

Problem 3 - Ray Tune for Hyperparameter Optimization 10 points

In this problem, we will compare the performance of Grid Search, Bayesian Search and Hyperband for hyperparameter optimization for a deep learning problem using Ray Tune. We will use the MNIST dataset alongwith the Lenet model. The hyperparameters to tune are:

- Number of filters in the first Conv2d layer: 64 to 256
- Learning Rate: 0.001 to 0.1
- Batch Size: 64,128,256
- Dropout: probability between 0 and 1

Use Ray Tune (<https://docs.ray.io/en/latest/tune/index.html>) for the search. You can use the same resources per trial and metric as those in Lab 8 and Lab 10 in class.

```
In [ ]: !pip install "ray[tune]"
        !pip install pyarrow
```

```
Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/
Requirement already satisfied: ray[tune] in /usr/local/lib/python3.8/dist-packages (2.1.0)
Requirement already satisfied: attrs in /usr/local/lib/python3.8/dist-packages (from ray[tune]) (22.1.0)
Requirement already satisfied: grpcio>=1.32.0 in /usr/local/lib/python3.8/dist-packages (from ray[tune]) (1.51.1)
Requirement already satisfied: msgpack<2.0.0,>=1.0.0 in /usr/local/lib/python3.8/dist-packages (from ray[tune]) (1.0.4)
Requirement already satisfied: pyyaml in /usr/local/lib/python3.8/dist-packages (from ray[tune]) (6.0)
Requirement already satisfied: protobuf!=3.19.5,>=3.15.3 in /usr/local/lib/python3.8/dist-packages (from ray[tune]) (3.19.6)
Requirement already satisfied: frozenlist in /usr/local/lib/python3.8/dist-packages (from ray[tune]) (1.3.3)
Requirement already satisfied: numpy>=1.16 in /usr/local/lib/python3.8/dist-packages (from ray[tune]) (1.21.6)
Requirement already satisfied: requests in /usr/local/lib/python3.8/dist-packages (from ray[tune]) (2.23.0)
Requirement already satisfied: jsonschema in /usr/local/lib/python3.8/dist-packages (from ray[tune]) (4.3.3)
Requirement already satisfied: virtualenv>=20.0.24 in /usr/local/lib/python3.8/dist-packages (from ray[tune]) (20.17.1)
Requirement already satisfied: filelock in /usr/local/lib/python3.8/dist-packages (from ray[tune]) (3.8.0)
Requirement already satisfied: aiosignal in /usr/local/lib/python3.8/dist-packages (from ray[tune]) (1.3.1)
Requirement already satisfied: click<=8.0.4,>=7.0 in /usr/local/lib/python3.8/dist-packages (from ray[tune]) (7.1.2)
Requirement already satisfied: pandas in /usr/local/lib/python3.8/dist-packages (from ray[tune]) (1.3.5)
Requirement already satisfied: tensorboardX>=1.9 in /usr/local/lib/python3.8/dist-packages (from ray[tune]) (2.5.1)
Requirement already satisfied: tabulate in /usr/local/lib/python3.8/dist-packages (from ray[tune]) (0.8.10)
Requirement already satisfied: platformdirs<3,>=2.4 in /usr/local/lib/python3.8/dist-packages (from virtualenv>=20.0.24->ray[tune]) (2.5.4)
Requirement already satisfied: distlib<1,>=0.3.6 in /usr/local/lib/python3.8/dist-packages (from virtualenv>=20.0.24->ray[tune]) (0.3.6)
```

Requirement already satisfied: importlib-resources>=1.4.0 in /usr/local/lib/python3.8/dist-packages (from jsonschema->ray[tune]) (5.10.0)
 Requirement already satisfied: pyrsistent!=0.17.0,!=0.17.1,!=0.17.2,>=0.14.0 in /usr/local/lib/python3.8/dist-packages (from jsonschema->ray[tune]) (0.19.2)
 Requirement already satisfied: zipp>=3.1.0 in /usr/local/lib/python3.8/dist-packages (from importlib-resources>=1.4.0->jsonschema->ray[tune]) (3.11.0)
 Requirement already satisfied: python-dateutil>=2.7.3 in /usr/local/lib/python3.8/dist-packages (from pandas->ray[tune]) (2.8.2)
 Requirement already satisfied: pytz>=2017.3 in /usr/local/lib/python3.8/dist-packages (from pandas->ray[tune]) (2022.6)
 Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.8/dist-packages (from python-dateutil>=2.7.3->pandas->ray[tune]) (1.15.0)
 Requirement already satisfied: urllib3!=1.25.0,!=1.25.1,<1.26,>=1.21.1 in /usr/local/lib/python3.8/dist-packages (from requests->ray[tune]) (1.24.3)
 Requirement already satisfied: idna<3,>=2.5 in /usr/local/lib/python3.8/dist-packages (from requests->ray[tune]) (2.10)
 Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.8/dist-packages (from requests->ray[tune]) (2022.9.24)
 Requirement already satisfied: chardet<4,>=3.0.2 in /usr/local/lib/python3.8/dist-packages (from requests->ray[tune]) (3.0.4)
ERROR: Operation cancelled by user
 Looking in indexes: <https://pypi.org/simple>, <https://us-python.pkg.dev/colab-wheels/public/simple/>
 Requirement already satisfied: pyarrow in /usr/local/lib/python3.8/dist-packages (9.0.0)
 Requirement already satisfied: numpy>=1.16.6 in /usr/local/lib/python3.8/dist-packages (from pyarrow) (1.21.6)

```
In [ ]: import tensorflow as tf
        from tensorflow import keras
        from tensorflow.keras.datasets import mnist
        from tensorflow.keras import layers, models

        import ray
        from ray import tune
        from ray.tune.integration.keras import TuneReportCallback
        from ray.tune.schedulers import HyperBandScheduler
```

```
In [ ]: def train_mnist(config):
        batch_size = int(config['batch_size'])
        epochs = 2

        (x_train, y_train), (x_test, y_test) = mnist.load_data()
        x_train, x_test = x_train / 255.0, x_test / 255.0
        model = tf.keras.models.Sequential([
            tf.keras.layers.Conv2D(filters=int(config["conv_filters"]), kernel_size=(3, 3),
            tf.keras.layers.MaxPooling2D(pool_size=(2, 2)),
            tf.keras.layers.Conv2D(filters=48, kernel_size=(5, 5), padding='valid'),
            tf.keras.layers.MaxPooling2D(pool_size=(2, 2)),
            tf.keras.layers.Flatten(),
            tf.keras.layers.Dense(256, activation="relu"),
            tf.keras.layers.Dropout(config["dropout"]),
            tf.keras.layers.Dense(84, activation="relu"),
            tf.keras.layers.Dense(10, activation="softmax")
        ])

        model.compile(
            loss="sparse_categorical_crossentropy",
            optimizer=tf.keras.optimizers.Adam(
                lr=config["lr"]),
            metrics=["accuracy"])

        model.fit(
            x_train,
            y_train,
```

```

batch_size=batch_size,
epochs=epochs,
verbose=0,
validation_data=(x_test, y_test),
callbacks=[TuneReportCallback({
    "accuracy": "accuracy"
})])

