Deep Learning

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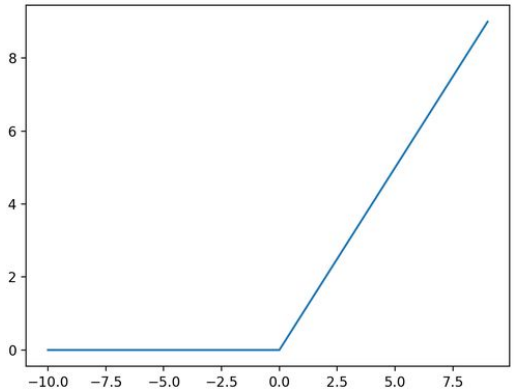
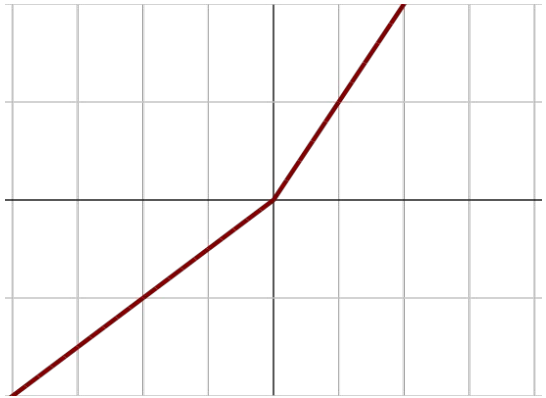
BARCELONATECH

