credit-risk-classification

October 8, 2019

1 Students Do: Credit Risk Classification with Amazon Sage-Maker

- **Dataset:** German Credit Risk Dataset - Prof. Dr. Hans Hofmann (original source: ics.uci.edu, download: Kaggle)

- **Goal:** Classify the credit risk of a person as described by a given set of input features.

Note: You should import and run this notebook into your notebook intance on Amazon SageMaker.

```
[1]: # Initial imports
     import numpy as np
     import pandas as pd
     from path import Path
     import matplotlib.pyplot as plt

     %matplotlib inline
```

1.1 Loading the data

```
[2]: # Upload the german_credit_data.csv file (located in ../Resources/) through
     # ↪through JupyterLab
     file_path = Path("Data/german_credit_data.csv")
     df = pd.read_csv(file_path, index_col=0)
     df.head()
```

```
[2]:    Age     Sex  Job Housing Saving accounts Checking account  Credit amount  \
     0   67    male    2     own             NaN           little           1169
     1   22  female    2     own          little         moderate           5951
     2   49    male    1     own          little              NaN           2096
     3   45    male    2    free          little           little           7882
     4   53    male    2    free          little           little           4870

         Duration             Purpose  Risk
     0           6            radio/TV  good
     1          48            radio/TV   bad
     2          12           education  good
     3          42  furniture/equipment  good
```

```
4          24                    car    bad
```

```
[3]: # Creating a DataFrame with the features (include all columns except "Risk")
     features_df = df.drop("Risk", axis=1)
     features_df.head()
```

```
[3]:    Age     Sex  Job Housing Saving accounts Checking account  Credit amount  \
     0   67    male    2     own              NaN           little            1169
     1   22  female    2     own           little         moderate            5951
     2   49    male    1     own           little              NaN            2096
     3   45    male    2    free           little           little            7882
     4   53    male    2    free           little           little            4870

        Duration                Purpose
     0         6               radio/TV
     1        48               radio/TV
     2        12              education
     3        42  furniture/equipment
     4        24                    car
```

```
[4]: # Creating a DataFrame with the target data (The "Risk" column)
     target_df = pd.DataFrame(df["Risk"])
     target_df.head()
```

```
[4]:    Risk
     0  good
     1   bad
     2  good
     3  good
     4   bad
```

1.2 Data Preparation

A logistic regression model will be trained using all the input features.

- X is the predictor variable vector with the values of all features.
- Y is the target variable vector with the risk result.

```
[5]: # Encode the categorical features (One-hot encode)
     features_enc = pd.get_dummies(features_df)
     features_enc.head()
```

```
[5]:    Age  Job  Credit amount  Duration  Sex_female  Sex_male  Housing_free  \
     0   67    2           1169         6           0         1             0
     1   22    2           5951        48           1         0             0
     2   49    1           2096        12           0         1             0
     3   45    2           7882        42           0         1             1
     4   53    2           4870        24           0         1             1
```

```
      Housing_own  Housing_rent  Saving accounts_little  …  \
0               1             0                       0  …
1               1             0                       1  …
2               1             0                       1  …
3               0             0                       1  …
4               0             0                       1  …

      Checking account_moderate  Checking account_rich  Purpose_business  \
0                             0                      0                 0
1                             1                      0                 0
2                             0                      0                 0
3                             0                      0                 0
4                             0                      0                 0

      Purpose_car  Purpose_domestic appliances  Purpose_education  \
0               0                            0                  0
1               0                            0                  0
2               0                            0                  1
3               0                            0                  0
4               1                            0                  0

      Purpose_furniture/equipment  Purpose_radio/TV  Purpose_repairs  \
0                               0                 1                0
1                               0                 1                0
2                               0                 0                0
3                               1                 0                0
4                               0                 0                0

      Purpose_vacation/others
0                           0
1                           0
2                           0
3                           0
4                           0

[5 rows x 24 columns]
```

```
[6]: # ignore DataConversionWarning messages
     import warnings
     from sklearn.exceptions import DataConversionWarning

     warnings.filterwarnings(action="ignore", category=DataConversionWarning)
```

```
[7]: # Scale the features
     from sklearn import preprocessing
```

```
scaler = preprocessing.StandardScaler().fit(features_enc)
scaler
print(scaler.mean_[:5])
print(scaler.scale_[:5])
```

```
[3.554600e+01 1.904000e+00 3.271258e+03 2.090300e+01 3.100000e-01]
[1.13697794e+01 6.53287073e-01 2.82132515e+03 1.20527835e+01
 4.62493243e-01]
```

[8]:
```
features_enc_scaled = scaler.transform(features_enc)
features_enc_scaled
```

[8]:
```
array([[ 2.76645648,  0.14694918, -0.74513141, …,  1.60356745,
        -0.14998296, -0.11020775],
       [-1.19140394,  0.14694918,  0.94981679, …,  1.60356745,
        -0.14998296, -0.11020775],
       [ 1.18331231, -1.38377145, -0.41656241, …, -0.62360956,
        -0.14998296, -0.11020775],
       …,
       [ 0.21583532,  0.14694918, -0.87450324, …,  1.60356745,
        -0.14998296, -0.11020775],
       [-1.10345149,  0.14694918, -0.50552769, …,  1.60356745,
        -0.14998296, -0.11020775],
       [-0.75164167,  0.14694918,  0.46245715, …, -0.62360956,
        -0.14998296, -0.11020775]])
```

[9]:
```
target_enc = pd.get_dummies(target_df)
target_enc.head()
```

[9]:
```
   Risk_bad  Risk_good
0         0          1
1         1          0
2         0          1
3         0          1
4         1          0
```

[10]:
```
X = features_enc_scaled
Y = target_enc["Risk_bad"].values.reshape(-1)  # 0 = Good, 1 = Bad Risk
print(X[:5])
print(Y[:5])
```

```
[[ 2.76645648  0.14694918 -0.74513141 -1.23647786 -0.67028006  0.67028006
  -0.3479601   0.63444822 -0.4669334  -1.23243324 -0.33886163 -0.25929878
  -0.22454436  1.62776996 -0.60662102 -0.25929878 -0.32774947 -0.71294854
  -0.11020775 -0.2503982  -0.47010767  1.60356745 -0.14998296 -0.11020775]
 [-1.19140394  0.14694918  0.94981679  2.24819436  1.49191369 -1.49191369
  -0.3479601   0.63444822 -0.4669334   0.81140298 -0.33886163 -0.25929878
  -0.22454436 -0.61433742  1.6484757  -0.25929878 -0.32774947 -0.71294854
```

```
       -0.11020775 -0.2503982  -0.47010767  1.60356745 -0.14998296 -0.11020775]
     [ 1.18331231 -1.38377145 -0.41656241 -0.73866754 -0.67028006  0.67028006
      -0.3479601   0.63444822 -0.4669334   0.81140298 -0.33886163 -0.25929878
      -0.22454436 -0.61433742 -0.60662102 -0.25929878 -0.32774947 -0.71294854
      -0.11020775  3.99363901 -0.47010767 -0.62360956 -0.14998296 -0.11020775]
     [ 0.8315025   0.14694918  1.63424694  1.75038404 -0.67028006  0.67028006
       2.8738927  -1.57617276 -0.4669334   0.81140298 -0.33886163 -0.25929878
      -0.22454436  1.62776996 -0.60662102 -0.25929878 -0.32774947 -0.71294854
      -0.11020775 -0.2503982   2.12717227 -0.62360956 -0.14998296 -0.11020775]
     [ 1.53512213  0.14694918  0.5666635   0.25695309 -0.67028006  0.67028006
       2.8738927  -1.57617276 -0.4669334   0.81140298 -0.33886163 -0.25929878
      -0.22454436  1.62776996 -0.60662102 -0.25929878 -0.32774947  1.40262577
      -0.11020775 -0.2503982  -0.47010767 -0.62360956 -0.14998296 -0.11020775]]
    [0 1 0 0 1]
```

```python
[11]:  # Split the data in training and testing sets
       from sklearn.model_selection import train_test_split

       X_train, X_test, Y_train, Y_test = train_test_split(X, Y, test_size=0.2)
```

1.3   Machine Learning Model Creation

```python
[12]:  bucket = "sagemaker-20191007-2307"   #'<your_s3_bucket_name_here>'
       prefix = "german-credit-risk"

       # Amazon SageMaker and related imports
       import sagemaker
       import sagemaker.amazon.common as smac
       from sagemaker.predictor import csv_serializer, json_deserializer
       from sagemaker import get_execution_role
       import boto3  # AWS Python sdk

       import os
       import io
       import json

       # AWS IAM role
       role = get_execution_role()
```

1.3.1   Uploading Training Data to Amazon S3

In order to train your machine learning model using Amazon SageMaker, the training data should passed through an Amazon S3 Bucket formatted as a protobuf recordIO format.

The profobuf recordIO format, is a method to serialize structured data (similar to `JSON`), to allow different applications to communicate with each other or for storing data.

Using the profobuf recordIO format, allows you to take advantage of *Pipe mode* when training the

algorithms that support it. In *Pipe mode*, your training job streams data directly from Amazon S3. Streaming can provide faster start times for training jobs and better throughput.

The following code converts the training data as a Protocol Buffer, next the data is uploaded to the Amazon S3 bucket.

```
[13]: # Encode the training data as Protocol Buffer
      buf = io.BytesIO()
      smac.write_numpy_to_dense_tensor(
          buf, np.array(X_train).astype("float32"), np.array(Y_train).
       ↪astype("float32")
      )
      buf.seek(0)

      # Upload encoded training data to Amazon S3
      key = "train.data"
      boto3.resource("s3").Bucket(bucket).Object(
          os.path.join(prefix, "train", key)
      ).upload_fileobj(buf)
      s3_train_data = "s3://{}/{}/train/{}".format(bucket, prefix, key)
      print("Training data uploaded to: {}".format(s3_train_data))
```

Training data uploaded to: s3://sagemaker-20191007-2307/german-credit-risk/train/train.data

Upload Test Data to Amazon S3   If you provide test data, the algorithm logs include the test score for the final model.

```
[14]: # Encode the testing data as Protocol Buffer
      buf = io.BytesIO()
      smac.write_numpy_to_dense_tensor(
          buf, np.array(X_test).astype("float32"), np.array(Y_test).astype("float32")
      )
      buf.seek(0)

      # Upload encoded testing data to Amazon S3
      key = "test.data"
      boto3.resource("s3").Bucket(bucket).Object(
          os.path.join(prefix, "test", key)
      ).upload_fileobj(buf)
      s3_test_data = "s3://{}/{}/test/{}".format(bucket, prefix, key)
      print("Testing data uploaded to: {}".format(s3_test_data))
```

Testing data uploaded to: s3://sagemaker-20191007-2307/german-credit-risk/test/test.data

1.3.2 Training the Machine Learning Model

Once you have uploaded your data to Amazon S3, it's time to train the machine learning model. In this activity, you will use the Amazon SageMaker's *linear learner algorithm* to run a linear regression prediction model.

You can learn more about the diferent Amazon SageMaker built-in algorithms in this page.

First, an intance of the linear learner algorithm is created.

```python
[15]: # Create an intance of the linear learner algorithm
from sagemaker.amazon.amazon_estimator import get_image_uri

container = get_image_uri(boto3.Session().region_name, "linear-learner")
```

Next, the estimator container is created in an AWS EC2 instance using a `ml.m4.xlarge`.