```

1. Perform Grid Search, Bayesian Search and Hyperband for the given hyperparameter configurations. For Grid Search, you can either sample uniformly between the given ranges, or specify a list of values in the given range (for e.g., filters = [64,128,256], lr=[0.001,0.01,0.1], etc). (6)

```

In [ ]: # -----Hyperband -----
search_list = {
    "batch_size": tune.grid_search([64,128,256]),
    "conv_filters": tune.grid_search([64,128,256]),
    "dropout": tune.uniform(0, 1),
    "lr": tune.uniform(0.001, 0.1)
}
hyperband_scheduler = HyperBandScheduler(
    time_attr='training_iteration',
    metric='mean_accuracy',
    mode='max',
    max_t=10,
    reduction_factor=3)

Hype_analysis = tune.run(
    train_mnist,
    name="exp",
    resources_per_trial={
        "gpu": 1
    },
    config=search_list,
    scheduler=hyperband_scheduler)

```

Tune Status

Current time: 2022-12-11 19:44:06
 Running for: 00:05:40.60
 Memory: 2.8/12.7 GiB

System Info

Using HyperBand: num_stopped=3 total_brackets=3
 Round #0:
 Bracket(Max Size (n)=3, Milestone (r)=10, completed=100.0%): {TERMINATED: 3}
 Bracket(Max Size (n)=2, Milestone (r)=7, completed=100.0%): {TERMINATED: 5}
 Bracket(Max Size (n)=1, Milestone (r)=7, completed=100.0%): {TERMINATED: 1}
 Resources requested: 0/2 CPUs, 0/1 GPUs, 0.0/7.2 GiB heap, 0.0/3.6 GiB objects (0.0/1.0 accelerator_type:T4)

Trial Status

Trial name	status	loc	batch_size	conv_filters	dropout
train_mnist_6167f_00000	TERMINATED	172.28.0.12:1679	64	64	0.373763

Trial name	status	loc	batch_size	conv_filters	dropout
train_mnist_6167f_00001	TERMINATED	172.28.0.12:2247	128	64	0.0861023
train_mnist_6167f_00002	TERMINATED	172.28.0.12:2655	256	64	0.353302
train_mnist_6167f_00003	TERMINATED	172.28.0.12:2446	64	128	0.224768
train_mnist_6167f_00004	TERMINATED	172.28.0.12:2000	128	128	0.685153
train_mnist_6167f_00005	TERMINATED	172.28.0.12:2548	256	128	0.166145
train_mnist_6167f_00006	TERMINATED	172.28.0.12:2163	64	256	0.481493

```
(train_mnist pid=1679) 2022-12-11 19:38:32.246458: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
```

```
(train_mnist pid=1679) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
```

```
(train_mnist pid=1679) super(Adam, self).__init__(name, **kwargs)
```

Trial Progress

Trial name	date	done	episodes_total	expe
train_mnist_6167f_00000	2022-12-11_19-39-13	False		59717ba6d9ca4f13b1842935
train_mnist_6167f_00001	2022-12-11_19-42-01	False		28a3aa4120e74f19a72a9f41
train_mnist_6167f_00002	2022-12-11_19-44-06	True		7a86f0843d8c47ac9af0a5e8
train_mnist_6167f_00003	2022-12-11_19-43-08	False	0	4762503d03f34cdfbe0c98c
train_mnist_6167f_00004	2022-12-11_19-40-38	False		7426f833d27f418dad3fe0a9
train_mnist_6167f_00005	2022-12-11_19-43-38	True	0	c547a6f7c6314421821ea4ea
train_mnist_6167f_00006	2022-12-11_19-41-26	False		9ce22bdb009f410d9ade3686
train_mnist_6167f_00007	2022-12-11_19-42-27	True		0797be25ad404276ba0e63b
train_mnist_6167f_00008	2022-12-11_19-40-17	True		74bdce6262304ca4bd8fdf3

```
(train_mnist pid=1807) 2022-12-11 19:39:19.666498: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
```

```
(train_mnist pid=1807) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
```

```
(train_mnist pid=1807) super(Adam, self).__init__(name, **kwargs)
```

```
(train_mnist pid=1889) 2022-12-11 19:39:42.667389: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
```

```
(train_mnist pid=1889) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
```

```
(train_mnist pid=1889) super(Adam, self).__init__(name, **kwargs)
```

```
(train_mnist pid=2000) 2022-12-11 19:40:23.800325: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
```

```
(train_mnist pid=2000) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
```

```
(train_mnist pid=2000) super(Adam, self).__init__(name, **kwargs)
```

```
(train_mnist pid=2082) 2022-12-11 19:40:44.681771: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
```

```

ntime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the T
F_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value wa
s 0.
(train_mnist pid=2082) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=2082) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=2163) 2022-12-11 19:41:03.024102: W tensorflow/core/common_ru
ntime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the T
F_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value wa
s 0.
(train_mnist pid=2163) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=2163) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=2247) 2022-12-11 19:41:32.930701: W tensorflow/core/common_ru
ntime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the T
F_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value wa
s 0.
(train_mnist pid=2247) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=2247) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=2365) 2022-12-11 19:42:08.682764: W tensorflow/core/common_ru
ntime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the T
F_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value wa
s 0.
(train_mnist pid=2365) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=2365) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=2446) 2022-12-11 19:42:32,000 INFO trainable.py:766 -- Resto
red on 172.28.0.12 from checkpoint: /root/ray_results/exp/train_mnist_6167f_00
003_3_batch_size=64,conv_filters=128,dropout=0.2248,lr=0.0724_2022-12-11_19-39
-14/checkpoint_tmp117eb4
(train_mnist pid=2446) 2022-12-11 19:42:32,000 INFO trainable.py:775 -- Curre
nt state after restoring: {'_iteration': 0, '_timesteps_total': 0, '_time_tota
l': 18.696871519088745, '_episodes_total': 0}
(train_mnist pid=2446) 2022-12-11 19:42:33.863919: W tensorflow/core/common_ru
ntime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the T
F_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value wa
s 0.
(train_mnist pid=2446) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=2446) super(Adam, self).__init__(name, **kwargs)
2022-12-11 19:42:41,620 INFO hyperband.py:472 -- Restoring from a previous poi
nt in time. Previous=3; Now=1
(train_mnist pid=2548) 2022-12-11 19:43:13,983 INFO trainable.py:766 -- Resto
red on 172.28.0.12 from checkpoint: /root/ray_results/exp/train_mnist_6167f_00
005_5_batch_size=256,conv_filters=128,dropout=0.1661,lr=0.0079_2022-12-11_19-4
0-39/checkpoint_tmp65e403
(train_mnist pid=2548) 2022-12-11 19:43:13,983 INFO trainable.py:775 -- Curre
nt state after restoring: {'_iteration': 0, '_timesteps_total': 0, '_time_tota
l': 13.293773174285889, '_episodes_total': 0}
(train_mnist pid=2548) 2022-12-11 19:43:15.834904: W tensorflow/core/common_ru
ntime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the T
F_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value wa
s 0.
(train_mnist pid=2548) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=2548) super(Adam, self).__init__(name, **kwargs)
2022-12-11 19:43:21,844 INFO hyperband.py:472 -- Restoring from a previous poi
nt in time. Previous=3; Now=1
(train_mnist pid=2655) 2022-12-11 19:43:45.158723: W tensorflow/core/common_ru
ntime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the T
F_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value wa
s 0.