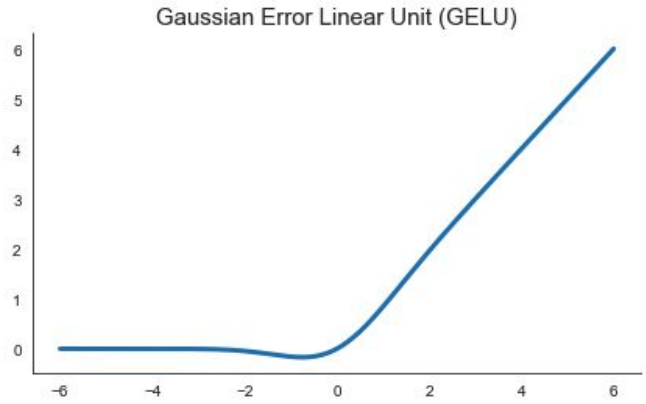
Facultat d'Informàtica de Barcelona

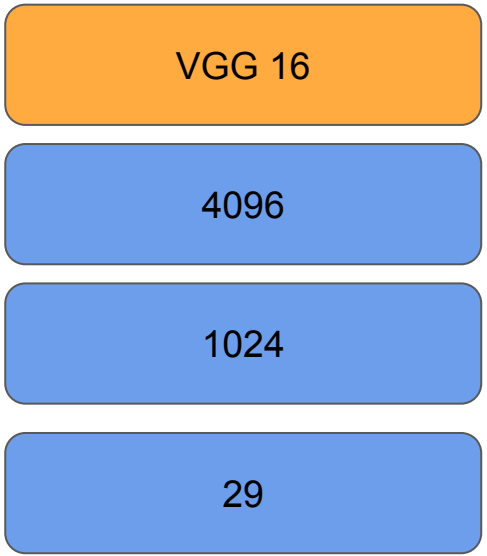
FIB

ReLu vs PReLu vs GeLu







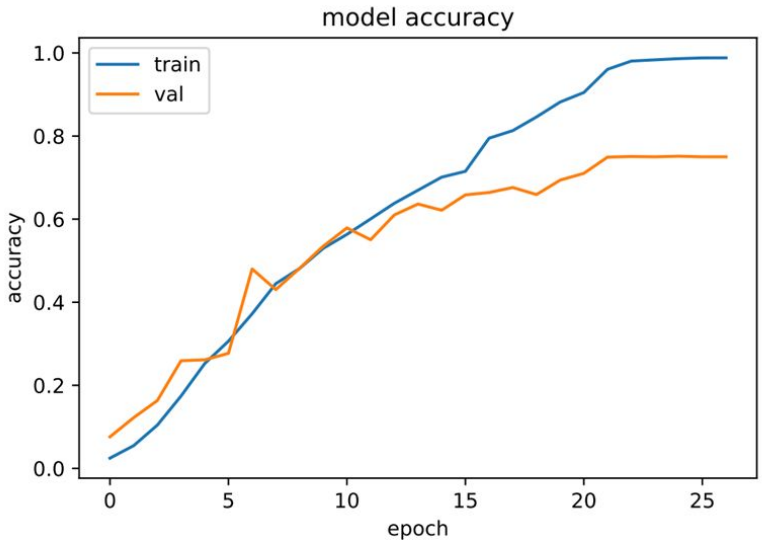


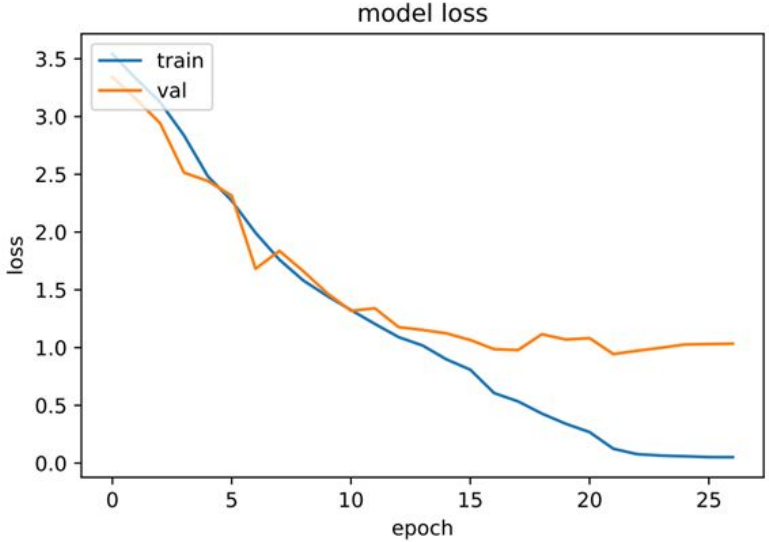
Activation Function: ReLu

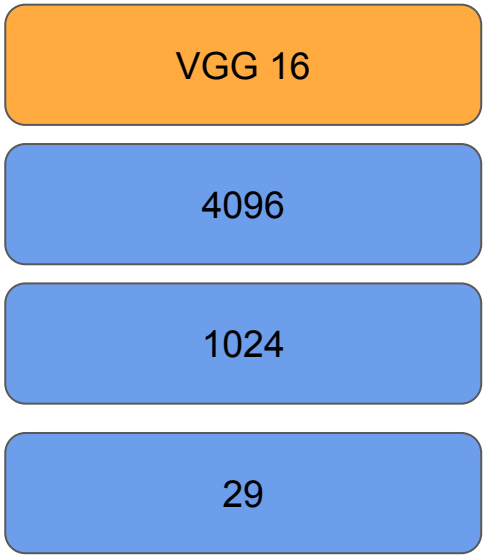
Frozen layers: 10

Drop out: No

Accuracy in test : 73%


model accuracy
train
val
accuracy
epoch
0.0
0.2
0.4
0.6
0.8
1.0
0
5
10
15
20
25


model loss
train
val
loss
epoch
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
0
5
10
15
20
25

