# **Hewlett Packard** Enterprise

# Operationalization for the Machine Learning Lifecycle live demonstration

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# **Overview and Introduction**

#### **Description and Objective**

This demo provides an overview of HPE Machine Learning (ML) Ops solution, powered by HPE servers and HPE Container Platform. HPE ML Ops solution supports every stage of machine learning lifecycle at enterprise scale on containerized distributed clusters — data preparation, model build, model training, model deployment, collaboration, and monitoring.

The demo environment provides access to:

• HPE Container Platform (formerly BlueData EPIC v5.0)

#### A CONTAINER-BASED SOLUTION FOR THE ML LIFECYCLE

Standardize processes across the ML lifecycle to build, train, deploy, and monitor machine learning models.



#### **Proceed with caution:**

HPE Container Platform (EPIC) demonstration does not include any HA and/or recovery mechanisms to protect against hardware failures and non-reversible actions.

Note: Please use Operationalization for the Machine Learning Lifecycle with HPE ML Ops recorded video as backup solution.



Operationalization for the Machine Learning Lifecycle with HPE ML Ops Recorded Demo Introductory 04 Mins 44 Secs

# You can stop and cleanup all running cluster(s) excepted Diabetes\_Prediction\_Web cluster.

Deployments	2	Diabetes_Prediction_Web	TensorFlow ModelServer ①	ModelServer(1/Small) ①	Created At: Thu May 07 2020 19:06:03	ready
			Dependent Distro: Endpoint Wrapper ①	RESTServer(1/Small)	Created By: mlops	
Data Sources	1			LoadBalancer(1/Small) (j)	Attached Model(s):Diabetes_Prediction, 1	

 $\triangleright$ 

#### How to schedule and access your demo









# **Configuration Diagram**

# **Target Audience**

All potential existing or new customers that are looking for solution to deploy distributed AI, machine learning (ML), and big data analytics running on Docker containers either on-premises or in the cloud...

HPE field personal and/or partners that need hands-on experience with HPE ML Ops platform will also find it valuable.

## **Requirements for Presenters**

Presenters should have some knowledge of HPE Container Platform (EPIC) software including Elastic Platform for Big Data Analytics servers.

## The HPE Advantage

HPE acquires leading provider of container-based software solution that offers an as-a-service experience for AI, machine learning, and analytics in the enterprise.. We believe this differentiated hardware EPA + software solution offer will help IT customers deploy BigData Analytics and AI in minutes to support more efficiently data science teams deriving insights from data, instead of waiting for infrastructure.

# HPE EPA demonstration platform Compute Blocks

HPE Deep Learning Accelerator Block with Nvidia GPU:

# HPE APOLLO 2000 GEN10 - DEEP LEARNING ACCELERATOR BLOCK 2 x HPE Apollo XL190r Gen10 - Accelerated Compute Block with GPUs HPE ProLiant XL190r HPE Apollo 2000 Chassis Nvidia Tesla V100 HPE Apollo 2000 Gen10 with 2 x XL190r • HPE Apollo r2600 Gen10 24SFF chassis HPE ProLiant XL190r Gen10 Server • 2 x Intel Xeon Gold 6126 CPUs (12-core@2.1GHz) • 2 x NVIDIA Tesla GPUs (V100) 384GB RAM (12x32GB) • 2 x 960GB SSD • 1 x 2-port 10/25GbE 640 FLR-SFP28 4 x Nvidia V100 GPU cards in a 2U frame 1

HPE Apollo 2000 Gen10 Standard Compute Block:



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# **Demo Use Cases**

# **Operationalization for the Machine Learning Lifecycle**

Much like pre-DevOps software development, data science organizations still spend a significant amount of time and effort when moving projects from development to production. Model version control and code sharing is manual and there is a lack of standardization on tools and frameworks, making it tedious and time-consuming to productize machine learning models.

HPE Machine Learning Ops (HPE ML Ops) extends the capabilities of the HPE Container Platform and brings DevOps-like agility to enterprise machine learning. With the HPE ML Ops solution, enterprises can implement DevOps processes to standardize their ML workflows.

HPE ML Ops provides data science teams with a platform for their end-to-end data science needs with the flexibility to run their machine learning or deep learning (DL) workloads on-premises, in multiple public clouds, or a hybrid model and respond to dynamic business requirements in a variety of use cases.



## **HPE ML Ops solution Architecture**

# Access HPE ML Ops demonstration platform as mlops user

Environment	Web UI	Username
HPE ML Ops	https://hpe-mlops.hpintelco.org	mlops
Once connected logon credentials	to the Jumphost station, open in you s provided on the BlueData_EPIC htm	r browser (chrome) the web ui login console, fill the nl page and click "Login".



This link will start Chrome and open an html document with links and credentials!

#### **Discover HPE ML Ops platform capabilities**

1. HPE Container Platform Login Page: Login in to the WebUI as **mlops** user: <u>http://hpe-mlops.hpintelco.org</u>



2. HPE Container Platform User Dashboard: See the monitoring



3. Select Project Repository from the left menu

- HPE ML Ops   Create	or Update i	× +		– o ×
← → C (0 No	ot secure	hpe-mlops.hpintelco.org/bdswebui/aiml/p	roject-repo	्र 🕁 😝 :
нр	E GPU	JaaS		HPE ML Ops / mlops 🗸 💮
Dashboard Project Repositor	Y	Project repository	ý	mounted
Source Control		Repo Name* ⊘	HPE_ML_Ops	
Model Degistry		Type* ⊘	NFS 👻	
Hodel Registry		NFS Host Name* ⊘	16.78.13.70	
Training	1	NFS Share* ⊘	/data/mlops/cic	
Deployments	1	Force?		
Data Sources	1			
App Store		1 2 * 1 *		
Notebooks	1	/hd fs mat/HDE ML Ons/		
		/bd-is-mni/HPE_ML_Ops/		
		HPE_ML_Ops		
		C XGR Income		
		data		
		bank-full.csv		
		allyears2k.csv		
		UCI_Income		
		adult_data.csv		
		adult_train_cleaned.	CSV	
		adult_test_cleaned.c	sv	
		encoding.json		
		adult_data_100.csv		
		adult_test_100.csv		

The **Project Repository** screen displays information about the project repository that was created by the Project Administrator for the current AI/ML project.

4. Select Source Control from the left menu

← → C ① Not se	trol Pe; x + tcure   hpe-mlops.hpintelco.org/bdswebui/source	-control	- 0 × * Q x 🕒 :
нре	GPUaaS		HPE ML Ops / miops 🗸 💮
Dashboard	Project Source Co	ontrol Page	
Project Repository	Source Control* ⊘	github 👻	
Source Control	Working Directory ⊘	mlops	
Model Registry	Credentials Repository URL* (2)	https://hpe-management.hpintelco.org/bluedata/mlops.git	
Deployments	1 Access Token* (2)		
Data Sources	1 Branch Name* ⊘	master	
App Store	User Name* ⊘	bluedata	
Notebooks	1 User Email* 💮	bluedata@hpe-management.hpintelco.org	

The **Project Source Control Page** screen allows you to specify a cloud-based source control service to hold notebooks for this project. Notebook clusters in this AI/ML project will retrieve notebooks from the source control location specified on this page.

5. Select Model Registry from the left menu

HPE ML Ops   Mode	ls Page	× +				- o ×
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н	PE GP	JaaS				HPE ML Ops / mlops 🗸 💮
Dashboard		Model Managem	nent			
Project Reposito	ry					Register New Model
Source Control	_	Model Name	Model Version	Description	Details	Actions
Model Registry Training	1	Income_Prediction	1	HPE ML Ops	Created At: Wed Jan 15 2020 11:02:24 Created By: mlops Model: repox//HPE_ML_Ops/models/XGB_Income/XGB.pickle.dat	
Deployments	1					
Deployments						
Data Sources	1					
App Store						
Notebooks	1					
		Microsoft Store				

The **Model Management** screen displays all of the models that have been registered for the current project.

6. Select Training from the left menu

🚥 HPE ML Ops   Trainin	igs	× +					-	σ×
€ → C (0 №	ot secure	hpe-mlops.hpintelco.org/	bdswebui/aiml/training				<b>6</b> 7 Q	☆ <b>0</b> :
н	PE GPU	JaaS					HPE ML Ops / mlops	~ 💮
Dashboard		Training					_	
Project Reposito	Υ.						Crea	te Training
Source Control		□ Name	Distribution	Role Configurations	Details	Status	Actions	
Model Registry		pythonmidi	Python ML and DL Toolkit ① Dependent Distro: Endpoint Wrapper ①	NotebookServer(1/Small) ① TrainingEngine(1/Small) ①	Created At: Wed Mar 25 2020 10:54:05 Created By: mlops	ready		
Training	1			RESTServer(1/Small) (j)				
Deployments	1			Ecologiance (4) smaily (p				
Data Sources	1							
App Store								
Notebooks	1							

## Create your HPE ML Ops Training cluster

1. Select Create Training



Don't forget to add a Training Engine and update the RunTime Image and Click on Submit

HPE ML Ops   Create or Update	w x +	- o ×				
← → C ▲ Not secure	C 🔺 Not secure   hpe-mlops.hpintelco.org/bdswebui/aimi/create-edit-training 🗣 🍳 🐒					
HPE GP	PUaaS	HPE ML Ops / mlops 🗸 💮				
Dashboard Project Repository Source Control Model Registry Training 1 Deployments 1 Data Sources 1 App Store Notebooks 1	Create training cluster         Cluster Detail         Name*© midemo         Description @ HPE ML Ops Demonstration         RunTime Image* @ Python ML and DL Toolkit         NotebookServer III @ Small - 4 VCPU, 8.00 GB RAM         TrainingEngine III @ Small - 4 VCPU, 8.00 GB RAM         Add-Ons         RestServer III @ Small - 4 VCPU, 8.00 GB RAM         TrainingEngine III @ Small - 4 VCPU, 8.00 GB RAM         LoadBalancer III @ Small - 4 VCPU, 8.00 GB RAM         LoadBalancer III @ Small - 4 VCPU, 8.00 GB RAM         Upload Scaling Policy @ Select a valid JSON file         Urwors	UTE ML Ops/Indps				

#### 2. Check that the cluster is ready

	mldemo	Python ML and DL Toolkit ${\rm O}$ Dependent Distro: Endpoint Wrapper ${\rm O}$	NotebookServer(1/Small) ① TrainingEngine(1/Small) ① RESTServer(1/Small) ① LoadBalancer(1/Small) ①	Created At: Wed Mar 25 2020 12:05:45 Created By: mlops	ready	
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#### 3. Open Training Cluster details (Click on mldemo)

mldemo     Python ML and DL Toolkit ①     Dependent Distro: Endpoint Wrapper 0	NotebookServer(1/Small) ① TrainingEngine(1/Small) ① RESTServer(1/Small) ① LoadBalancer(1/Small) ①	Created At: Wed Mar 25 2020 12:05:45 Created By: mlops	ready	
--	--	---	-------	--