```



```
(train_mnist pid=2655) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=2655) super(Adam, self).__init__(name, **kwargs)
2022-12-11 19:44:06,715 INFO tune.py:777 -- Total run time: 340.74 seconds (34
0.59 seconds for the tuning loop).
```

```
In [ ]: #-----Gridsearch-----
analysis = tune.run(
    train_mnist,
    name="exp",
    metric="mean_accuracy",
    mode="max",
    stop={
        "mean_accuracy": 0.90,
    },
    resources_per_trial={
        "gpu": 1
    },
    config={
        "conv_filters": tune.grid_search([64, 128, 256]),
        "lr": tune.grid_search([0.001, 0.01, 0.1]),
        "batch_size": tune.grid_search([64, 128, 256]),
        "dropout": tune.grid_search([0, .33, .66])
    })
```

Tune Status

Current time: 2022-12-11 20:23:16
 Running for: 00:39:10.02
 Memory: 3.0/12.7 GiB

System Info

Using FIFO scheduling algorithm.
 Resources requested: 0/2 CPUs, 0/1 GPUs, 0.0/7.2
 GiB heap, 0.0/3.6 GiB objects (0.0/1.0
 accelerator_type:T4)

Trial Status

	Trial name	status	loc	batch_size	conv_filters	dropout
	train_mnist_2c8b9_00000	TERMINATED	172.28.0.12:2781	64	64	0 0.00
	train_mnist_2c8b9_00001	TERMINATED	172.28.0.12:2878	128	64	0 0.00
	train_mnist_2c8b9_00002	TERMINATED	172.28.0.12:2948	256	64	0 0.00
	train_mnist_2c8b9_00003	TERMINATED	172.28.0.12:3017	64	128	0 0.00
	train_mnist_2c8b9_00004	TERMINATED	172.28.0.12:3088	128	128	0 0.00
	train_mnist_2c8b9_00005	TERMINATED	172.28.0.12:3157	256	128	0 0.00
	train_mnist_2c8b9_00006	TERMINATED	172.28.0.12:3227	64	256	0 0.00
	train_mnist_2c8b9_00007	TERMINATED	172.28.0.12:3295	128	256	0 0.00
	train_mnist_2c8b9_00008	TERMINATED	172.28.0.12:3362	256	256	0 0.00
	train_mnist_2c8b9_00009	TERMINATED	172.28.0.12:3429	64	64	0.33 0.00
	train_mnist_2c8b9_00010	TERMINATED	172.28.0.12:3498	128	64	0.33 0.00
	train_mnist_2c8b9_00011	TERMINATED	172.28.0.12:3564	256	64	0.33 0.00
	train_mnist_2c8b9_00012	TERMINATED	172.28.0.12:3631	64	128	0.33 0.00
	train_mnist_2c8b9_00013	TERMINATED	172.28.0.12:3698	128	128	0.33 0.00

Trial name	status	loc	batch_size	conv_filters	dropout	
train_mnist_2c8b9_00014	TERMINATED	172.28.0.12:3765	256	128	0.33	0.00
train_mnist_2c8b9_00015	TERMINATED	172.28.0.12:3831	64	256	0.33	0.00
train_mnist_2c8b9_00016	TERMINATED	172.28.0.12:3899	128	256	0.33	0.00
train_mnist_2c8b9_00017	TERMINATED	172.28.0.12:3967	256	256	0.33	0.00
train_mnist_2c8b9_00018	TERMINATED	172.28.0.12:4034	64	64	0.66	0.00
train_mnist_2c8b9_00019	TERMINATED	172.28.0.12:4103	128	64	0.66	0.00
train_mnist_2c8b9_00020	TERMINATED	172.28.0.12:4169	256	64	0.66	0.00
train_mnist_2c8b9_00021	TERMINATED	172.28.0.12:4240	64	128	0.66	0.00
train_mnist_2c8b9_00022	TERMINATED	172.28.0.12:4308	128	128	0.66	0.00
train_mnist_2c8b9_00023	TERMINATED	172.28.0.12:4376	256	128	0.66	0.00
train_mnist_2c8b9_00024	TERMINATED	172.28.0.12:4448	64	256	0.66	0.00
train_mnist_2c8b9_00025	TERMINATED	172.28.0.12:4516	128	256	0.66	0.00
train_mnist_2c8b9_00026	TERMINATED	172.28.0.12:4585	256	256	0.66	0.00
train_mnist_2c8b9_00027	TERMINATED	172.28.0.12:4657	64	64	0	0.00
train_mnist_2c8b9_00028	TERMINATED	172.28.0.12:4729	128	64	0	0.00
train_mnist_2c8b9_00029	TERMINATED	172.28.0.12:4799	256	64	0	0.00
train_mnist_2c8b9_00030	TERMINATED	172.28.0.12:4868	64	128	0	0.00
train_mnist_2c8b9_00031	TERMINATED	172.28.0.12:4935	128	128	0	0.00
train_mnist_2c8b9_00032	TERMINATED	172.28.0.12:5003	256	128	0	0.00
train_mnist_2c8b9_00033	TERMINATED	172.28.0.12:5076	64	256	0	0.00
train_mnist_2c8b9_00034	TERMINATED	172.28.0.12:5151	128	256	0	0.00
train_mnist_2c8b9_00035	TERMINATED	172.28.0.12:5221	256	256	0	0.00
train_mnist_2c8b9_00036	TERMINATED	172.28.0.12:5290	64	64	0.33	0.00
train_mnist_2c8b9_00037	TERMINATED	172.28.0.12:5357	128	64	0.33	0.00
train_mnist_2c8b9_00038	TERMINATED	172.28.0.12:5424	256	64	0.33	0.00
train_mnist_2c8b9_00039	TERMINATED	172.28.0.12:5491	64	128	0.33	0.00
train_mnist_2c8b9_00040	TERMINATED	172.28.0.12:5559	128	128	0.33	0.00
train_mnist_2c8b9_00041	TERMINATED	172.28.0.12:5634	256	128	0.33	0.00
train_mnist_2c8b9_00042	TERMINATED	172.28.0.12:5701	64	256	0.33	0.00
train_mnist_2c8b9_00043	TERMINATED	172.28.0.12:5768	128	256	0.33	0.00
train_mnist_2c8b9_00044	TERMINATED	172.28.0.12:5835	256	256	0.33	0.00
train_mnist_2c8b9_00045	TERMINATED	172.28.0.12:5909	64	64	0.66	0.00
train_mnist_2c8b9_00046	TERMINATED	172.28.0.12:5975	128	64	0.66	0.00
train_mnist_2c8b9_00047	TERMINATED	172.28.0.12:6047	256	64	0.66	0.00
train_mnist_2c8b9_00048	TERMINATED	172.28.0.12:6119	64	128	0.66	0.00
train_mnist_2c8b9_00049	TERMINATED	172.28.0.12:6193	128	128	0.66	0.00
train_mnist_2c8b9_00050	TERMINATED	172.28.0.12:6267	256	128	0.66	0.00

