HYPERPARAMETER TUNING WITH RAY TUNE – MLP. RANDOM 6K FILES
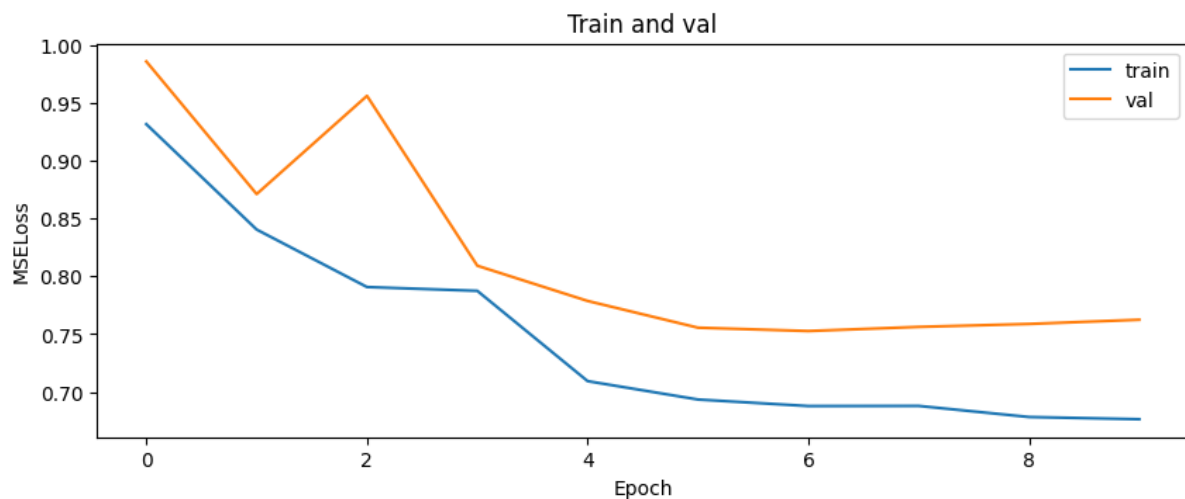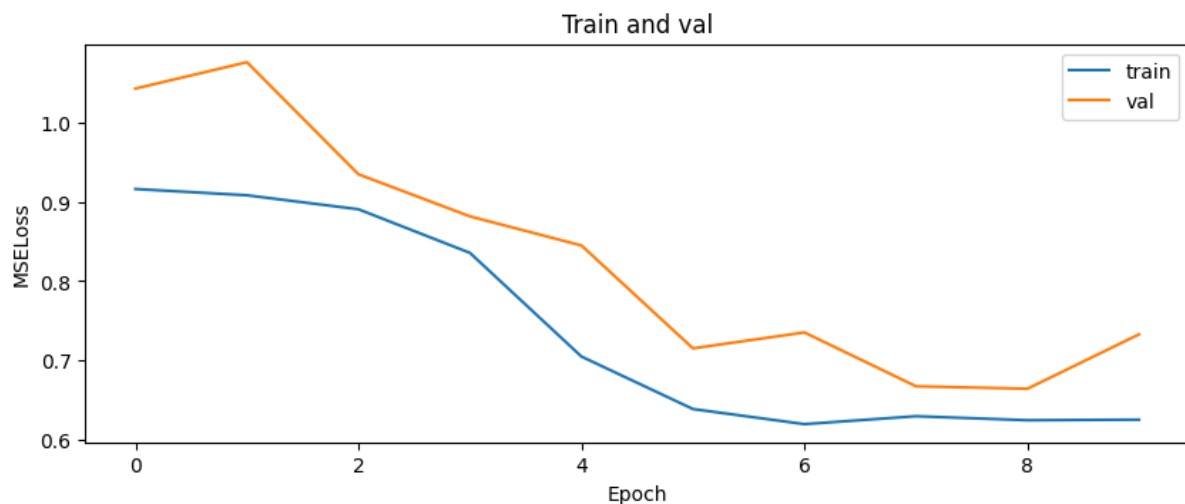
Grid search:

