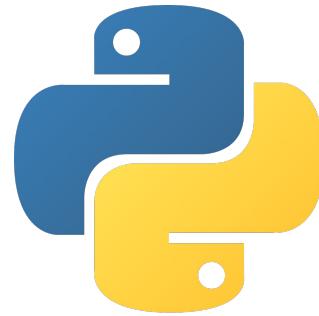
2014



NumPy

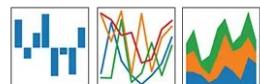


theano



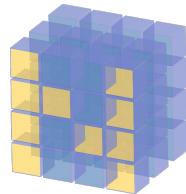
pandas

$$y_{it} = \beta' x_{it} + \mu_i + \epsilon_{it}$$



Caffe

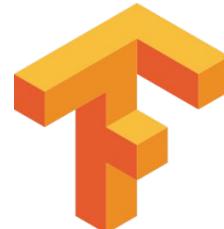
2015



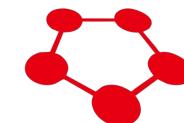
NumPy



DL4J



theano



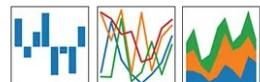
Chainer

K Keras



pandas

$$y_{it} = \beta' x_{it} + \mu_i + \epsilon_{it}$$

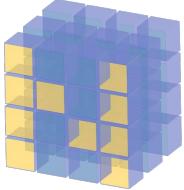


APACHE
mxnet™



Caffe

Today



NumPy

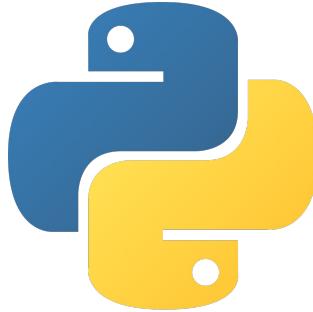


Caffe2

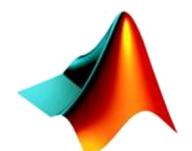
theano



K Keras



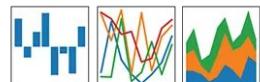
Chainer



MATLAB®

pandas

$$y_{it} = \beta' x_{it} + \mu_i + \epsilon_{it}$$



APACHE
mxnet™

R

Microsoft
CNTK

Caffe

One More ML Solution



One More ML
Solution???





ginablaber

@ginablaber

Follow



The story of enterprise Machine Learning: “It took me 3 weeks to develop the model. It’s been >11 months, and it’s still not deployed.”

@DineshNirmalIBM #StrataData #strataconf

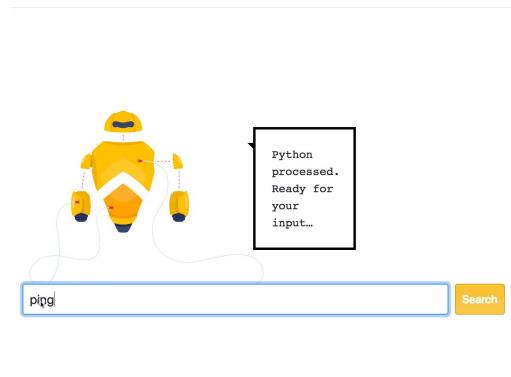
10:19 AM - 7 Mar 2018

GitHub Natural Language Search

Prototype MVP With Demo In Jupyter Notebook: **2 Weeks**



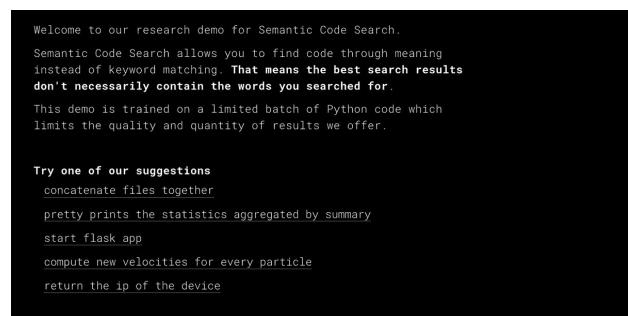
Demo with front-end mockup with blog post: **+3 Days**