4. Show the cluster nodes and services. (NotebookServer / TrainingEngine / ...)

← → C ① No	r Dashboard ot secure	+	/aiml/cluster?id=/api/v2/cluster/179				- o ×
н	PE GP	UaaS					HPE ML Ops / mlops V
Dashboard Project Repositor Source Control Model Registry	Y	MIdemo [AIML/Training] HPE ML Ops I Node(s) Info ActionSci	Demonstration ript(s) ServiceStatus Cluster His 	tories			ready      Cluster Operations       Public Endpoints       Actions       Actions
Training	2	Name	Distribution	Role	Instance IP	Services	
Deployments	1	bluedata-424.bdlocal	Python ML and DL Toolkit	TrainingEngine	172.18.0.27	ssh : g3str3tc9-c.hpintelco.org -p 10025	
Data Sources	1	bluedata-423.bdlocal	Python ML and DL Toolkit	NotebookServer	172.18.0.28	Standalone Jupyterhub ssh : g3str3tc9-c.hpintelco.org -p 10024	
App Store Notebooks	1	bluedata-426.bdlocal	Endpoint Wrapper	LoadBalancer	172.18.0.26	Model serving request balancer stats API Server: http://g5str3tc9-chpintelco.org:10029 [Auth Token] Training API Server: http://g3str3tc9-chpintelco.org:10030/trait [Auth Token]	
		bluedata-425.bdlocal	Endpoint Wrapper	RESTServer	172.18.0.25	API Server : http://g3str3tc9-c.hpintelco.org:10026 [Auth Token] SSH : g3str3tc9-c.hpintelco.org -p 10027	

5. Check the Services Status of your cluster (Application / System services)

[AIML/Training] HPE ML Ops Demons Node(s) Info ActionScript(s)	ServiceStatus	Cluster Histories			Cluster Operations 🗸
Name	API Server	Model Serving LoadBalancer	Standalone Jupyterhub	BlueData Agent	User Auth
bluedata-426.bdlocal	•	•	•	•	•
bluedata-425.bdlocal	•	•	•	•	•
bluedata-423.bdlocal	•	•	•	•	•
bluedata-424.bdlocal	•	•	•	•	•

# **Develop/Create Jupyter Notebooks**

1. Select Notebooks from the left menu

HPE ML Ops   Notebo	$ = 101 \text{ ML Cyr} [ \text{Networks}  \mathbf{x} + \mathbf{z} ] $						
нр	E GP	UaaS	uur gruuswebuly anny hotebooks				HPE ML Ops / mlops V
Dashboard Project Repositor	,	Notebo	ooks				Create Notebook
Source Control		□ Name	Distribution	Role Configurations	Details	Status	Actions
Model Registry		mlops	Jupyter Notebook with JupyterHub ①	NotebookServer(1/Small)	Created At: Wed Mar 25 2020 11:03:01 Created By: mlops	ready	
Training	2				Attached Cluster(s):pythonmidl		
Deployments	1						
Data Sources	1						
App Store							
Notebooks	1						

2. Create a Jupyter Notebook (Click on Create Notebook)

- HPE ML Ops   Notebo	ooks	× +					– a ×
← → C ③ No	ot secure	hpe-mlops.hpintel	co.org/bdswebui/aiml/notebooks				० 🖈 🕒 :
нр	E GP	UaaS					HPE ML Ops / mlops 🗸 💮
Dashboard Project Repositor	v	Notebo	poks				
Source Control		□ Name	Distribution	Role Configurations	Details	Status	Create Notebook
		mlops	Jupyter Notebook with JupyterHub	NotebookServer(1/Sn	nall) ① Created At: Wed Mar 25 2	2020 11:03:01	
Model Registry					Created By: mlops		
Training	2				Attached Cluster(s,tpytho	onmidi	
Deployments	1						
Data Sources	1						
App Store							
Notebooks	1						
	_						

3. Associate the Notebook with your Training cluster



Don't forget to select Training Engine, setup flavor and update the Jupyter RunTime Image

4. Create Notebook Cluster (Click on Submit)

← → C ▲ Not se	Update x + secure he-mboscheintekco.org/bdisvebul/aiml/create-edit-notebook	- σ × Q ☆ ⊖ :
нре	GPUaaS	HPE ML Ops / mlops 🗸 💮
Dashboard Project Repository Source Control Model Registry Training Deployments Data Sources App Store Notebooks	cluster Detail Cluster Detail RunTime image <sup>®</sup> Jupyter Notebook with Jupyter Hub Note RookServer © Small - 4 VCPU, 8.00 GB RAM NotebookServer © Small - 4 VCPU, 8.00 GB RAM Locate with Training midemo Environments Locate Settings	

5. Make sure that the status of your notebook is ready

lumiter Netsheek with Juniter July (	Notobook Conver(1/Empli)	Created At: Wed Mar 25 2020 12:14:72	ready	
зарутег нотероок with зарутегнар ()	NotebookServer(1/Smail)	Created Ris man 25 2020 12.14.52	ready	
		Attached Cluster(c)mldeme		
		Affacted Cluster(s),midemo		

6. Open JupyterHub web ui (Click on NotebookServer)

Jupyter [AIML/Notebook] Build an Income Pred Node(s) Info ActionScript(s)	iliction Model ServiceStatus Cluster Histories			Cluster Operations 🗸
				Public Endpoints V
Name	Distribution	Role	Instance IP	Services
bluedata-427.bdlocal	Jupyter Notebook with JupyterHub	NotebookServer	172.18.0.29	NotebookServer

7. Login in to the Jupyter WebUI as mlops user



# **Income Prediction Demo Scenario**

This tutorial uses a model to classify a person's income as being either less than or equal to \$50,000 or more than \$50,000.

Data set is available from <u>https://archive.ics.uci.edu/ml/datasets/Adult</u>. This data set is a spreadsheet with approximately 32,000 rows of training data that was acquired from the 1994 Census database.

e i x 😳 Home Page - Select or create a n x   🧧 XGB_Income - Jupyter Notebook x   +	- 0 ×
hpe-mlops.hpintelco.org/bdswebui/aiml/project-repo	् 🖈 😝 :
PUaaS	HPE ML Ops/mlops 🗸 💮
Project repository	mounted
Repo Name" (2) HPE_ML_Ops	
Type" 🖉 NFS 👻	
NFS Host Name* ② 16.78.13.70	
NFS Share* ⑦ /data/mlops/cic	
Force? ⑦	
~ <b>-</b>	
+ 🖉 🖆 😃 🗓	
/bd-fs-mnt/HPE_ML_Ops/data/UCL_Income/adult_test.csv	
<ul> <li>HPE_ML_Ops</li> <li>models</li> <li>data</li> <li>bask-fullcav</li> <li>dataseitan</li> <li>bask-fullcav</li> <li>dataseitan</li> <li>baskt data.cov</li> <li>baskt gas.cov</li> <li>aduit_stat_daned.csv</li> <li>aduit_stat_claned.csv</li> <li>aduit_stat_plot.csv</li> <li>aduit_stat_plot.csv</li> <li>code</li> </ul>	
	Voran Rage-Steet or create s X    X    X    X    X    X    X

#### Data set is in the Project Repository

The features (columns) in this spreadsheet that are used to train the model are:

- age
- workclass
- fnlwgt (the number that the census believes represents the population)
- education
- education\_num (number representation of education)
- marital\_status
- occupation
- relationship
- race
- sex
- capital\_gain
- capital\_loss
- hours\_per\_week
- native\_country

The last column indicates the income classification of that individual.

#### Load XGB\_Income.ipynb notebook

1. Load XGB\_Income.ipynb notebook

Open the XGB\_Income.ipynb file, and then run each cell individually. This generates cleaned .csv files, an encoded file, and model files. The Notebook contains detailed comments and explanations.

🚥 HPE ML Ops   Create or Update F 🗙   🔵 Home Page - Select or create a	XGB_Income - Jupyter Notebook X +		- ø ×
← → C (③ Not secure   g3str3tc9-c.hpintelco.org:10031/user	/mlops/notebooks/XGB_Income.ipynb		् 🖈 😝 :
💭 Jupyter	XGB_Income (unsaved changes)	Logout Control Panel	
File Edit	View Insert Cell Kernel Widgets Help	Not Trusted Python 3 O	
<b>E</b> + 3< 0	2 🗈 🛧 V N Run 🔳 C 🕨 Markdown 🔹 🖾 O		
In (1) In (2) In (3) In (4)	XGBoost Model • Attempting to predict likelyhood of income either <=50K or >50K from 1994 Census database • https://essewy.com/Xd-Boost/ Setting up environment Tattachments If alining Likiter MG brighte = deeo python Timideeo print('test') History ME; http://bluedata-425.bdlocal:10001/history/1 logsurl http://bluedata-425.bdlocal:10001/history/1 logs 5-atus: Finished test		Ì
In [5]:	<pre>def saveInProjectRepo(path):     ProjectRepo = os.popen('bdvcliget cluster.project_repo').read().rstrip()     return str(ProjectRepo + '/' + path)</pre>		

#### (Caution: Update the variable according to your Training Cluster including History urls.)

Once the model is tuned to the optimal parameters, run the cell on a remote Training cluster (where there are potentially more resources to train a model on a larger dataset).