Note: This step might take a few minutes.

```python
[16]: # Start the Amazon SageMaker session
sess = sagemaker.Session()

# Create an instance of the linear learner estimator
linear = sagemaker.estimator.Estimator(
    container,
    role,
    train_instance_count=1,
    train_instance_type="ml.m4.xlarge",
    output_path="s3://{}/{}/output".format(bucket, prefix),
    sagemaker_session=sess,
)

# Get the dimension of the feature-input vector
feature_dim = len(X[:1][0])


# Define lineal learner hyperparameters
# Note how in this case we use: predictor_type='binary_classifier' # (credit␣
 ↪risk: good or bad)
linear.set_hyperparameters(
    feature_dim=feature_dim, mini_batch_size=200,␣
 ↪predictor_type="binary_classifier"
)

# Fitting the linear learner model with the training data
linear.fit({"train": s3_train_data, "test": s3_test_data})
```

```
2019-10-09 03:57:24 Starting - Starting the training job…
2019-10-09 03:57:25 Starting - Launching requested ML instances…
2019-10-09 03:58:24 Starting - Preparing the instances for training…
```

2019-10-09 03:59:42 Downloading - Downloading input data…
2019-10-09 04:00:09 Training - Downloading the training image..Docker

entrypoint called with argument(s): train
[10/09/2019 04:00:30 INFO 140715555129152] Reading default configuration

from /opt/amazon/lib/python2.7/site-packages/algorithm/resources/default-

input.json: {u'loss_insensitivity': u'0.01', u'epochs': u'15', u'init_bias':

u'0.0', u'lr_scheduler_factor': u'auto', u'num_calibration_samples':

u'10000000', u'accuracy_top_k': u'3', u'_num_kv_servers': u'auto', u'use_bias':

u'true', u'num_point_for_scaler': u'10000', u'_log_level': u'info', u'quantile':

u'0.5', u'bias_lr_mult': u'auto', u'lr_scheduler_step': u'auto', u'init_method':

u'uniform', u'init_sigma': u'0.01', u'lr_scheduler_minimum_lr': u'auto',

u'target_recall': u'0.8', u'num_models': u'auto', u'early_stopping_patience':

u'3', u'momentum': u'auto', u'unbias_label': u'auto', u'wd': u'auto',

u'optimizer': u'auto', u'_tuning_objective_metric': u'',

u'early_stopping_tolerance': u'0.001', u'learning_rate': u'auto', u'_kvstore':

u'auto', u'normalize_data': u'true',

u'binary_classifier_model_selection_criteria': u'accuracy', u'use_lr_scheduler':

u'true', u'target_precision': u'0.8', u'unbias_data': u'auto', u'init_scale':

u'0.07', u'bias_wd_mult': u'auto', u'f_beta': u'1.0', u'mini_batch_size':

u'1000', u'huber_delta': u'1.0', u'num_classes': u'1', u'beta_1': u'auto',

u'loss': u'auto', u'beta_2': u'auto', u'_enable_profiler': u'false',

u'normalize_label': u'auto', u'_num_gpus': u'auto',

u'balance_multiclass_weights': u'false', u'positive_example_weight_mult':

u'1.0', u'l1': u'auto', u'margin': u'1.0'}
[10/09/2019 04:00:30 INFO 140715555129152] Reading provided configuration

from /opt/ml/input/config/hyperparameters.json: {u'feature_dim': u'24',

u'mini_batch_size': u'200', u'predictor_type': u'binary_classifier'}

```
[10/09/2019 04:00:30 INFO 140715555129152] Final configuration:
{u'loss_insensitivity': u'0.01', u'epochs': u'15', u'feature_dim': u'24',
u'init_bias': u'0.0', u'lr_scheduler_factor': u'auto',
u'num_calibration_samples': u'10000000', u'accuracy_top_k': u'3',
u'_num_kv_servers': u'auto', u'use_bias': u'true', u'num_point_for_scaler':
u'10000', u'_log_level': u'info', u'quantile': u'0.5', u'bias_lr_mult': u'auto',
u'lr_scheduler_step': u'auto', u'init_method': u'uniform', u'init_sigma':
u'0.01', u'lr_scheduler_minimum_lr': u'auto', u'target_recall': u'0.8',
u'num_models': u'auto', u'early_stopping_patience': u'3', u'momentum': u'auto',
u'unbias_label': u'auto', u'wd': u'auto', u'optimizer': u'auto',
u'_tuning_objective_metric': u'', u'early_stopping_tolerance': u'0.001',
u'learning_rate': u'auto', u'_kvstore': u'auto', u'normalize_data': u'true',
u'binary_classifier_model_selection_criteria': u'accuracy', u'use_lr_scheduler':
u'true', u'target_precision': u'0.8', u'unbias_data': u'auto', u'init_scale':
u'0.07', u'bias_wd_mult': u'auto', u'f_beta': u'1.0', u'mini_batch_size':
u'200', u'huber_delta': u'1.0', u'num_classes': u'1', u'predictor_type':
u'binary_classifier', u'beta_1': u'auto', u'loss': u'auto', u'beta_2': u'auto',
u'_enable_profiler': u'false', u'normalize_label': u'auto', u'_num_gpus':
u'auto', u'balance_multiclass_weights': u'false',
u'positive_example_weight_mult': u'1.0', u'l1': u'auto', u'margin': u'1.0'}
[10/09/2019 04:00:30 WARNING 140715555129152] Loggers have already been
setup.
Process 1 is a worker.
[10/09/2019 04:00:30 INFO 140715555129152] Using default worker.
[2019-10-09 04:00:30.525] [tensorio] [warning] TensorIO is already
initialized; ignoring the initialization routine.
[2019-10-09 04:00:30.542] [tensorio] [info] epoch_stats={"data_pipeline":
"/opt/ml/input/data/train", "epoch": 0, "duration": 17, "num_examples": 1,
"num_bytes": 28000}
[10/09/2019 04:00:30 INFO 140715555129152] Create Store: local
[2019-10-09 04:00:30.573] [tensorio] [info] epoch_stats={"data_pipeline":
"/opt/ml/input/data/train", "epoch": 1, "duration": 30, "num_examples": 4,
"num_bytes": 112000}
```

```
[10/09/2019 04:00:30 INFO 140715555129152] Scaler algorithm parameters

 <algorithm.scaler.ScalerAlgorithmStable object at 0x7ffa875716d0>
[10/09/2019 04:00:30 INFO 140715555129152] Scaling model computed with

parameters:

 {'stdev_weight':
[0.99205065 1.0159258  0.9912237  0.9905084  1.0054456  1.0054456

 0.98767006 1.0018125  1.0102462  0.99571484 0.9759129  1.0146644

 0.9950393  1.0025402  1.0040722  1.0236894  0.9848723  1.0012691

 1.0694876  0.99801165 1.0085175  0.9958644  0.95443696 1.0694876 ]
<NDArray 24 @cpu(0)>, 'stdev_label': None, 'mean_label': None,

'mean_weight':
[-0.01800826 -0.01186308 -0.02497913 -0.03374739  0.01351372 -0.01351372

 -0.00966556 -0.00386857  0.01239068  0.01941646 -0.01809455  0.00823172

 -0.00233901  0.00504472  0.00789282  0.01337654 -0.01098129  0.00370225

  0.01607196 -0.001061    0.01038911 -0.00835189 -0.01363481  0.01607196]
<NDArray 24 @cpu(0)>}
[10/09/2019 04:00:30 INFO 140715555129152] nvidia-smi took: 0.0251929759979

secs to identify 0 gpus
[10/09/2019 04:00:30 INFO 140715555129152] Number of GPUs being used: 0
#metrics {"Metrics": {"Max Batches Seen Between Resets": {"count": 1,

"max": 4, "sum": 4.0, "min": 4}, "Number of Batches Since Last Reset": {"count":

1, "max": 0, "sum": 0.0, "min": 0}, "Number of Records Since Last Reset":

{"count": 1, "max": 0, "sum": 0.0, "min": 0}, "Total Batches Seen": {"count": 1,

"max": 5, "sum": 5.0, "min": 5}, "Total Records Seen": {"count": 1, "max": 1000,

"sum": 1000.0, "min": 1000}, "Max Records Seen Between Resets": {"count": 1,

"max": 800, "sum": 800.0, "min": 800}, "Reset Count": {"count": 1, "max": 2,

"sum": 2.0, "min": 2}}, "EndTime": 1570593630.684933, "Dimensions": {"Host":

"algo-1", "Meta": "init_train_data_iter", "Operation": "training", "Algorithm":

"Linear Learner"}, "StartTime": 1570593630.684888}


[2019-10-09 04:00:30.830] [tensorio] [info] epoch_stats={"data_pipeline":

"/opt/ml/input/data/train", "epoch": 4, "duration": 145, "num_examples": 4,

"num_bytes": 112000}
```

#metrics {"Metrics":
{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":
0.6749308013916016, "sum": 0.6749308013916016, "min": 0.6749308013916016}},
"EndTime": 1570593630.830804, "Dimensions": {"model": 0, "Host": "algo-1",
"Operation": "training", "Algorithm": "Linear Learner", "epoch": 0},
"StartTime": 1570593630.830705}

#metrics {"Metrics":
{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":
0.6973088836669922, "sum": 0.6973088836669922, "min": 0.6973088836669922}},
"EndTime": 1570593630.830983, "Dimensions": {"model": 1, "Host": "algo-1",
"Operation": "training", "Algorithm": "Linear Learner", "epoch": 0},
"StartTime": 1570593630.830887}

#metrics {"Metrics":
{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":
0.6710798645019531, "sum": 0.6710798645019531, "min": 0.6710798645019531}},
"EndTime": 1570593630.831061, "Dimensions": {"model": 2, "Host": "algo-1",
"Operation": "training", "Algorithm": "Linear Learner", "epoch": 0},
"StartTime": 1570593630.831041}

#metrics {"Metrics":
{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":
0.6865583419799804, "sum": 0.6865583419799804, "min": 0.6865583419799804}},
"EndTime": 1570593630.831135, "Dimensions": {"model": 3, "Host": "algo-1",
"Operation": "training", "Algorithm": "Linear Learner", "epoch": 0},
"StartTime": 1570593630.831115}

```
#metrics {"Metrics":
{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":
0.6112659645080566, "sum": 0.6112659645080566, "min": 0.6112659645080566}},
"EndTime": 1570593630.831201, "Dimensions": {"model": 4, "Host": "algo-1",
"Operation": "training", "Algorithm": "Linear Learner", "epoch": 0},
"StartTime": 1570593630.831182}

#metrics {"Metrics":
{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":
0.6132129001617431, "sum": 0.6132129001617431, "min": 0.6132129001617431}},
"EndTime": 1570593630.83127, "Dimensions": {"model": 5, "Host": "algo-1",
"Operation": "training", "Algorithm": "Linear Learner", "epoch": 0},
"StartTime": 1570593630.83125}

#metrics {"Metrics":
{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":
0.6145219326019287, "sum": 0.6145219326019287, "min": 0.6145219326019287}},
"EndTime": 1570593630.831337, "Dimensions": {"model": 6, "Host": "algo-1",
"Operation": "training", "Algorithm": "Linear Learner", "epoch": 0},
"StartTime": 1570593630.831317}

#metrics {"Metrics":
{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":
0.6175027847290039, "sum": 0.6175027847290039, "min": 0.6175027847290039}},
"EndTime": 1570593630.831401, "Dimensions": {"model": 7, "Host": "algo-1",
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[10/09/2019 04:00:30 INFO 140715555129152] #quality_metric: host=algo-1,

epoch=0, train binary_classification_cross_entropy_objective

<loss>=0.674930801392