Combinations tested:

```
== Status ==
Current time: 2023-03-17 19:54:34 (running for 00:00:00.28)
Memory usage on this node: 2.6/14.1 GiB
Using FIFO scheduling algorithm.
Resources requested: 14.0/16 CPUs, 1.0/1 GPUs, 0.0/6.91 GiB heap, 0.0/3.45 GiB objects
Result logdir: /home/maiolvalenti/outs_mlp_train/train_2023-03-17_19-54-34
Number of trials: 8/8 (7 PENDING, 1 RUNNING)
+-------------------+----------+-------------------+------------+----------+----------+-------------+-------------+-----------+
| Trial name        | status   | loc               | batch_size | img_size | img_vars |          l2 |          lr | n_epochs  |
|-------------------+----------+-------------------+------------+----------+----------+-------------+-------------+-----------|
| train_8a27f_00000 | RUNNING  | 10.140.0.2:28296  |         64 |      128 |        1 | 1.89828e-05 | 0.0933321   |        10 |
| train_8a27f_00001 | PENDING  |                   |         32 |       32 |        1 | 0.0665903   | 0.0136505   |        10 |
| train_8a27f_00002 | PENDING  |                   |         64 |       64 |        1 | 0.0865628   | 0.000130066 |        10 |
| train_8a27f_00003 | PENDING  |                   |         32 |      128 |        1 | 0.0305989   | 0.00161613  |        10 |
| train_8a27f_00004 | PENDING  |                   |         64 |       28 |        1 | 3.22419e-05 | 0.059454    |        10 |
| train_8a27f_00005 | PENDING  |                   |         32 |       64 |        1 | 0.00249983  | 0.0136503   |        10 |
| train_8a27f_00006 | PENDING  |                   |         64 |       28 |        1 | 0.00194668  | 0.00207079  |        10 |
| train_8a27f_00007 | PENDING  |                   |         32 |       32 |        1 | 0.000498743 | 0.000120991 |        10 |
+-------------------+----------+-------------------+------------+----------+----------+-------------+-------------+-----------+
```
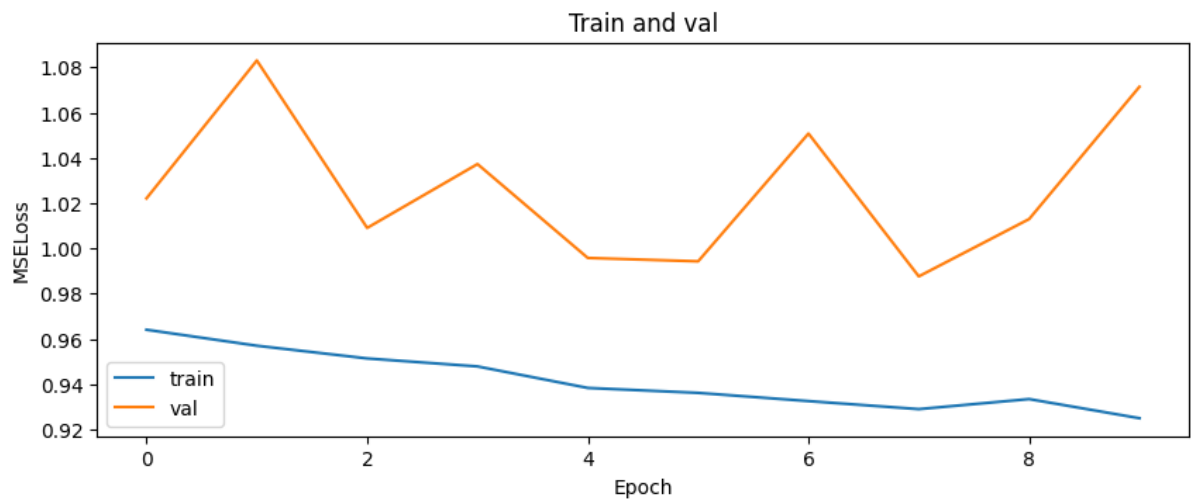
000000: batch_size=32,img_size=32,img_vars=1,l2=0.0352,lr=0.0249,n_epochs=10
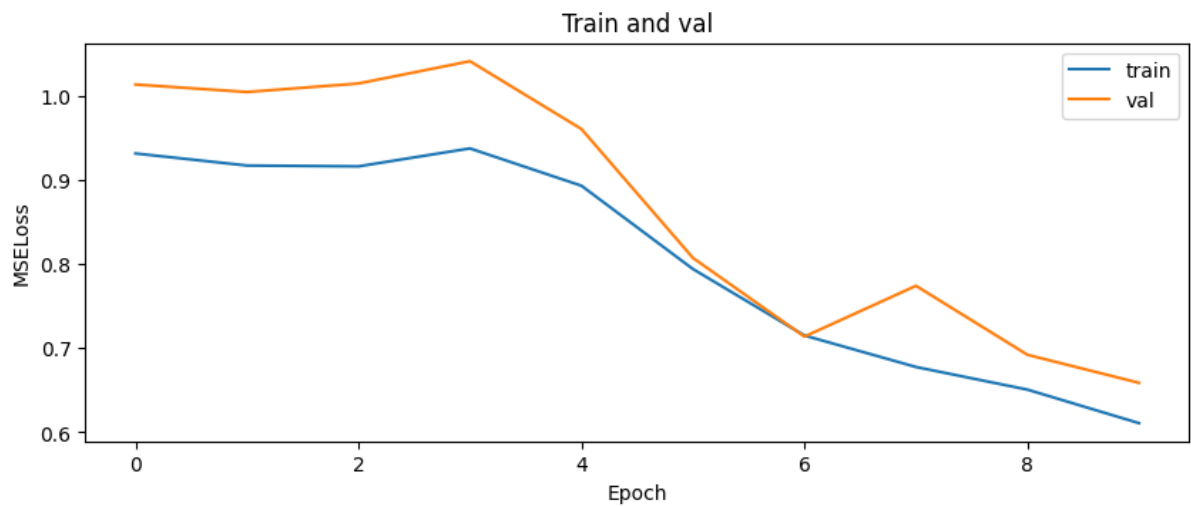