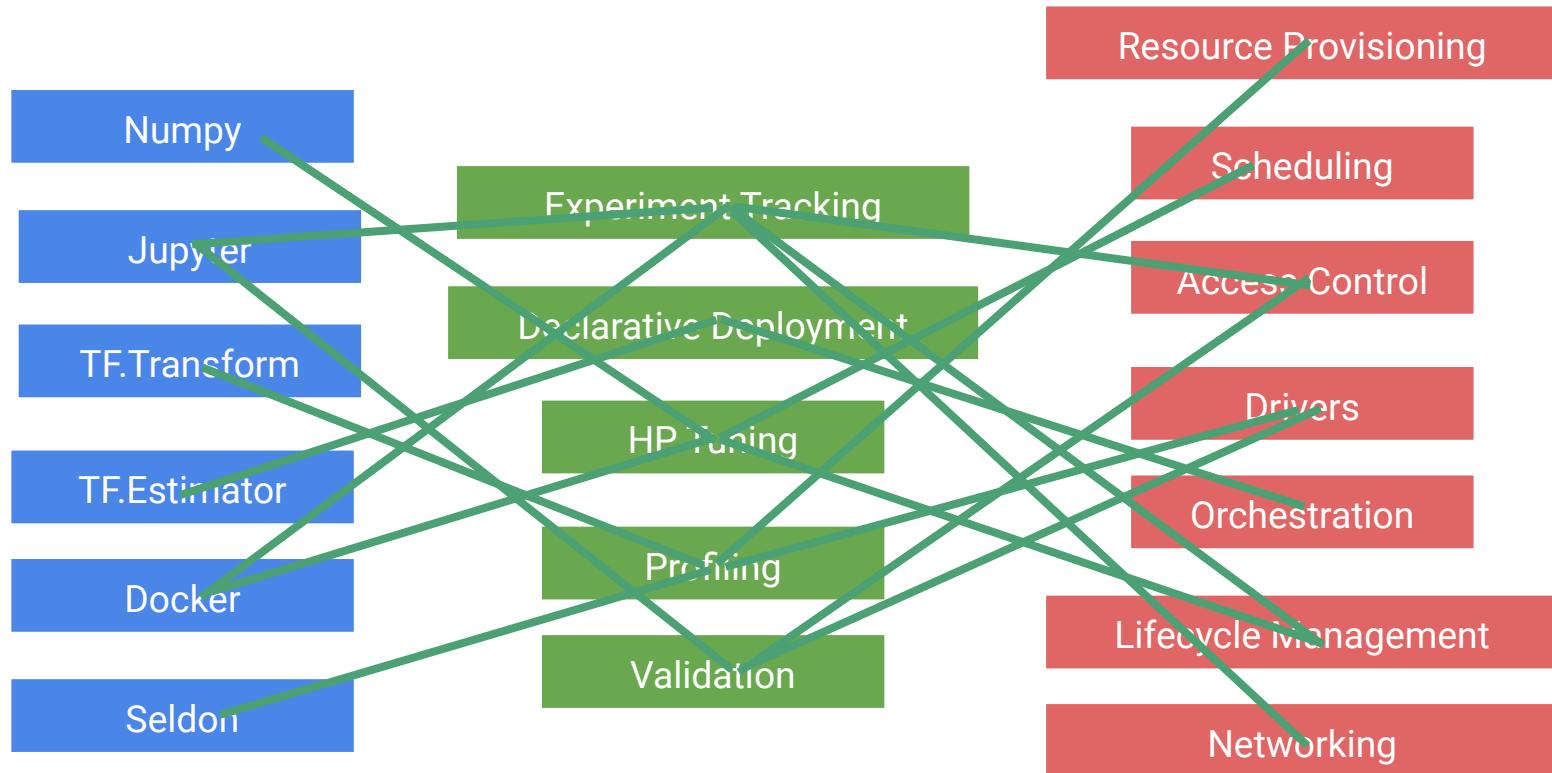
https://github.com/hamelsmu/code_search

<https://towardsdatascience.com/semantic-code-search-3cd6d244a39c>

