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

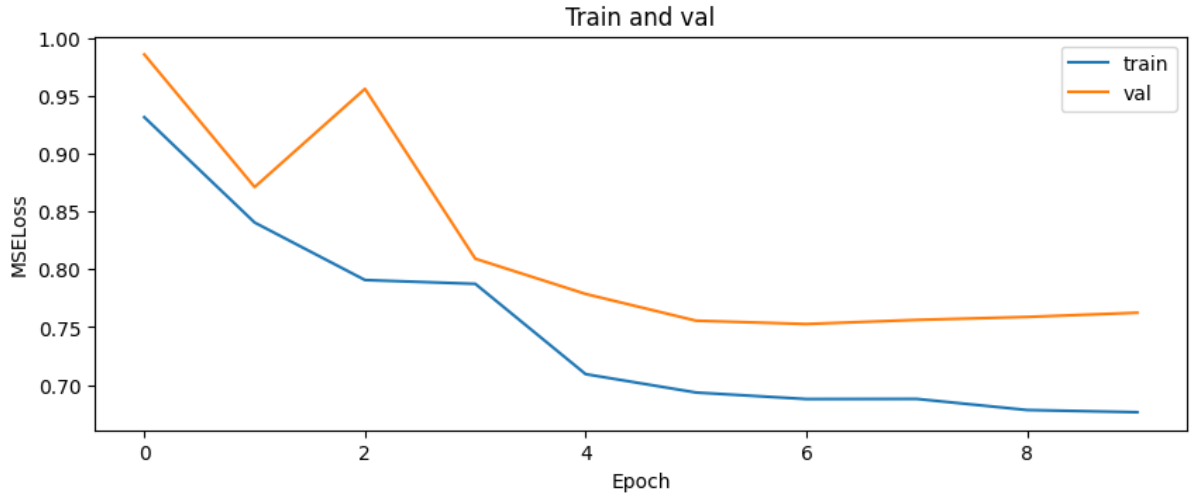
Grid search:

Combinations tested:

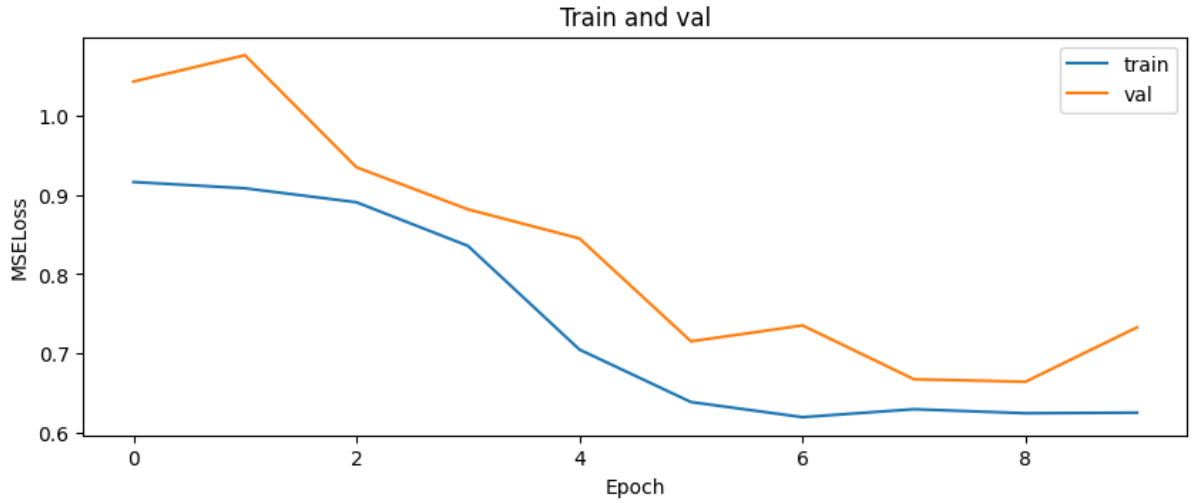
```
== Status ==
Current time: 2023-03-17 19:54:34 (running for 00:00:00.28)
Memory usage on this node: 2.6/14.1 GiB
Using FIFO scheduling algorithm.