000001: batch_size=64, img_size=32, img_vars=1,l2=0.0001,lr=0.0183,n_epochs=10
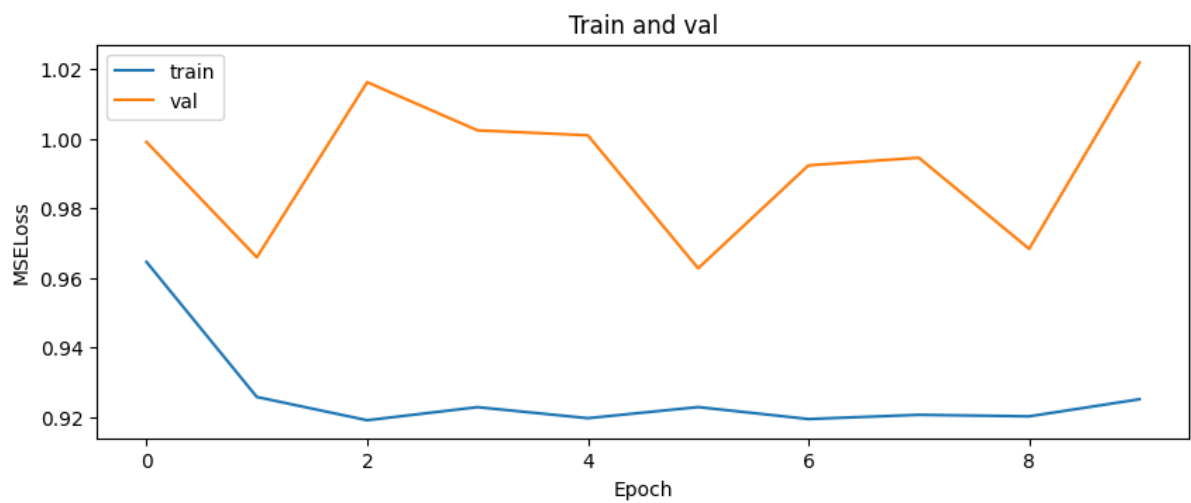
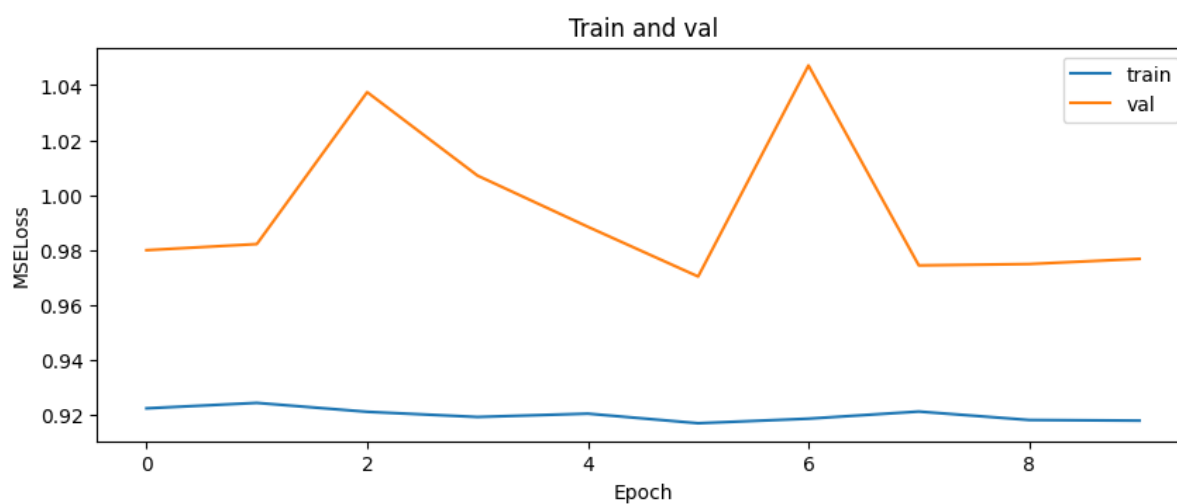**00002_batch_size=128,img_size=32,img_vars=1,l2=0.0003,lr=0.0011,n_epochs=10_**

Train and val

00003_batch_size=32,img_size=64,img_vars=1,l2=0.0015,lr=0.0190,n_epochs=10

Train and val