O Not secure   g3str	3tc9-c.hpintelco.org:10031/u	ser/mlops/notebooks/XGB_Income.ipynb		Q
	💭 jupyte	Pr XGB_Income (unsaved changes)	Logout Control Panel	
	File Edit	View Insert Cell Kernel Widgets Help	Not Trusted Python 3 O	
	B + %			
		Build model remotely on a distributed Python deep dataset	learning cluster on larger	
	In (75	<pre>1: XWaldemo * Importing libraries') import nonys anp import pands as pd import pands as pd import active free sile import active import active free sile import active fr</pre>	ubjective": "binary:logistic", error"],	
		<pre># Save model into project repo print("Saving model")</pre>		

# **Register and Deploy the Model**

1. Select Model Registry from the left menu and click on Register New Model

🚥 HPE ML Ops   Models	Page	X C Home Page - Select or create a n X 8	XGB_Income - Jupyter Notebook 🗙   🕂			- 0
← → C (▲ №	secure	hpe-mlops.hpintelco.org/bdswebui/aiml/mode	ls			् ☆ 😝
нр	E GPI	JaaS				HPE ML Ops / mlops 🗸 💮
Dashboard		Model Managemer	nt			
Project Repository						Register New Model
Source Control		Model Name	Model Version	Description	Details	Actions
Model Registry				Sorry, no matching records found		
Training	2					
Deployments	1					
Data Sources	1					
App Store						
Notebooks	2					

2. Register New Model using the information displayed below.

🚥 HPE ML Ops   Registe	r or Updat	K C Home Page - Select or create a n x	ZGB_Income - Jupyter Notebook × +	- 0
← → C (▲ No	ot secure	hpe-mlops.hpintelco.org/bdswebui/aiml/cr	e 🖈 😝	
— нр	E GP	UaaS		HPE ML Ops / mlops 🗸 🕐
Dashboard		Register/Update	model	
Project Repositor	y	Label Name* ⊘	Income_Prediction	
Model Registry		Description (?)	HPE ML Ops	
Training	2	Model Version* ②		
Deployments Data Sources	1	Path to Scoring Script ③	repo://HIPE_ML_Ops/code/XGB/XGB_Scoring.py Browse	
App Store		Trained on Environment ⊘	mlops	
Notebooks	2		Submit	

3. Deploy your registered model (Click on Deploy)

Bluedata ML   Models	X C Home Page - Select or create a	n 🗙 📔 🤗 XGB_Income - Jupyter Notel	ook ×   +		- σ ×
BlueDa	ata GPUaaS	aimi/models			HPE ML Ops / mlops 🗸 💮
Dashboard	Model Manage	ement			
Project Repository					Register New Model
Source Control Model Registry Training	Model Name     Income_Prediction 2	Model Version	Description HPE ML Ops	Details Created At: Tue Jan 14 2020 15:36:33 Created By: mlops Model: repo;//HPE_ML_Ops/models/XGB_Income/XGB.pickle.dat	Acti Deploy
Deployments Data Sources App Store	1				
Notebooks	2				
					Varian & O Build Number - 2217
hpe-mlops.hpintelco.org/bdsweb	ui/aiml/create-edit-deployment?model_id=/api/v2	/model/3			Version: 4.0 Build Number : 22

4. Create a Deployment Cluster for Income Prediction (Click on Submit)

- HPE ML Ops   Create of	r Update	C 🗙 🙄 Home Page - Select or create a n 🗴	XGB_Income - Jupyter Notebook × +		- o ×
← → C 🔺 Not	t secure	hpe-mlops.hpintelco.org/bdswebui/aiml/cr	eate-edit-deployment?model_id=/api/v2/model/6		् ☆ 😝 :
нрі	E GPI	UaaS			HPE ML Ops/mlops 🗸 💮
Dashboard		create deplovmer	nt cluster		
Project Repository		Cluster Detail			
Source Control		Name* ⊘	Income_Prediction		
Model Registry		Description (?)	HPE ML Ops Cluster		
Training	2	Select Model ⊘	Income_Prediction, 1	•	
Deployments	1	Run Time Image* ⊘	Python ML/DL Toolkit	•	
Data Sources	1	Node Roles InferenceEngine ≡ ⊘	Small - 4 VCPU, 8.00 GB RAM		
Notebooks	2	Add-Ons Endpoint Wrapper () RESTServer () LoadBalancer () Upload Scaling Policy () Advanced Settings	Small - 4 VCPU, 8.00 GB RAM     Small - 4 VCPU, 8.00 GB RAM     Select a valid JSON file    Submot	l 1 Course	

5. Income Prediction Cluster is now Ready

- HPE ML Ops   Cluster	Charler Daphboard X C Home Page - Select or create a :: X 🖉 XGB_Income - Jupyter Notebook X   +					
← → C (0 N	ot secure	hpe-mlops.hpintelco.org/bdswebu	i/aiml/cluster?id=/api/v2/cluster/181			् 🕁 🔁 :
ня	PE GP	UaaS				HPE ML Ops / mkps 🗸 💮
Dashboard Project Repositor Source Control Model Registry	y	Income_Predic (AIML/Deployment) HPE ML ( Node(s) Info ActionSo	Ction Ops Cluster rript(s) ServiceStatus Clu	ster Histories		■ ready Cluster Operations. 〜
Tasisian	2					Public Endpoints 🗸 Actions 🗸
maining	2	Name bluedata-428 bdlocal	Distribution	Role	Instance IP	Services
Deployments	2	bidedala 420.bulocal	Python ML/DL Toolkit	interenceEngine	1/2.18.0.30	33H0. G33H3H7+CHJHHERCONIG -P 20032
Data Sources App Store	1	bluedata-430.bdlocal	Endpoint Wrapper	LoadBalancer	172.18.0.31	Model serving request balancer stats API server: http://j3str3tr9-chpintelco.org.10036 [Auth Token]
Notebooks	2					Model serving Loadbalancer : http://g.str/stc9-c.npintelco.org.10057/< <model_name>&gt;/&lt;<model_version>&gt;/predict [Auth Token]</model_version></model_name>
		bluedata-429.bdlocal	Endpoint Wrapper	RESTServer	172.18.0.32	API Server : http://g3str3tc9-c.hpintelco.org.10033 [Auth Token] SSH : g3str3tc9-c.hpintelco.org - p 10034
_						

#### 6. Generate your Prediction Request

[AIML/Deployment] HPE ML Ops	ion <sub>Cluster</sub>			<ul> <li>ready</li> </ul>
Node(s) Info ActionScript	(s) ServiceStatus Cluste	r Histories		Cluster Operations 🗸
				Public Endpoints V
Name	Distribution	Role	Instance IP	Services
bluedata-428.bdlocal	Python ML/DL Toolkit	InferenceEngine	172.18.0.30	sshd : g3str3tc9-chpintelco.org -p 10032
bluedata-430.bdlocal	Endpoint Wrapper	LoadBalancer	172.18.0.31	Model serving request balancer stats API Server : http://g3str3tc9-c.hpintelco.org:10036 [Auth Token] [Auth Token]
bluedata-429.bdlocal	Endpoint Wrapper	RESTServer	172.18.0.32	Art server

Copy the link and check update the port + model version

http://g3str3tc9-c.hpintelco.org:10037/Income\_Prediction/1/predict [Auth Token] Click to copy the token

# Run the Income prediction using Postman



#### This link will start Postman!

1. Select Skip signing in to go directly to the app

🤣 Postman		×
Fie Edit View Hejs		
Skip signing in and take me straight to the app		

2. Copy the Income Json request in Postman body tab: Click on below icon



## 3. Create a new Request

🧭 Postman						-		×
File Edit View Help								
🕂 New 🔻 Import Runner 📑 🔻		My Workspace 🔻	🛻 Invite		B C	r +	•	Sign In
Q Filter	Launchpad X	+ •••			No Environment		•	\$
History Collections APIs BETA								
Save Responses								
You haven't sent any requests								
Any request you send in this workspace will appear here.	Start something new			Discover				
	Create a request			Explore some templates and	d public APIs you might find	d useful.		
🏠 Show me how	Create a collection			Templates		APIs		
	Create an environment							
	••• View More							
	Customize							
	Dark mode							
	Open Launchpad			Browse more				
	••• More settings							
					😌 Boot	camp		1 ()

4. Fill in the Body tab to match the image below

Postman File Edit View Help			>	×
H New T Import Runner	👪 My Workspace 🔹 🐔 Invite	Ø & \$	🌲 🏾 🎔 🛛 Sign Ir	n
Q Filter	Launchped POST http://g3str3sc9-chpintekco.or_• + •••	No Environment	▼ ⊙ <b>‡</b>	3
Save Responses	Untitled Request POST  V http://g3sr/3ts9-c.hpintelco.org/10048/Income_Prediction/1/predict	Send	Comments (0)	
You haven't sent any requests	Params Authorization Headers (2) Body Pre-request Script Tests Settings		Cookies Code	e
Show me how	<pre>1 * 0 **********************************</pre>			
	Response			
. 9, 5		😌 Bootcamp		?

5. Fill in the Header tab with your token

🤣 Postman				-	□ ×
File Edit View Help					
🕂 New 🔻 Import Runner 📭	# N	y Workspace 🔻 🗼 Invite		Ø € ♣ ♦ ♥	Sign In
Q Filter	Launchpad POST http://g3str3tc9-c.hpintelco.c	r• + ···	N	No Environment 🔻	•
History Collections APIs	Untitled Request			📮 Comn	nents (0)
Save Responses	POST • http://g3str3tc9-c.hpintelco.org:10048/income_Pred	liction/1/predict		Send <b>v</b> Sa	ve 💌
You haven't sent any requests	Params Authorization Headers (2] Body   Pre-reque	st Script Tests Settings		Cook	ies Code
appear here.	▼ Headers (2)				
	KEY	VALUE	DESCRIPTION	••• Bulk Edit Pr	esets 🔻
🆌 Show me how	Content-Type	application/json			
	✓ x-auth-token	xDIV6rX0Kp			
	Key	Value	Description		
	Response				
		Hit Send to get a response			
E 9 5				😌 Bootcamp 📑	s_ (?

6. Send the post request to the cluster and get the income prediction result

🤣 Postman				- 🗆 X		
File Edit View Help						
🛨 New 🔻 Import Runner 📭 🖛	port Runner 🛃 🐑 🔛 My Workspace 🔻 🕹 Invite					
Q Filter	Launchpad POST http://g3str3tc9-c.hpintelco.or		Ν	No Environment 🔻 💿 🌞		
History Collections APIs BETA	Untitled Request			Gomments (0)		
Save Responses     Clear all     Today	POST	ction/1/predict		Send 🔻 Save 👻		
POST http://g3str3tc9-c.hpintelco.org:1004 8/Income_Prediction/1/predict	Params Authorization Headers (10) Body  Pre-reque	st Script Tests Settings		Cookies Code		
	▼ Headers (2)					
	KEY	VALUE	DESCRIPTION	•••• Bulk Edit Presets 💌		
	Content-Type	application/json				
	x-auth-token	xDIV6rX0Kp				
	Кеу	Value	Description			
	<ul> <li>Temporary Headers (8) </li> </ul>					
	Body Cookies Headers (4) Test Results		Status: 200 OK T	ime: 3.33s Size: 778 B Save Response 👻		
	Pretty Raw Preview Visualize <sup>BETA</sup> JSON <b>v</b>			🖬 Q.		
<pre>input:: "{''age': 35, ''workclass': ''Self-emp-inc'', ''fnlugt'': 182148, ''education': ''Bachelors'', ''education_num': 3, ''marital_status':: ''Narried-clw-spouse'', ''occupation':: ''Exc-managerial', ''relationship'': ''Wuited-States'')', ''cautisl_inst': 8, ''hourt new metry': ''United-States'')', ''cautisl_inst': 8, ''node': ''Wuited': ''Wu</pre>						
I 9 E				😌 Bootcamp 📑 🛄 🕐		

# **Fraud Detection Demo Scenario**

This use case demonstrates using HPE ML Ops and XGBoost to detect credit card fraud.