Resources requested: 14.0/16 CPUs, 1.0/1 GPUs, 0.0/6.91 GiB heap, 0.0/3.45 GiB objects
Result logdir: /home/maiolvalenti/outs_mlp_train/train_2023-03-17_19-54-34
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

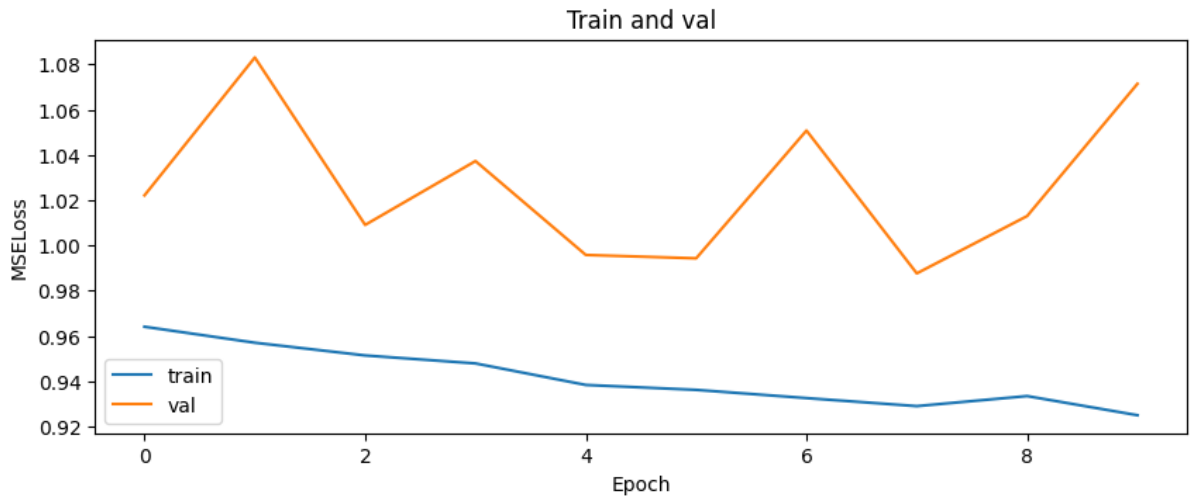
000000: batch_size=32,img_size=32,img_vars=1,l2=0.0352,lr=0.0249,n_epochs=10



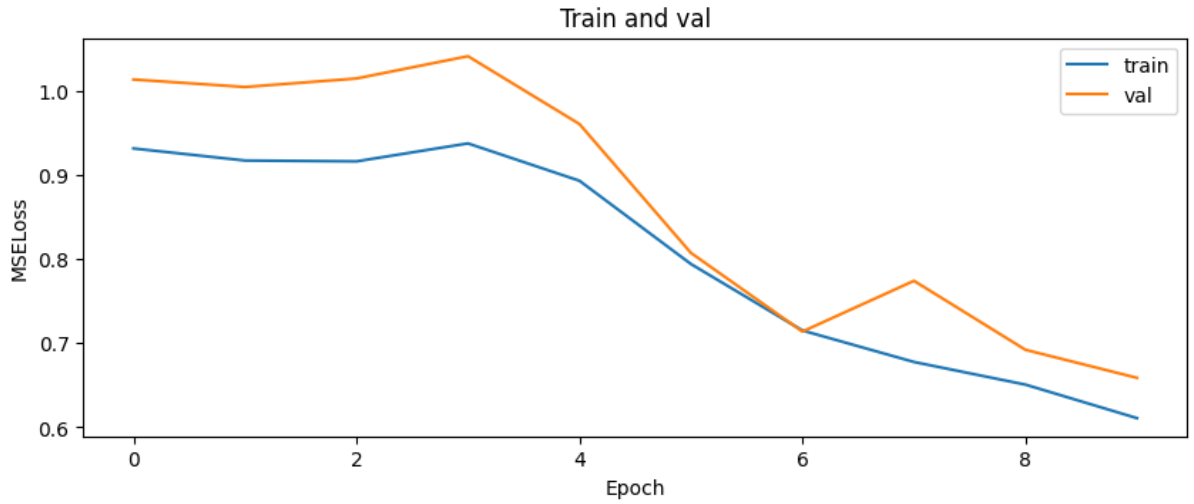