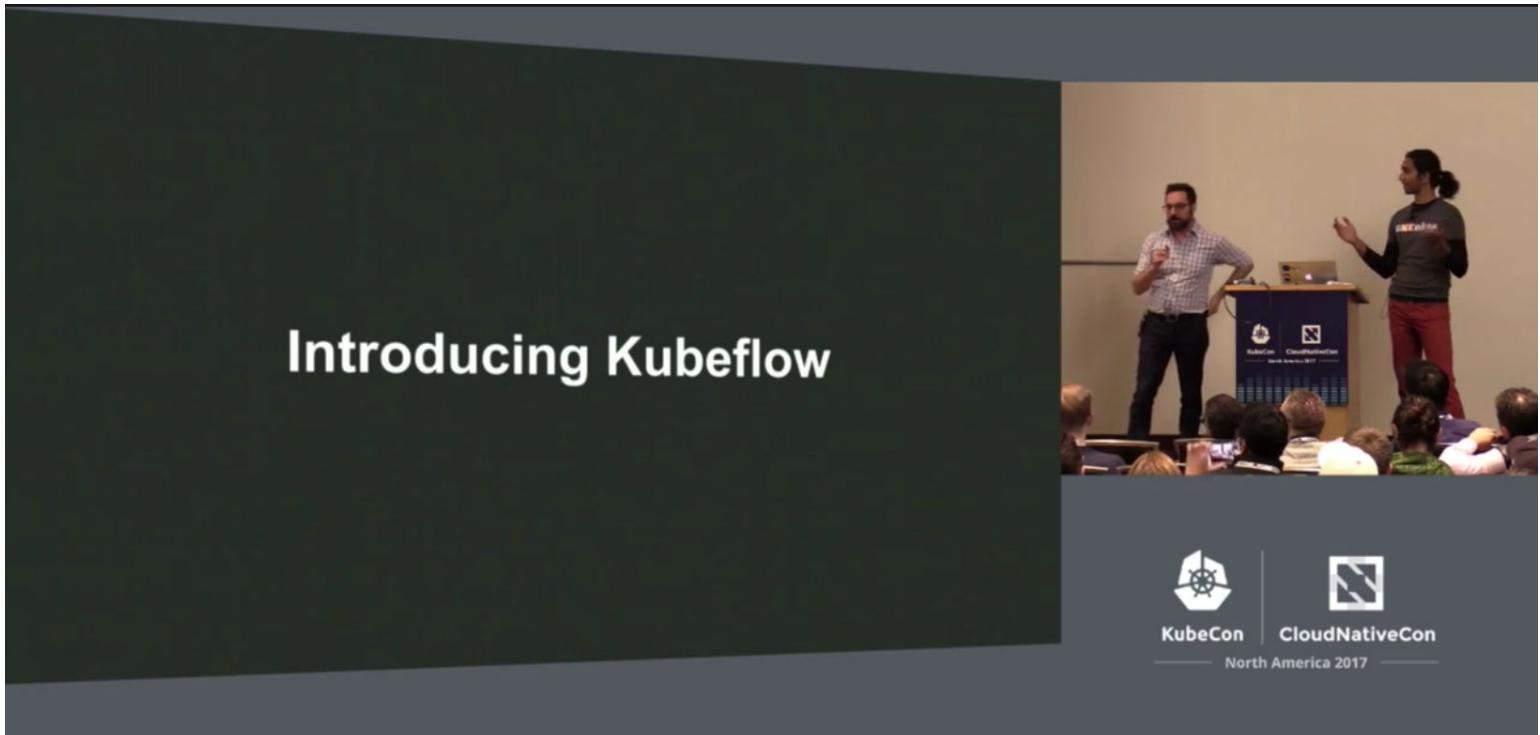
Experiments.Github.Com: **+3 Months**

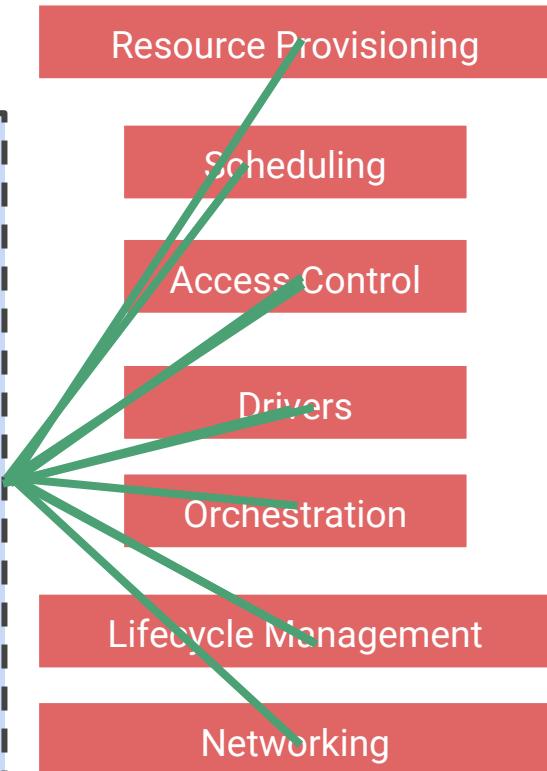
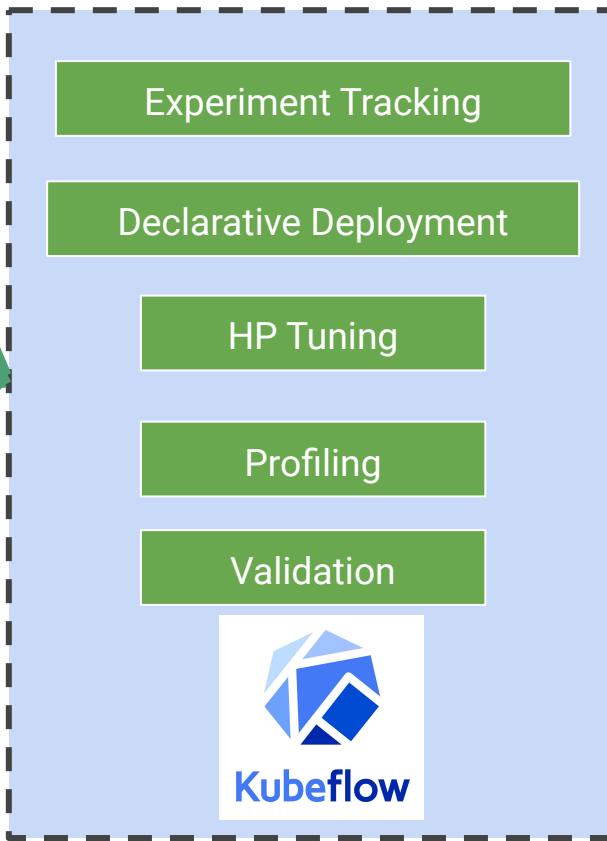