Data set is in the Project Repository

This dataset contains the credit card transactions that occurred during a period of two days with 492 frauds out of 284,807 transactions. All the variables in the dataset are numerical. The time column contains the seconds elapsed between the first transaction in the dataset.

👄 HPE ML Ops   Create o	es H9E MIL Copi   Create or Update : X +			
← → C ③ No	t secure	hpe-mlops.hpintelco.org/bdswebui/aiml/pi	oject-repo	લ ☆ 🖰 :
	E GP	UaaS		HPE ML Ops / milops 🗸 💮
Dashboard Project Repository Source Control Model Registry Training Deployments	1	Project repository Repo Name" () Type" () NFS Host Name" () NFS Share" () Ecored ()	/ HPE_ML_Ops NF5 ~ 16.78.13.70 /data/mlops/cic	mounted
Data Sources	1	Holder ()		
App Store Notebooks	1	HPE_ML_Ops/data/Tran HPE_ML_Ops/data/Tran HPE_ML_Ops HPE_ML_Ops data data bank-ful.csv libenk-ful.csv libenk-ful.csv remote the full csv libent full csv liben	sections	
		☐ ☐ docs ☐ ☐ misc		

#### mlops project member (data scientist)

As a project member of ML Ops project, the following are typical tasks a data scientist would perform: 1. Create Training Cluster

- 2. Create personal Jupyter Notebook
- 3. Fraud data discover
- 4. Train XGBoost with CPU
- 5. Train XGBoost with GPU
- 6. Register a model
- 7. Create deployment cluster
- 8. Fraud prediction with PostMan

# Create your HPE ML Ops Training cluster

1. Select Create Training

- HPE ML Ops   Create or Upda	de X +	– o ×
← → C ▲ Not secu	re   hpe-mlops.hpintelco.org/bdswebui/aiml/create-edit-training	☆ <b>⊖</b> :
	JaaS	HPE ML Ops / mlops \vee 💮
Dashboard Project Repository Source Control Deployments 1 Data Sources 1 App Store Notebooks 1	Custer Detail Custer Detail Custer Detail Description () Credit Fraud Training Description () Credit Fraud Training Cluster RunTime Image* () Python ML and DL Toolkr Node Roles NotebookServer II () Small - 4 VCPU, 8.00 GB RAM v 1 TrainingEngine II () Small - 4 VCPU, 8.00 GB RAM v 1 Composition Wrapper () Endpoint Wrapper () Endpoint Wrapper () Small - 4 VCPU, 8.00 GB RAM v 1 LeadBlaincer II () Select a valid JSON file Description Add-ons Endpoint Wrapper () Select a valid JSON file Description LeadBlaincer II () Select a valid JSON file Description Select	FIFE ML Ups / micps 🗸 🥶

Don't forget to add a Training Engine with GPU flavor and update the RunTime Image

RunTime Image* 🔿	Python ML and DL Toolkit	-
Node Roles		x
NotebookServer 🚞 🕐	Small - 4 VCPU, 8.00 GB RAM	$\sim$
TrainingEngine 🚍 🕐	SmallGPU - 4 VCPU, 12.00 GB RAM, 1 GPU Devices, 100 GB root disk	•
	1	$\widehat{}$

#### 2. Click on Submit

Add-Ons		
Endpoint Wrapper ⊘		
RESTServer 🚍 ⊘	Small - 4 VCPU, 8.00 GB RAM	1
LoadBalancer 🚍 ⊘	Small - 4 VCPU, 8.00 GB RAM	1
Upload Scaling Policy (?)	Select a valid ISON file	Browse
Advanced Settings		
	Submit	

For HPE and Channel Partner Internal Use Only © Copyright 2019 Hewlett Packard Enterprise 3. Check that the cluster is ready

Dependent Distro: Endpoint Wrapper ①

FraudTraining	Python ML and DL Toolkit ${\rm O}$ Dependent Distro: Endpoint Wrapper ${\rm O}$	NotebookServer(1/Small) ① TrainingEngine(1/SmallGPU) ① RESTServer(1/Small) ① LoadBalancer(1/Small) ①	Created At: Wed Apr 22 2020 12:30:41 Created By: mlops	ready	
Open Trair	ning Cluster details (Clic	k on FraudTraining)			
FraudTraining	Python ML and DL Toolkit $\oplus$	NotebookServer(1/Small)	Created At: Wed Apr 22 2020 12:30:41	🔵 ready	

Created By: mlops

TrainingEngine(1/SmallGPU)

RESTServer(1/Small) ① LoadBalancer(1/Small) ①

5. Show the cluster nodes and services. (NotebookServer / TrainingEngine / ...)

← → C ③	ter Dashb Not secu	ooard x +	aiml/cluster?id=/api/v2/cluster/218				- ¤ × ☆ ⊖ :
нр	E GP	PUaaS					HPE ML Ops / mlops 🗸 💮
Dashboard Project Repository Source Control Model Registry	Y	FraudTraining [AIML/Training] Credit Fraud Training Node(s) Info ActionScript(s)	Cluster ServiceStatus Cluster Histories				● ready Cluster Operations >
Training	2	Name	Distribution	Pole	Instance ID	Canalizar	Public Endpoints V
Deployments Data Sources	1	bluedata-518.bdlocal	Endpoint Wrapper	RESTServer	172.18.0.21	API Server : http://g3str3tc9-c.hpintekco.org:10011 [Auth Token] SSH : g3str3tc9-c.hpintekco.org -p 10012	
App Store		bluedata-517.bdlocal	Python ML and DL Toolkit	TrainingEngine	172.18.0.20	ssh : g3str3tc9-c.hpintelco.org -p 10010	
Notebooks	1	bluedata-516.bdlocal	Python ML and DL Toolkit	NotebookServer	172.18.0.22	Standalone Jupyterhub ssh : g3str3tc9-c.hpintelco.org -p 10009	
		bluedata-519.bdlocal	Endpoint Wrapper	LoadBalancer	172.18.0.19	Model serving request halancer stats API Server : http://gistri3te?-chpinte(co.org:10015 L/uth Token Training API Server : http://gistri3te?-chpinte(co.org:10026/train L/uth Token]	

6. Check the Services Status of your cluster (Application / System services)

FraudTraining LAIML/Training Credit Fraud Training Ch Node(s) Info ActionScript(s)	ServiceStatus	listories			Cluster Operations V
Name	API Server	Model Serving LoadBalancer	Standalone Jupyterhub	BlueData Agent	User Auth
bluedata-519.bdlocal	٠	•	•	٠	•
bluedata-518.bdlocal	•	•	•	•	•
bluedata-517.bdlocal	•	•	•	•	•
bluedata-516.bdlocal	•	•	•	•	•

# **Develop/Create Jupyter Notebooks**

1. Select Notebooks from the left menu

- HPE ML Ops   Note	Notebooks X +							- ø ×
← → C (0 ≀	← → C (② Not secure   hpe-mlops.hpintalco.org/bdswebui/aimi/notebooks							
HP	HPE GPUaaS HEEMLOps/mi							
Dashboard		Notebo	oks					
Project Repository	,							Create Notebook
Source Control		Name	Distribution	Role Configurations	Details	Status	Actions	
Model Registry		mlops	Jupyter Notebook with JupyterHub $\ensuremath{}$	NotebookServer(1/Small)	Created At: Wed Apr 01 2020 17:16:34 Created By: mlops	ready		
Training	2				Attached Cluster(s):mldemo			
Deployments	1							
Data Sources	1							
App Store								
Notebooks								

2. Create a Jupyter Notebook (Click on Create Notebook)

HFE ML Cps   Notebools x +     ←         → C ③ Not secure   hpe-mlogs.hpintelco.org/todswebu//alm//hotebools								
← → C (① Not secure   hpa-mlops.hpintelco.org/bdswebul/aim//notebooks								
нр	E GPU	JaaS					HPE ML Ops / mlops 🗸 💮	
Dashboard		Noteboo	oks					
Project Repository	'						Create Notebook	
Source Control		Name	Distribution	Role Configurations	Details	Status A	ctions	
Model Registry	2	mlops	Jupyter Notebook with JupyterHub ${\mathbb O}$	NotebookServer(1/Small)	Created At: Wed Apr 01 2020 17:16:34 Created By: mlops	ready		
Training					Anached Cruster(s), midemo			
Deployments	1							
Data Sources	1							
App Store								
Notebooks	1							
	_							

3. Associate the Notebook with your Training cluster

create notebook	cluster			
Name* ⑦ FraudDetection				
Description ⊘	HPE Credit Fraud Detection			
RunTime Image* 🕐	Jupyter Notebook with JupyterHub			
Node Roles NotebookServer ≡ ⊘	SmallGPU     4 VCPU, 12.00 GB RAM, 1 GPU Devices, 100 GB root disk       1	J		
Associate with Training (?) Environments	FraudTraining			
Advanced Settings		J		
	Submit			

Don't forget to associate with Training Engine, setup GPU flavor and update the RunTime Image v2

4. Create Notebook Cluster (Click on Submit)

# create notebook cluster

Cluster Detail	
Name* ⊘	FraudDetection
Description ⊘	HPE Credit Fraud Detection
RunTime Image* ⊘	Jupyter Notebook with JupyterHub
Node Roles	
NotebookServer 🗮 ⊘	SmallGPU - 4 VCPU, 12.00 GB RAM, 1 GPU Devices, 100 GB root disk
	1
Associate with Training (?) Environments	FraudTraining •
Advanced Settings	
[	Submit

5. Make sure that the status of your notebook is ready

FraudDetection	Jupyter Notebook with JupyterHub ${\mathbb O}$	NotebookServer(1/SmallGPU)	Created At: Wed Apr 22 2020 13:03:30	ready	
			Created By: mlops		
			Attached Cluster(s):FraudTraining		

6. Open JupyterHub web ui (Click on NotebookServer)

FraudDetection       [AML/Notebook] HPE Credit Fraud Detection         Node(s) Info       ActionScript(s)       ServiceStatus       Cluster Histories								
				Public Endpoints V				
Name	Distribution	Role	Instance IP	Services				
bluedata-520.bdlocal	Jupyter Notebook with JupyterHub	NotebookServer	172.18.0.29	NotebookServer				

7. Login in to the Jupyter WebUI as **mlops** user

Jupyter	HPE ML Ops   Cluster Dashboard X C JupyterHub     A Not secure   a3str3tr9-c bnintelco arau10	× +		- -
Sign in Warning: JupyterHub seems to be served over a recommend enabling HTTPS for JupyterHub. Username: micps Password: 	C jupyter			
Sign In			Sign in Warning: JupyterHub seems to be served over an unsecured HTTP connection. We strongly recommend enabling HTTPS for JupyterHub. Username: mlops Password:	
			Sign In	

#### 8. Load CreditFraud.ipynb notebook

Open the CreditFraud.ipynb file, and then run each cell individually. This generates model files using CPUs and GPUs. The Notebook contains detailed comments and explanations.