000001: batch_size=64, img_size=32, img_vars=1,l2=0.0001,lr=0.0183,n_epochs=10



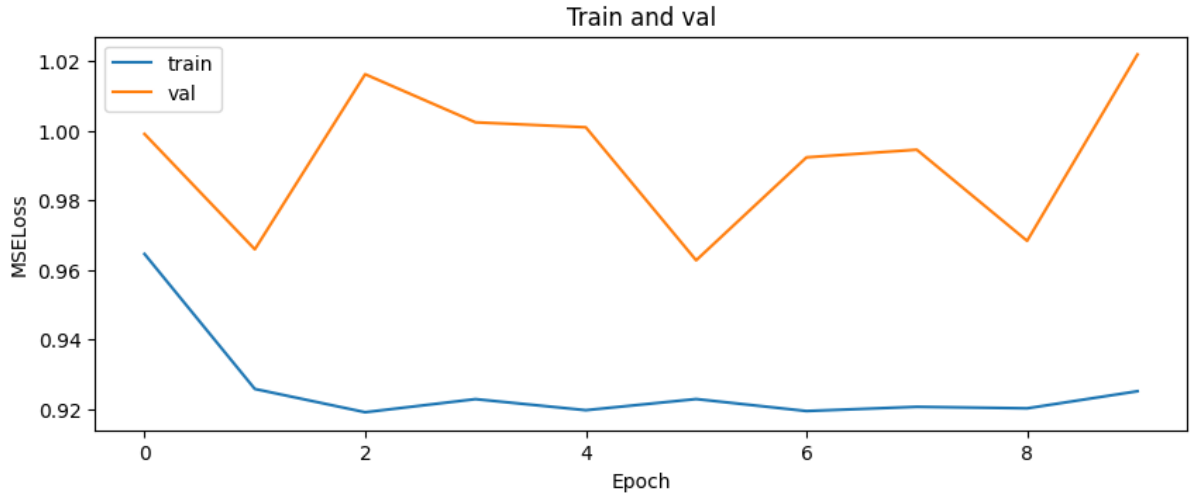
00002_batch_size=128,img_size=32,img_vars=1,l2=0.0003,lr=0.0011,n_epochs=10_



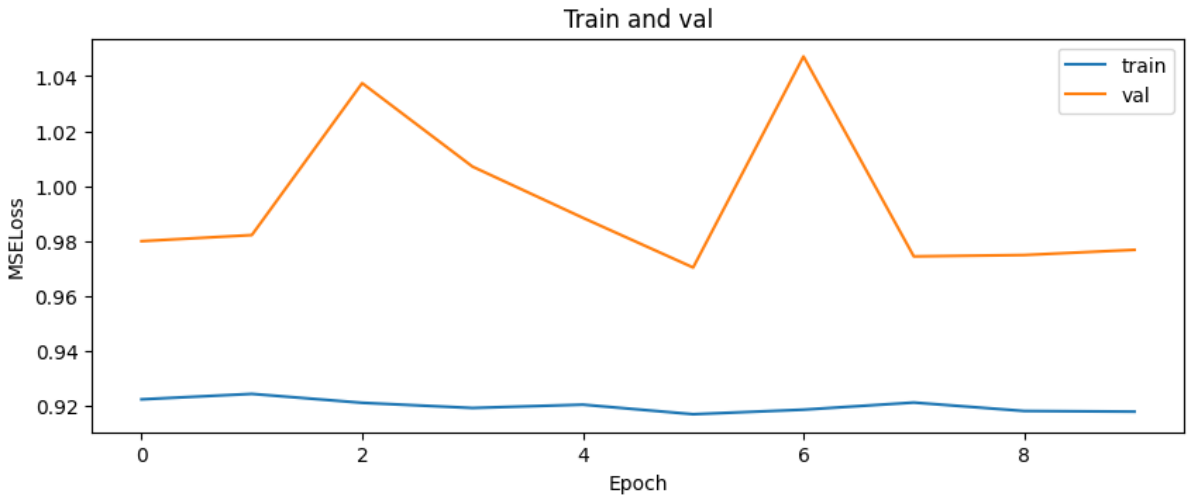
00003_batch_size=32,img_size=64,img_vars=1,l2=0.0015,lr=0.0190,n_epochs=10



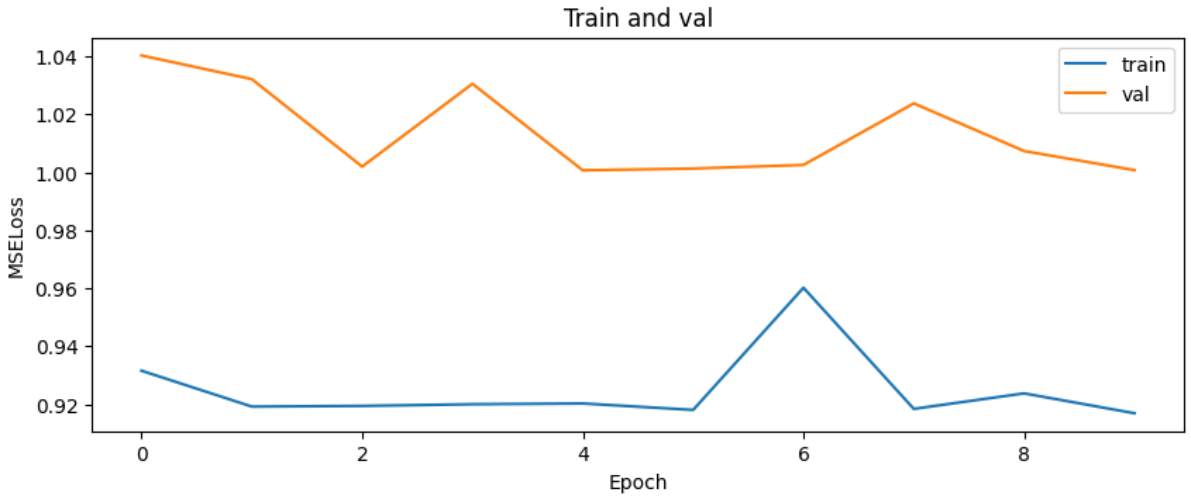