<https://experiments.github.com/>



KubeCon 2017





Mission (2017)

**Make it Easy for Everyone
to Develop, Deploy and Manage
Portable, Distributed ML
on Kubernetes**



Kubeflow 2018

11

Kubecon 2017

Introducing Kubeflow

Rachel Silver

M Michal Jastrzębski

Holden Karau

Edd Wilder-James

1:13 / 22:20

CC

Mission (2018)

**Make it Easy for Everyone
to Develop, Deploy and Manage
Portable, Distributed ML
on Kubernetes**



Kubeflow 2019

Kubeflow Contributor Summit 2018

Kubecon 2017



Mission (2019)

**Make it Easy for Everyone
to Develop, Deploy and Manage
Portable, Distributed ML
on Kubernetes**



Mission (2020)

**Make it Easy for Everyone
to Develop, Deploy and Manage
Portable, Distributed ML
on Kubernetes**



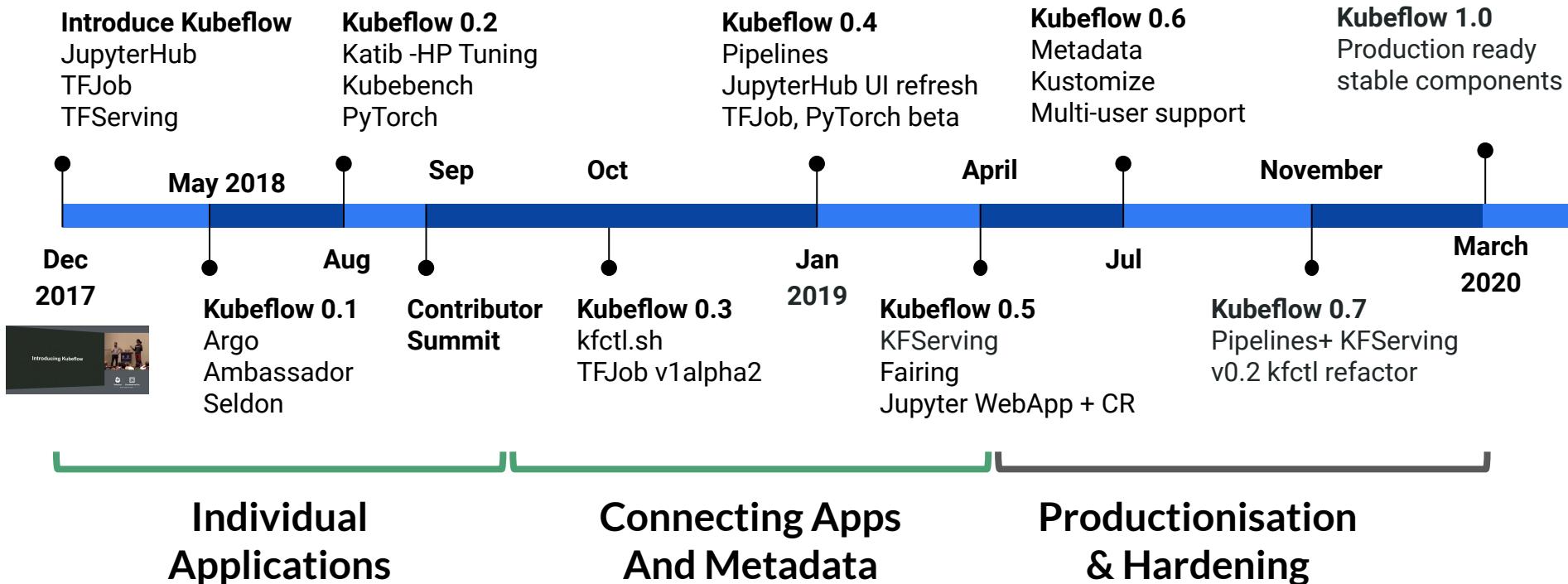
Why Kubeflow?