```
[10/09/2019 04:00:30 INFO 140715555129152] #early_stopping_criteria_metric:
host=algo-1, epoch=0, criteria=binary_classification_cross_entropy_objective,
value=0.608668718338
[10/09/2019 04:00:30 INFO 140715555129152] Epoch 0: Loss improved. Updating
best model
[10/09/2019 04:00:30 INFO 140715555129152] #progress_metric: host=algo-1,
completed 6 % of epochs
#metrics {"Metrics": {"Max Batches Seen Between Resets": {"count": 1,
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[10/09/2019 04:00:30 INFO 140715555129152] #throughput_metric: host=algo-1,
train throughput=5265.54653234 records/second
[2019-10-09 04:00:30.965] [tensorio] [info] epoch_stats={"data_pipeline":
"/opt/ml/input/data/train", "epoch": 6, "duration": 126, "num_examples": 4,
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"EndTime": 1570593630.967395, "Dimensions": {"model": 30, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 1},

"StartTime": 1570593630.967377}

#metrics {"Metrics":

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"EndTime": 1570593630.967459, "Dimensions": {"model": 31, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 1},

"StartTime": 1570593630.967441}

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[10/09/2019 04:00:30 INFO 140715555129152] #quality_metric: host=algo-1,
epoch=1, train binary_classification_cross_entropy_objective
<loss>=0.629243021011
[10/09/2019 04:00:30 INFO 140715555129152] #early_stopping_criteria_metric:
host=algo-1, epoch=1, criteria=binary_classification_cross_entropy_objective,
value=0.557498950958
[10/09/2019 04:00:30 INFO 140715555129152] Epoch 1: Loss improved. Updating
best model
[10/09/2019 04:00:30 INFO 140715555129152] #progress_metric: host=algo-1,
completed 13 % of epochs
```

#metrics {"Metrics": {"Max Batches Seen Between Resets": {"count": 1, "max": 4, "sum": 4.0, "min": 4}, "Number of Batches Since Last Reset": {"count": 1, "max": 4, "sum": 4.0, "min": 4}, "Number of Records Since Last Reset": {"count": 1, "max": 800, "sum": 800.0, "min": 800}, "Total Batches Seen": {"count": 1, "max": 13, "sum": 13.0, "min": 13}, "Total Records Seen": {"count": 1, "max": 2600, "sum": 2600.0, "min": 2600}, "Max Records Seen Between Resets": {"count": 1, "max": 800, "sum": 800.0, "min": 800}, "Reset Count": {"count": 1, "max": 4, "sum": 4.0, "min": 4}}, "EndTime": 1570593630.970553, "Dimensions": {"Host": "algo-1", "Meta": "training_data_iter", "Operation": "training", "Algorithm": "Linear Learner", "epoch": 1}, "StartTime": 1570593630.837273}

[10/09/2019 04:00:30 INFO 140715555129152] #throughput_metric: host=algo-1, train throughput=5995.87795399 records/second
[2019-10-09 04:00:31.094] [tensorio] [info] epoch_stats={"data_pipeline": "/opt/ml/input/data/train", "epoch": 8, "duration": 123, "num_examples": 4, "num_bytes": 112000}
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#metrics {"Metrics":

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"EndTime": 1570593631.094735, "Dimensions": {"model": 2, "Host": "algo-1",

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"StartTime": 1570593631.094716}


#metrics {"Metrics":

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"StartTime": 1570593631.094781}


#metrics {"Metrics":

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"EndTime": 1570593631.094861, "Dimensions": {"model": 4, "Host": "algo-1",

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"StartTime": 1570593631.094844}


#metrics {"Metrics":

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"StartTime": 1570593631.094908}
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#metrics {"Metrics":

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"EndTime": 1570593631.094988, "Dimensions": {"model": 6, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 2},

"StartTime": 1570593631.09497}

#metrics {"Metrics":

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"EndTime": 1570593631.095052, "Dimensions": {"model": 7, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 2},

"StartTime": 1570593631.095035}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

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"EndTime": 1570593631.095109, "Dimensions": {"model": 8, "Host": "algo-1",

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"StartTime": 1570593631.095092}

#metrics {"Metrics":

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"EndTime": 1570593631.095172, "Dimensions": {"model": 9, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 2},

"StartTime": 1570593631.095154}

#metrics {"Metrics":

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"EndTime": 1570593631.09521, "Dimensions": {"model": 10, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 2},

"StartTime": 1570593631.095201}

#metrics {"Metrics":

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"EndTime": 1570593631.095241, "Dimensions": {"model": 11, "Host": "algo-1",

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"StartTime": 1570593631.095233}

#metrics {"Metrics":

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"EndTime": 1570593631.095271, "Dimensions": {"model": 12, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 2},

"StartTime": 1570593631.095263}

#metrics {"Metrics":

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"EndTime": 1570593631.095301, "Dimensions": {"model": 13, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 2},

"StartTime": 1570593631.095293}

#metrics {"Metrics":

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"EndTime": 1570593631.095331, "Dimensions": {"model": 14, "Host": "algo-1",

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"StartTime": 1570593631.095323}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

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"EndTime": 1570593631.095363, "Dimensions": {"model": 15, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 2},

"StartTime": 1570593631.095355}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

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"EndTime": 1570593631.095393, "Dimensions": {"model": 16, "Host": "algo-1",

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"StartTime": 1570593631.095385}

#metrics {"Metrics":

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"EndTime": 1570593631.095422, "Dimensions": {"model": 17, "Host": "algo-1",

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"StartTime": 1570593631.095415}

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"EndTime": 1570593631.095452, "Dimensions": {"model": 18, "Host": "algo-1",

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"StartTime": 1570593631.095444}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

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"EndTime": 1570593631.095481, "Dimensions": {"model": 19, "Host": "algo-1",

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"StartTime": 1570593631.095473}

#metrics {"Metrics":

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"StartTime": 1570593631.095502}

#metrics {"Metrics":

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"EndTime": 1570593631.095539, "Dimensions": {"model": 21, "Host": "algo-1",

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"StartTime": 1570593631.095531}

#metrics {"Metrics":

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"EndTime": 1570593631.095575, "Dimensions": {"model": 22, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 2},

"StartTime": 1570593631.095568}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

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"EndTime": 1570593631.095619, "Dimensions": {"model": 23, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 2},

"StartTime": 1570593631.095604}

#metrics {"Metrics":

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"EndTime": 1570593631.095678, "Dimensions": {"model": 24, "Host": "algo-1",

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"StartTime": 1570593631.095661}

#metrics {"Metrics":

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"EndTime": 1570593631.095737, "Dimensions": {"model": 25, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 2},

"StartTime": 1570593631.095721}

#metrics {"Metrics":

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"EndTime": 1570593631.095795, "Dimensions": {"model": 26, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 2},

"StartTime": 1570593631.095778}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

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"EndTime": 1570593631.09586, "Dimensions": {"model": 27, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 2},

"StartTime": 1570593631.095843}

#metrics {"Metrics":

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"EndTime": 1570593631.095918, "Dimensions": {"model": 28, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 2},

"StartTime": 1570593631.095901}

#metrics {"Metrics":

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"EndTime": 1570593631.095979, "Dimensions": {"model": 29, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 2},

"StartTime": 1570593631.095961}

#metrics {"Metrics":

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"EndTime": 1570593631.096037, "Dimensions": {"model": 30, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 2},

"StartTime": 1570593631.096021}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

0.6127698135375976, "sum": 0.6127698135375976, "min": 0.6127698135375976}},

"EndTime": 1570593631.096096, "Dimensions": {"model": 31, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 2},

"StartTime": 1570593631.09608}

[10/09/2019 04:00:31 INFO 140715555129152] #quality_metric: host=algo-1,

epoch=2, train binary_classification_cross_entropy_objective

<loss>=0.596773500443
[10/09/2019 04:00:31 INFO 140715555129152] #early_stopping_criteria_metric:

host=algo-1, epoch=2, criteria=binary_classification_cross_entropy_objective,

value=0.527155656815
[10/09/2019 04:00:31 INFO 140715555129152] Epoch 2: Loss improved. Updating

best model
[10/09/2019 04:00:31 INFO 140715555129152] #progress_metric: host=algo-1,

completed 20 % of epochs

#metrics {"Metrics": {"Max Batches Seen Between Resets": {"count": 1, "max": 4, "sum": 4.0, "min": 4}, "Number of Batches Since Last Reset": {"count": 1, "max": 4, "sum": 4.0, "min": 4}, "Number of Records Since Last Reset": {"count": 1, "max": 800, "sum": 800.0, "min": 800}, "Total Batches Seen": {"count": 1, "max": 17, "sum": 17.0, "min": 17}, "Total Records Seen": {"count": 1, "max": 3400, "sum": 3400.0, "min": 3400}, "Max Records Seen Between Resets": {"count": 1, "max": 800, "sum": 800.0, "min": 800}, "Reset Count": {"count": 1, "max": 5, "sum": 5.0, "min": 5}}, "EndTime": 1570593631.099056, "Dimensions": {"Host": "algo-1", "Meta": "training_data_iter", "Operation": "training", "Algorithm": "Linear Learner", "epoch": 2}, "StartTime": 1570593630.970845}

[10/09/2019 04:00:31 INFO 140715555129152] #throughput_metric: host=algo-1, train throughput=6232.51587642 records/second
[2019-10-09 04:00:31.252] [tensorio] [info] epoch_stats={"data_pipeline": "/opt/ml/input/data/train", "epoch": 10, "duration": 152, "num_examples": 4, "num_bytes": 112000}
#metrics {"Metrics": {"train_binary_classification_cross_entropy_objective": {"count": 1, "max": 0.575627727508545, "sum": 0.575627727508545, "min": 0.575627727508545}}, "EndTime": 1570593631.252742, "Dimensions": {"model": 0, "Host": "algo-1", "Operation": "training", "Algorithm": "Linear Learner", "epoch": 3}, "StartTime": 1570593631.252617}

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#metrics {"Metrics":

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"EndTime": 1570593631.252928, "Dimensions": {"model": 2, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 3},

"StartTime": 1570593631.252908}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

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"EndTime": 1570593631.252995, "Dimensions": {"model": 3, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 3},

"StartTime": 1570593631.252977}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

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"EndTime": 1570593631.253062, "Dimensions": {"model": 4, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 3},

"StartTime": 1570593631.253043}

#metrics {"Metrics":

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"EndTime": 1570593631.253123, "Dimensions": {"model": 5, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 3},

"StartTime": 1570593631.253107}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

0.5309745597839356, "sum": 0.5309745597839356, "min": 0.5309745597839356}},

"EndTime": 1570593631.253176, "Dimensions": {"model": 6, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 3},

"StartTime": 1570593631.253162}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

0.5304384136199951, "sum": 0.5304384136199951, "min": 0.5304384136199951}},

"EndTime": 1570593631.253229, "Dimensions": {"model": 7, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 3},

"StartTime": 1570593631.253214}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

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"EndTime": 1570593631.253289, "Dimensions": {"model": 8, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 3},

"StartTime": 1570593631.253273}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

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"EndTime": 1570593631.253348, "Dimensions": {"model": 9, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 3},

"StartTime": 1570593631.253332}

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#metrics {"Metrics":
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"EndTime": 1570593631.25341, "Dimensions": {"model": 10, "Host": "algo-1",
"Operation": "training", "Algorithm": "Linear Learner", "epoch": 3},
"StartTime": 1570593631.253393}

#metrics {"Metrics":
{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":
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"EndTime": 1570593631.253474, "Dimensions": {"model": 11, "Host": "algo-1",
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"StartTime": 1570593631.253451}

#metrics {"Metrics":
{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":
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"EndTime": 1570593631.253561, "Dimensions": {"model": 12, "Host": "algo-1",
"Operation": "training", "Algorithm": "Linear Learner", "epoch": 3},
"StartTime": 1570593631.253515}

#metrics {"Metrics":
{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":
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"EndTime": 1570593631.253622, "Dimensions": {"model": 13, "Host": "algo-1",
"Operation": "training", "Algorithm": "Linear Learner", "epoch": 3},
"StartTime": 1570593631.253606}
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#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

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"EndTime": 1570593631.253679, "Dimensions": {"model": 14, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 3},

"StartTime": 1570593631.253663}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

0.5302707862854004, "sum": 0.5302707862854004, "min": 0.5302707862854004}},

"EndTime": 1570593631.253734, "Dimensions": {"model": 15, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 3},

"StartTime": 1570593631.253719}

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"StartTime": 1570593631.253781}

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"StartTime": 1570593631.253834}

#metrics {"Metrics":

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"EndTime": 1570593631.253903, "Dimensions": {"model": 18, "Host": "algo-1",

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"StartTime": 1570593631.253888}

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"EndTime": 1570593631.254124, "Dimensions": {"model": 22, "Host": "algo-1",

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"StartTime": 1570593631.254109}

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"EndTime": 1570593631.254181, "Dimensions": {"model": 23, "Host": "algo-1",

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"StartTime": 1570593631.254165}

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"StartTime": 1570593631.254282}

#metrics {"Metrics":

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"EndTime": 1570593631.254357, "Dimensions": {"model": 26, "Host": "algo-1",

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"StartTime": 1570593631.254341}

#metrics {"Metrics":

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"StartTime": 1570593631.254397}

#metrics {"Metrics":

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#metrics {"Metrics":

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"Operation": "training", "Algorithm": "Linear Learner", "epoch": 3},

"StartTime": 1570593631.254514}

#metrics {"Metrics":

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"Operation": "training", "Algorithm": "Linear Learner", "epoch": 3},

"StartTime": 1570593631.254567}

#metrics {"Metrics":

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"EndTime": 1570593631.254638, "Dimensions": {"model": 31, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 3},

"StartTime": 1570593631.254622}

[10/09/2019 04:00:31 INFO 140715555129152] #quality_metric: host=algo-1,

epoch=3, train binary_classification_cross_entropy_objective

<loss>=0.575627727509

[10/09/2019 04:00:31 INFO 140715555129152] #early_stopping_criteria_metric:

host=algo-1, epoch=3, criteria=binary_classification_cross_entropy_objective,

value=0.529021949768

[10/09/2019 04:00:31 INFO 140715555129152] #progress_metric: host=algo-1,

completed 26 % of epochs

#metrics {"Metrics": {"Max Batches Seen Between Resets": {"count": 1,

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"max": 6, "sum": 6.0, "min": 6}}, "EndTime": 1570593631.258538, "Dimensions":

{"Host": "algo-1", "Meta": "training_data_iter", "Operation": "training",

"Algorithm": "Linear Learner", "epoch": 3}, "StartTime": 1570593631.099348}

[10/09/2019 04:00:31 INFO 140715555129152] #throughput_metric: host=algo-1,
train throughput=5020.8336326 records/second
[2019-10-09 04:00:31.425] [tensorio] [info] epoch_stats={"data_pipeline":
"/opt/ml/input/data/train", "epoch": 12, "duration": 166, "num_examples": 4,
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#metrics {"Metrics":
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"StartTime": 1570593631.42604}

#metrics {"Metrics":
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#metrics {"Metrics":
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"EndTime": 1570593631.426443, "Dimensions": {"model": 3, "Host": "algo-1",
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"StartTime": 1570593631.426423}

#metrics {"Metrics":

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"EndTime": 1570593631.426507, "Dimensions": {"model": 4, "Host": "algo-1",

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"StartTime": 1570593631.42649}

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"StartTime": 1570593631.426554}

#metrics {"Metrics":

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"EndTime": 1570593631.426634, "Dimensions": {"model": 6, "Host": "algo-1",

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"StartTime": 1570593631.426616}

#metrics {"Metrics":

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"EndTime": 1570593631.426695, "Dimensions": {"model": 7, "Host": "algo-1",

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"StartTime": 1570593631.426677}

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"StartTime": 1570593631.42674}


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#metrics {"Metrics":

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"StartTime": 1570593631.426988}

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"StartTime": 1570593631.427114}

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"EndTime": 1570593631.427199, "Dimensions": {"model": 15, "Host": "algo-1",

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"StartTime": 1570593631.427182}

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"EndTime": 1570593631.42726, "Dimensions": {"model": 16, "Host": "algo-1",

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"StartTime": 1570593631.427243}

#metrics {"Metrics":

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"EndTime": 1570593631.427321, "Dimensions": {"model": 17, "Host": "algo-1",

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"StartTime": 1570593631.427304}

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0.5805837059020996, "sum": 0.5805837059020996, "min": 0.5805837059020996}},

"EndTime": 1570593631.427383, "Dimensions": {"model": 18, "Host": "algo-1",

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"StartTime": 1570593631.427366}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

0.5771821308135986, "sum": 0.5771821308135986, "min": 0.5771821308135986}},

"EndTime": 1570593631.427445, "Dimensions": {"model": 19, "Host": "algo-1",

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"StartTime": 1570593631.427428}

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0.5859636974334717, "sum": 0.5859636974334717, "min": 0.5859636974334717}},

"EndTime": 1570593631.427506, "Dimensions": {"model": 20, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 4},

"StartTime": 1570593631.427489}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

0.5859659767150879, "sum": 0.5859659767150879, "min": 0.5859659767150879}},

"EndTime": 1570593631.427567, "Dimensions": {"model": 21, "Host": "algo-1",

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"StartTime": 1570593631.42755}

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"StartTime": 1570593631.427612}

#metrics {"Metrics":

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"EndTime": 1570593631.427692, "Dimensions": {"model": 23, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 4},

"StartTime": 1570593631.427675}

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#metrics {"Metrics":

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#metrics {"Metrics":

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0.620714807510376, "sum": 0.620714807510376, "min": 0.620714807510376}},

"EndTime": 1570593631.428, "Dimensions": {"model": 28, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 4},

"StartTime": 1570593631.427984}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

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"EndTime": 1570593631.428061, "Dimensions": {"model": 29, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 4},

"StartTime": 1570593631.428044}

#metrics {"Metrics":

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"EndTime": 1570593631.428122, "Dimensions": {"model": 30, "Host": "algo-1",

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"StartTime": 1570593631.428104}

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{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

0.6179575443267822, "sum": 0.6179575443267822, "min": 0.6179575443267822}},

"EndTime": 1570593631.428183, "Dimensions": {"model": 31, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 4},

"StartTime": 1570593631.428165}

[10/09/2019 04:00:31 INFO 140715555129152] #quality_metric: host=algo-1,

epoch=4, train binary_classification_cross_entropy_objective

<loss>=0.562915830612

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[10/09/2019 04:00:31 INFO 140715555129152] #early_stopping_criteria_metric:
host=algo-1, epoch=4, criteria=binary_classification_cross_entropy_objective,
value=0.524595966339
[10/09/2019 04:00:31 INFO 140715555129152] Epoch 4: Loss improved. Updating
best model
[10/09/2019 04:00:31 INFO 140715555129152] #progress_metric: host=algo-1,
completed 33 % of epochs
#metrics {"Metrics": {"Max Batches Seen Between Resets": {"count": 1,
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1, "max": 5000, "sum": 5000.0, "min": 5000}, "Max Records Seen Between Resets":
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"max": 7, "sum": 7.0, "min": 7}}, "EndTime": 1570593631.43243, "Dimensions":
{"Host": "algo-1", "Meta": "training_data_iter", "Operation": "training",