Trial name	status	loc	batch_size	conv_filters	dropout	
train_mnist_2c8b9_00051	TERMINATED	172.28.0.12:6339	64	256	0.66	0.0
train_mnist_2c8b9_00052	TERMINATED	172.28.0.12:6413	128	256	0.66	0.0
train_mnist_2c8b9_00053	TERMINATED	172.28.0.12:6481	256	256	0.66	0.0
train_mnist_2c8b9_00054	TERMINATED	172.28.0.12:6559	64	64	0	0
train_mnist_2c8b9_00055	TERMINATED	172.28.0.12:6690	128	64	0	0
train_mnist_2c8b9_00056	TERMINATED	172.28.0.12:6824	256	64	0	0
train_mnist_2c8b9_00057	TERMINATED	172.28.0.12:6957	64	128	0	0
train_mnist_2c8b9_00058	TERMINATED	172.28.0.12:7101	128	128	0	0
train_mnist_2c8b9_00059	TERMINATED	172.28.0.12:7239	256	128	0	0
train_mnist_2c8b9_00060	TERMINATED	172.28.0.12:7369	64	256	0	0
train_mnist_2c8b9_00061	TERMINATED	172.28.0.12:7525	128	256	0	0
train_mnist_2c8b9_00062	TERMINATED	172.28.0.12:7676	256	256	0	0
train_mnist_2c8b9_00063	TERMINATED	172.28.0.12:7810	64	64	0.33	0
train_mnist_2c8b9_00064	TERMINATED	172.28.0.12:7941	128	64	0.33	0
train_mnist_2c8b9_00065	TERMINATED	172.28.0.12:8069	256	64	0.33	0
train_mnist_2c8b9_00066	TERMINATED	172.28.0.12:8194	64	128	0.33	0
train_mnist_2c8b9_00067	TERMINATED	172.28.0.12:8327	128	128	0.33	0
train_mnist_2c8b9_00068	TERMINATED	172.28.0.12:8458	256	128	0.33	0
train_mnist_2c8b9_00069	TERMINATED	172.28.0.12:8586	64	256	0.33	0
train_mnist_2c8b9_00070	TERMINATED	172.28.0.12:8724	128	256	0.33	0
train_mnist_2c8b9_00071	TERMINATED	172.28.0.12:8859	256	256	0.33	0
train_mnist_2c8b9_00072	TERMINATED	172.28.0.12:8994	64	64	0.66	0
train_mnist_2c8b9_00073	TERMINATED	172.28.0.12:9131	128	64	0.66	0
train_mnist_2c8b9_00074	TERMINATED	172.28.0.12:9263	256	64	0.66	0
train_mnist_2c8b9_00075	TERMINATED	172.28.0.12:9389	64	128	0.66	0
train_mnist_2c8b9_00076	TERMINATED	172.28.0.12:9524	128	128	0.66	0

```
(train_mnist pid=2781) 2022-12-11 19:44:13.715221: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
```

```
(train_mnist pid=2781) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
```

```
(train_mnist pid=2781) super(Adam, self).__init__(name, **kwargs)
```

Trial Progress

Trial name	date	done	episodes_total	ex
train_mnist_2c8b9_00000	2022-12-11_19-44-20	True		4e7f41b4e97041baa75ba1
train_mnist_2c8b9_00001	2022-12-11_19-44-32	True		ccb15e6c4c2d435389f803
train_mnist_2c8b9_00002	2022-12-11_19-44-44	True		2587f9f05ee04dbaa175cc