C A Not secure   g3t	tr3tc9-c.hpintelco.org:10027/use	/mlops/notebooks/CreditFraud.ipynb		् 🖈 🖯
	💭 Jupyter	CreditFraud Last Checkpoint: a minute ago (autosaved)	Logout Control Panel	
	File Edit	View Insert Cell Kernel Widgets Help	Not Trusted Python 3 O	
	* * *	2 15 1 4 H Run 🔳 C 🗰 Code T 📖 O		
	In [1]	<pre>import pandsx as pd import mathiotil import mathiotils puplet as plt import scaborn as no immathiotils inline import plotly.graph.objs as go import plotly.figure_factory as ff from plotly.import tools from plotly.ordfline import download_plotlyjs, init_notebook_mode, plot, iplot init_notebook_mode(connected=True) from skilaern.model_plotLips.init_notebook_mode, plot, iplot inform skilaern.model_plotLips from skilaern.model_scienter(still) from skilaern.model_scienter(still) import ogbotts support train_test_split import splotLips.import collection import joblib diset_otion('display.max_columns', 100)</pre>		
	In [2]	Xattachments Training Cluster ML Engine fraudtraining python		
	In [3]	X1fraudtraining print('test') History UB1: http://bluedata.519.bdlocal:10001/bistory/1		
	In [4]	%logsunl http://bluedata-519.bdlocal:10001/history/1		
		Job Status: Finished test		
	In [6]	<pre>HyProjectRepo = os.popen('bdvcliget cluster.project_repo').read().rstrip()</pre>		
		A Location to one (BU and )		

(Caution: Update the variable according to your Training Cluster including History urls.)

Once the model is tuned to the optimal parameters, run the cell on a remote Training cluster (where there are potentially more resources to train a model on a larger dataset).

9. Cleanup your Notebook and Training cluster (Needed to release GPU resources)

	FraudDetection	Jupyter Notebook with JupyterHub ${\rm D}$	NotebookServer(1/SmallGPU)	Created At: Wed Apr 22 2020 13:03:30 Created By: miops Attached Cluster(s):FraudTraining		ready 🗌 🔂 🖉	
1	rnw(s) selected Name FraudTraining	Distribution Python ML and DL Toolkit ① Dependent Distro: Endpoint Wrapper ①	Role Configurations NotebookServer(1/Small) ① TrainingEngine(1/Small)CPU) ① RESTServer(1/Small) ① LoadBalancer(1/Small) ①	Details Created Ar: Wed Apr 22 2020 12:30:41 Created By: mlops	Status ready	Actions	Delete
	Name FraudTraining	Distribution Python ML and DL Toolkit ① Dependent Distro: Endpoint Wrapper ①	Role Configurations NotebookServer(1/Small) ① TrainingEngine(1/SmallCPU) ① RESTServer(1/Small) ① LoadBalancer(1/Small) ①	Details Created At: Wed Apr 22 2020 12:30:41 Created By: mlops	Status deleting	Actions	

# **Register and Deploy the Model**

1. Select Model Registry from the left menu and click on Register New Model

IPE ML Ops   Models P						
	age >	X 🧧 CreditFraud - Jupyter Notebook	×   +			-
→ C ① Not	secure   h	hpe-mlops.hpintelco.org/bdswebui/ain	nl/models			લ દ્ર
— НРЕ	GPU	aaS				HPE ML Ops / mlops
hboard		Model Manager	ment			
ect Repository		5				Register Ne
rce Control		Model Name	Model Version	Description	Details	Actions
lel Registry		Income_Prediction	1	HPE ML Ops	Created At: Wed Mar 25 2020 12:36:16 Created By: mlops	
ning	1				Model: repo;//HPE_ML_Ops/models/XGB_Income/XGB.pickle.dat	
loyments	1					
Sources	1					
Store						
ebooks	1					

2. Register New Model using the information displayed below. (GPU / CPU option)

- HPE ML Ops   Register	or Updat	× +		- 0
← → C ▲ №	t secure	hpe-mlops.hpintelco.org/bdswebui/aiml/cr	reate-edit-model	
нр	E GP	UaaS		HPE ML Ops / mlops 🗸 😳
Dashboard		Register/Update	model	
Project Repository	'	LabelName* ⊘	Fraud Detection	
Source Control		Description (?)	Fraud Detection with xnboost and GPU	
Model Registry				
Training	1	Model Version" (2)	1	
Deployments	1	Path to Model Repo" ⊘	repo://HPE_ML_Ops/models/Credit_Fraud/GPU_credit_fraud_xgboost.model Browse	
Data Sources	1	Path to Scoring Script ⊘	repo://HPE_ML_Ops/code/CreditFraud/GPU_scoring_fraud.py Browse	
App Store		Trained on Environment ⊘	Python ML and DL Toolkit	
Notebooks	1		Submit	
	_			

3. GPU option

# Register/Update model

Label		
Name* (?	Fraud_Detection	
Description ?	Fraud Detection with xgboost and GPU	
Model Version* (?)	1	
Path to Model Repo $^*$ (?)	repo://HPE_ML_Ops/models/Credit_Fraud/GPU_credit_fraud_xgboost.model	Browse
Path to Scoring Script ⊘	repo://HPE_ML_Ops/code/CreditFraud/GPU_scoring_fraud.py	Browse
Trained on Environment (?)	Python ML and DL Toolkit	
	Submit	

4. CPU option

# Register/Update model

Label		
Name* ⊘	Fraud_Detection_CPU	
Description ⊘	Fraud Detection with xgboost and CPU	
Model Version* 🕐	1	
Path to Model Repo* $\bigcirc$	repo://HPE_ML_Ops/models/Credit_Fraud/CPU_credit_fraud_xgboost.model	Browse
Path to Scoring Script 🕐	repo://HPE_ML_Ops/code/CreditFraud/CPU_scoring_fraud.py	Browse
Trained on Environment (?)	Python ML and DL Toolkit	
	Submit	

5. Deploy your registered model (Click on Deploy)

Model Manag	gement			
				Register New Model
Model Name	Model Version	Description	Details	Actions
□ Fraud_Detection	1	Fraud Detection with xgboost and GPU	Created At: Wed Apr 22 2020 15:29:03 Created By: mlops Model: repo://HPE_ML_Ops/models/Credit_Fraud/GPU_credit_fraud_xgboost.model	
Fraud_Detection_CPU	J 1	Fraud Detection with xgboost and CPU	Created At: Wed Apr 22 2020 15:21:13 Created By: mlops Model: repoc//HPE_ML_Ops/models/Credit_Fraud/CPU_credit_fraud_xgboost.model	010
Income_Prediction	1	HPE ML Ops	Created At: Wed Mar 25 2020 12:36:16 Created By: mlops Model: repox//HPE_ML_Ops/models/XGB_Income/XGB.pickle.dat	

6. Create a Deployment Cluster for Credit Fraud Prediction (Click on Submit)

create deploymer	nt cluster	
Name* ⊘	CreditFraud	
Description ⊘	Credit Fraud Detection	
Select Model (?)	Fraud_Detection, 1	▼
RunTime Image* ⊘	Python ML/DL Toolkit	¥
Node Roles		
interenceEngine <u></u>	SmallGPU - 4 VCPU, 12.00 GB RAM, 1 GPU Devices, 1	LOO GB root disk
Add-Ons		
Endpoint Wrapper ⊘		
RESTServer 🚍 🖓	Small - 4 VCPU, 8.00 GB RAM	1
LoadBalancer 🚍 🕐	Small - 4 VCPU, 8.00 GB RAM	1
Upload Scaling Policy (?)	Select a valid JSON file	Browse
Advanced Settings		
	Submit	

## 7. Credit Fraud Prediction Cluster is now Ready

Deployments						Create Deployment
Name	Distribution		Role Configurations	Details	Status	Actions
Income_Prediction	Python ML/DL Toolkit ① Dependent Distro: Endpoint Wra	apper ①	InferenceEngine(1/Small) ① RESTServer(1/Small) ① LoadBalancer(1/Small) ①	Created At: Wed Mar 25 2020 12:37:53 Created By: mlops Attached Model(s):Income_Prediction, 1	ready	
CreditFraud	Python ML/DL Toolkit ① Dependent Distro: Endpoint Wra	apper ①	InferenceEngine(1/SmallGPU) ( RESTServer(1/Small) ( LoadBalancer(1/Small) (	Created At: Wed Apr 22 2020 15:33:19 Created By: mlops Attached Model(s):Fraud_Detection, 1	ready	
CreditFraud [AIML/Deployment] Credit Fra Node(s) Info ActionSc	aud Detection ript(s) ServiceStatus Clu ————————————————————————————————————	ster Histories				Cluster Operations V Public Endpoints V Actions V
Name	Distribution	Role	Instance IP	Services		
bluedata-522.bdlocal	Endpoint Wrapper	RESTServer	172.18.0.20	API Server : http://g3str3tc9-c.hpintelco.org:10009 [Auth Token] SSH : g3str3tc9-c.hpintelco.org -p 10010		
bluedata-521.bdlocal	Python ML/DL Toolkit	InferenceEng	ine 172.18.0.21	sshd:g3str3tc9-c.hpintelco.org-p10008		
bluedata-523.bdlocal	Endpoint Wrapper	LoadBalance	r 172.18.0.19	Model serving request balancer stats API Server : http://g3str3tc9-chpintelco.org:10012 [Auth Token] Model Serving LoadBalancer : http://g3str3tc9-chpini [Auth Token]	telco.org:10013/< <mod< td=""><td>łel_name&gt;&gt;/&lt;<model_version>&gt;/predict</model_version></td></mod<>	łel_name>>/< <model_version>&gt;/predict</model_version>