"Algorithm": "Linear Learner", "epoch": 4}, "StartTime": 1570593631.258865}

[10/09/2019 04:00:31 INFO 140715555129152] #throughput_metric: host=algo-1,
train throughput=4605.24750451 records/second
[2019-10-09 04:00:31.609] [tensorio] [info] epoch_stats={"data_pipeline":
"/opt/ml/input/data/train", "epoch": 14, "duration": 176, "num_examples": 4,
"num_bytes": 112000}
#metrics {"Metrics":
{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":
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#metrics {"Metrics":

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"EndTime": 1570593631.609738, "Dimensions": {"model": 1, "Host": "algo-1",

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[10/09/2019 04:00:31 INFO 140715555129152] #quality_metric: host=algo-1,
epoch=5, train binary_classification_cross_entropy_objective
<loss>=0.555650062561
[10/09/2019 04:00:31 INFO 140715555129152] #early_stopping_criteria_metric:
host=algo-1, epoch=5, criteria=binary_classification_cross_entropy_objective,
value=0.515345964432
[10/09/2019 04:00:31 INFO 140715555129152] Epoch 5: Loss improved. Updating
best model
[10/09/2019 04:00:31 INFO 140715555129152] #progress_metric: host=algo-1,
completed 40 % of epochs
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[10/09/2019 04:00:31 INFO 140715555129152] #throughput_metric: host=algo-1, train throughput=4382.00155929 records/second
[2019-10-09 04:00:31.780] [tensorio] [info] epoch_stats={"data_pipeline": "/opt/ml/input/data/train", "epoch": 16, "duration": 164, "num_examples": 4, "num_bytes": 112000}
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"EndTime": 1570593631.782102, "Dimensions": {"model": 25, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 6},

"StartTime": 1570593631.782084}

#metrics {"Metrics":

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"EndTime": 1570593631.782163, "Dimensions": {"model": 26, "Host": "algo-1",

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"StartTime": 1570593631.782146}

#metrics {"Metrics":

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"StartTime": 1570593631.782201}

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"StartTime": 1570593631.782261}

#metrics {"Metrics":

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"EndTime": 1570593631.782321, "Dimensions": {"model": 29, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 6},

"StartTime": 1570593631.782312}

#metrics {"Metrics":

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"EndTime": 1570593631.782375, "Dimensions": {"model": 30, "Host": "algo-1",

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"StartTime": 1570593631.782362}

#metrics {"Metrics":

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"EndTime": 1570593631.782419, "Dimensions": {"model": 31, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 6},

"StartTime": 1570593631.782404}

[10/09/2019 04:00:31 INFO 140715555129152] #quality_metric: host=algo-1,

epoch=6, train binary_classification_cross_entropy_objective

<loss>=0.551237916946
[10/09/2019 04:00:31 INFO 140715555129152] #early_stopping_criteria_metric:

host=algo-1, epoch=6, criteria=binary_classification_cross_entropy_objective,

value=0.516226606369
[10/09/2019 04:00:31 INFO 140715555129152] #progress_metric: host=algo-1,

completed 46 % of epochs
#metrics {"Metrics": {"Max Batches Seen Between Resets": {"count": 1,

"max": 4, "sum": 4.0, "min": 4}, "Number of Batches Since Last Reset": {"count":

1, "max": 4, "sum": 4.0, "min": 4}, "Number of Records Since Last Reset":

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{"count": 1, "max": 33, "sum": 33.0, "min": 33}, "Total Records Seen": {"count":

1, "max": 6600, "sum": 6600.0, "min": 6600}, "Max Records Seen Between Resets":

{"count": 1, "max": 800, "sum": 800.0, "min": 800}, "Reset Count": {"count": 1,

"max": 9, "sum": 9.0, "min": 9}}, "EndTime": 1570593631.785089, "Dimensions":

{"Host": "algo-1", "Meta": "training_data_iter", "Operation": "training",

"Algorithm": "Linear Learner", "epoch": 6}, "StartTime": 1570593631.615498}

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[10/09/2019 04:00:31 INFO 140715555129152] #throughput_metric: host=algo-1,
train throughput=4713.15125602 records/second
[2019-10-09 04:00:31.948] [tensorio] [info] epoch_stats={"data_pipeline":
"/opt/ml/input/data/train", "epoch": 18, "duration": 162, "num_examples": 4,
"num_bytes": 112000}
#metrics {"Metrics":
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"Operation": "training", "Algorithm": "Linear Learner", "epoch": 7},
"StartTime": 1570593631.948452}

#metrics {"Metrics":
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"EndTime": 1570593631.948678, "Dimensions": {"model": 1, "Host": "algo-1",
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"StartTime": 1570593631.948656}

#metrics {"Metrics":
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"StartTime": 1570593631.948726}

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"StartTime": 1570593631.948795}
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#metrics {"Metrics":

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#metrics {"Metrics":

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#metrics {"Metrics":

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#metrics {"Metrics":

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"Operation": "training", "Algorithm": "Linear Learner", "epoch": 7},

"StartTime": 1570593631.949107}

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"StartTime": 1570593631.949173}

#metrics {"Metrics":

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"EndTime": 1570593631.949257, "Dimensions": {"model": 10, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 7},

"StartTime": 1570593631.949238}

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#metrics {"Metrics":

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#metrics {"Metrics":

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"Operation": "training", "Algorithm": "Linear Learner", "epoch": 7},

"StartTime": 1570593631.949434}

#metrics {"Metrics":

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"EndTime": 1570593631.949516, "Dimensions": {"model": 14, "Host": "algo-1",

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"StartTime": 1570593631.949498}

#metrics {"Metrics":

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"EndTime": 1570593631.949613, "Dimensions": {"model": 15, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 7},

"StartTime": 1570593631.949594}

#metrics {"Metrics":

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"EndTime": 1570593631.94968, "Dimensions": {"model": 16, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 7},

"StartTime": 1570593631.949661}

#metrics {"Metrics":

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"EndTime": 1570593631.949744, "Dimensions": {"model": 17, "Host": "algo-1",

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"StartTime": 1570593631.949728}

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"EndTime": 1570593631.949809, "Dimensions": {"model": 18, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 7},

"StartTime": 1570593631.94979}

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"EndTime": 1570593631.949875, "Dimensions": {"model": 19, "Host": "algo-1",

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"StartTime": 1570593631.949856}

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"EndTime": 1570593631.949939, "Dimensions": {"model": 20, "Host": "algo-1",

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"StartTime": 1570593631.949921}

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"EndTime": 1570593631.950001, "Dimensions": {"model": 21, "Host": "algo-1",

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"StartTime": 1570593631.949985}

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"EndTime": 1570593631.950066, "Dimensions": {"model": 22, "Host": "algo-1",

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"StartTime": 1570593631.950047}

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"EndTime": 1570593631.950131, "Dimensions": {"model": 23, "Host": "algo-1",

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"StartTime": 1570593631.950113}

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"StartTime": 1570593631.950178}

#metrics {"Metrics":
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#metrics {"Metrics":
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"EndTime": 1570593631.950334, "Dimensions": {"model": 26, "Host": "algo-1",
"Operation": "training", "Algorithm": "Linear Learner", "epoch": 7},
"StartTime": 1570593631.950317}

#metrics {"Metrics":
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"EndTime": 1570593631.950398, "Dimensions": {"model": 27, "Host": "algo-1",
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"StartTime": 1570593631.95038}
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#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

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"EndTime": 1570593631.950459, "Dimensions": {"model": 28, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 7},

"StartTime": 1570593631.950442}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

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"EndTime": 1570593631.950528, "Dimensions": {"model": 29, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 7},

"StartTime": 1570593631.950507}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

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"EndTime": 1570593631.950592, "Dimensions": {"model": 30, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 7},

"StartTime": 1570593631.950574}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

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"EndTime": 1570593631.950654, "Dimensions": {"model": 31, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 7},

"StartTime": 1570593631.950636}

[10/09/2019 04:00:31 INFO 140715555129152] #quality_metric: host=algo-1,

epoch=7, train binary_classification_cross_entropy_objective

<loss>=0.547957839966

[10/09/2019 04:00:31 INFO 140715555129152] #early_stopping_criteria_metric:
host=algo-1, epoch=7, criteria=binary_classification_cross_entropy_objective,
value=0.513439512253
[10/09/2019 04:00:31 INFO 140715555129152] Epoch 7: Loss improved. Updating
best model
[10/09/2019 04:00:31 INFO 140715555129152] #progress_metric: host=algo-1,
completed 53 % of epochs
#metrics {"Metrics": {"Max Batches Seen Between Resets": {"count": 1,
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{"Host": "algo-1", "Meta": "training_data_iter", "Operation": "training",
"Algorithm": "Linear Learner", "epoch": 7}, "StartTime": 1570593631.785381}

[10/09/2019 04:00:31 INFO 140715555129152] #throughput_metric: host=algo-1,
train throughput=4733.56337341 records/second
[2019-10-09 04:00:32.133] [tensorio] [info] epoch_stats={"data_pipeline":
"/opt/ml/input/data/train", "epoch": 20, "duration": 178, "num_examples": 4,
"num_bytes": 112000}
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"StartTime": 1570593632.133157}

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"EndTime": 1570593632.133424, "Dimensions": {"model": 1, "Host": "algo-1",
"Operation": "training", "Algorithm": "Linear Learner", "epoch": 8},
"StartTime": 1570593632.1334}

#metrics {"Metrics":
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"EndTime": 1570593632.133497, "Dimensions": {"model": 2, "Host": "algo-1",
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#metrics {"Metrics":
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"EndTime": 1570593632.133586, "Dimensions": {"model": 3, "Host": "algo-1",
"Operation": "training", "Algorithm": "Linear Learner", "epoch": 8},
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#metrics {"Metrics":
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"EndTime": 1570593632.133644, "Dimensions": {"model": 4, "Host": "algo-1",
"Operation": "training", "Algorithm": "Linear Learner", "epoch": 8},
"StartTime": 1570593632.13363}

#metrics {"Metrics":

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"EndTime": 1570593632.133699, "Dimensions": {"model": 5, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 8},

"StartTime": 1570593632.133686}

#metrics {"Metrics":

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"EndTime": 1570593632.13375, "Dimensions": {"model": 6, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 8},

"StartTime": 1570593632.133736}

#metrics {"Metrics":

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"EndTime": 1570593632.133805, "Dimensions": {"model": 7, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 8},

"StartTime": 1570593632.133794}

#metrics {"Metrics":

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"Operation": "training", "Algorithm": "Linear Learner", "epoch": 8},

"StartTime": 1570593632.133829}

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"StartTime": 1570593632.133861}

#metrics {"Metrics":

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"EndTime": 1570593632.133936, "Dimensions": {"model": 10, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 8},

"StartTime": 1570593632.133918}

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"StartTime": 1570593632.133977}

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"StartTime": 1570593632.134013}

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"StartTime": 1570593632.134043}

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"EndTime": 1570593632.134102, "Dimensions": {"model": 14, "Host": "algo-1",

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"StartTime": 1570593632.134086}

#metrics {"Metrics":

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"StartTime": 1570593632.134131}

#metrics {"Metrics":

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"EndTime": 1570593632.134204, "Dimensions": {"model": 16, "Host": "algo-1",

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"StartTime": 1570593632.134188}

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"StartTime": 1570593632.134246}

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"StartTime": 1570593632.134305}

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#metrics {"Metrics":

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"StartTime": 1570593632.134558}

#metrics {"Metrics":

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#metrics {"Metrics":

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"EndTime": 1570593632.134783, "Dimensions": {"model": 25, "Host": "algo-1",

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"StartTime": 1570593632.134766}

#metrics {"Metrics":

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"EndTime": 1570593632.134836, "Dimensions": {"model": 26, "Host": "algo-1",

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#metrics {"Metrics":

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"StartTime": 1570593632.134877}

#metrics {"Metrics":

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"StartTime": 1570593632.134985}

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#metrics {"Metrics":

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"EndTime": 1570593632.135116, "Dimensions": {"model": 31, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 8},

"StartTime": 1570593632.135101}

[10/09/2019 04:00:32 INFO 140715555129152] #quality_metric: host=algo-1,

epoch=8, train binary_classification_cross_entropy_objective

<loss>=0.545039844513
[10/09/2019 04:00:32 INFO 140715555129152] #early_stopping_criteria_metric:

host=algo-1, epoch=8, criteria=binary_classification_cross_entropy_objective,

value=0.51277967453
[10/09/2019 04:00:32 INFO 140715555129152] Epoch 8: Loss improved. Updating

best model
[10/09/2019 04:00:32 INFO 140715555129152] #progress_metric: host=algo-1,

completed 60 % of epochs

#metrics {"Metrics": {"Max Batches Seen Between Resets": {"count": 1,

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"max": 11, "sum": 11.0, "min": 11}}, "EndTime": 1570593632.139315, "Dimensions":

{"Host": "algo-1", "Meta": "training_data_iter", "Operation": "training",

"Algorithm": "Linear Learner", "epoch": 8}, "StartTime": 1570593631.954571}

[10/09/2019 04:00:32 INFO 140715555129152] #throughput_metric: host=algo-1,

train throughput=4326.99118468 records/second
[2019-10-09 04:00:32.313] [tensorio] [info] epoch_stats={"data_pipeline":

"/opt/ml/input/data/train", "epoch": 22, "duration": 173, "num_examples": 4,

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#metrics {"Metrics":

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"StartTime": 1570593632.313382}

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"StartTime": 1570593632.313637}

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#metrics {"Metrics":

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"StartTime": 1570593632.313964}

#metrics {"Metrics":
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"StartTime": 1570593632.314019}

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"StartTime": 1570593632.314192}


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"StartTime": 1570593632.31425}


#metrics {"Metrics":

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"EndTime": 1570593632.314328, "Dimensions": {"model": 12, "Host": "algo-1",

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"StartTime": 1570593632.31431}


#metrics {"Metrics":

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"StartTime": 1570593632.31437}
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#metrics {"Metrics":

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"EndTime": 1570593632.31445, "Dimensions": {"model": 14, "Host": "algo-1",

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"StartTime": 1570593632.31443}

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{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

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"StartTime": 1570593632.314499}

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"EndTime": 1570593632.314568, "Dimensions": {"model": 16, "Host": "algo-1",

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"StartTime": 1570593632.314554}

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{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

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"Operation": "training", "Algorithm": "Linear Learner", "epoch": 9},

"StartTime": 1570593632.314673}

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{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

0.5770412635803223, "sum": 0.5770412635803223, "min": 0.5770412635803223}},

"EndTime": 1570593632.314746, "Dimensions": {"model": 19, "Host": "algo-1",

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"StartTime": 1570593632.314732}

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{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

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"StartTime": 1570593632.314788}

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{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

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"StartTime": 1570593632.314862}

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"StartTime": 1570593632.31498}

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"EndTime": 1570593632.315067, "Dimensions": {"model": 24, "Host": "algo-1",

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"StartTime": 1570593632.31505}

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"EndTime": 1570593632.315136, "Dimensions": {"model": 25, "Host": "algo-1",

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"StartTime": 1570593632.315117}

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"StartTime": 1570593632.315427}

#metrics {"Metrics":
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"EndTime": 1570593632.315504, "Dimensions": {"model": 31, "Host": "algo-1",
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"StartTime": 1570593632.315487}

[10/09/2019 04:00:32 INFO 140715555129152] #quality_metric: host=algo-1,
epoch=9, train binary_classification_cross_entropy_objective
<loss>=0.542273874283
[10/09/2019 04:00:32 INFO 140715555129152] #early_stopping_criteria_metric:
host=algo-1, epoch=9, criteria=binary_classification_cross_entropy_objective,
value=0.514247875214
[10/09/2019 04:00:32 INFO 140715555129152] #progress_metric: host=algo-1,
completed 66 % of epochs
#metrics {"Metrics": {"Max Batches Seen Between Resets": {"count": 1,
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"max": 12, "sum": 12.0, "min": 12}}, "EndTime": 1570593632.319438, "Dimensions":
{"Host": "algo-1", "Meta": "training_data_iter", "Operation": "training",
"Algorithm": "Linear Learner", "epoch": 9}, "StartTime": 1570593632.139636}

[10/09/2019 04:00:32 INFO 140715555129152] #throughput_metric: host=algo-1,
train throughput=4445.4555692 records/second
[2019-10-09 04:00:32.489] [tensorio] [info] epoch_stats={"data_pipeline":
"/opt/ml/input/data/train", "epoch": 24, "duration": 169, "num_examples": 4,
"num_bytes": 112000}
#metrics {"Metrics":
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"EndTime": 1570593632.489167, "Dimensions": {"model": 0, "Host": "algo-1",
"Operation": "training", "Algorithm": "Linear Learner", "epoch": 10},
"StartTime": 1570593632.489054}

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"EndTime": 1570593632.489416, "Dimensions": {"model": 1, "Host": "algo-1",
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"StartTime": 1570593632.489248}

#metrics {"Metrics":
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#metrics {"Metrics":
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"EndTime": 1570593632.489591, "Dimensions": {"model": 3, "Host": "algo-1",
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{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":
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"StartTime": 1570593632.489788}

#metrics {"Metrics":
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"EndTime": 1570593632.490017, "Dimensions": {"model": 6, "Host": "algo-1",
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#metrics {"Metrics":
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#metrics {"Metrics":
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"EndTime": 1570593632.49035, "Dimensions": {"model": 9, "Host": "algo-1",
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"EndTime": 1570593632.490417, "Dimensions": {"model": 10, "Host": "algo-1",
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#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

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"StartTime": 1570593632.490541}

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"EndTime": 1570593632.490618, "Dimensions": {"model": 13, "Host": "algo-1",

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"StartTime": 1570593632.490602}

#metrics {"Metrics":

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"EndTime": 1570593632.490682, "Dimensions": {"model": 14, "Host": "algo-1",

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"StartTime": 1570593632.490664}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

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"EndTime": 1570593632.490745, "Dimensions": {"model": 15, "Host": "algo-1",

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"StartTime": 1570593632.490728}

#metrics {"Metrics":

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#metrics {"Metrics":

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#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max": 0.575642728805542, "sum": 0.575642728805542, "min": 0.575642728805542}}, "EndTime": 1570593632.490927, "Dimensions": {"model": 18, "Host": "algo-1", "Operation": "training", "Algorithm": "Linear Learner", "epoch": 10}, "StartTime": 1570593632.49091}

#metrics {"Metrics":

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#metrics {"Metrics":

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#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max": 0.5804242706298828, "sum": 0.5804242706298828, "min": 0.5804242706298828}}, "EndTime": 1570593632.491219, "Dimensions": {"model": 23, "Host": "algo-1", "Operation": "training", "Algorithm": "Linear Learner", "epoch": 10}, "StartTime": 1570593632.491202}