00004_batch_size=64,img_size=64,img_vars=1,l2=0.0324,lr=0.0127,n_epochs=10



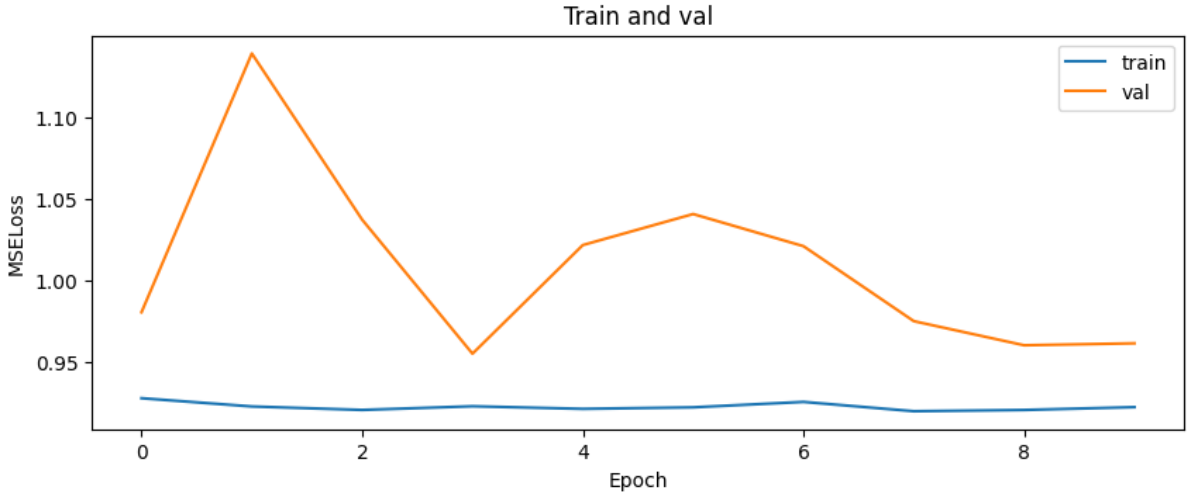
00005 batch_size=128,img_size=64,img_vars=1,l2=0.0086,lr=0.0305,n_epochs=10



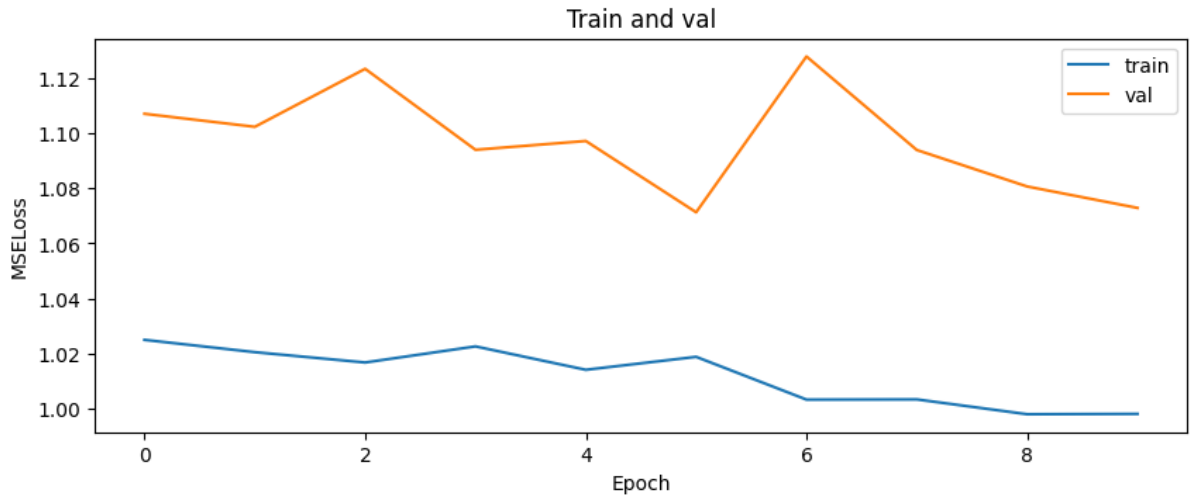
00006_batch_size=32,img_size=128,img_vars=1,l2=0.0000,lr=0.0161,n_epochs=10



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



El resumen/resultado final.