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CreditFraud [AIML/Deployment] Credit Frau	ud Detection			ready
Node(s) Info ActionScr	ipt(s) ServiceStatus Clu	uster Histories		Cluster Operations V Public Endpoints V Actions V
Name	Distribution	Role	Instance IP	Services
bluedata-522.bdlocal	Endpoint Wrapper	RESTServer	172.18.0.20	API Server : http://g3str3tc9-c.hpintelco.org:10009 [Auth Token] SSH : g3str3tc9-c.hpintelco.org -p 10010
bluedata-521.bdlocal	Python ML/DL Toolkit	InferenceEngine	172.18.0.21	sshd : g3str3tc9-c.hpintelco.org -p 10008
bluedata-523.bdlocal	Endpoint Wrapper	LoadBalancer	172.18.0.19	Model serving request balancer stats API Server : http://g3str3tc9-chpintelco.org:10012 [Auth Token] _oadBalance : http://g3str3tc9-c.hpintelco.org:10013/< <model_name>&gt;/&lt;<model_version>&gt;/predict [Auth Token]</model_version></model_name>

Copy the link and check update the port + model version

http://g3str3tc9-c.hpintelco.org:10013/Fraud Detection/1/predict [Auth Token] Click to copy the token

Non-Fraudulent Request

```
Ł
 "use_scoring" : true,
"scoring_args" : {
"transaction": "0,-1.359807134,-0.072781173,2.536346738,1.378155224,-
0.33832077,0.462387778,0.239598554,0.098697901,0.36378697,0.090794172,-0.551599533,-0.617800856,-0.991389847,-
0.311169354,1.468176972,-0.470400525,0.207971242,0.02579058,0.40399296,0.251412098,-0.018306778,0.277837576,-
0.11047391,0.066928075,0.128539358,-0.189114844,0.133558377,-0.021053053,149.62,0",
 "execCount": 1
}}
Fraudulent Request
{
 "use_scoring" : true,
 "scoring_args" : {
  "transaction": "406,-2.3122265423263,1.95199201064158,-1.60985073229769,3.9979055875468,-0.522187864667764,-
1.42654531920595,-2.53738730624579,1.39165724829804,-2.77008927719433,-2.77227214465915,3.20203320709635,-
2.89990738849473, -0.595221881324605, -4.28925378244217, 0.389724120274487, -1.14074717980657, -2.83005567450437, -
0.0168224681808257,0.416955705037907,0.126910559061474,0.517232370861764,-0.0350493686052974,-
0.465211076182388,0.320198198514526,0.0445191674731724,0.177839798284401,0.261145002567677,-
0.143275874698919,0,0",
"execCount": 1
}}
```

# Run the Fraud Detection prediction using Postman



#### This link will start Postman!

9. Select Skip signing in to go directly to the app

🤣 Postman	1774) 1	×
Fie Edit View Help		
Skip signing in and take me straight to the app		

10. Copy the Json request in Postman body tab: Click on below icon



## 11. Create a new Request

🤣 Postman						-		×
File Edit View Help							~ 1	
+ New T Import Runner		My Workspace 🔻	🛃 Invite					Sign In
Q Filter	Launchpad X	+ •••			No Environment	Ŧ	G	۵
History Collections APIs BETA								
Save Responses								
You haven't sent any requests								
Any request you send in this workspace will appear here.	Start something new			Discover				
	Create a request			Explore some templates and	l public APIs you might find	useful.		
🏠 Show me how	Create a collection 🔻			Templates	A	Pls		
	Create an environment							
	••• View More							
	Customize							
	Dark mode			Browse more				
	Open Launchpad							
	••• More settings							
					😌 Boot	tamp		1 ()

12. Fill in the Body tab to match the image below

🚱 Postman File: Edit: View Heln		- a ×
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History Collections APIs	Untitled Request	🛱 Comments 🕱
Save Responses     Clear a     April 14	POST http://ghts/lts/f-chpintelca.org/10013/Feud_Detection/1/predict	Send - Save -
	Params Authorization Headers (11 Body Trerequest Script Tests Settings	Cookles Code
	1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1	
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	â <sub>s</sub>	
	Hit Send to get a response	
		🕾 Bootcamp 🔛 🏭 ⊘

For HPE and Channel Partner Internal Use Only © Copyright 2019 Hewlett Packard Enterprise 13. Fill in the Header tab with your token

POST				Send <b>•</b> Save •
Params Authorization Headers (1 Body • Pre-request Script Tests	Settings			Cookies Co
Headers 🛛 9 hidden				
070			DESCRIPTION	••• Bulk Edit Presets
✓ x-auth-token	72EtZWCeVR			
Content-Type	application/json			
ĸĕy	value		Description	
Response				
		A		

14. Send the post request to the cluster and get the Credit Fraud prediction result

Postman File Edit View Help			- 0	×
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History Collections APIs	Untitled Request	Ę	Comments	
Save Responses Clear all				
<ul> <li>Yesterday</li> </ul>	POST * http://gStr2itc%-chpintelco.org/10013/Faud_Detection/1/predict	Send	Save	*
April 14	Params Authonization Headers (11) Body  Pre-request Script Tests Settings		Cookles	Code
	none     form-data     swww-form-uriencoded     raw     binary     GraphQL     JSDN     *		Beau	utify
	5 "exection": 1 5 Jack Caster Hadre 10 Tan Bende State State State	Time: 447 5 - Gire: 781 8	Save Response	
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	<pre>     *********************************</pre>	11399047,-0.311169354,1.46	8176972,	T
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#### 15. Fraudulent Request

Body Cookies Headers (4) Test Results Status: 200 OK T	Time: 6.52 s Size: 967 B	Save Response 💌
Pretty Raw Preview Visualize JSON 🔻 🛱		n Q
<pre> 1 {</pre>	/19433,-2.7722721446591 ,0.517232370861764,	5,

# **Diabetes Prediction Demo Scenario**

This tutorial generates a model that classifies whether a person has diabetes or not taking into account a dataset that contains data from female patients who were at least 21 years old and of Pima Indian heritage...

Data set is in the Project Repository

- HPE ML Ops   Creat	e or Upda	te F × +		- a >
← → C (0)	lot secu	re   hpe-mlops.hpintelco.org/bdswebu	ii/aiml/project-repo	* <del>0</del>
HP	E GPU	JaaS		HPE ML Ops/miops 🗸 💮
Dashboard		Project repositor	y	mounted
Project Repository				
Source Control		Repo Name* (2)	HPE_ML_Ops	
Model Registry		Туре* ⊘	NFS *	
Training	1	NFS Host Name* ⊘	16.78.13.70	
Deployments	2	NFS Share* ⊘	/data/mlops/ai	
Data Sources	1	Force? ⊘		
App Store		干涉面区市		
Notebooks	1	/bd-fs-mnt/HPE_ML_Ops/		
		HELMLOOS     models     data     bank-fullcav     allysan2.ccv     UCL_Income     Transactions     code     grows addens.cdube     code     docs     misc	HELCY	

The features (columns) in this spreadsheet that are used to train the model are:

- Pregnancies
- Glucose The blood plasma glucose concentration after a 2 hour oral glucose tolerance test.
- BloodPressure Diastolic blood pressure (mm/HG).
- SkinThickness Skinfold thickness of the triceps (mm).
- Insulin—2 hour serum insulin (mu U/ml).
- BMI—Body mass index (kg/m squared)
- DiabetesPedigreeFunction: Function that determines the risk of type 2 diabetes based on family history.
- Age
- Outcome—whether the person is diagnosed with type 2 diabetes (1 = yes, 0 = no).

# Create your HPE ML Ops Training cluster

1. Select Create training cluster

HPE ML Ops   Create or Update	de X +	– ø ×
← → C ▲ Not secure	e   hpe-mlops.hpintelco.org/bdswebui/aiml/create-edit-training	् ☆ 🖰 :
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Dashboard Project Repository Source Control Model Reaistry Training 1	Create training cluster Cluster Detail Name® () miditraining Description () HPE ML Ops Training for Healthcare RunTime Image® () Pyrthon ML and DL Toolkit *	
Deployments     2       Data Sources     1       App Store     1       Notebooks     1	NotebookServer       Image: Small - 4 VCPU, 8.00 GB RAM       Image: Small - 4 VCPU, 8.00 GB RAM         TrainingEngine       Small - 4 VCPU, 8.00 GB RAM       Image: Small - 4 VCPU, 8.00 GB RAM         Add-Ons       Image: Small - 4 VCPU, 8.00 GB RAM       Image: Small - 4 VCPU, 8.00 GB RAM         Endpoint Wrapper       Image: Small - 4 VCPU, 8.00 GB RAM       Image: Small - 4 VCPU, 8.00 GB RAM         Endpoint Wrapper       Image: Small - 4 VCPU, 8.00 GB RAM       Image: Small - 4 VCPU, 8.00 GB RAM	
	LoadBalancer 📰 💿 Small - 4 VCPU, 8.00 GB RAM 🔹 1	

## Don't forget to add a Training Engine with CPU flavor and update the RunTime Image

RunTime Image* 🕜 Python ML and DL Toolkit	•
Node Roles	к
NotebookServer = ⑦ Small - 4 VCPU, 8.00 GB RAM 🔹 1	$\sim$
TrainingEngine = 🕐 Small - 4 VCPU, 8.00 GB RAM 🔹 1	$\Diamond$

#### 2. Click on Submit

Add-Ons		s l				
Endpoint Wrapper ⊘						
RESTServer 🚍 🕐	Small - 4 VCPU, 8.00 GB RAM	1				
LoadBalancer 🚍 🕐	Small - 4 VCPU, 8.00 GB RAM	1				
Upload Scaling Policy 🕐	Select a valid JSON file	Browse				
Advanced Settings						
Submit						

#### 3. Check that the cluster is ready

Name	Distribution	Role Configurations	Details	510105	Actions
mldltraining	Python ML and DL Toolkit ${\mathbb O}$ Dependent Distro: Endpoint Wrapper ${\mathbb O}$	NotebookServer(1/Small) ① TrainingEngine(1/Small) ① RESTServer(1/Small) ① LoadBalancer(1/Small) ①	Created At: Tue May 19 2020 10:10:22 Created By: mlops	ready	

#### 4. Open Training Cluster details (Click on mldltraining)

- Nome	Distribution	Role Configurations	Details	Status	Actions
mldltraining	Python ML and DL Toolkit ① Dependent Distro: Endpoint Wrapper ①	NotebookServer(1/Small)	Created At: Tue May 19 2020 10:10:22 Created By: mlops	ready	
		RESTServer(1/Small)			