	Trial name	date	done	episodes_total	ex
	train_mnist_2c8b9_00003	2022-12-11_19-44-58	True		2d3c2d857b48449cbf46c
	train_mnist_2c8b9_00004	2022-12-11_19-45-11	True		ced839828dbc44ab85e24c
	train_mnist_2c8b9_00005	2022-12-11_19-45-23	True		96909d12a1304eca8775bd
	train_mnist_2c8b9_00006	2022-12-11_19-45-39	True		e84918dffdf747bbaf5e29
	train_mnist_2c8b9_00007	2022-12-11_19-45-55	True		be4746c598454095984ea0
	train_mnist_2c8b9_00008	2022-12-11_19-46-09	True		603bc2f0d33c4a848cbf6
	train_mnist_2c8b9_00009	2022-12-11_19-46-22	True		bb99c6a2c5784a1998fb89
	train_mnist_2c8b9_00010	2022-12-11_19-46-34	True		f9a5ac4e15524edabeb5f0
	train_mnist_2c8b9_00011	2022-12-11_19-46-45	True		63468cfd2fc448daaa406f
	train_mnist_2c8b9_00012	2022-12-11_19-46-59	True		bff5fc3cd8a14c59a2b96f
	train_mnist_2c8b9_00013	2022-12-11_19-47-12	True		a19ff48552344c83aaba5
	train_mnist_2c8b9_00014	2022-12-11_19-47-24	True		ca4b797518774f28a6f61f
	train_mnist_2c8b9_00015	2022-12-11_19-47-40	True		bce965cbb9a54db7a48102
	train_mnist_2c8b9_00016	2022-12-11_19-47-55	True		a10bc85c032046e1891ece
	train_mnist_2c8b9_00017	2022-12-11_19-48-09	True		65b61be53160464b8afb0
	train_mnist_2c8b9_00018	2022-12-11_19-48-22	True		ef83eb2bf4204c9db0d119
	train_mnist_2c8b9_00019	2022-12-11_19-48-34	True		1d2de1355331437eabd64e
	train_mnist_2c8b9_00020	2022-12-11_19-48-47	True		7444dffde80042b094714c
	train_mnist_2c8b9_00021	2022-12-11_19-49-01	True		307dc59fb370484bb33b9e
	train_mnist_2c8b9_00022	2022-12-11_19-49-16	True		1bfba003da754835b27e8d
	train_mnist_2c8b9_00023	2022-12-11_19-49-31	True		c5ce3199d95c4b2d94f003
	train_mnist_2c8b9_00024	2022-12-11_19-49-47	True		ee714ab76fce4f31b0ebf5
	train_mnist_2c8b9_00025	2022-12-11_19-50-02	True		610c08b7cb8c44f1976016
	train_mnist_2c8b9_00026	2022-12-11_19-50-21	True		f7ad6e8a54534af9abe14
	train_mnist_2c8b9_00027	2022-12-11_19-50-35	True		5677285fbc4549c1b5df17
	train_mnist_2c8b9_00028	2022-12-11_19-50-47	True		5266428bfbcc479889a58f
	train_mnist_2c8b9_00029	2022-12-11_19-50-58	True		ab8633e5e42d4784b8c3ce
	train_mnist_2c8b9_00030	2022-12-11_19-51-12	True		133d78f299684fe99a920k
	train_mnist_2c8b9_00031	2022-12-11_19-51-25	True		b95e9e6518814791b38890f
	train_mnist_2c8b9_00032	2022-12-11_19-51-40	True		d9c9efeb1c90457fa2597e
	train_mnist_2c8b9_00033	2022-12-11_19-52-03	True		a18c9d53d9144186988af0
	train_mnist_2c8b9_00034	2022-12-11_19-52-18	True		23b081af6fcf43d1973f4
	train_mnist_2c8b9_00035	2022-12-11_19-52-34	True		56d16e82dcad4bbeaf5d8a
	train_mnist_2c8b9_00036	2022-12-11_19-52-48	True		fb58ae8f8efe40bca4f0d6
	train_mnist_2c8b9_00037	2022-12-11_19-53-00	True		a7477497c6bc4fccabefd7
	train_mnist_2c8b9_00038	2022-12-11_19-53-11	True		718078845d2f43bc90726k
	train_mnist_2c8b9_00039	2022-12-11_19-53-25	True		c71b945b52c84e79a4a69f

	Trial name	date	done	episodes_total	ex
	train_mnist_2c8b9_00040	2022-12-11_19-53-43	True		a5e11a2d3f3c47fda7112
	train_mnist_2c8b9_00041	2022-12-11_19-53-55	True		31f1710a2ddb47ffa33786
	train_mnist_2c8b9_00042	2022-12-11_19-54-11	True		8638c70deb34785a5165k
	train_mnist_2c8b9_00043	2022-12-11_19-54-25	True		3b9e9890d6d64af6aa049e
	train_mnist_2c8b9_00044	2022-12-11_19-54-44	True		d8cd3d79fae04eb093a081
	train_mnist_2c8b9_00045	2022-12-11_19-54-57	True		878c356557394f9f867f68
	train_mnist_2c8b9_00046	2022-12-11_19-55-12	True		c1bd180fa2924f138ea037
	train_mnist_2c8b9_00047	2022-12-11_19-55-25	True		8e2f12c00a664ba9b021fd
	train_mnist_2c8b9_00048	2022-12-11_19-55-44	True		36745afdd17c4b01b67436
	train_mnist_2c8b9_00049	2022-12-11_19-56-03	True		8beecd241658499da84bcc
	train_mnist_2c8b9_00050	2022-12-11_19-56-18	True		e10c7108b1a7422ca7ea78
	train_mnist_2c8b9_00051	2022-12-11_19-56-41	True		2c7c2e2d19334bbeb0009d
	train_mnist_2c8b9_00052	2022-12-11_19-56-56	True		2561096f19c7465496c7b1