00004_batch_size=64,img_size=64,img_vars=1,l2=0.0324,lr=0.0127,n_epochs=10

Train and val

00005_batch_size=128,img_size=64,img_vars=1,l2=0.0086,lr=0.0305,n_epochs=10

00006_batch_size=32,img_size=128,img_vars=1,l2=0.0000,lr=0.0161,n_epochs=10
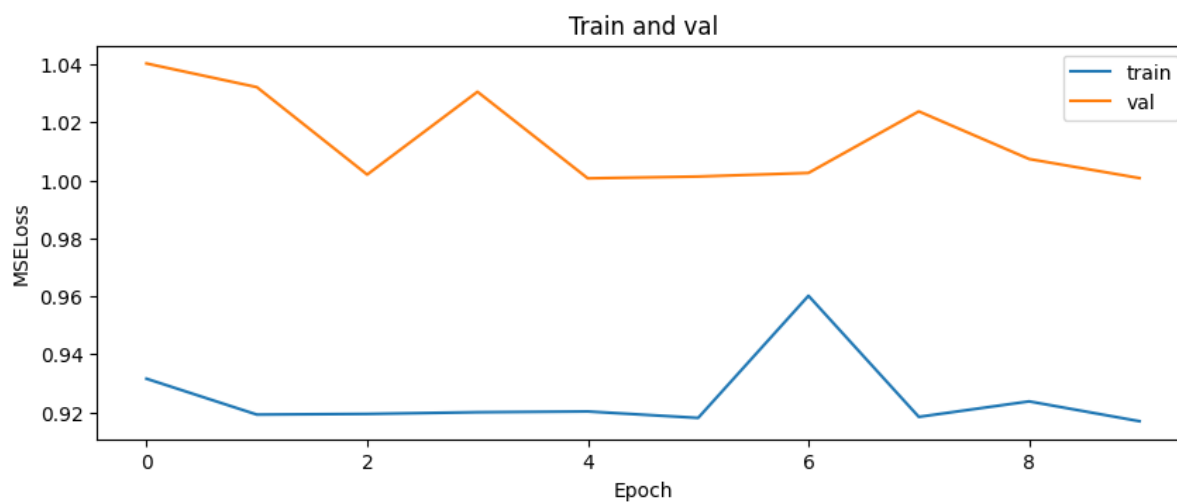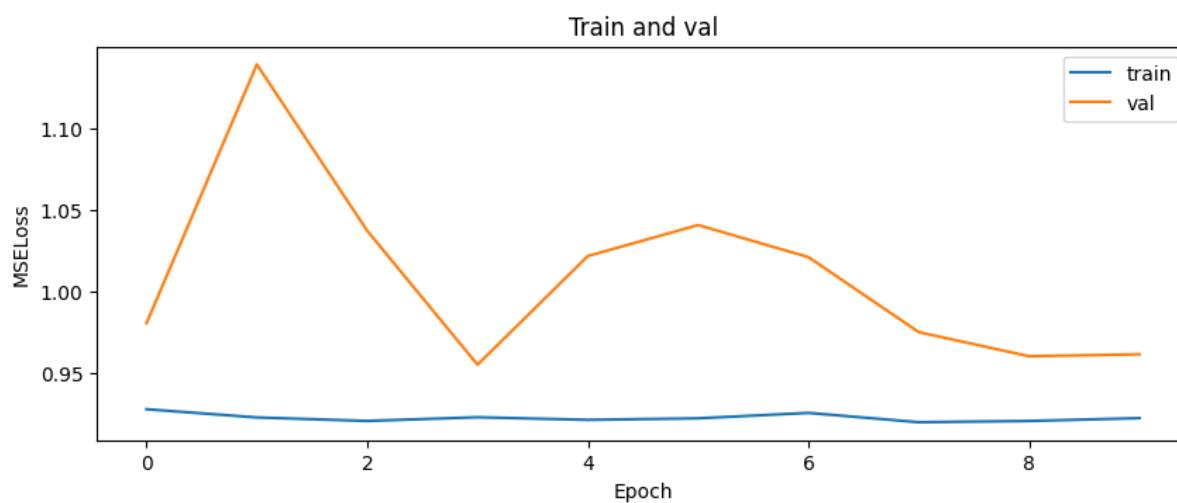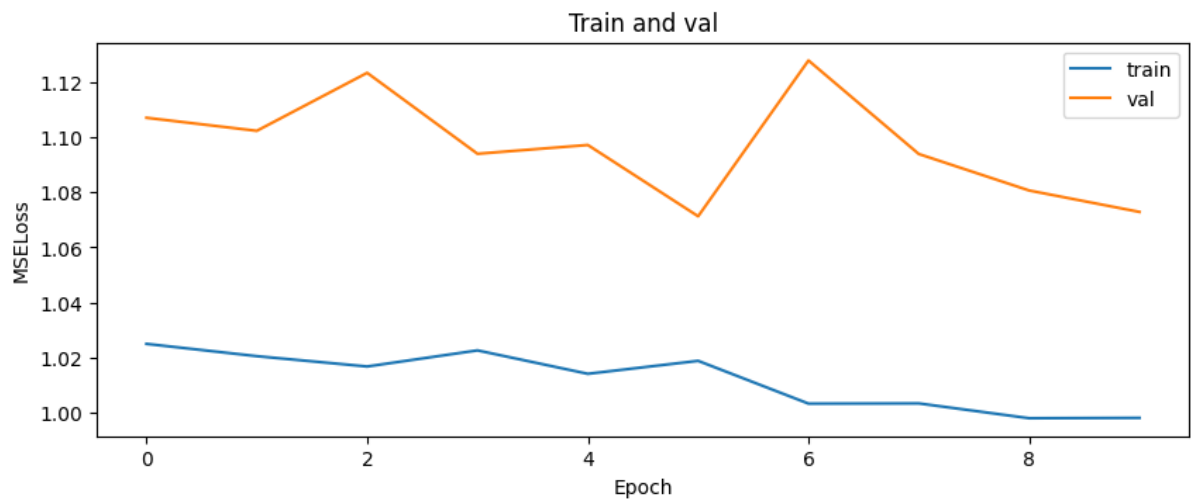