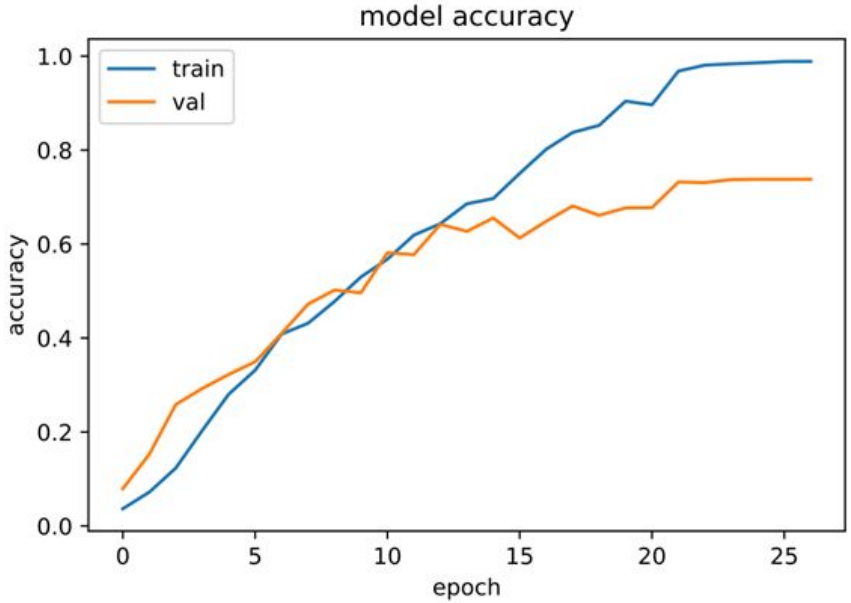


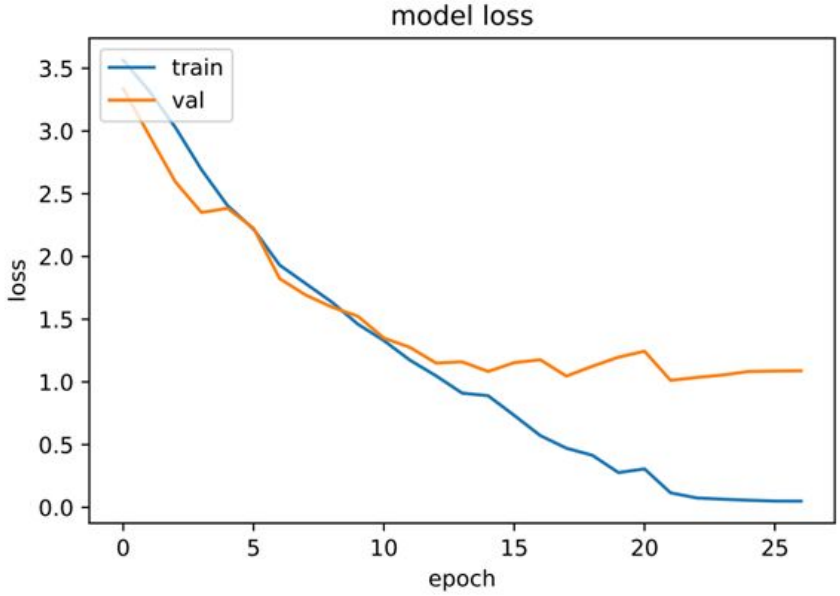
Activation Function: PReLu

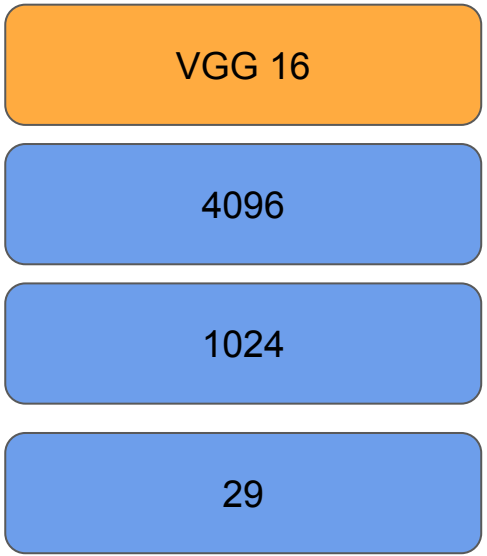
Frozen layers: 10

Drop out: No

Accuracy in test : 74%


model accuracy
train
val
accuracy
epoch
0.0
0.2
0.4
0.6
0.8
1.0
0
5
10
15
20
25


model loss
train
val
loss
epoch
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
0
5
10
15
20
25