	train_mnist_2c8b9_00053	2022-12-11_19-57-15	True		d57e32c25a9c49428c5a72
	train_mnist_2c8b9_00054	2022-12-11_19-58-09	True		5665a3449df445cda2cc00
	train_mnist_2c8b9_00055	2022-12-11_19-58-50	True		c0fe9964283e45ce893eb7
	train_mnist_2c8b9_00056	2022-12-11_19-59-23	True		8cdc89b018da4b7e98ce1f
	train_mnist_2c8b9_00057	2022-12-11_20-00-28	True		c2f44e83f35341bda5478b
	train_mnist_2c8b9_00058	2022-12-11_20-01-23	True		57ef2d80ee0c4744b930a5
	train_mnist_2c8b9_00059	2022-12-11_20-02-04	True		fc9814025c69404aa19d38
	train_mnist_2c8b9_00060	2022-12-11_20-03-35	True		488aef664b324d58a4f6f3
	train_mnist_2c8b9_00061	2022-12-11_20-04-47	True		41fd2f6c6e49495f9f7779
	train_mnist_2c8b9_00062	2022-12-11_20-05-52	True		7242566e6c2c4a9ab57ea17
	train_mnist_2c8b9_00063	2022-12-11_20-06-48	True		fd73116e6df14c88844965
	train_mnist_2c8b9_00064	2022-12-11_20-07-30	True		ebd7ce7a1bfc4a9a81c9af
	train_mnist_2c8b9_00065	2022-12-11_20-08-02	True		37c60b12e1984c5b99fc44
	train_mnist_2c8b9_00066	2022-12-11_20-09-08	True		555e8ee14fe24439b7d1a
	train_mnist_2c8b9_00067	2022-12-11_20-10-03	True		61870f0a965847aabd476k
	train_mnist_2c8b9_00068	2022-12-11_20-10-45	True		ac9538f86fca4af4966039
	train_mnist_2c8b9_00069	2022-12-11_20-12-16	True		8d08ac6a4bdc4ad8b7ac50
	train_mnist_2c8b9_00070	2022-12-11_20-13-31	True		7319b5723f434982a38299
	train_mnist_2c8b9_00071	2022-12-11_20-14-36	True		eb282ab2d42d47f59255f8
	train_mnist_2c8b9_00072	2022-12-11_20-15-32	True		4a79ae9586f94433b5fc50
	train_mnist_2c8b9_00073	2022-12-11_20-16-15	True		7d19d128c5fa4b42b0ea8d
	train_mnist_2c8b9_00074	2022-12-11_20-16-47	True		34ee6c2ffc5849ed9e1486
	train_mnist_2c8b9_00075	2022-12-11_20-17-51	True		d799335c98e246f9aac1dc
	train_mnist_2c8b9_00076	2022-12-11_20-18-46	True		fd288aacd26b4bb69e87bc

```

(train_mnist pid=2878) 2022-12-11 19:44:27.050535: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
(train_mnist pid=2878) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
(train_mnist pid=2878) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=2948) 2022-12-11 19:44:39.116584: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
(train_mnist pid=2948) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
(train_mnist pid=2948) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=3017) 2022-12-11 19:44:51.017079: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
(train_mnist pid=3017) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
(train_mnist pid=3017) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=3088) 2022-12-11 19:45:04.810105: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
(train_mnist pid=3088) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
(train_mnist pid=3088) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=3157) 2022-12-11 19:45:17.827006: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
(train_mnist pid=3157) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
(train_mnist pid=3157) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=3227) 2022-12-11 19:45:29.912600: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
(train_mnist pid=3227) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
(train_mnist pid=3227) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=3295) 2022-12-11 19:45:46.467341: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
(train_mnist pid=3295) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
(train_mnist pid=3295) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=3362) 2022-12-11 19:46:01.801456: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
(train_mnist pid=3362) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
(train_mnist pid=3362) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=3429) 2022-12-11 19:46:15.891658: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.