- **Declarative** - Repeatable, cloud-native deployments that work anywhere Kubernetes can be deployed
- **Abstracted** - Data scientists and ML engineers can spin up complicated deployments without knowing anything about infrastructure (ideally)
- **Scalable** - Complicated workflows and distributed machine learning shouldn't be hard!

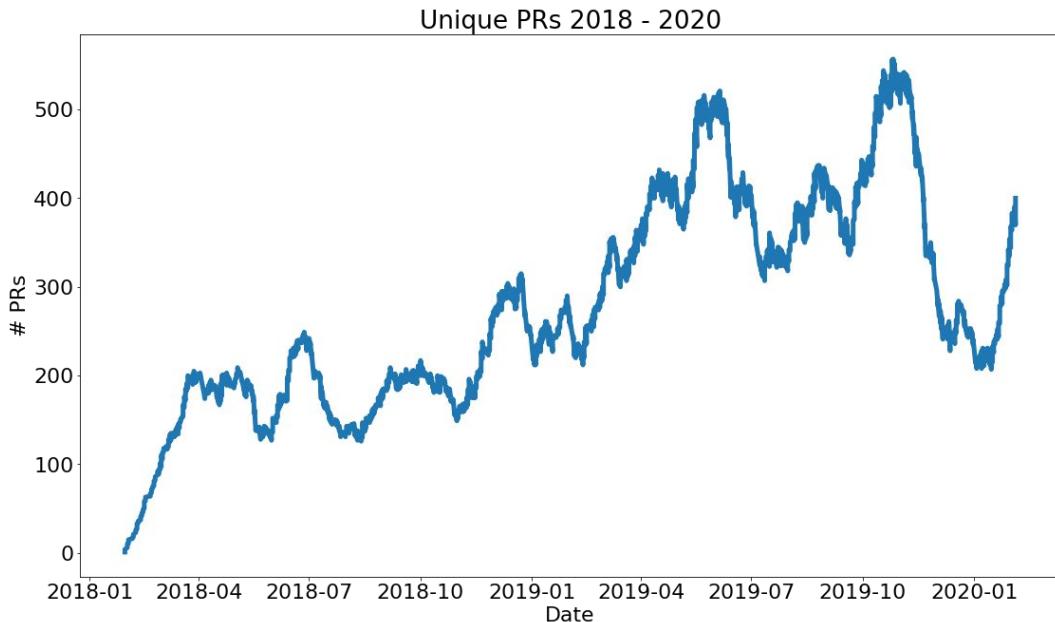
Machine Learning Without the Letter ‘K!’



From Single Apps to Complete Platform



Momentum!



- 9500+ commits
- 300+ Community contributors
- 30+ Companies contributing, including:



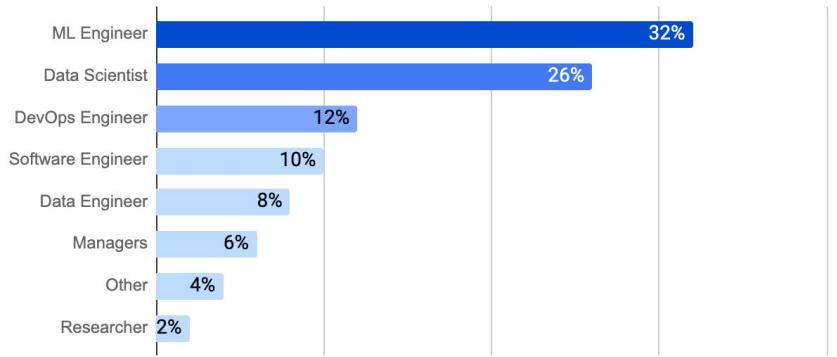
Community Contributions



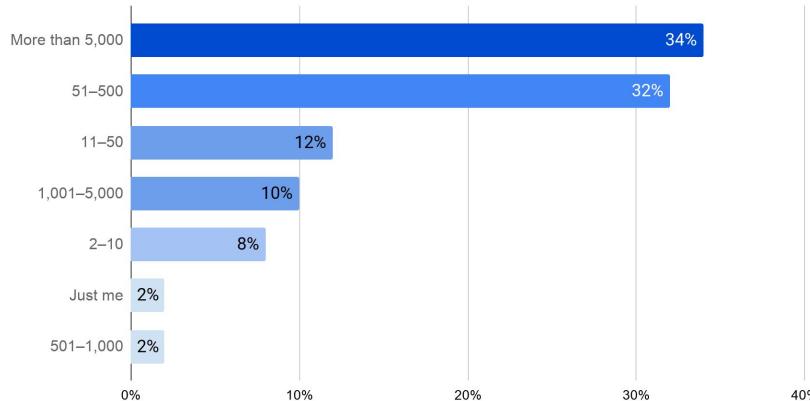
Kubeflow 1.0

Kubeflow Survey Results

User type



Organization type



Infrastructure type



Deploy on Cloud and On-premises!