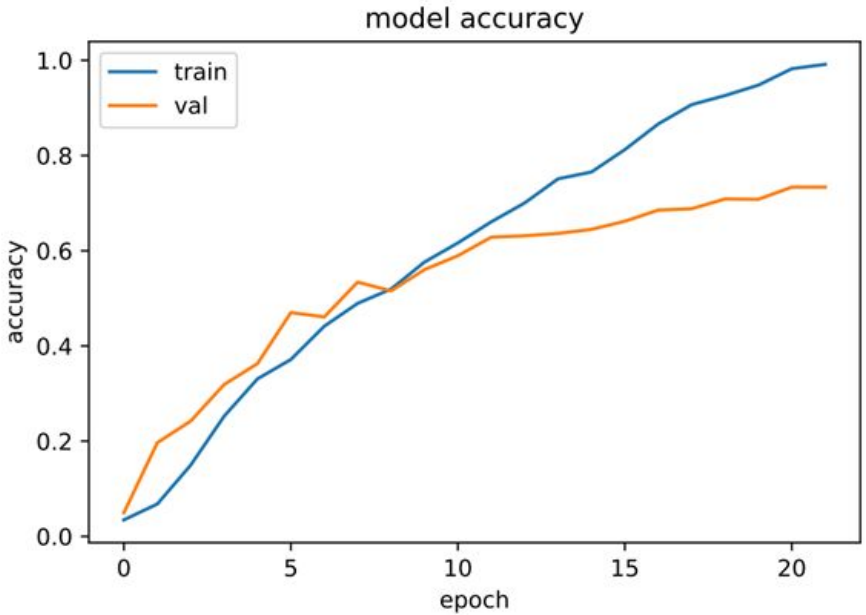


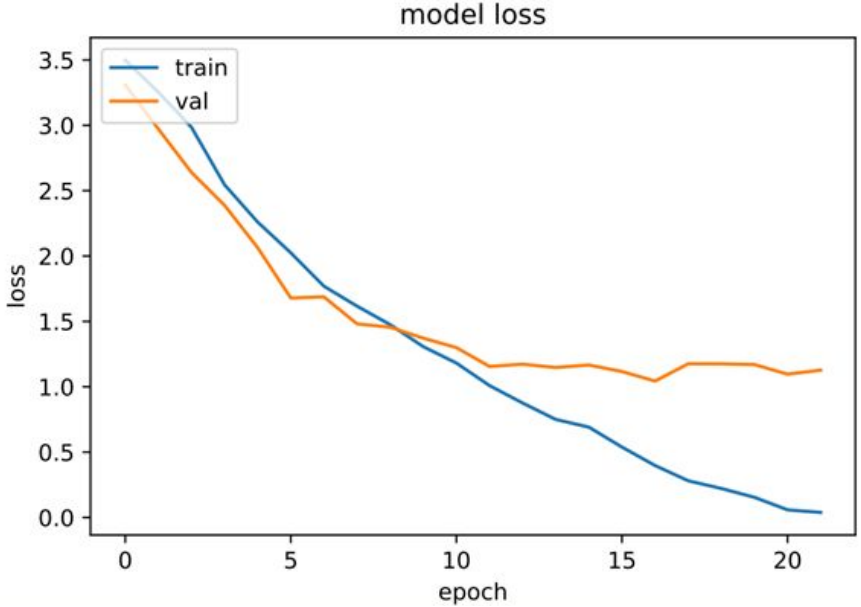
Activation Function: GeLu

Frozen layers: 10

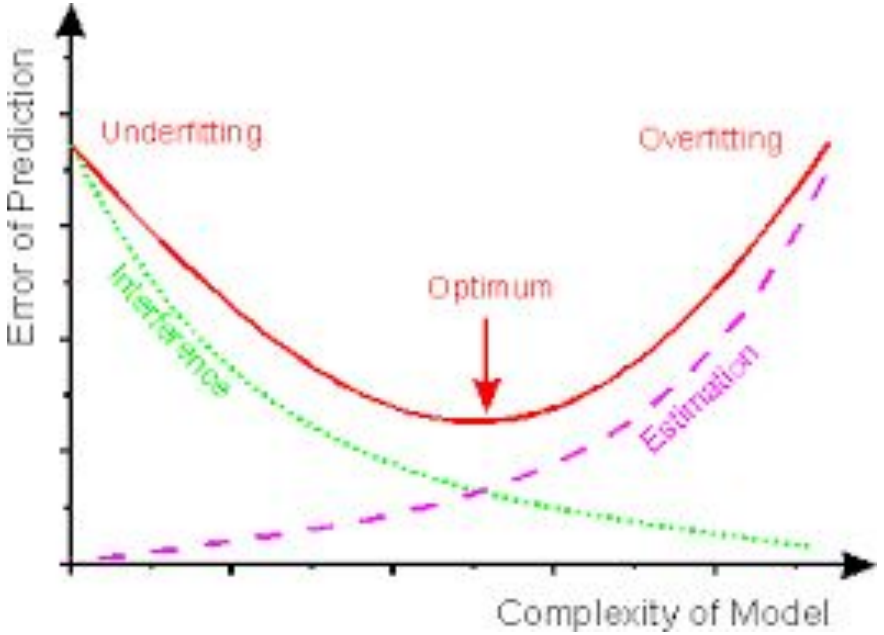
Drop out: No

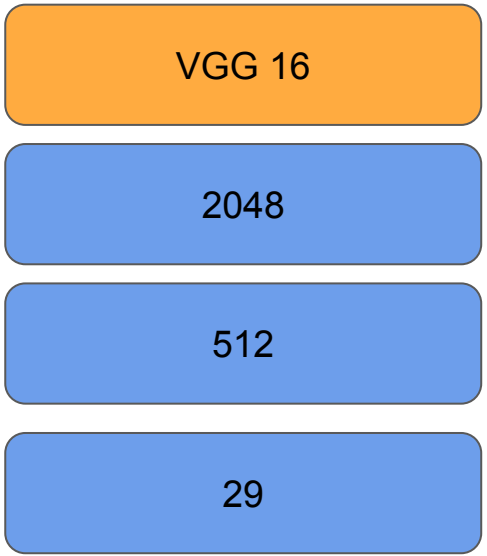
Accuracy test: 67%


model accuracy
train
val
accuracy
epoch
0.0
0.2
0.4
0.6
0.8
1.0
0
5
10
15
20


model loss
train
val
loss
epoch
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
0
5
10
15
20