00007_batch_size=64,img_size=128,img_vars=1,l2=0.0528,lr=0.0004,n_epochs=10

00008_batch_size=128,img_size=128,img_vars=1,l2=0.0001,lr=0.0002,n_epochs=10

Final results grid search.

```
== Status ==
Current time: 2023-03-17 16:42:35 (running for 03:28:21.03)
Memory usage on this node: 10.6/14.1 GiB
Using FIFO scheduling algorithm.
Resources requested: 0/16 CPUs, 0/1 GPUs, 0.0/6.96 GiB heap, 0.0/3.48 GiB objects
Current best trial: 9d7d7_00003 with val_loss=0.6588335445052699 and parameters={'img_size': 64, 'img_vars': 1, 'batch_size': 32, 'n_epochs': 10, 'l2': 0.0015437599875849839, 'lr':
 0.01898635166558231}
Result logdir: /home/maiolvalenti/outs_mlp_train/train_2023-03-17_13-14-14
Number of trials: 9/9 (9 TERMINATED)
+--------------------+------------+-------------------+------------+----------+----------+-------------+-------------+----------+----------+--------------------+
| Trial name         | status     | loc               | batch_size | img_size | img_vars |          l2 |          lr | n_epochs | val_loss | training_iteration |
|--------------------+------------+-------------------+------------+----------+----------+-------------+-------------+----------+----------+--------------------|
| train_9d7d7_00000  | TERMINATED | 10.140.0.2:12821  |         32 |       32 |        1 | 0.0351573   | 0.0249455   |       10 | 0.762481 |                 10 |
| train_9d7d7_00001  | TERMINATED | 10.140.0.2:27245  |         64 |       32 |        1 | 0.000110303 | 0.0182665   |       10 | 0.732869 |                 10 |
| train_9d7d7_00002  | TERMINATED | 10.140.0.2:4952   |        128 |       32 |        1 | 0.000253636 | 0.00113841  |       10 | 1.07143  |                 10 |
| train_9d7d7_00003  | TERMINATED | 10.140.0.2:29311  |         32 |       64 |        1 | 0.00154376  | 0.0189864   |       10 | 0.658834 |                 10 |
| train_9d7d7_00004  | TERMINATED | 10.140.0.2:4314   |         64 |       64 |        1 | 0.0324294   | 0.0127369   |       10 | 1.0219   |                 10 |
| train_9d7d7_00005  | TERMINATED | 10.140.0.2:16731  |        128 |       64 |        1 | 0.00859501  | 0.0305413   |       10 | 0.976878 |                 10 |
| train_9d7d7_00006  | TERMINATED | 10.140.0.2:2974   |         32 |      128 |        1 | 2.8694e-05  | 0.0161188   |       10 | 1.00073  |                 10 |
| train_9d7d7_00007  | TERMINATED | 10.140.0.2:27453  |         64 |      128 |        1 | 0.0528163   | 0.000400129 |       10 | 0.96119  |                 10 |
| train_9d7d7_00008  | TERMINATED | 10.140.0.2:20554  |        128 |      128 |        1 | 7.32912e-05 | 0.000216687 |       10 | 1.07291  |                 10 |
+--------------------+------------+-------------------+------------+----------+----------+-------------+-------------+----------+----------+--------------------+


Best config: {'img_size': 64, 'img_vars': 1, 'batch_size': 32, 'n_epochs': 10, 'l2': 0.0015437599875849839, 'lr': 0.01898635166558231}
Best trained model:
BasicMlp(
  (mlp): Sequential(
    (0): Linear(in_features=4096, out_features=2048, bias=True)
    (1): ReLU()
    (2): Linear(in_features=2048, out_features=1024, bias=True)
    (3): ReLU()
    (4): Linear(in_features=1024, out_features=512, bias=True)
    (5): ReLU()
    (6): Linear(in_features=512, out_features=256, bias=True)
    (7): ReLU()
    (8): Linear(in_features=256, out_features=128, bias=True)
    (9): ReLU()
    (10): Linear(in_features=128, out_features=64, bias=True)
    (11): ReLU()
    (12): Linear(in_features=64, out_features=32, bias=True)
    (13): ReLU()
    (14): Linear(in_features=32, out_features=16, bias=True)
    (15): ReLU()
    (16): Linear(in_features=16, out_features=1, bias=True)
  )
)
```
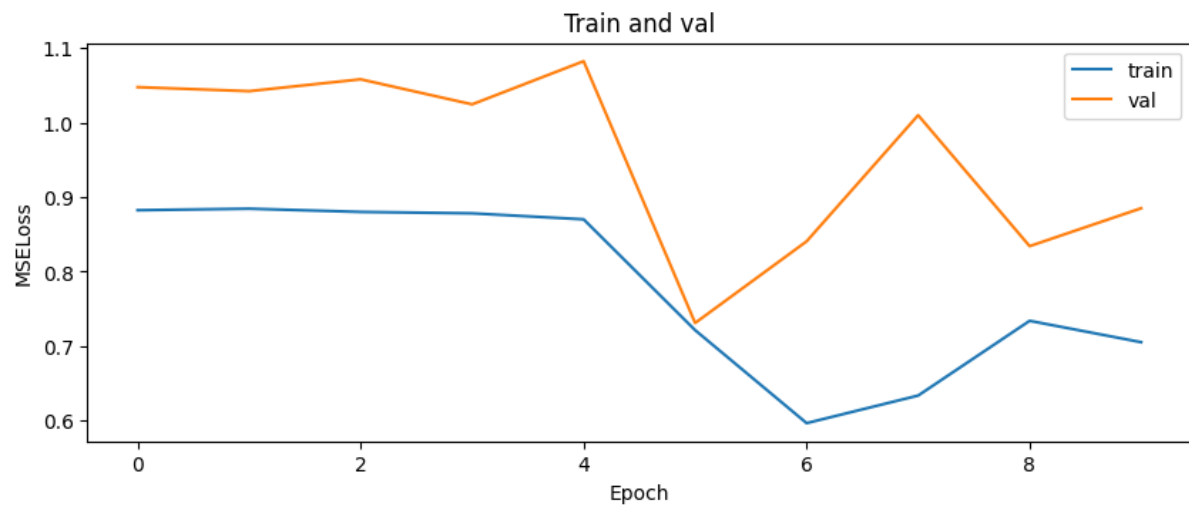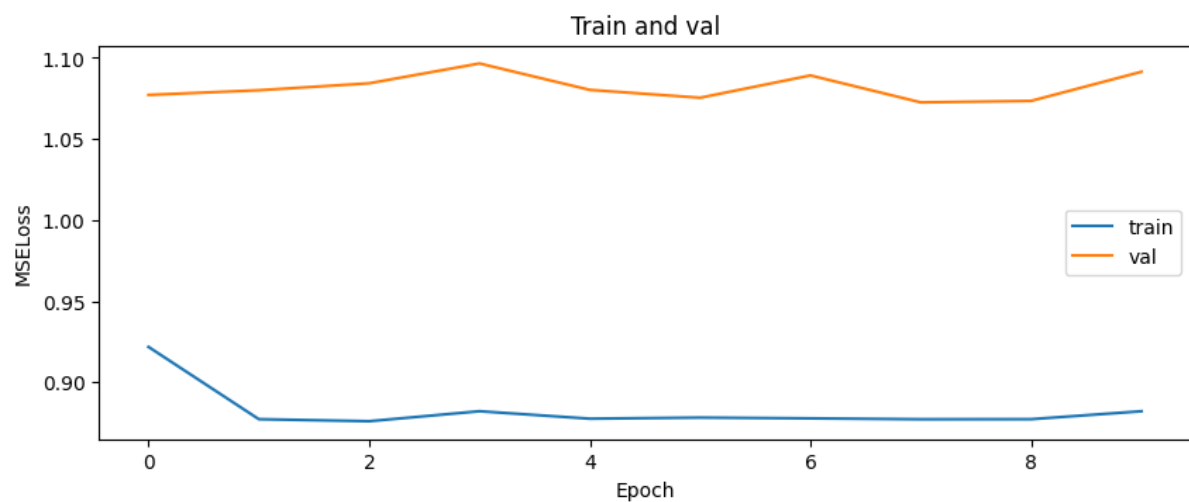
Random search:

Combinations tested:

```
== Status ==
Current time: 2023-03-17 19:54:34 (running for 00:00:00.28)
Memory usage on this node: 2.6/14.1 GiB
Using FIFO scheduling algorithm.
Resources requested: 14.0/16 CPUs, 1.0/1 GPUs, 0.0/6.91 GiB heap, 0.0/3.45 GiB objects
Result logdir: /home/maiolvalenti/outs_mlp_train/train_2023-03-17_19-54-34
Number of trials: 8/8 (7 PENDING, 1 RUNNING)
+------------------+---------+------------------+------------+----------+----------+-------------+-------------+-----------+
| Trial name       | status  | loc              | batch_size | img_size | img_vars |          l2 |          lr |  n_epochs |
|------------------+---------+------------------+------------+----------+----------+-------------+-------------+-----------|
| train_8a27f_00000 | RUNNING | 10.140.0.2:28296 |         64 |      128 |        1 | 1.89828e-05 | 0.0933321   |        10 |
| train_8a27f_00001 | PENDING |                  |         32 |       32 |        1 | 0.0665903   | 0.0136505   |        10 |
| train_8a27f_00002 | PENDING |                  |         64 |       64 |        1 | 0.0865628   | 0.000130066 |        10 |
| train_8a27f_00003 | PENDING |                  |         32 |      128 |        1 | 0.0305989   | 0.00161613  |        10 |
| train_8a27f_00004 | PENDING |                  |         64 |       28 |        1 | 3.22419e-05 | 0.059454    |        10 |
| train_8a27f_00005 | PENDING |                  |         32 |       64 |        1 | 0.00249983  | 0.0136503   |        10 |
| train_8a27f_00006 | PENDING |                  |         64 |       28 |        1 | 0.00194668  | 0.00207079  |        10 |
| train_8a27f_00007 | PENDING |                  |         32 |       32 |        1 | 0.000498743 | 0.000120991 |        10 |
+------------------+---------+------------------+------------+----------+----------+-------------+-------------+-----------+
```
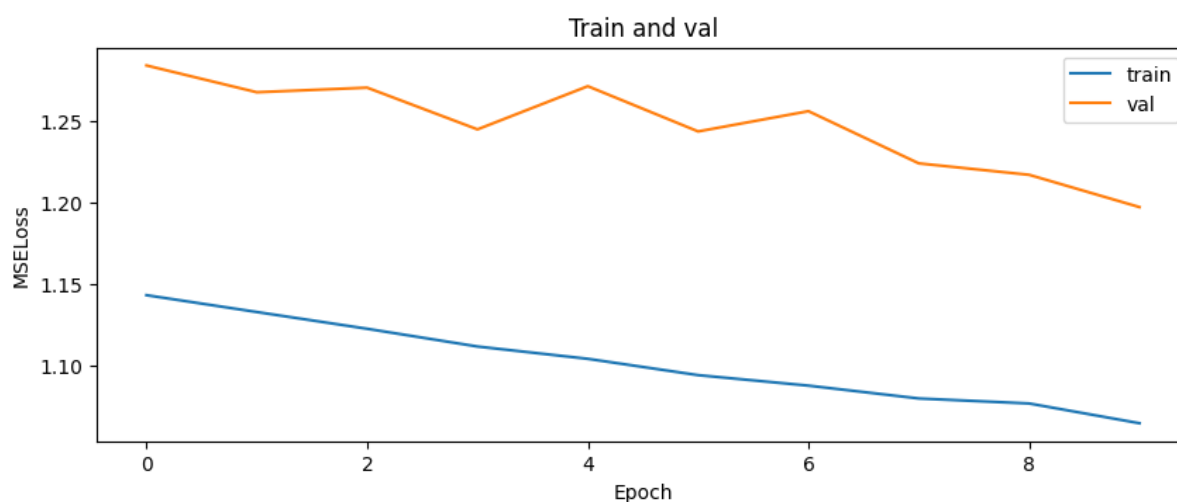
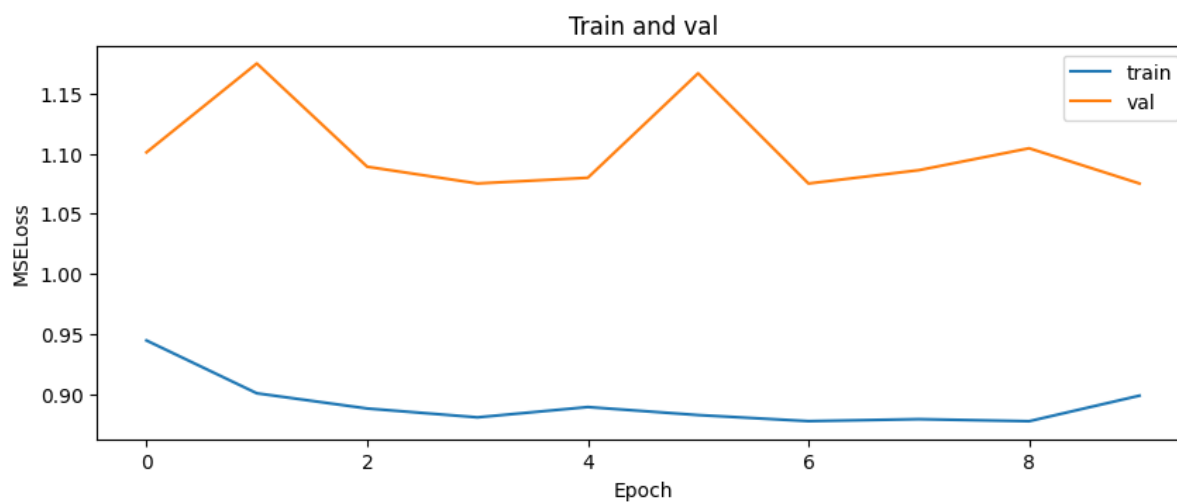## 00000_batch_size=64,img_size=128,img_vars=1,l2=0.0000,lr=0.0933,n_epochs=10