#metrics {"Metrics":

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"EndTime": 1570593632.49128, "Dimensions": {"model": 24, "Host": "algo-1",

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"StartTime": 1570593632.491263}

#metrics {"Metrics":

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"EndTime": 1570593632.491341, "Dimensions": {"model": 25, "Host": "algo-1",

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"StartTime": 1570593632.491324}

#metrics {"Metrics":

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"EndTime": 1570593632.491401, "Dimensions": {"model": 26, "Host": "algo-1",

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"StartTime": 1570593632.491384}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

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"EndTime": 1570593632.491462, "Dimensions": {"model": 27, "Host": "algo-1",

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"StartTime": 1570593632.491445}

#metrics {"Metrics":

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"EndTime": 1570593632.491523, "Dimensions": {"model": 28, "Host": "algo-1",

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"StartTime": 1570593632.491506}

#metrics {"Metrics":

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"EndTime": 1570593632.491584, "Dimensions": {"model": 29, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 10},

"StartTime": 1570593632.491566}

#metrics {"Metrics":

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"EndTime": 1570593632.491643, "Dimensions": {"model": 30, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 10},

"StartTime": 1570593632.491626}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

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"EndTime": 1570593632.491703, "Dimensions": {"model": 31, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 10},

"StartTime": 1570593632.491686}

[10/09/2019 04:00:32 INFO 140715555129152] #quality_metric: host=algo-1,

epoch=10, train binary_classification_cross_entropy_objective

<loss>=0.539730787277

[10/09/2019 04:00:32 INFO 140715555129152] #early_stopping_criteria_metric:
host=algo-1, epoch=10, criteria=binary_classification_cross_entropy_objective,
value=0.513230352402
[10/09/2019 04:00:32 INFO 140715555129152] #progress_metric: host=algo-1,
completed 73 % of epochs
#metrics {"Metrics": {"Max Batches Seen Between Resets": {"count": 1,
"max": 4, "sum": 4.0, "min": 4}, "Number of Batches Since Last Reset": {"count":
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1, "max": 9800, "sum": 9800.0, "min": 9800}, "Max Records Seen Between Resets":
{"count": 1, "max": 800, "sum": 800.0, "min": 800}, "Reset Count": {"count": 1,
"max": 13, "sum": 13.0, "min": 13}}, "EndTime": 1570593632.49424, "Dimensions":
{"Host": "algo-1", "Meta": "training_data_iter", "Operation": "training",
"Algorithm": "Linear Learner", "epoch": 10}, "StartTime": 1570593632.319751}

[10/09/2019 04:00:32 INFO 140715555129152] #throughput_metric: host=algo-1,
train throughput=4581.06624398 records/second
[2019-10-09 04:00:32.675] [tensorio] [info] epoch_stats={"data_pipeline":
"/opt/ml/input/data/train", "epoch": 26, "duration": 181, "num_examples": 4,
"num_bytes": 112000}
#metrics {"Metrics":
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"EndTime": 1570593632.676138, "Dimensions": {"model": 0, "Host": "algo-1",
"Operation": "training", "Algorithm": "Linear Learner", "epoch": 11},
"StartTime": 1570593632.676024}

#metrics {"Metrics":

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"EndTime": 1570593632.676255, "Dimensions": {"model": 1, "Host": "algo-1",

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"StartTime": 1570593632.676233}

#metrics {"Metrics":

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"EndTime": 1570593632.676327, "Dimensions": {"model": 2, "Host": "algo-1",

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"StartTime": 1570593632.676307}

#metrics {"Metrics":

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"EndTime": 1570593632.676401, "Dimensions": {"model": 3, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 11},

"StartTime": 1570593632.676383}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

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"EndTime": 1570593632.676468, "Dimensions": {"model": 4, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 11},

"StartTime": 1570593632.67645}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

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"EndTime": 1570593632.676547, "Dimensions": {"model": 5, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 11},

"StartTime": 1570593632.676527}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

0.5136480045318603, "sum": 0.5136480045318603, "min": 0.5136480045318603}},

"EndTime": 1570593632.676616, "Dimensions": {"model": 6, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 11},

"StartTime": 1570593632.676599}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

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"EndTime": 1570593632.676684, "Dimensions": {"model": 7, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 11},

"StartTime": 1570593632.676666}

#metrics {"Metrics":

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"EndTime": 1570593632.676749, "Dimensions": {"model": 8, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 11},

"StartTime": 1570593632.676732}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

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"EndTime": 1570593632.676811, "Dimensions": {"model": 9, "Host": "algo-1",

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"StartTime": 1570593632.676793}

#metrics {"Metrics":

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"EndTime": 1570593632.676871, "Dimensions": {"model": 10, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 11},

"StartTime": 1570593632.676853}

#metrics {"Metrics":

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"EndTime": 1570593632.676935, "Dimensions": {"model": 11, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 11},

"StartTime": 1570593632.676917}

#metrics {"Metrics":

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"EndTime": 1570593632.676997, "Dimensions": {"model": 12, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 11},

"StartTime": 1570593632.67698}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max": 0.5147710227966309, "sum": 0.5147710227966309, "min": 0.5147710227966309}}, "EndTime": 1570593632.67705, "Dimensions": {"model": 13, "Host": "algo-1", "Operation": "training", "Algorithm": "Linear Learner", "epoch": 11}, "StartTime": 1570593632.677033}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max": 0.5149316310882568, "sum": 0.5149316310882568, "min": 0.5149316310882568}}, "EndTime": 1570593632.677103, "Dimensions": {"model": 14, "Host": "algo-1", "Operation": "training", "Algorithm": "Linear Learner", "epoch": 11}, "StartTime": 1570593632.677087}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max": 0.5150235557556152, "sum": 0.5150235557556152, "min": 0.5150235557556152}}, "EndTime": 1570593632.677154, "Dimensions": {"model": 15, "Host": "algo-1", "Operation": "training", "Algorithm": "Linear Learner", "epoch": 11}, "StartTime": 1570593632.677143}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max": 0.5765493965148926, "sum": 0.5765493965148926, "min": 0.5765493965148926}}, "EndTime": 1570593632.677219, "Dimensions": {"model": 16, "Host": "algo-1", "Operation": "training", "Algorithm": "Linear Learner", "epoch": 11}, "StartTime": 1570593632.6772}

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"EndTime": 1570593632.677298, "Dimensions": {"model": 17, "Host": "algo-1",
"Operation": "training", "Algorithm": "Linear Learner", "epoch": 11},
"StartTime": 1570593632.677279}

#metrics {"Metrics":
{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":
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"EndTime": 1570593632.677365, "Dimensions": {"model": 18, "Host": "algo-1",
"Operation": "training", "Algorithm": "Linear Learner", "epoch": 11},
"StartTime": 1570593632.677347}

#metrics {"Metrics":
{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":
0.5771057510375976, "sum": 0.5771057510375976, "min": 0.5771057510375976}},
"EndTime": 1570593632.67743, "Dimensions": {"model": 19, "Host": "algo-1",
"Operation": "training", "Algorithm": "Linear Learner", "epoch": 11},
"StartTime": 1570593632.677413}

#metrics {"Metrics":
{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":
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"EndTime": 1570593632.677492, "Dimensions": {"model": 20, "Host": "algo-1",
"Operation": "training", "Algorithm": "Linear Learner", "epoch": 11},
"StartTime": 1570593632.677475}

#metrics {"Metrics":

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"EndTime": 1570593632.677592, "Dimensions": {"model": 21, "Host": "algo-1",

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"StartTime": 1570593632.677572}

#metrics {"Metrics":

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"EndTime": 1570593632.677666, "Dimensions": {"model": 22, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 11},

"StartTime": 1570593632.677648}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

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"EndTime": 1570593632.677726, "Dimensions": {"model": 23, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 11},

"StartTime": 1570593632.67771}

#metrics {"Metrics":

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"EndTime": 1570593632.677792, "Dimensions": {"model": 24, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 11},

"StartTime": 1570593632.677775}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

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"EndTime": 1570593632.677855, "Dimensions": {"model": 25, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 11},

"StartTime": 1570593632.677838}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

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"EndTime": 1570593632.677916, "Dimensions": {"model": 26, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 11},

"StartTime": 1570593632.677898}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

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"EndTime": 1570593632.677977, "Dimensions": {"model": 27, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 11},

"StartTime": 1570593632.67796}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

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"EndTime": 1570593632.678044, "Dimensions": {"model": 28, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 11},

"StartTime": 1570593632.678026}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

0.6112211322784424, "sum": 0.6112211322784424, "min": 0.6112211322784424}},

"EndTime": 1570593632.678105, "Dimensions": {"model": 29, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 11},

"StartTime": 1570593632.678087}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

0.6112359046936036, "sum": 0.6112359046936036, "min": 0.6112359046936036}},

"EndTime": 1570593632.678165, "Dimensions": {"model": 30, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 11},

"StartTime": 1570593632.678148}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

0.6090494441986084, "sum": 0.6090494441986084, "min": 0.6090494441986084}},

"EndTime": 1570593632.678225, "Dimensions": {"model": 31, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 11},

"StartTime": 1570593632.678214}

[10/09/2019 04:00:32 INFO 140715555129152] #quality_metric: host=algo-1,

epoch=11, train binary_classification_cross_entropy_objective

<loss>=0.537494544983
[10/09/2019 04:00:32 INFO 140715555129152] #early_stopping_criteria_metric:

host=algo-1, epoch=11, criteria=binary_classification_cross_entropy_objective,

value=0.513610258102
[10/09/2019 04:00:32 INFO 140715555129152] #progress_metric: host=algo-1,

completed 80 % of epochs

#metrics {"Metrics": {"Max Batches Seen Between Resets": {"count": 1,
"max": 4, "sum": 4.0, "min": 4}, "Number of Batches Since Last Reset": {"count":
1, "max": 4, "sum": 4.0, "min": 4}, "Number of Records Since Last Reset":
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1, "max": 10600, "sum": 10600.0, "min": 10600}, "Max Records Seen Between
Resets": {"count": 1, "max": 800, "sum": 800.0, "min": 800}, "Reset Count":
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"Dimensions": {"Host": "algo-1", "Meta": "training_data_iter", "Operation":
"training", "Algorithm": "Linear Learner", "epoch": 11}, "StartTime":
1570593632.494547}

[10/09/2019 04:00:32 INFO 140715555129152] #throughput_metric: host=algo-1,
train throughput=4295.09374356 records/second
[2019-10-09 04:00:32.803] [tensorio] [info] epoch_stats={"data_pipeline":
"/opt/ml/input/data/train", "epoch": 28, "duration": 122, "num_examples": 4,
"num_bytes": 112000}
#metrics {"Metrics":
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"Operation": "training", "Algorithm": "Linear Learner", "epoch": 12},
"StartTime": 1570593632.803748}

#metrics {"Metrics":
{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":
0.5407158756256103, "sum": 0.5407158756256103, "min": 0.5407158756256103}},
"EndTime": 1570593632.803959, "Dimensions": {"model": 1, "Host": "algo-1",
"Operation": "training", "Algorithm": "Linear Learner", "epoch": 12},
"StartTime": 1570593632.803938}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

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"EndTime": 1570593632.804025, "Dimensions": {"model": 2, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 12},

"StartTime": 1570593632.804011}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

0.5393428325653076, "sum": 0.5393428325653076, "min": 0.5393428325653076}},

"EndTime": 1570593632.804076, "Dimensions": {"model": 3, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 12},

"StartTime": 1570593632.804061}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

0.5129618263244629, "sum": 0.5129618263244629, "min": 0.5129618263244629}},

"EndTime": 1570593632.80413, "Dimensions": {"model": 4, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 12},

"StartTime": 1570593632.804116}

#metrics {"Metrics":

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"EndTime": 1570593632.804192, "Dimensions": {"model": 5, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 12},

"StartTime": 1570593632.804174}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

0.5131415748596191, "sum": 0.5131415748596191, "min": 0.5131415748596191}},

"EndTime": 1570593632.804256, "Dimensions": {"model": 6, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 12},

"StartTime": 1570593632.804238}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

0.5131036853790283, "sum": 0.5131036853790283, "min": 0.5131036853790283}},

"EndTime": 1570593632.804319, "Dimensions": {"model": 7, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 12},

"StartTime": 1570593632.804301}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

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"EndTime": 1570593632.804394, "Dimensions": {"model": 8, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 12},

"StartTime": 1570593632.804374}

#metrics {"Metrics":

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"EndTime": 1570593632.804462, "Dimensions": {"model": 9, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 12},

"StartTime": 1570593632.804444}

#metrics {"Metrics":

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"EndTime": 1570593632.804527, "Dimensions": {"model": 10, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 12},

"StartTime": 1570593632.804508}

#metrics {"Metrics":

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1570593632.804596, "Dimensions": {"model": 11, "Host": "algo-1", "Operation":

"training", "Algorithm": "Linear Learner", "epoch": 12}, "StartTime":

1570593632.804578}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

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"EndTime": 1570593632.804671, "Dimensions": {"model": 12, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 12},

"StartTime": 1570593632.804653}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

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"EndTime": 1570593632.804736, "Dimensions": {"model": 13, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 12},

"StartTime": 1570593632.804717}

#metrics {"Metrics":
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"EndTime": 1570593632.80481, "Dimensions": {"model": 14, "Host": "algo-1",
"Operation": "training", "Algorithm": "Linear Learner", "epoch": 12},
"StartTime": 1570593632.804791}

#metrics {"Metrics":
{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":
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"EndTime": 1570593632.804874, "Dimensions": {"model": 15, "Host": "algo-1",
"Operation": "training", "Algorithm": "Linear Learner", "epoch": 12},
"StartTime": 1570593632.804859}

#metrics {"Metrics":
{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":
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"StartTime": 1570593632.804906}

#metrics {"Metrics":
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"EndTime": 1570593632.80499, "Dimensions": {"model": 17, "Host": "algo-1",
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"StartTime": 1570593632.804972}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

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"EndTime": 1570593632.80506, "Dimensions": {"model": 18, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 12},

"StartTime": 1570593632.805042}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

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"EndTime": 1570593632.805128, "Dimensions": {"model": 19, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 12},

"StartTime": 1570593632.80511}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

0.5792412090301514, "sum": 0.5792412090301514, "min": 0.5792412090301514}},

"EndTime": 1570593632.805196, "Dimensions": {"model": 20, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 12},

"StartTime": 1570593632.805177}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

0.5781543731689454, "sum": 0.5781543731689454, "min": 0.5781543731689454}},

"EndTime": 1570593632.805266, "Dimensions": {"model": 21, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 12},

"StartTime": 1570593632.805247}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

0.5787388610839844, "sum": 0.5787388610839844, "min": 0.5787388610839844}},

"EndTime": 1570593632.805342, "Dimensions": {"model": 22, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 12},

"StartTime": 1570593632.805322}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

0.5788704299926758, "sum": 0.5788704299926758, "min": 0.5788704299926758}},

"EndTime": 1570593632.805427, "Dimensions": {"model": 23, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 12},

"StartTime": 1570593632.805407}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

0.6103784561157226, "sum": 0.6103784561157226, "min": 0.6103784561157226}},

"EndTime": 1570593632.805502, "Dimensions": {"model": 24, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 12},

"StartTime": 1570593632.805483}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

0.6107520198822022, "sum": 0.6107520198822022, "min": 0.6107520198822022}},

"EndTime": 1570593632.805609, "Dimensions": {"model": 25, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 12},

"StartTime": 1570593632.805588}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max": 0.6107794189453125, "sum": 0.6107794189453125, "min": 0.6107794189453125}}, "EndTime": 1570593632.805676, "Dimensions": {"model": 26, "Host": "algo-1", "Operation": "training", "Algorithm": "Linear Learner", "epoch": 12}, "StartTime": 1570593632.805658}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max": 0.6108103084564209, "sum": 0.6108103084564209, "min": 0.6108103084564209}}, "EndTime": 1570593632.805737, "Dimensions": {"model": 27, "Host": "algo-1", "Operation": "training", "Algorithm": "Linear Learner", "epoch": 12}, "StartTime": 1570593632.80572}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max": 0.611264877319336, "sum": 0.611264877319336, "min": 0.611264877319336}}, "EndTime": 1570593632.805798, "Dimensions": {"model": 28, "Host": "algo-1", "Operation": "training", "Algorithm": "Linear Learner", "epoch": 12}, "StartTime": 1570593632.805781}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max": 0.6114034843444824, "sum": 0.6114034843444824, "min": 0.6114034843444824}}, "EndTime": 1570593632.805871, "Dimensions": {"model": 29, "Host": "algo-1", "Operation": "training", "Algorithm": "Linear Learner", "epoch": 12}, "StartTime": 1570593632.805852}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

0.6113945484161377, "sum": 0.6113945484161377, "min": 0.6113945484161377}},

"EndTime": 1570593632.805937, "Dimensions": {"model": 30, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 12},

"StartTime": 1570593632.805919}

#metrics {"Metrics":

{"train_binary_classification_cross_entropy_objective": {"count": 1, "max":

0.6132266998291016, "sum": 0.6132266998291016, "min": 0.6132266998291016}},

"EndTime": 1570593632.805999, "Dimensions": {"model": 31, "Host": "algo-1",

"Operation": "training", "Algorithm": "Linear Learner", "epoch": 12},

"StartTime": 1570593632.805982}

[10/09/2019 04:00:32 INFO 140715555129152] #quality_metric: host=algo-1,

epoch=12, train binary_classification_cross_entropy_objective

<loss>=0.535552625656
[10/09/2019 04:00:32 INFO 140715555129152] #early_stopping_criteria_metric:

host=algo-1, epoch=12, criteria=binary_classification_cross_entropy_objective,

value=0.512961826324
[10/09/2019 04:00:32 INFO 140715555129152] Early stop condition met.

Stopping training.
[10/09/2019 04:00:32 INFO 140715555129152] #progress_metric: host=algo-1,

completed 100 % epochs

#metrics {"Metrics": {"Max Batches Seen Between Resets": {"count": 1, "max": 4, "sum": 4.0, "min": 4}, "Number of Batches Since Last Reset": {"count": 1, "max": 4, "sum": 4.0, "min": 4}, "Number of Records Since Last Reset": {"count": 1, "max": 800, "sum": 800.0, "min": 800}, "Total Batches Seen": {"count": 1, "max": 57, "sum": 57.0, "min": 57}, "Total Records Seen": {"count": 1, "max": 11400, "sum": 11400.0, "min": 11400}, "Max Records Seen Between Resets": {"count": 1, "max": 800, "sum": 800.0, "min": 800}, "Reset Count": {"count": 1, "max": 15, "sum": 15.0, "min": 15}}, "EndTime": 1570593632.808488, "Dimensions": {"Host": "algo-1", "Meta": "training_data_iter", "Operation": "training", "Algorithm": "Linear Learner", "epoch": 12}, "StartTime": 1570593632.680968}

[10/09/2019 04:00:32 INFO 140715555129152] #throughput_metric: host=algo-1, train throughput=6266.88979202 records/second
[10/09/2019 04:00:32 WARNING 140715555129152] wait_for_all_workers will not sync workers since the kv store is not running distributed
[10/09/2019 04:00:32 WARNING 140715555129152] wait_for_all_workers will not sync workers since the kv store is not running distributed
[2019-10-09 04:00:32.810] [tensorio] [info] epoch_stats={"data_pipeline": "/opt/ml/input/data/train", "epoch": 30, "duration": 1, "num_examples": 1, "num_bytes": 28000}
[2019-10-09 04:00:32.917] [tensorio] [info] epoch_stats={"data_pipeline": "/opt/ml/input/data/train", "epoch": 33, "duration": 104, "num_examples": 4, "num_bytes": 112000}
[2019-10-09 04:00:32.942] [tensorio] [info] epoch_stats={"data_pipeline": "/opt/ml/input/data/train", "epoch": 35, "duration": 11, "num_examples": 4, "num_bytes": 112000}
[10/09/2019 04:00:32 INFO 140715555129152] #train_score (algo-1) : ('binary_classification_cross_entropy_objective', 0.5121596527099609)
[10/09/2019 04:00:32 INFO 140715555129152] #train_score (algo-1) : ('binary_classification_accuracy', 0.75875)
[10/09/2019 04:00:32 INFO 140715555129152] #train_score (algo-1) : ('binary_f_1.000', 0.5187032418952618)
[10/09/2019 04:00:32 INFO 140715555129152] #train_score (algo-1) : ('precision', 0.6459627329192547)