#### 5. Show the cluster nodes and services. (NotebookServer / TrainingEngine / ...)

MIdItraining [AIML/Training] HPE ML Ops Traini Node(s) Info ActionScript(:	ing for Healthcare s) ServiceStatus Cluster Historie:				Cluster Operations 🗸
		_			Public Endpoints V Actions V
Name	Distribution	Role	Instance IP	Services	
bluedata-735.bdlocal	Python ML and DL Toolkit	TrainingEngine	172.18.0.34	ssh : g3str3tc9-c.hpintelco.org -p 10039	
bluedata-736.bdlocal	Endpoint Wrapper	RESTServer	172.18.0.35	API Server : http://g3str3tc9-c.hpintelco.org:10040 [Auth Token] SSH : g3str3tc9-c.hpintelco.org -p 10041	
bluedata-734.bdlocal	Python ML and DL Toolkit	NotebookServer	172.18.0.37	Standalone Jupyterhub ssh : g3str3tc9-c.hpintelco.org -p 10038	
bluedata-737.bdlocal	Endpoint Wrapper	LoadBalancer	172.18.0.36	Model serving request balancer stats API Server : http://g3str3tc9-chpintelco.org:10043 [Auth Token] Training API Server : http://g3str3tc9-c.hpintelco.org:10044/train [Auth Token]	

#### 6. Check the Services Status of your cluster (Application / System services)

Mdltraining [AIML/Training] HPE ML Ops Training Node(s) Info ActionScript(s)	for Healthcare ServiceStatus Clu	uster Histories			Cluster Operations 🗸
Name	API Server	Model Serving LoadBalancer	Standalone Jupyterhub	BlueData Agent	User Auth
bluedata-737.bdlocal	•	•	•	•	•
bluedata-736.bdlocal	•	•	•	•	•
bluedata-735.bdlocal	•	•	•	•	•
bluedata-734.bdlocal	•	0	•	•	•

# **Develop/Create Jupyter Notebooks**

1. Select Notebooks from the left menu

- HPE ML Ops   Note	- 0 X							
← → C (0 ≀	Not secu	re   hpe-mlops.hpir	ntelco.org/bdswebui/aiml/notebooks					☆ <b>0</b> :
HP	E GPI	UaaS					HPE ML Op	:/mlops 🗸 💮
Dashboard		Notebo	oks					
Project Repository	,							Create Notebook
Source Control		Name	Distribution	Role Configurations	Details	Status	Actions	
Model Registry		mlops	Jupyter Notebook with JupyterHub $\ensuremath{}$	NotebookServer(1/Small)	Created At: Wed Apr 01 2020 17:16:34 Created By: mlops	ready		
Training	2				Attached Cluster(s):mldemo			
Deployments	1							
Data Sources	1							
App Store								
Notebooks								

2. Create a Jupyter Notebook (Click on Create Notebook)

HPE ML Ops   Note	- 0 X						
← → C (0 )	Not secu	re   hpe-mlops.hpin	ntelco.org/bdswebui/aiml/notebooks				<b>☆ Θ</b> :
нр	E GPU	JaaS					HPE ML Ops / mlops 🗸 💮
Dashboard		Noteboo	oks				
Project Repository	'						Create Notebook
Source Control		Name	Distribution	Role Configurations	Details	Status A	ctions
Model Registry	2	mlops	Jupyter Notebook with JupyterHub ${\mathbb O}$	NotebookServer(1/Small)	Created At: Wed Apr 01 2020 17:16:34 Created By: mlops	ready	
Training					Anached Cruster(s), midemo		
Deployments	1						
Data Sources	1						
App Store							
Notebooks	1						
	_						

3. Associate the Notebook with your Training cluster

Name* ⊘	Notebook	
Description ⊘	Healthcare	
RunTime Image* 곗	Jupyter Notebook with JupyterHub v2	•
Node Roles		
NotebookServer 🚍 🖓	Small - 4 VCPU, 8.00 GB RAM 🔹 1	$\langle \hat{\cdot} \rangle$
Associate with Training 🖓	mldltraining	•
Environments		
Advanced Settings		

Don't forget to associate with Training Engine, setup CPU flavor and update the RunTime Image v2

4. Create Notebook Cluster (Click on Submit)

# create notebook cluster

Cluster Detail		
Name* 🕐	Notebook	
Description ⊘	Healthcare	
Run Time Image* ⊘	Jupyter Notebook with JupyterHub v2	•
Node Roles		<u>a</u> k
NotebookServer 🗮 ⊘	Small - 4 VCPU, 8.00 GB RAM	
Associate with Training ⑦ Environments	mldltraining	<b>~</b>
Advanced Settings		ري الا
	Submit	

#### 5. Make sure that the status of your notebook is ready

Notebook	Jupyter Notebook with JupyterHub v2 $\oplus$	NotebookServer(1/Small) ①	Created At: Tue May 19 2020 10:25:17 Created By: mlops Attached Cluster(s):mldItraining	🔹 ready

6. Open JupyterHub web ui (Click on NotebookServer)

Notebook [AIML/Notebook] Healthcare				ready
Node(s) Info ActionScript(s)	ServiceStatus Cluster Histories			Cluster Operations $\checkmark$
				Public Endpoints V
Name	Distribution	Role	Instance IP	Services
bluedata-771.bdlocal	Jupyter Notebook with JupyterHub v2	NotebookServer	172.18.0.38	NotebookServer

7. Login in to the Jupyter WebUI as mlops user



8. Open the Diabetes\_Prediction.ipynb file, and then run each cell individually.



(Caution: Update the variable according to your Training Cluster including History urls.)

# **Register and Deploy the Model**

1. Select Model Registry from the left menu and click on Register New Model

HFM ND opt   Model Nay         ×							
C O Not secure hpe-miops.hpintelc hpe hpe hpe hpe hpe hpe hodel Na hodel Na hining hpioyments hasources hp brore hpione h h h h h h h h h h h h h h h h h h h	HPE ML Ops   Models	Page	X CreditFraud - Jupyter Notebook X	+			-
HPE GPUaaS  hboard MOdel  ject Repository rrce Control del Registry  ining 1  soloyments 1  soloyments 1  soloyments 1	→ C ③ No	t secure	hpe-mlops.hpintelco.org/bdswebui/aiml	/models			Q 1
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ning 1 loyments 1 a Sources 1	lel Registry		Income_Prediction	1	HPE ML Ops	Created At: Wed Mar 25 2020 12:36:16	@ 📋 🖤
a Sources 1	ining	1				Model: repo;//HPE_ML_Ops/models/XGB_Income/XGB.pickle.dat	
a Sources 1	oloyments	1					
p Store	a Sources	1					
	n Store						
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2. Register New Model using the information displayed below.

HPE ML Ops   Register or Upda	e   10.6.56.71/	/bdswebui/aiml/create-edit-model?id=/api/v2/model/22		– व × ९ इ. 🔁 :
ш	PE GPI	UaaS		HPE ML Ops / mlops \vee 💮
Dashboard		Register/Update	model	1
Project Repositor	ry	Name* ⊘	Diabetes_Prediction_4u	
Model Registry		Description ⊘	Model for Diabetes Prediction (Postman)	
Training	1	Model Version* ⊘	1	1
Deployments	2	Path to Model Repo* ⊘	repo://HPE_ML_Ops/models/Diabetes_Prediction_4u/db_remote.h5 Browse	
Data Sources	1	Path to Scoring Script ⊘	repo://HPE_ML_Ops/code/Diabetes/Diabetes_Scoring_4u.py Browse	
App Store		Trained on Environment ⊘	mld	
Notebooks	1		Submit	

3. Deploy your registered model (Click on Deploy)

Model Management

				Register New Model
Model Name	Model Version	Description	Details	Actions
Diabetes_Prediction_4u	1	Model for Diabetes Prediction (Postman)	Created At: Tue May 19 2020 16:37:38 Created By: mlops Model: repo://HPE_ML_Ops/models/Diabetes_Prediction_4u/db_remote.h5	

4. Create a Deployment Cluster for Diabetes Prediction (Click on Submit)

HPE ML Ops   Create or Up	date 0 ×	+ 56.71/bdsvebu/jaimi/create-edit-deployment?model_id=/ppi/v2/model/22	- ♂ × < ☆ ⊖ :
— нр	e gpu	laaS	HPE ML Ops / mlops 🗸 💮
Dashboard		create deployment cluster	
Project Repository Source Control		Cluster Detail Name* ② Diabetes,Predict Description ③ HPF ML Oxs for Healthcare	
Model Registry Training	1	Select Model () Diabeter Brediction 4u 1   RunTime Image" () TensorFlow ModelServer	
Deployments Data Sources App Store	1	Node Roles ModelServer ≡ ⑦ Small - 4 VCPU, 8.00 GB RAM ▼ 1	
Notebooks	1	C Add-Ons Endpoint Wrapper ⑦ ♥ BFSTServer = ⑦ C	
		LoadBalancer = O Small - 4 VCPU, 8.00 GB RAM   I  Small - 4 VCPU, 8.00 GB RAM  I	
		Upload Scaling Policy  Select a valid JSON file Browse Advanced Settings	
		Submit	

Don't forget to update the RunTime Image to TensorFlow ModelServer

#### 5. Diabetes Prediction Cluster is now Ready

#### Deployments

					Create Deployment
Name	Distribution	Role Configurations	Details	Status	Actions
pythonmldl	Python ML/DL Toolkit ① Dependent Distro: Endpoint Wrapper ①	InferenceEngine(1/Small) ① RESTServer(1/Small) ① LoadBalancer(1/Small) ①	Created At: Wed May 06 2020 16:31:20 Created By: mlops Attached Model(s):Income_Prediction, 1	<ul> <li>ready</li> </ul>	
Diabetes_Predict	TensorFlow ModelServer ① Dependent Distro: Endpoint Wrapper ①	ModelServer(1/Small) ① RESTServer(1/Small) ① LoadBalancer(1/Small) ①	Created At: Tue May 19 2020 16:51:11 Created By: mlops Attached Model(s):Diabetes_Prediction_4u, 1	<ul> <li>ready</li> </ul>	
Diabetes_Prediction_Web	TensorFlow ModelServer $\oplus$ Dependent Distro: Endpoint Wrapper $\oplus$	ModelServer(1/Small) ① RESTServer(1/Small) ① LoadBalancer(1/Small) ①	Created At: Thu May 07 2020 19:06:03 Created By: mlops Attached Model(s):Diabetes_Prediction, 1	ready	

# Diabetes\_Predict

[AIML/Deployment] HPE ME O	ps for Healthcare					
Node(s) Info ActionScr	ipt(s) ServiceStatus (	Cluster Histories			Cluster	Operations ∨
					Public Endpoints $\lor$	Actions $\checkmark$
Name	Distribution	Role	Instance IP	Services		
bluedata-763.bdlocal	TensorFlow ModelServer	ModelServer	172.18.0.36	Tensorflow Model Server : g3str3tc9-c.hpintelco.org:10039 SSH : g3str3tc9-c.hpintelco.org -p 10037 REST API port for tensorflow serving : g3str3tc9-c.hpintelco.org:10038		
bluedata-764.bdlocal	Endpoint Wrapper	RESTServer	172.18.0.35	API Server : http://g3str3tc9-c.hpintelco.org:10040 [Auth Token] SSH : g3str3tc9-c.hpintelco.org -p 10041		
bluedata-765.bdlocal	Endpoint Wrapper	LoadBalancer	172.18.0.34	Model serving request balancer stats API Server : http://g3str3tc9-c.hpintelco.org:10043 [Auth Token] Model Serving LoadBalancer : http://g3str3tc9- c.hpintelco.org:10044/< <model_name>&gt;/&lt;<model_version>&gt;/predict [Auth Token]</model_version></model_name>		

ready

. .