00001_batch_size=32,img_size=32,img_vars=1,l2=0.0666,lr=0.0137,n_epochs=10
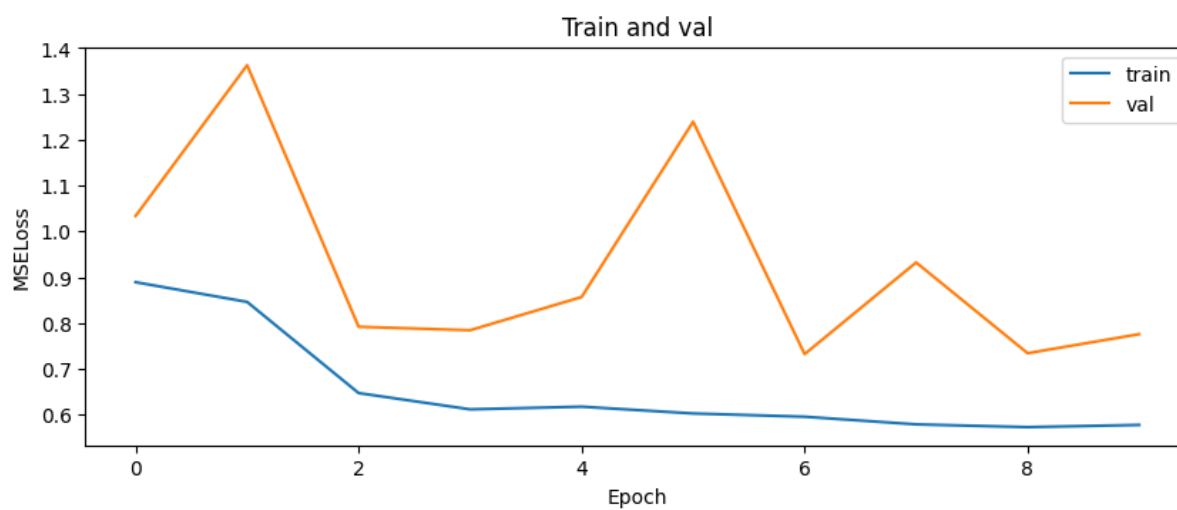
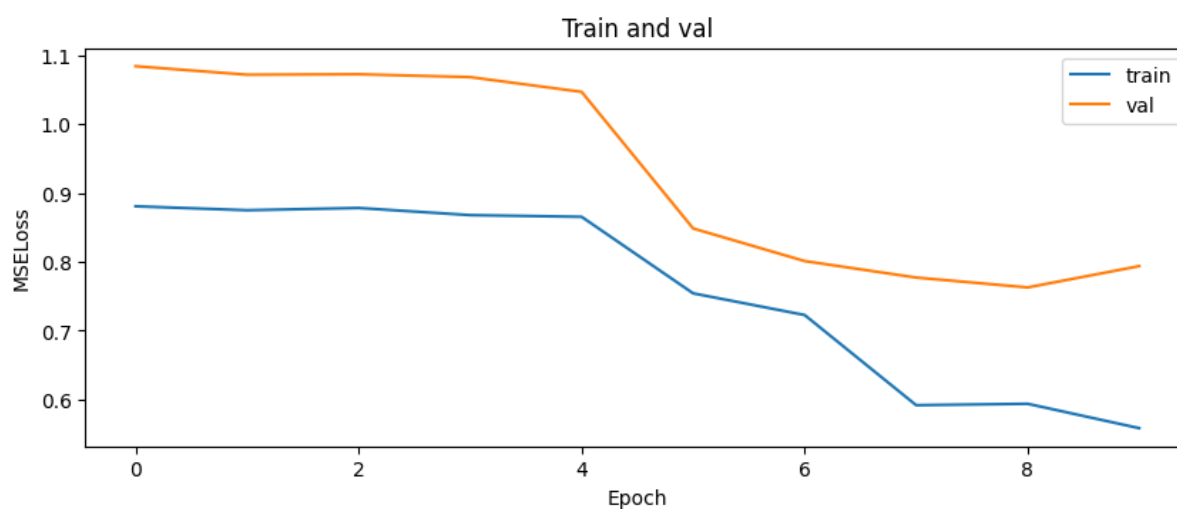**00002_batch_size=64,img_size=64,img_vars=1,l2=0.0866,lr=0.0001,n_epochs=10**

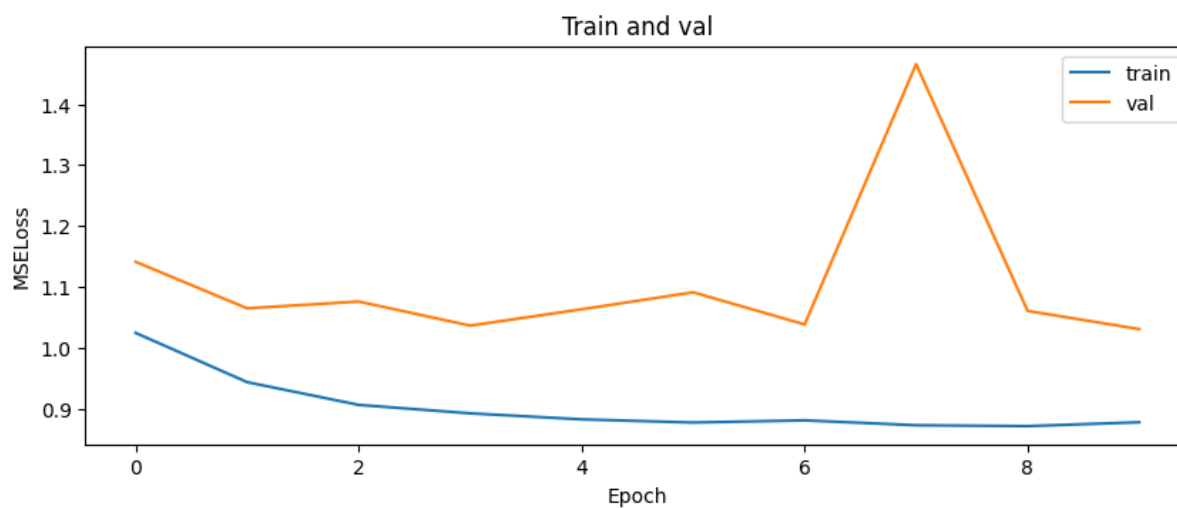**00003_batch_size=32,img_size=128,img_vars=1,l2=0.0306,lr=0.0016,n_epochs=10**