```
[10/09/2019 04:00:32 INFO 140715555129152] #train_score (algo-1) :
('recall', 0.43333333333333335)
[10/09/2019 04:00:32 INFO 140715555129152] #quality_metric: host=algo-1,
train binary_classification_cross_entropy_objective <loss>=0.51215965271
[10/09/2019 04:00:32 INFO 140715555129152] #quality_metric: host=algo-1,
train binary_classification_accuracy <score>=0.75875
[10/09/2019 04:00:32 INFO 140715555129152] #quality_metric: host=algo-1,
train binary_f_1.000 <score>=0.518703241895
[10/09/2019 04:00:32 INFO 140715555129152] #quality_metric: host=algo-1,
train precision <score>=0.645962732919
[10/09/2019 04:00:32 INFO 140715555129152] #quality_metric: host=algo-1,
train recall <score>=0.433333333333
[10/09/2019 04:00:32 INFO 140715555129152] Best model found for
hyperparameters: {"lr_scheduler_step": 100, "wd": 0.0001, "optimizer": "adam",
"lr_scheduler_factor": 0.99, "l1": 0.0, "learning_rate": 0.1,
"lr_scheduler_minimum_lr": 1e-05}
[10/09/2019 04:00:32 INFO 140715555129152] Saved checkpoint to
"/tmp/tmpCT_Ixi/mx-mod-0000.params"
[2019-10-09 04:00:32.948] [tensorio] [info] epoch_stats={"data_pipeline":
"/opt/ml/input/data/test", "epoch": 0, "duration": 2423, "num_examples": 1,
"num_bytes": 28000}
[2019-10-09 04:00:32.952] [tensorio] [info] epoch_stats={"data_pipeline":
"/opt/ml/input/data/test", "epoch": 1, "duration": 3, "num_examples": 1,
"num_bytes": 28000}
#metrics {"Metrics": {"Max Batches Seen Between Resets": {"count": 1,
"max": 1, "sum": 1.0, "min": 1}, "Number of Batches Since Last Reset": {"count":
1, "max": 1, "sum": 1.0, "min": 1}, "Number of Records Since Last Reset":
{"count": 1, "max": 200, "sum": 200.0, "min": 200}, "Total Batches Seen":
{"count": 1, "max": 1, "sum": 1.0, "min": 1}, "Total Records Seen": {"count": 1,
"max": 200, "sum": 200.0, "min": 200}, "Max Records Seen Between Resets":
{"count": 1, "max": 200, "sum": 200.0, "min": 200}, "Reset Count": {"count": 1,
"max": 1, "sum": 1.0, "min": 1}}, "EndTime": 1570593632.952265, "Dimensions":
{"Host": "algo-1", "Meta": "test_data_iter", "Operation": "training",
"Algorithm": "Linear Learner"}, "StartTime": 1570593632.948623}
```