Reducing complexity of the model



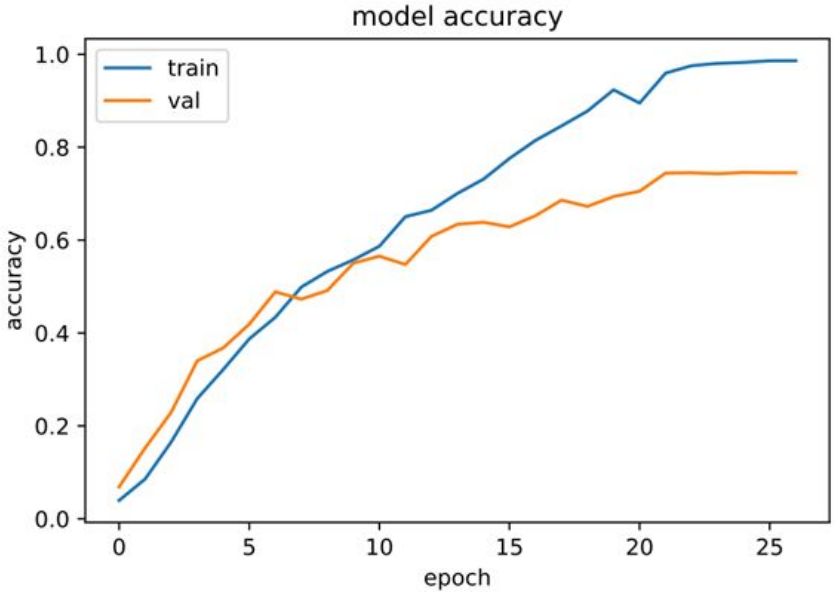


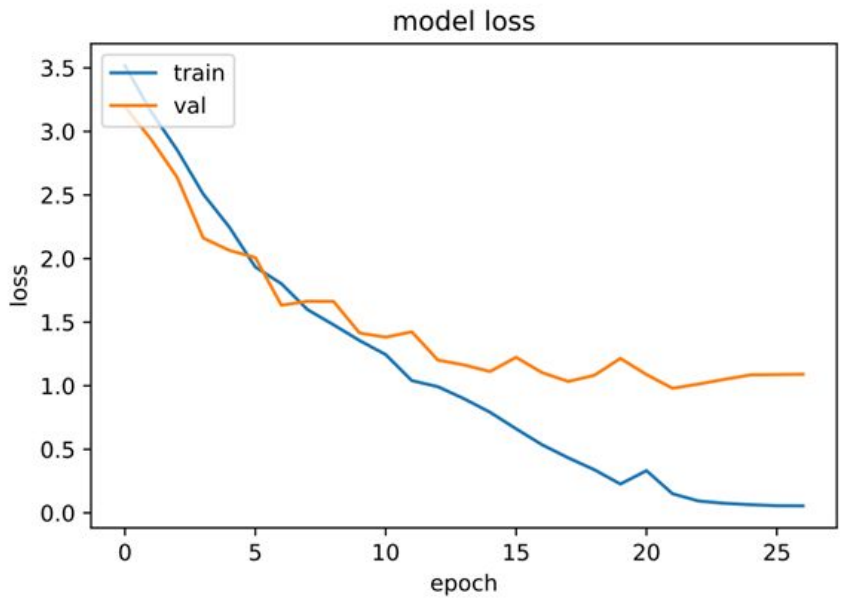
Activation Function: PReLu

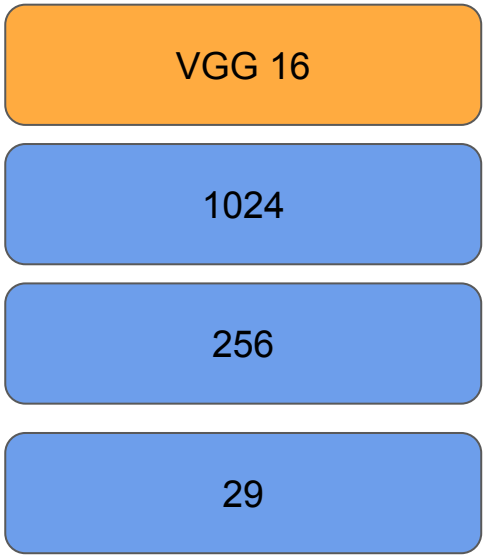
Frozen layers: 10

Drop out: No

Accuracy test: 72%


model accuracy
train
val
accuracy
epoch
0.0
0.2
0.4
0.6
0.8
1.0
0
5
10
15
20
25


model loss
train
val
loss
epoch
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
0
5
10
15
20
25