Getting Started with ML on Kubernetes

Kubernetes is an amazing platform for leveraging infrastructure (whether on public cloud or on-premises), but deploying Kubernetes optimized for ML and integrated with your cloud is no easy task. With 1.0 we are providing a CLI and configuration files so you can deploy Kubeflow with one command:

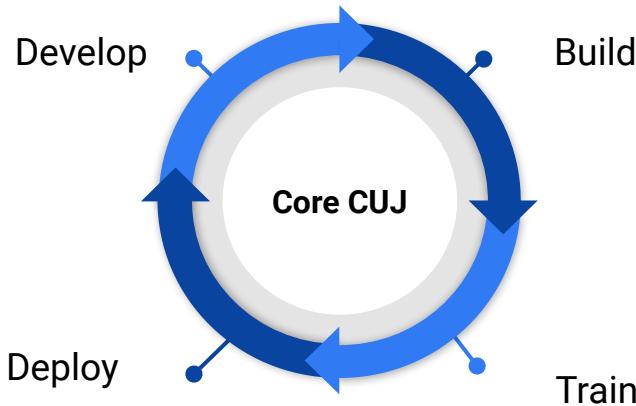
```
kfctl apply -f kfctl_qcp_iap.v1.0.0.yaml  
  
kfctl apply -f kfctl_k8s_istio.v1.0.0.yaml  
  
kfctl apply -f kfctl_aws_cognito.v1.0.0.yaml  
  
kfctl apply -f kfctl_ibm.v1.0.0.yaml
```

1.0 deployment available for

- AKS
- AWS
- GCP
- IBM Cloud
- Cisco UCS

Kubernetes v1.15 or later

Kubeflow 1.0



Read more in Kubeflow's [versioning policies](#) and [application requirements](#) for graduation.