```
== 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, '12': 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, '12': 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)
  )
)
```

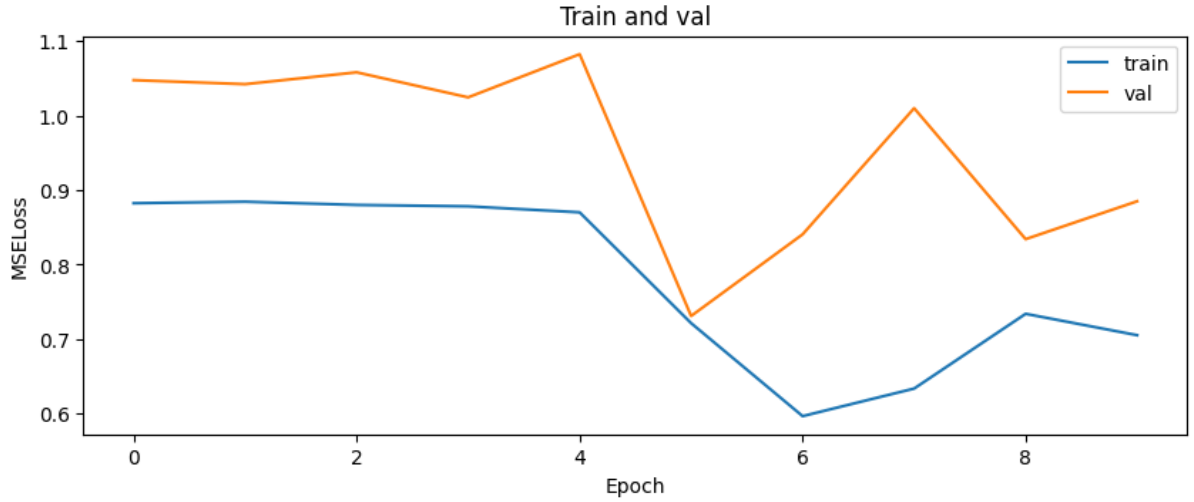
Random search:

Combinations tested:

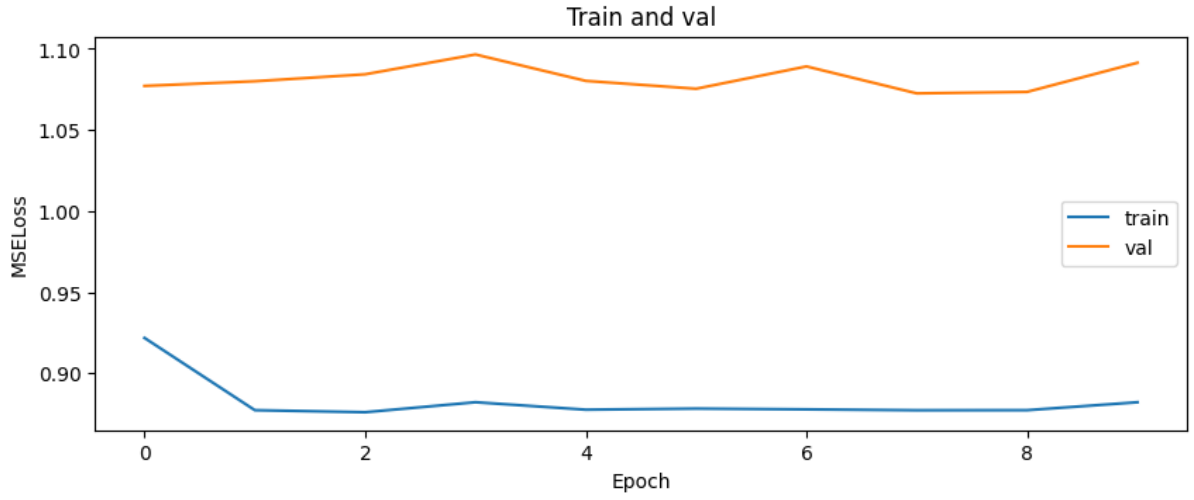
```
== Status ==
Current time: 2023-03-17 19:54:34 (running for 00:00:00.28)
Memory usage on this node: 2.6/14.1 GiB
Using FIFO scheduling algorithm.