00004_batch_size=64,img_size=28,img_vars=1,l2=0.0000,lr=0.0595,n_epochs=10
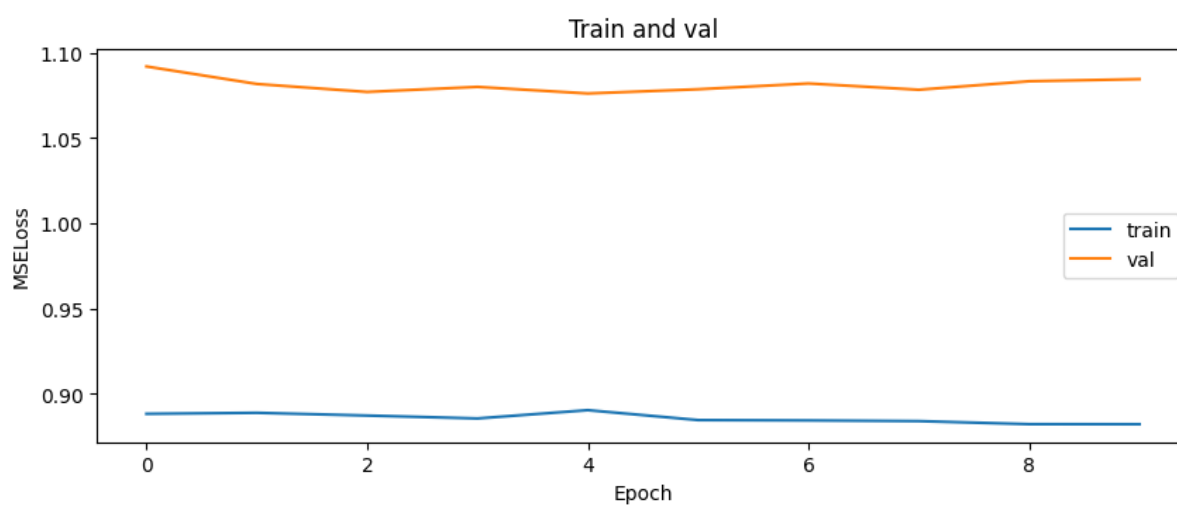
00005_batch_size=32,img_size=64,img_vars=1,l2=0.0025,lr=0.0137,n_epochs=10

00006_batch_size=64,img_size=28,img_vars=1,l2=0.0019,lr=0.0021,n_epochs=10

00007_batch_size=32,img_size=32,img_vars=1,l2=0.0005,lr=0.0001,n_epochs=10

Final results random search:

```
Trial train_8a27f_00007 completed.
== Status ==
Current time: 2023-03-17 23:00:53 (running for 03:06:19.32)
Memory usage on this node: 10.5/14.1 GiB
Using FIFO scheduling algorithm.
Resources requested: 0/16 CPUs, 0/1 GPUs, 0.0/6.91 GiB heap, 0.0/3.45 GiB objects
Current best trial: 8a27f_00004 with val_loss=0.7756583362817764 and parameters={'img_size': 28, 'img_vars': 1, 'batch_size': 64, 'n_epochs': 10, 'l2': 3.2241884718310675e-05, 'l
r': 0.0594540214199007}
Result logdir: /home/maiolvalenti/outs_mlp_train/train_2023-03-17_19-54-34
Number of trials: 8/8 (8 TERMINATED)
+------------------+------------+--------------------+------------+----------+----------+-------------+-------------+----------+----------+--------------------+
| Trial name       | status     | loc                | batch_size | img_size | img_vars |         l2  |          lr | n_epochs | val_loss | training_iteration |
|------------------+------------+--------------------+------------+----------+----------+-------------+-------------+----------+----------+--------------------|
| train_8a27f_00000 | TERMINATED | 10.140.0.2:28296 |         64 |      128 |        1 | 1.89828e-05 | 0.0933321   |       10 | 0.885016 |                 10 |
| train_8a27f_00001 | TERMINATED | 10.140.0.2:14700 |         32 |       32 |        1 | 0.0665903   | 0.0136505   |       10 | 1.0914   |                 10 |
| train_8a27f_00002 | TERMINATED | 10.140.0.2:12502 |         64 |       64 |        1 | 0.0865628   | 0.000130066 |       10 | 1.19718  |                 10 |
| train_8a27f_00003 | TERMINATED | 10.140.0.2:26249 |         32 |      128 |        1 | 0.0305989   | 0.00161613  |       10 | 1.07504  |                 10 |
| train_8a27f_00004 | TERMINATED | 10.140.0.2:15628 |         64 |       28 |        1 | 3.22419e-05 | 0.059454    |       10 | 0.775658 |                 10 |
| train_8a27f_00005 | TERMINATED | 10.140.0.2:3508  |         32 |       64 |        1 | 0.00249983  | 0.0136503   |       10 | 0.793836 |                 10 |
| train_8a27f_00006 | TERMINATED | 10.140.0.2:15388 |         64 |       28 |        1 | 0.00194668  | 0.00207079  |       10 | 1.03039  |                 10 |
| train_8a27f_00007 | TERMINATED | 10.140.0.2:13250 |         32 |       32 |        1 | 0.000498743 | 0.000120991 |       10 | 1.08453  |                 10 |
+------------------+------------+--------------------+------------+----------+----------+-------------+-------------+----------+----------+--------------------+

Best config: {'img_size': 28, 'img_vars': 1, 'batch_size': 64, 'n_epochs': 10, 'l2': 3.2241884718310675e-05, 'lr': 0.0594540214199007}
```

We pick grid search combi (00003):
-   batch_size=32,
-   img_size=64,
-   img_vars=1,
-   l2=0.0015437599875849839,
-   lr=0.01898635166558231,
-   n_epochs=10

In random search very similar (00005):
-   batch_size=32,
-   img_size=64,
-   img_vars=1,
-   l2=3.2241884718310675e-05,
-   lr=0.0594540214199007,
-   n_epochs=10