```
[10/09/2019 04:00:32 INFO 140715555129152] #test_score (algo-1) :
('binary_classification_cross_entropy_objective', 0.5098339462280274)
[10/09/2019 04:00:32 INFO 140715555129152] #test_score (algo-1) :
('binary_classification_accuracy', 0.76)
[10/09/2019 04:00:32 INFO 140715555129152] #test_score (algo-1) :
('binary_f_1.000', 0.5471698113207547)
[10/09/2019 04:00:32 INFO 140715555129152] #test_score (algo-1) :
('precision', 0.6304347826086957)
[10/09/2019 04:00:32 INFO 140715555129152] #test_score (algo-1) :
('recall', 0.48333333333333334)
[10/09/2019 04:00:32 INFO 140715555129152] #quality_metric: host=algo-1,
test binary_classification_cross_entropy_objective <loss>=0.509833946228
[10/09/2019 04:00:32 INFO 140715555129152] #quality_metric: host=algo-1,
test binary_classification_accuracy <score>=0.76
[10/09/2019 04:00:32 INFO 140715555129152] #quality_metric: host=algo-1,
test binary_f_1.000 <score>=0.547169811321
[10/09/2019 04:00:32 INFO 140715555129152] #quality_metric: host=algo-1,
test precision <score>=0.630434782609
[10/09/2019 04:00:32 INFO 140715555129152] #quality_metric: host=algo-1,
test recall <score>=0.483333333333
```
```
#metrics {"Metrics": {"totaltime": {"count": 1, "max": 2521.078109741211,
"sum": 2521.078109741211, "min": 2521.078109741211}, "finalize.time": {"count":
1, "max": 134.95492935180664, "sum": 134.95492935180664, "min":
134.95492935180664}, "initialize.time": {"count": 1, "max": 158.45298767089844,
"sum": 158.45298767089844, "min": 158.45298767089844},
"check_early_stopping.time": {"count": 13, "max": 1.1780261993408203, "sum":
8.686065673828125, "min": 0.2219676971435547}, "setuptime": {"count": 1, "max":
30.95102310180664, "sum": 30.95102310180664, "min": 30.95102310180664},
"update.time": {"count": 13, "max": 185.94002723693848, "sum":
2116.9722080230713, "min": 127.22992897033691}, "epochs": {"count": 1, "max":
15, "sum": 15.0, "min": 15}}, "EndTime": 1570593632.956638, "Dimensions":
{"Host": "algo-1", "Operation": "training", "Algorithm": "Linear Learner"},
"StartTime": 1570593630.523559}
```