Resources requested: 14.0/16 CPUs, 1.0/1 GPUs, 0.0/6.91 GiB heap, 0.0/3.45 GiB objects
Result logdir: /home/maiolvalenti/outs_mlp_train/train_2023-03-17_19-54-34
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

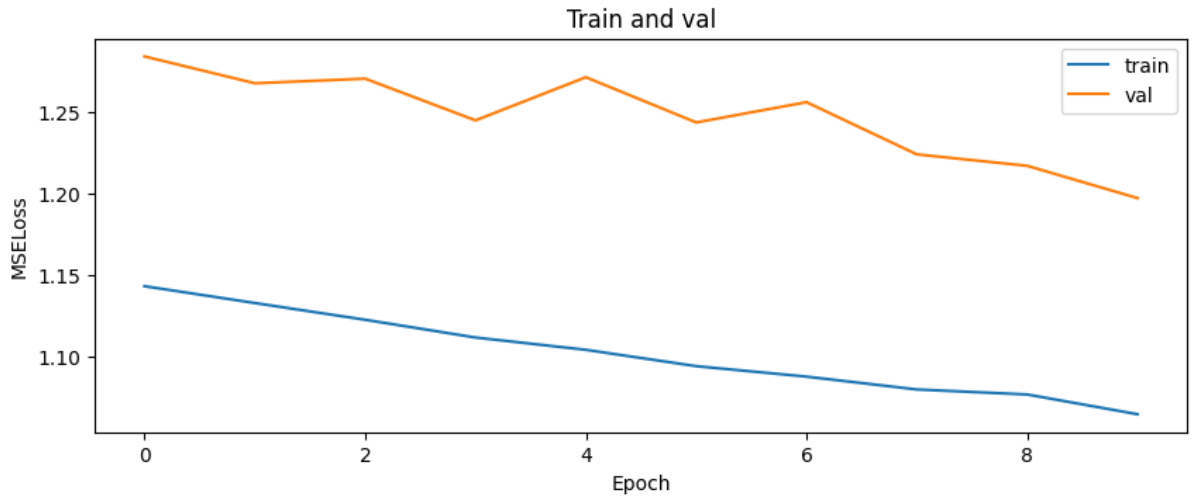
<u>00000</u>_batch_size=64,img_size=128,img_vars=1,l2=0.0000,lr=0.0933,n_epochs=10



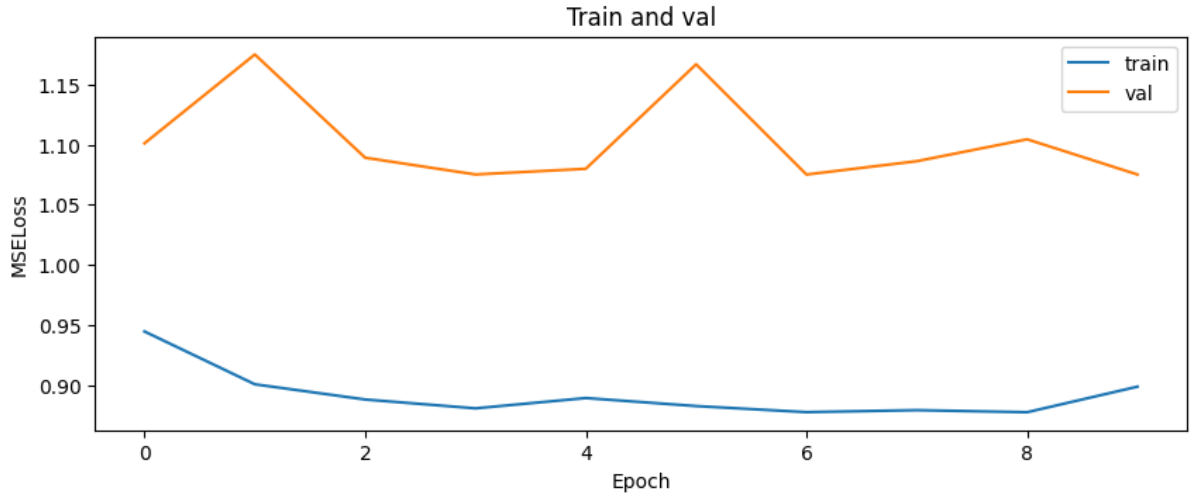
<u>00001</u>_batch_size=32,img_size=32,img_vars=1,l2=0.0666,lr=0.0137,n_epochs=10



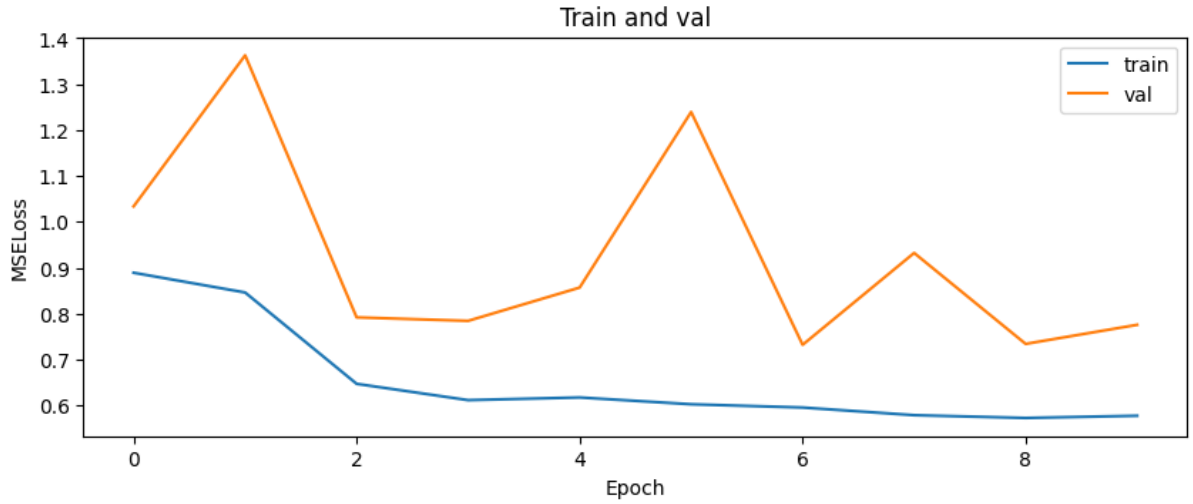
00002_batch_size=64,img_size=64,img_vars=1,l2=0.0866,lr=0.0001,n_epochs=10