#### 6. Generate your Prediction Request

Diabetes\_Predict

[AIML/Deployment] HPE ML Op	s for Healthcare					Teady
Node(s) Info ActionScrip	pt(s) ServiceStatus Clust	er Histories			Cluster	Operations $\vee$
					Public Endpoints $ \smallsetminus $	Actions $\lor$
Name	Distribution	Role	Instance IP	Services		
bluedata-763.bdlocal	TensorFlow ModelServer	ModelServer	172.18.0.36	Tensorflow Model Server : g3str3tc9-c.hpintelco.org:10039 SSH : g3str3tc9-c.hpintelco.org -p 10037 REST API port for tensorflow serving : g3str3tc9-c.hpintelco.org:10038		
bluedata-764.bdlocal	Endpoint Wrapper	RESTServer	172.18.0.35	API Server : http://g3str3tc9-c.hpintelco.org:10040 [Auth Token] SSH : g3str3tc9-c.hpintelco.org -p 10041		
bluedata-765.bdlocal	Endpoint Wrapper	LoadBalancer	172.18.0.34	Model serving request balancer stats API Server : http://g3str3tc9-c.hpintelco.org:10043		
				Model Serving LoadBalancer : http://g3str3tc9- c.bninte/co.org10044/< <model_name>&gt;/&lt;<model_version>&gt;/predict [Auth Token]</model_version></model_name>		

Copy the link and check update the port, model name and version

http://g3str3tc9-c.hpintelco.org:10044/Diabetes\_Prediction\_4u/1/predict

[Auth Token] Click to copy the token

# Run the Diabetes prediction using Postman



#### This link will start Postman!

1. Select Skip signing in to go directly to the app

🤣 Postman		×
File Edt View Help		
Slop signing in and take me straight to the app		

2. Copy the Json request in Postman body tab: Click on below icon



## 3. Create a new Request

🧭 Postman						_			×
File Edit View Help									
🕂 New 🔻 Import Runner 📭 🖛	1	My Workspace 🔻	🛃 Invite		B C	r +	• [	Sign I	In
Q Filter	Launchpad X	+ ••••			No Environment			> 3	¢
History Collections APIs BELA									
You haven't sent any requests									
Any request you send in this workspace will appear here.	Start something new			<b>Discover</b> Explore some templates and	d public APIs you might find	d useful.			
🏠 Show me how	Create a collection 🔹			Templates		\PIs			
	. Create an environment								
	••• View More								
	Dark mode								
	Open Launchpad			Browse more					
	••• More settings								
					🗇 Boot	camp	<b>=</b> •	5	?

4. Fill in the Body tab to match the image below

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Q. Filter		No Environment 🔹 🐵 🎄
History Collections APIs	Untitled Request	G Comments 0
Save Responses     Clet     Today	POST + http://g3or3icf-chpinelca.org/10044/Debrest_Prediction_4////predic	Send • Save •
POST http://g3str3tc9-c.hpintelco.org:10044/Diabetes_Pr ediction_4u/1/predict	Params Authorization Headers (1 Bode Revenuent Script Tests Section	Cookies Code
http://gludidid-chaptelia.org/15644Dabrees_P ediction_full/predict	Open deal         Open deal <t< td=""><td>Beady</td></t<>	Beady
<b>I</b> 9 II		🕆 Bootcamp 🖬 🕮 🕐

5. Fill in the Header tab with your token

POST • http://g3str3tc9-c-hpintelco.org:10044/Diabetes_Prediction_4u/1/predict					
Params Authorization Headers (1 Body • Pre-request Script Tests Se	ttings				
Headers 💿 9 hidden					
KFY	VALUE	DESCRIPTION	••• Bulk Edit		
x-auth-token	C0CRyj958O				
Content-Type	application/json				
Ney	value	Description			
Response					

6. Send the post request to the cluster and get the Diabetes prediction result

POST	Send	▼ Save ▼
Params Authorization Headers (11) Body  Pre-request Script Tests Settings		Cookies Code
none     form-data     xwww-form-urlencoded     raw     binary     GraphQL     JSON     *		Beautify
1 • (0 • (0) • scoring_magnet ( • scoring_m		
Body Cookies Headers (4) Test Results	Status: 200 OK Time: 2.44 s Size: 542 B	Save Response 👻
Pretty Raw Preview Visualize JSON 🔻 🚍		n Q
<pre>input:: "(''NumPreg'': 1, ''Glucose'': 85, ''BloodPressure'': 66, ''SkinThick'': 29, ''Insulin'': 0, ''BKI'': 26.6, ''DiabetesPedFunc'': 0.351, ''Age'': 35)",</pre>		T

# Deploy Customized Notebook Image

1. Create a new Notebook

Dashboard	create notebook cluster					
Project Repository	Cluster Detail					
Source Control	Name* ② Diabetes_Predict_Web					
Model Registry	Description ⑦ HPE ML Ops Customized Image					
Training 1	RunTime Image* ⊘ Diabetes Web Server 🔹					
Deployments <sup>3</sup>	Node Roles       WebServer ≡ ⊘       Small - 4 VCPU, 8.00 GB RAM					
Data Sources 1						
App Store	Applicable clusters are not available					
Notebooks 1	Advanced Settings					
	Submit					

2. Diabetes Prediction Notebook is now Ready

← → C ① Notebooks	x cure   10	+ 0.6.56.71/bdswebui/aiml/notebooks					– ¤ × 0. ± <b>A</b> :
нр	E GP	UaaS					HPE ML Ops / mlops 🗸 …
Dashboard		Notebooks					
Project Repository	,						Create Notebook
Source Control		□ Name	Distribution	Role Configurations	Details	Status	Actions
Model Registry		mlops	Jupyter Notebook with JupyterHub v2 $$	NotebookServer(1/SmallGPU) ①	Created At: Wed May 06 2020 19:52:44 Created By: mlops	🔵 ready	
Training	1	Diabetes Predict Web	Diabetes Web Server	WebServer(1/Small)	Created At: Tue May 19 2020 18:10:00	ready	
Deployments	3		blabeles web server ()	webserver(1/smail) ()	Created By: mlops	ready	
Data Sources	1						
App Store							
Notebooks	2						

3. Check that the Notebook is ready

Diabetes_Predict_Web [AIML/Notebook] HPE ML Ops Customized Image							ready
Node(s) Info	ActionScript(s)	ServiceStatus	Cluster Histories				Cluster Operations $\checkmark$
							Public Endpoints V
Name			Distribution		Role	Instance IP	Services
bluedata-766.bd	local		Diabetes Web Server		WebServer	172.18.0.37	WebServer

## Run the Diabetes prediction using Customized Image

1. Register a new patient



2. Fill in your first and last name and save

🚥 HPE ML Ops   Cluster Dashboard 🗙 🍖 Register Patient - foo 🛛 🗙 🕇					-	ø ×
← → C (① Not secure   g3str3tc9-c.hpintelco.org:10045/patients/create-	form				@ ☆	Θ:
🦕 diabetes-app						
				_		
Register P	atient					
	First Name	Eric				
	Last Name	Dominois				
		SAVE				

3. Patient card has been created



#### 4. Add consultation

← HPE ML Ops   Cluster Dashboard × ► Patie ← → C ① Not secure   g3str3tc9-c.h	ent card - foo × + pintelco.org:10045/patients/1/			– ♂ × Q ☆ 🔁 ::
	diabetes-app	PATIENT - CONSULTATION -	SC CONTACT OF HELP OF LA	NGUAGES +
	Patient ca			
	Patient data			
	First Name Last Name	Eric Dominois		
				EDIT
	¢ BACK			
g3str3tc9-chpintelco.org:10045/consultations/create-for	m			

#### 5. Create consultation

🚥 HPE ML Ops   Cluster Dashboard 🗴 🍖 Create Consultation - foo 🛛 🗴 🕇			-	ø ×
← → C (① Not secure   g3str3tc9-c.hpintelco.org:10045/consultations/create-form			Q \$	Θ:
diabetes-app PATIENT -				·
Oreate Concultati	0.0			
Create Consultati	on			
Patient	Patient {id='1', version='0', firstName='Eric', la	sstName='Dominois'} × ~		
Consultation Date	May 19, 2020			
Pregnancies	1			
Glucose	85			
Blood Prossure	80			
DIOUN FIESSUE				
Skin Thickness	29			
Insulin	4			
Bmi	26.6			
Diabetes Pedigree Function	5			
400	60			
Age				
Prediction %	Prediction %			
	SAVE			

6. Consultation card has been created with Diabetes prediction score!

🚥 HPE ML Ops   Cluster Dashboard 🗙 🍉 Consultation card -	100 × +				- a ×
← → C ① Not secure   g3str3tc9-c.hpintelco.org:1	10045/consultations/1/				() ☆ 🖰 :
	diabetes-app	PATIENT - CONSULTATION -	S CONTACT	HELP Q LANGUAGES -	
	Consultati	on card			
	Consultation data				
	Patient	Patient (id='1', version='0', firstName='Eric', lastName='Dominois')			
	Consultation Date	May 19, 2020			
	Glucose	85			
	Blood Pressure	80			
	Skin Thickness	29			
	Insulin	4			
	Bmi	26.6			
	Diabetes Pedigree Function	n 5			
	Age	60			
	Prediction %	26.79		_	
	_			EDIT	
	< BACK				

Contributors: Terry Chiang, Nanda Vijaydev, and Chris Snow

# HPE Container Platform GPU Nodes Monitoring

Environment	Web UI	Username			
HPE_ML_Ops	http://hpe-gpumon.hpintelco.org	cicdemo@hpintelco.org			
Once connected to the Citrix, lumphost, onen in your browser (chrome) the web ui login console, fill the					

Once connected to the Citrix Jumphost, open in your browser (chrome) the web ui login console, fill the user logon credentials provided on the BlueData\_EPIC html page and click "Login".



#### This link will start Chrome and open an html document with links and credentials!





# Thanks!

- End of document -

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