Stable components

Central Dashboard

Training Operators

Jupyter Notebooks

Profile Controller

kfctl

Beta components

Serving

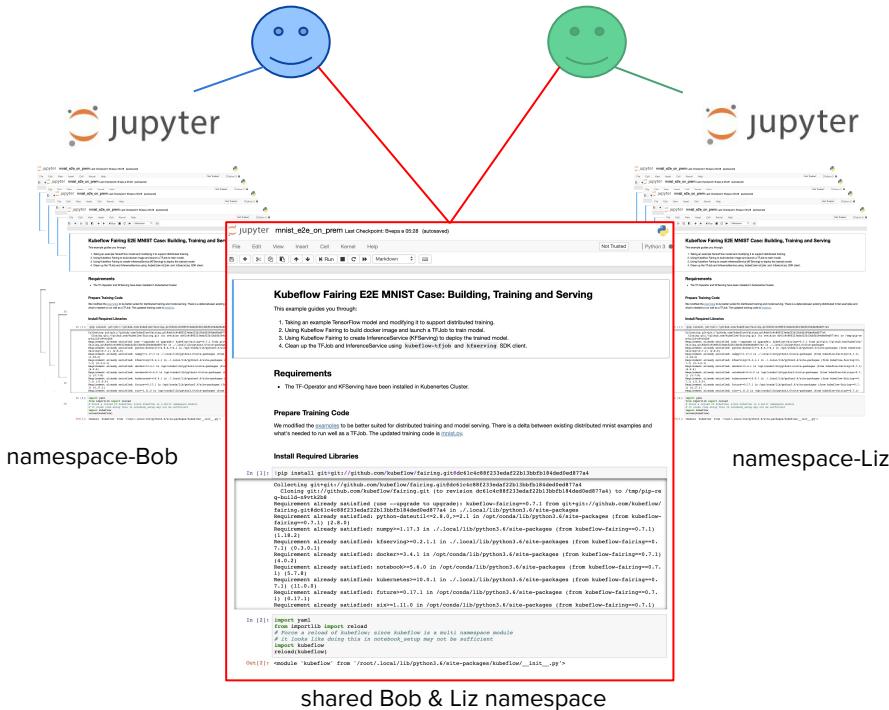
Pipelines

Katib - HP tuning

Workflow Building
Fairing

Metadata

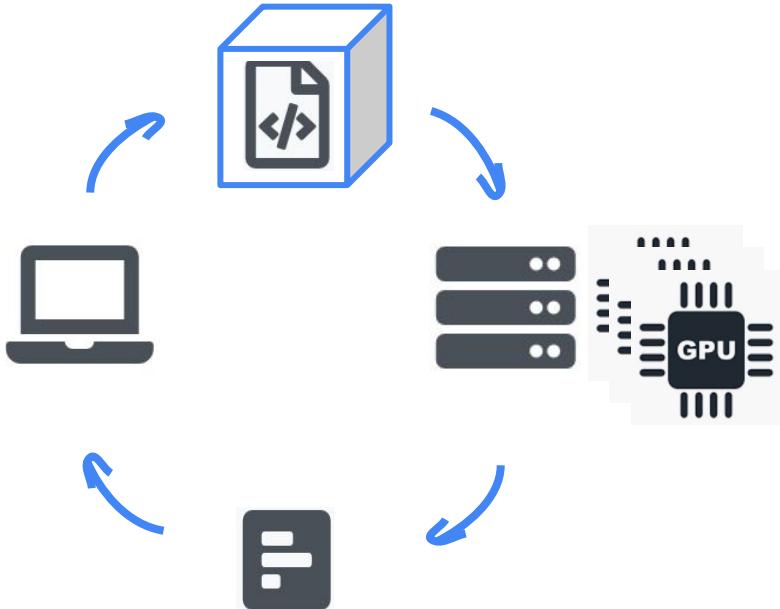
Develop (Jupyter Notebook & Profile Controller)



The screenshot shows the Kubeflow UI interface. On the left, there's a sidebar with links for Home, Pipelines, Notebook Servers, Katib, and Artifact Store. The main area is titled "Notebook Servers" and lists two entries:

Status	Name	Age	Image
✓	demo-notebook-server	4 days ago	pipeline
✓	mnist-demo	1 day ago	tensorflow

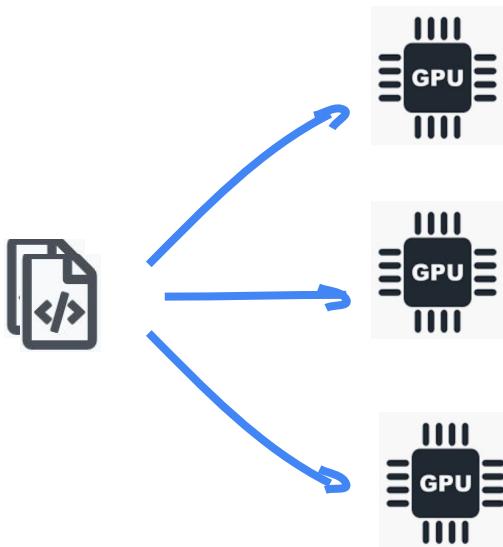
Build



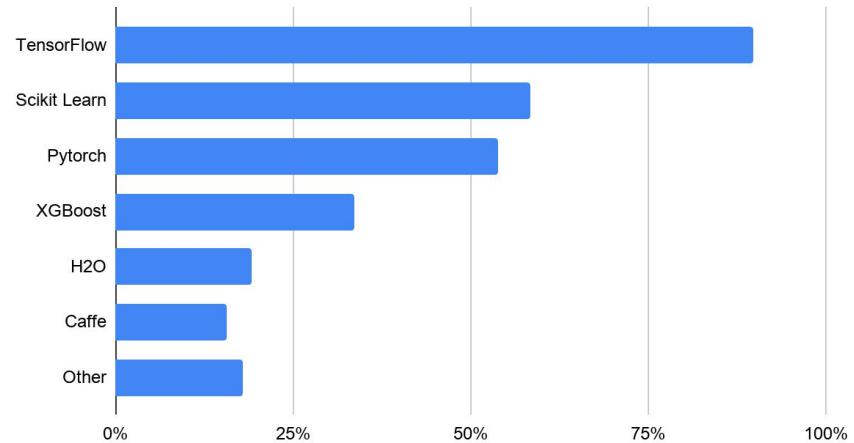
```
from kubeflow.fairing import TrainJob
train_job = TrainJob(BlerssiServe, input_files=["iBeacon_RSSI_Labeled.csv", "requirements.txt"],
                     docker_registry=DOCKER_REGISTRY,
                     backend=BackendClass(build_context_source=BuildContext))

train_job.submit()
3.6.5
INFO[0002] Resolved base name registry.hub.docker.com/library/python:3.6.5 to registry.hub.docker.com/library/python:3.6.5
ERROR: logging before flag.Parse: E0401 18:23:16.024731      1 metadata.go:142] while reading 'adata: http status code: 404 while fetching url http://metadata.google.internal./computeMetadata/es/google-dockercfg
ERROR: logging before flag.Parse: E0401 18:23:16.029171      1 metadata.go:159] while reading 'metadata: http status code: 404 while fetching url http://metadata.google.internal./computeMetadata/butes/google-dockercfg-url
INFO[0006] Error while retrieving image from cache: getting file info: stat /cache/sha256:bf5470ab0fb0a4d5c4f3e9f3624fd4950b54cf6549: no such file or directory
INFO[0006] Downloading base image registry.hub.docker.com/library/python:3.6.5
INFO[0009] Built cross stage deps: map[]
INFO[0009] Downloading base image registry.hub.docker.com/library/python:3.6.5
INFO[0011] Error while retrieving image from cache: getting file info: stat /cache/sha256:bf5470ab0fb0a4d5c4f3e9f3624fd4950b54cf6549: no such file or directory
INFO[0011] Downloading base image registry.hub.docker.com/library/python:3.6.5
INFO[0013] Executing 0 build triggers
INFO[0013] Using files from context: [/kaniko/buildcontext/app/requirements.txt]
```