```

```

(train_mnist pid=3429) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=3429) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=3498) 2022-12-11 19:46:28.910911: W tensorflow/core/common_ru
ntime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the T
F_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value wa
s 0.
(train_mnist pid=3498) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=3498) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=3564) 2022-12-11 19:46:40.781777: W tensorflow/core/common_ru
ntime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the T
F_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value wa
s 0.
(train_mnist pid=3564) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=3564) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=3631) 2022-12-11 19:46:51.740235: W tensorflow/core/common_ru
ntime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the T
F_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value wa
s 0.
(train_mnist pid=3631) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=3631) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=3698) 2022-12-11 19:47:05.830441: W tensorflow/core/common_ru
ntime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the T
F_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value wa
s 0.
(train_mnist pid=3698) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=3698) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=3765) 2022-12-11 19:47:18.818318: W tensorflow/core/common_ru
ntime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the T
F_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value wa
s 0.
(train_mnist pid=3765) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=3765) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=3831) 2022-12-11 19:47:30.824750: W tensorflow/core/common_ru
ntime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the T
F_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value wa
s 0.
(train_mnist pid=3831) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=3831) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=3899) 2022-12-11 19:47:46.758801: W tensorflow/core/common_ru
ntime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the T
F_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value wa
s 0.
(train_mnist pid=3899) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=3899) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=3967) 2022-12-11 19:48:01.822119: W tensorflow/core/common_ru
ntime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the T
F_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value wa
s 0.
(train_mnist pid=3967) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=3967) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=4034) 2022-12-11 19:48:15.868979: W tensorflow/core/common_ru

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ntime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the T
F_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value wa
s 0.
(train_mnist pid=4034) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=4034) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=4103) 2022-12-11 19:48:28.763280: W tensorflow/core/common_ru
ntime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the T
F_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value wa
s 0.
(train_mnist pid=4103) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=4103) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=4169) 2022-12-11 19:48:40.789244: W tensorflow/core/common_ru
ntime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the T
F_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value wa
s 0.
(train_mnist pid=4169) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=4169) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=4240) 2022-12-11 19:48:53.761609: W tensorflow/core/common_ru
ntime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the T
F_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value wa
s 0.
(train_mnist pid=4240) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=4240) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=4308) 2022-12-11 19:49:08.584716: W tensorflow/core/common_ru
ntime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the T
F_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value wa
s 0.
(train_mnist pid=4308) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=4308) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=4376) 2022-12-11 19:49:22.833576: W tensorflow/core/common_ru
ntime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the T
F_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value wa
s 0.
(train_mnist pid=4376) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=4376) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=4448) 2022-12-11 19:49:37.967611: W tensorflow/core/common_ru
ntime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the T
F_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value wa
s 0.
(train_mnist pid=4448) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=4448) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=4516) 2022-12-11 19:49:53.823777: W tensorflow/core/common_ru
ntime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the T
F_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value wa
s 0.
(train_mnist pid=4516) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=4516) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=4585) 2022-12-11 19:50:08.880322: W tensorflow/core/common_ru
ntime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the T
F_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value wa
s 0.
(train_mnist pid=4585) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use

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`learning_rate` instead.
(train_mnist pid=4585) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=4657) 2022-12-11 19:50:28.160987: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
(train_mnist pid=4657) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
(train_mnist pid=4657) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=4729) 2022-12-11 19:50:41.953404: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
(train_mnist pid=4729) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
(train_mnist pid=4729) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=4799) 2022-12-11 19:50:53.793694: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
(train_mnist pid=4799) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
(train_mnist pid=4799) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=4868) 2022-12-11 19:51:04.871480: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
(train_mnist pid=4868) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
(train_mnist pid=4868) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=4935) 2022-12-11 19:51:18.855978: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
(train_mnist pid=4935) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
(train_mnist pid=4935) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=5003) 2022-12-11 19:51:31.807148: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
(train_mnist pid=5003) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
(train_mnist pid=5003) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=5076) 2022-12-11 19:51:46.813872: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
(train_mnist pid=5076) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
(train_mnist pid=5076) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=5151) 2022-12-11 19:52:09.951531: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
(train_mnist pid=5151) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
(train_mnist pid=5151) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=5221) 2022-12-11 19:52:25.284148: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was

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s 0.
(train_mnist pid=5221) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=5221) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=5290) 2022-12-11 19:52:41.055789: W tensorflow/core/common_ru
ntime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the T
F_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value wa
s 0.
(train_mnist pid=5290) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=5290) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=5357) 2022-12-11 19:52:54.149574: W tensorflow/core/common_ru
ntime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the T
F_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value wa
s 0.
(train_mnist pid=5357) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=5357) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=5424) 2022-12-11 19:53:06.050018: W tensorflow/core/common_ru
ntime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the T
F_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value wa
s 0.
(train_mnist pid=5424) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=5424) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=5491) 2022-12-11 19:53:17.958971: W tensorflow/core/common_ru
ntime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the T
F_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value wa
s 0.
(train_mnist pid=5491) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=5491) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=5559) 2022-12-11 19:53:32.000531: W tensorflow/core/common_ru
ntime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the T
F_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value wa
s 0.
(train_mnist pid=5559) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=5559) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=5634) 2022-12-11 19:53:49.055025: W tensorflow/core/common_ru
ntime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the T
F_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value wa
s 0.
(train_mnist pid=5634) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=5634) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=5701) 2022-12-11 19:54:01.127354: W tensorflow/core/common_ru
ntime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the T
F_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value wa
s 0.
(train_mnist pid=5701) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=5701) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=5768) 2022-12-11 19:54:17.122621: W tensorflow/core/common_ru
ntime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the T
F_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value wa
s 0.
(train_mnist pid=5768) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=5768) super(Adam, self).__init__(name, **kwargs)

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(train_mnist pid=5835) 2022-12-11 19:54:31.939703: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
(train_mnist pid=5835) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
(train_mnist pid=5835) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=5909) 2022-12-11 19:54:51.024417: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
(train_mnist pid=5909) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
(train_mnist pid=5909) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=5975) 2022-12-11 19:55:03.985861: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
(train_mnist pid=5975) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
(train_mnist pid=5975) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=6047) 2022-12-11 19:55:18.946657: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
(train_mnist pid=6047) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
(train_mnist pid=6047) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=6119) 2022-12-11 19:55:32.007155: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
(train_mnist pid=6119) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
(train_mnist pid=6119) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=6193) 2022-12-11 19:55:52.368070: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
(train_mnist pid=6193) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
(train_mnist pid=6193) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=6267) 2022-12-11 19:56:10.041042: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
(train_mnist pid=6267) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
(train_mnist pid=6267) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=6339) 2022-12-11 19:56:24.961333: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
(train_mnist pid=6339) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
(train_mnist pid=6339) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=6413) 2022-12-11 19:56:47.981601: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
(train_mnist pid=6413) /usr/local/lib/python3.8/dist-packages/keras/optimizer
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s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=6413) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=6481) 2022-12-11 19:57:02.959016: W tensorflow/core/common_ru
ntime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the T
F_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value wa
s 0.
(train_mnist pid=6481) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=6481) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=6559) 2022-12-11 19:57:22.008303: W tensorflow/core/common_ru
ntime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the T
F_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value wa
s 0.
(train_mnist pid=6559) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=6559) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=6690) 2022-12-11 19:58:16.159559: W tensorflow/core/common_ru
ntime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the T
F_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value wa
s 0.
(train_mnist pid=6690) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=6690) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=6824) 2022-12-11 19:58:57.042398: W tensorflow/core/common_ru
ntime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the T
F_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value wa
s 0.
(train_mnist pid=6824) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=6824) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=6957) 2022-12-11 19:59:29.041536: W tensorflow/core/common_ru
ntime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the T
F_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value wa
s 0.
(train_mnist pid=6957) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=6957) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=7101) 2022-12-11 20:00:34.148588: W tensorflow/core/common_ru
ntime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the T
F_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value wa
s 0.
(train_mnist pid=7101) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=7101) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=7239) 2022-12-11 20:01:29.221568: W tensorflow/core/common_ru
ntime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the T
F_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value wa
s 0.
(train_mnist pid=7239) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=7239) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=7369) 2022-12-11 20:02:11.054815: W tensorflow/core/common_ru
ntime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the T
F_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value wa
s 0.
(train_mnist pid=7369) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=7369) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=7525) 2022-12-11 20:03:41.117515: W tensorflow/core/common_ru
ntime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the T
```

```

F_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
(train_mnist pid=7525) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
(train_mnist pid=7525) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=7676) 2022-12-11 20:04:54.236542: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
(train_mnist pid=7676) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
(train_mnist pid=7676) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=7810) 2022-12-11 20:05:59.068183: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
(train_mnist pid=7810) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
(train_mnist pid=7810) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=7941) 2022-12-11 20:06:55.174513: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
(train_mnist pid=7941) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
(train_mnist pid=7941) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=8069) 2022-12-11 20:07:37.036985: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
(train_mnist pid=8069) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
(train_mnist pid=8069) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=8194) 2022-12-11 20:08:08.208138: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
(train_mnist pid=8194) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
(train_mnist pid=8194) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=8327) 2022-12-11 20:09:14.082844: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
(train_mnist pid=8327) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
(train_mnist pid=8327) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=8458) 2022-12-11 20:10:09.262542: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
(train_mnist pid=8458) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
(train_mnist pid=8458) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=8586) 2022-12-11 20:10:52.188823: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
(train_mnist pid=8586) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.