```
2019-10-09 04:00:44 Uploading - Uploading generated training model
2019-10-09 04:00:44 Completed - Training job completed
Training seconds: 62
Billable seconds: 62
```

1.3.3 Deploying the Model to Make Predictions

In this section, the `lineal-learner` model that was trained will be used to make predictions of credit risk. Deploy the model using a `ml.t2.medium` instance type.

Note: This step might take a few minutes.

```python
[17]: # An instance of the lineal-learner predictor is created
      linear_predictor = linear.deploy(initial_instance_count=1, instance_type="ml.t2.
       ↪medium")
```

```
----------------------------------------------------------------------------
---------------------------!
```

```python
[18]: # Linear predictor configurations
      linear_predictor.content_type = "text/csv"
      linear_predictor.serializer = csv_serializer
      linear_predictor.deserializer = json_deserializer
```

```python
[19]: # Making some predictions using the test data.
      result = linear_predictor.predict(X_test)
      y_predictions = np.array(
          [np.uint8(r["predicted_label"]) for r in result["predictions"]]
      )
      y_predictions
```

```
[19]: array([0, 0, 1, 0, 1, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0,
             0, 0, 0, 1, 0, 0, 0, 1, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0,
             0, 0, 1, 0, 1, 0, 1, 0, 0, 0, 0, 1, 0, 0, 1, 0, 0, 0, 1, 0, 1, 0,
             1, 0, 1, 0, 0, 1, 0, 1, 0, 1, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 1, 0,
             0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 1, 1, 0,
             0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0,
             0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0,
             0, 0, 1, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0,
             0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 1, 0, 0,
             0, 0], dtype=uint8)
```

1.3.4 Model Evaluation

To evaluate the model, we create a confusion matrix to compare the cases where each predicted value matches the expected test-value and when not.

```python
[20]: import pandas as pd
```

```python
# Encode the predictios results as 0 = Good, 1 = Bad Risk
cat_test = np.array(["Good" if x == 0 else "Bad" for x in Y_test])
cat_pred = np.array(["Good" if x == 0 else "Bad" for x in y_predictions])

# Create the confusion matrix
pd.crosstab(cat_test, cat_pred, rownames=["actuals"], colnames=["predictions"])
```

```
[20]: predictions  Bad   Good
      actuals
      Bad           22    40
      Good          17   121
```

The model is also evaluated using the **sklearn** metrics module. The following metrics are calculated:

- accuracy_score
- confusion_matrix
- classification_report

```python
[21]: from sklearn.metrics import accuracy_score, confusion_matrix,
      ↪classification_report

      print(f"accuracy_score: {accuracy_score(Y_test,y_predictions)}\n\n")
      print(
          f"sklearn's confusion_matrix: \n\n{confusion_matrix(Y_test, y_predictions,
      ↪labels=[0, 1])}\n\n"
      )
      print(
          f"classification_report: \n\n{classification_report(Y_test, y_predictions,
      ↪target_names=['Good', 'Bad'])}\n\n"
      )
```

```
accuracy_score: 0.715


sklearn's confusion_matrix:

[[121  17]
 [ 40  22]]


classification_report:

              precision    recall  f1-score   support

        Good       0.75      0.88      0.81       138
         Bad       0.56      0.35      0.44        62
```

```
    micro avg       0.71        0.71        0.71        200
    macro avg       0.66        0.62        0.62        200
 weighted avg       0.69        0.71        0.69        200
```

Finally the end point is deleted to avoid additional AWS resources usage.

```
[22]:  # Delete Amazon SageMaker end-point
       sagemaker.Session().delete_endpoint(linear_predictor.endpoint)
```