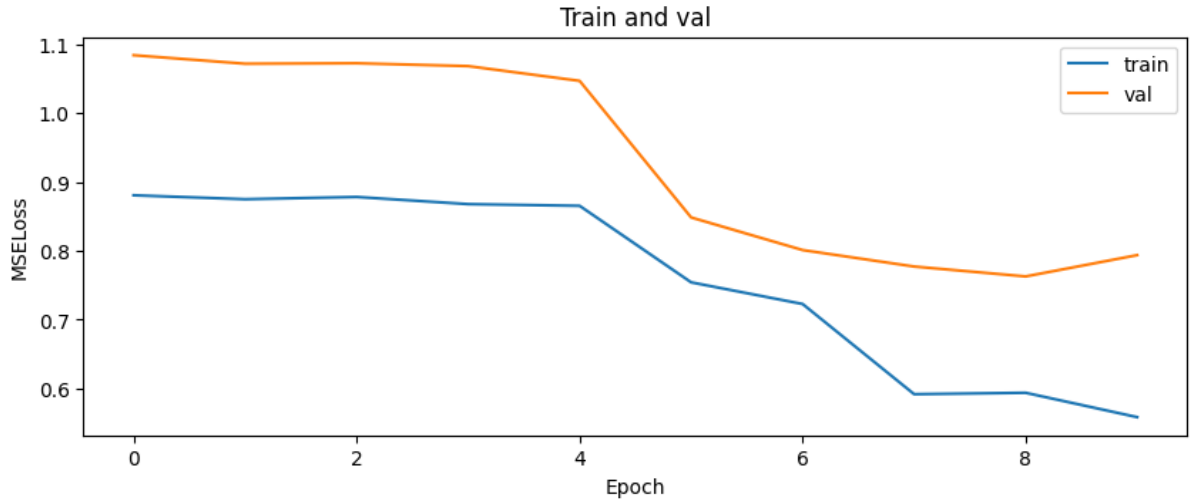
00003_batch_size=32,img_size=128,img_vars=1,l2=0.0306,lr=0.0016,n_epochs=10



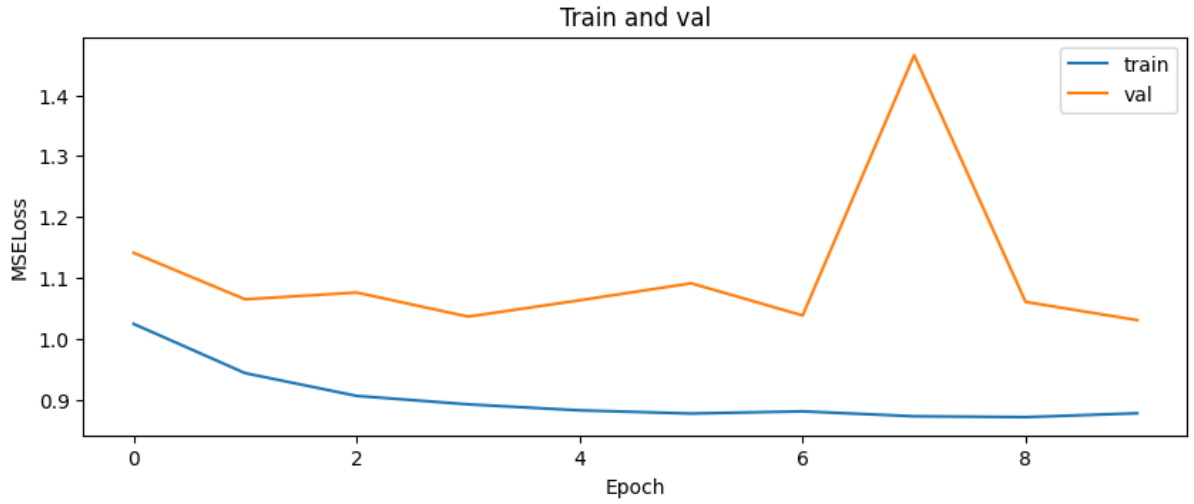
00004_batch_size=64,img_size=28,img_vars=1,l2=0.0000,lr=0.0595,n_epochs=10



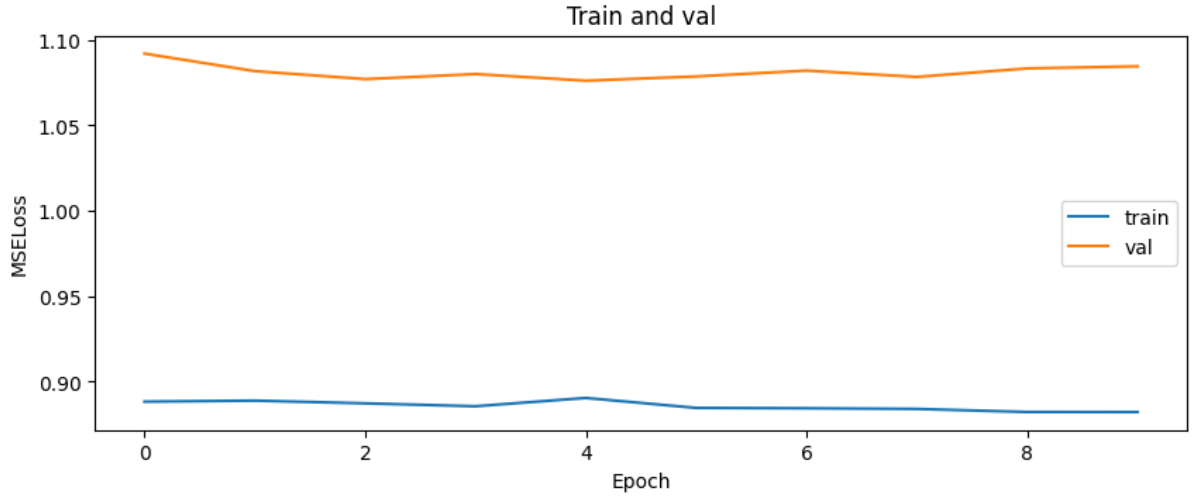
00005_batch_size=32,img_size=64,img_vars=1,l2=0.0025,lr=0.0137,n_epochs=10



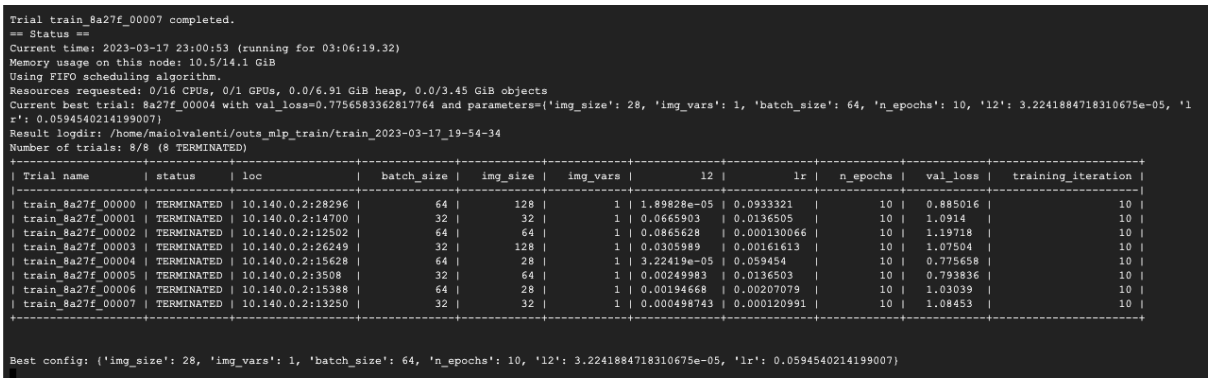
00006_batch_size=64,img_size=28,img_vars=1,l2=0.0019,lr=0.0021,n_epochs=10



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}
```

The best results in “random search” are very similar between de test 00004 and the 00005. We would say that the 00005 seems more regular or stable. Despite of the lowest loss is in the 00004, we choose the 00005 params as the best combinations. The reason is that the best combination is the same as tested in the “grid search” and uses smaller hypaparameters, so, probably, in the case that 00004 and 0005 would perform the same in the main dataset in terms of loss, 00004 probably will have a lot of more parameters, memory consumption… because of the img_size and the batch size.

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