```



```

(train_mnist pid=8586) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=8724) 2022-12-11 20:12:24.830867: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
(train_mnist pid=8724) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
(train_mnist pid=8724) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=8859) 2022-12-11 20:13:38.281635: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
(train_mnist pid=8859) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
(train_mnist pid=8859) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=8994) 2022-12-11 20:14:43.236675: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
(train_mnist pid=8994) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
(train_mnist pid=8994) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=9131) 2022-12-11 20:15:39.308501: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
(train_mnist pid=9131) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
(train_mnist pid=9131) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=9263) 2022-12-11 20:16:21.573883: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
(train_mnist pid=9263) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
(train_mnist pid=9263) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=9389) 2022-12-11 20:16:53.279545: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
(train_mnist pid=9389) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
(train_mnist pid=9389) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=9524) 2022-12-11 20:17:58.310673: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
(train_mnist pid=9524) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
(train_mnist pid=9524) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=9654) 2022-12-11 20:18:54.076737: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.
(train_mnist pid=9654) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
(train_mnist pid=9654) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=9782) 2022-12-11 20:19:37.262915: W tensorflow/core/common_runtime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value was 0.

```

```
(train_mnist pid=9782) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=9782) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=9920) 2022-12-11 20:21:06.302837: W tensorflow/core/common_ru
ntime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the T
F_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value wa
s 0.
(train_mnist pid=9920) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=9920) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=10059) 2022-12-11 20:22:19.264337: W tensorflow/core/common_r
untime/gpu/gpu_bfc_allocator.cc:42] Overriding orig_value setting because the
TF_FORCE_GPU_ALLOW_GROWTH environment variable is set. Original config value w
as 0.
(train_mnist pid=10059) /usr/local/lib/python3.8/dist-packages/keras/optimizer
s/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use
`learning_rate` instead.
(train_mnist pid=10059) super(Adam, self).__init__(name, **kwargs)
2022-12-11 20:23:16,991 INFO tune.py:777 -- Total run time: 2350.20 seconds (2
350.00 seconds for the tuning loop).
```

```
In [ ]: !pip install bayesian-optimization
```

```
Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-w
heels/public/simple/
Collecting bayesian-optimization
  Downloading bayesian_optimization-1.4.2-py3-none-any.whl (17 kB)
Collecting colorama>=0.4.6
  Downloading colorama-0.4.6-py2.py3-none-any.whl (25 kB)
Requirement already satisfied: scipy>=1.0.0 in /usr/local/lib/python3.8/dist-p
ackages (from bayesian-optimization) (1.7.3)
Requirement already satisfied: scikit-learn>=0.18.0 in /usr/local/lib/python3.
8/dist-packages (from bayesian-optimization) (1.0.2)
Requirement already satisfied: numpy>=1.9.0 in /usr/local/lib/python3.8/dist-p
ackages (from bayesian-optimization) (1.21.6)
Requirement already satisfied: joblib>=0.11 in /usr/local/lib/python3.8/dist-p
ackages (from scikit-learn>=0.18.0->bayesian-optimization) (1.2.0)
Requirement already satisfied: threadpoolctl>=2.0.0 in /usr/local/lib/python3.
8/dist-packages (from scikit-learn>=0.18.0->bayesian-optimization) (3.1.0)
Installing collected packages: colorama, bayesian-optimization
Successfully installed bayesian-optimization-1.4.2 colorama-0.4.6
```

```
In [ ]: #----- Bayesian search-----
from ray.tune.search import ConcurrencyLimiter
from ray.tune.search.bayesopt import BayesOptSearch
algo = BayesOptSearch(utility_kwargs={"kind": "ucb", "kappa": 2.5, "xi": 0.0})
algo = ConcurrencyLimiter(algo, max_concurrent=4)

search_space = {
    "conv_filters": tune.uniform(64, 256),
    "lr": tune.uniform(0.0009, 0.0011),
    "batch_size": tune.uniform(64, 256),
    "dropout": tune.uniform(0, 1)
}
tuner = tune.Tuner(
    train_mnist,
    tune_config=tune.TuneConfig(
        metric="accuracy",
        mode="max",
        search_alg=algo,
        num_samples=2,
    ),
    param_space=search_space
)
results = tuner.fit()
```



```
2022-12-11 22:35:43,062 WARNING bayesopt_search.py:423 -- BayesOpt does not support specific sampling methods. The Uniform sampler will be dropped.
2022-12-11 22:35:43,065 WARNING bayesopt_search.py:423 -- BayesOpt does not support specific sampling methods. The Uniform sampler will be dropped.
2022-12-11 22:35:43,068 WARNING bayesopt_search.py:423 -- BayesOpt does not support specific sampling methods. The Uniform sampler will be dropped.
2022-12-11 22:35:43,069 WARNING bayesopt_search.py:423 -- BayesOpt does not support specific sampling methods. The Uniform sampler will be dropped.
```

Tune Status

Current time: 2022-12-11 22:49:28

Running for: 00:13:45.29

Memory: 1.9/12.7 GiB

System Info

Using FIFO scheduling algorithm.

Resources requested: 0/2 CPUs, 0/1 GPUs, 0.0/7.2 GiB heap, 0.0/3.6 GiB objects (0.0/1.0 accelerator_type:T4)

Trial Status

Trial name	status	loc	batch_size	conv_filters	dropout
train_mnist_2599aa8e	TERMINATED	172.28.0.12:1002	135.912	246.537	0.731994 0.0010
train_mnist_28c03b9c	TERMINATED	172.28.0.12:1041	93.9556	93.9509	0.0580836 0.0010

```
(train_mnist pid=1002) 2022-12-11 22:35:49.686094: E tensorflow/stream_executor/cuda/cuda_driver.cc:271] failed call to cuInit: CUDA_ERROR_NO_DEVICE: no CUDA-capable device is detected
(train_mnist pid=1002) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
(train_mnist pid=1002) super(Adam, self).__init__(name, **kwargs)
(train_mnist pid=1041) 2022-12-11 22:35:57.020464: E tensorflow/stream_executor/cuda/cuda_driver.cc:271] failed call to cuInit: CUDA_ERROR_NO_DEVICE: no CUDA-capable device is detected
(train_mnist pid=1041) /usr/local/lib/python3.8/dist-packages/keras/optimizers/optimizer_v2/adam.py:110: UserWarning: The `lr` argument is deprecated, use `learning_rate` instead.
(train_mnist pid=1041) super(Adam, self).__init__(name, **kwargs)
```

Trial Progress

Trial name	accuracy	date	done	episodes_total
train_mnist_2599aa8e	0.973117	2022-12-11_22-49-28	True	b2650d94fd584f75
train_mnist_28c03b9c	0.986483	2022-12-11_22-44-24	True	84e0b431ab1241aca

```
2022-12-11 22:49:28,479 INFO tune.py:777 -- Total run time: 825.43 seconds (825.29 seconds for the tuning loop).
```

1. For each of the search technique in part 1, display the time taken to perform the analysis and display the hyperparameters for the best model. (2)

In []:

```
#Hyperband best model-----

print(Hype_analysis.get_best_config("mean_accuracy", "max"))
#Grid Search best model-----
print(analysis.best_config)

{'batch_size': 256, 'conv_filters': 128, 'dropout': 0.16614474270272972, 'lr': 0.0078739746012135}
{'conv_filters': 128, 'lr': 0.01, 'batch_size': 256, 'dropout': 0}
```

```
In [ ]: # Bayesian Search-----  
results.get_best_result("accuracy", "max")
```

```
Out[ ]: Result(metrics={'accuracy': 0.9864833354949951, 'done': True, 'trial_id': '28c  
03b9c', 'experiment_tag': '2_batch_size=93.9556,conv_filters=93.9509,dropout=  
0.0581,lr=0.0011'}, error=None, log_dir=PosixPath('/root/ray_results/train_mni  
st_2022-12-11_22-35-43/train_mnist_28c03b9c_2_batch_size=93.9556,conv_filters=  
93.9509,dropout=0.0581,lr=0.0011_2022-12-11_22-35-48'))
```

1. What are your observations regarding time taken and performance of the best model?
(2)

The best models were not the most time consuming for grid search and

For the Bayesian Search algorithm we had to change the lr rate a little otherwise the time for search would take a long time because it was not converging.

Also, once the learning rate was adjusted the best model was not the most time consuming.