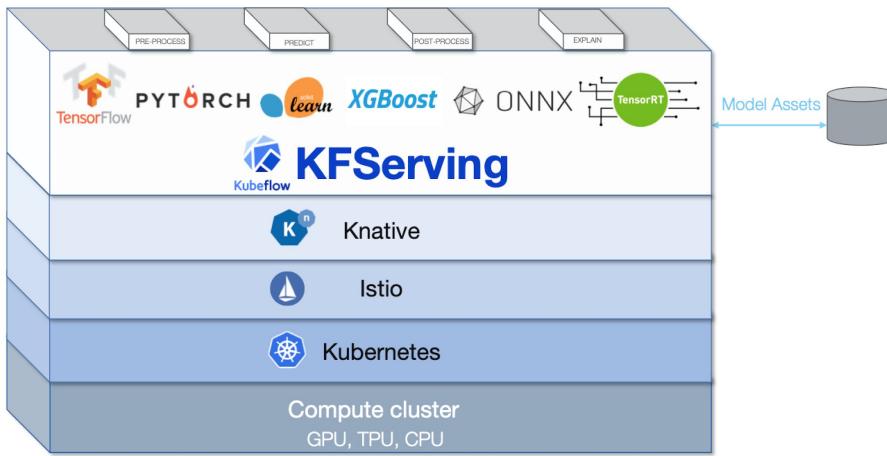
Train



ML Framework usage



Deploy



```
apiVersion: "serving.kubeflow.org/v1alpha2"
kind: "InferenceService"
metadata:
  name: "sklearn-iris"
spec:
  default:
    sklearn:
      storageUri:
        gs://kfserving-samples/models/sklearn/iris"
```

```
apiVersion: "serving.kubeflow.org/v1alpha2"
kind: "InferenceService"
metadata:
  name: "flowers-sample"
spec:
  default:
    tensorflow:
      storageUri: "gs://kfserving-samples/models/tensorflow/flowers"
```

```
apiVersion: "serving.kubeflow.org/v1alpha2"
kind: "InferenceService"
metadata:
  name: "pytorch-cifar10"
spec:
  default:
    pytorch:
      storageUri:
        gs://kfserving-samples/models/pytorch/cifar10"
      modelClassName: "Net"
```

Demo

Success User Stories/ Quotes

“Kubeflow provides a seamless interface to a great set of tools that together manages the complexity of ML workflows and encourages best practices. Leonard Aukea, **Volvo Cars**

“With Kubeflow at the heart of our ML platform, our small company has been able to stack models in production to improve CR, find new customers, and present the right product to the right customer at the right time.” — Senior Director, **One Technologies**

“Kubeflow is helping GroupBy in standardizing ML workflows and simplifying very complicated deployments!” — Mohamed Elsaied, Machine Learning Team Lead, **GroupBy**

What's next

- Graduation of other Kubeflow applications:
 - Pipelines - a tool for orchestrating complex ML workflows
 - Metadata - a tool for keeping track of all your data sets and models
 - Katib - hyperparameter tuning
- Enterprise readiness:
 - Stringent security and compliance requirements.
 - Upgrades and SLAs

Thank you!

Kubeflow Website: <https://www.kubeflow.org/>

Join kubeflow-discuss mailer kubeflow-discuss@googlegroups.com

Demo source: <https://github.com/CiscoAI/cisco-kubeflow-starter-pack>

Link to user survey <https://bit.ly/3aDnELJ>

David Aronchick - daron@microsoft.com
Elvira Dzhuraeva - edzhurae@cisco.com
Johnu George - johnugeo@cisco.com