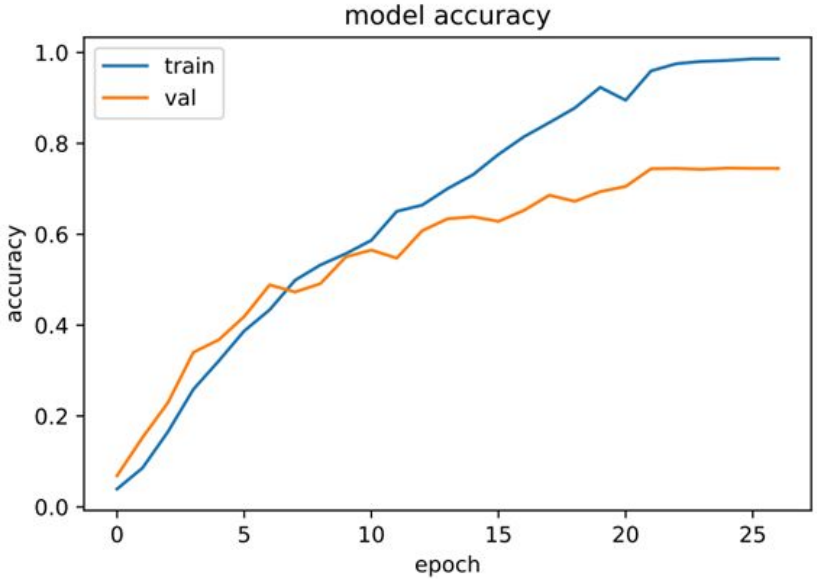


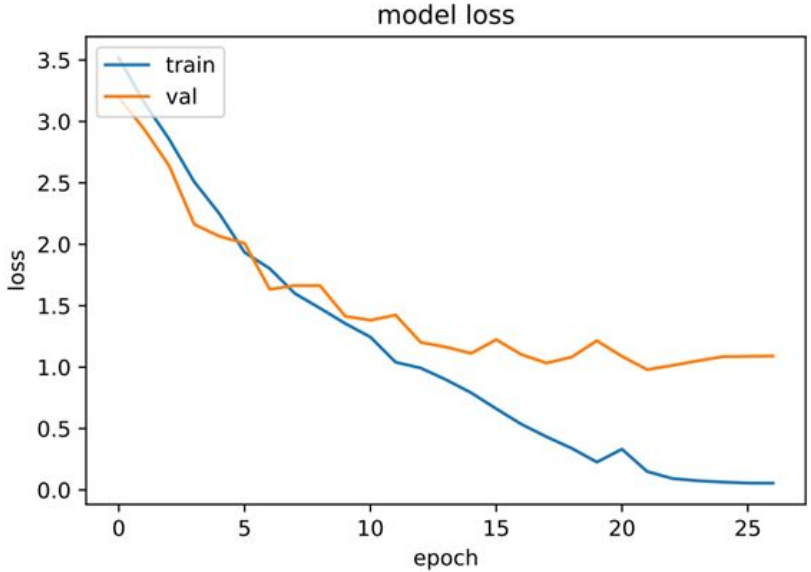
Activation Function: PReLu

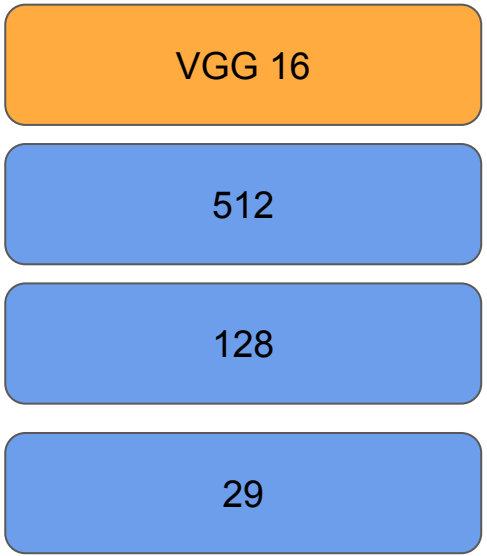
Frozen layers: 10

Drop out: No

Accuracy test: 72%


model accuracy
train
val
accuracy
epoch
0.0
0.2
0.4
0.6
0.8
1.0
0
5
10
15
20
25


model loss
train
val
loss
epoch
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
0
5
10
15
20
25

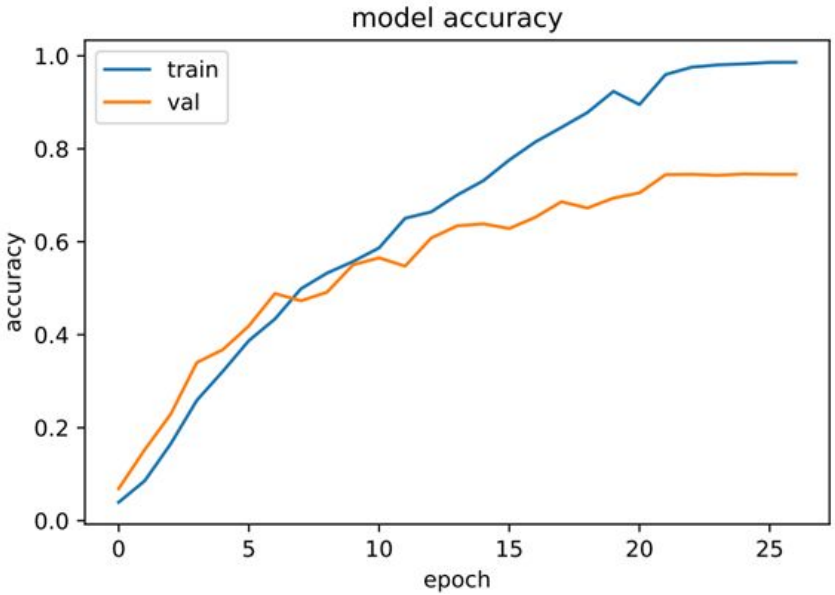


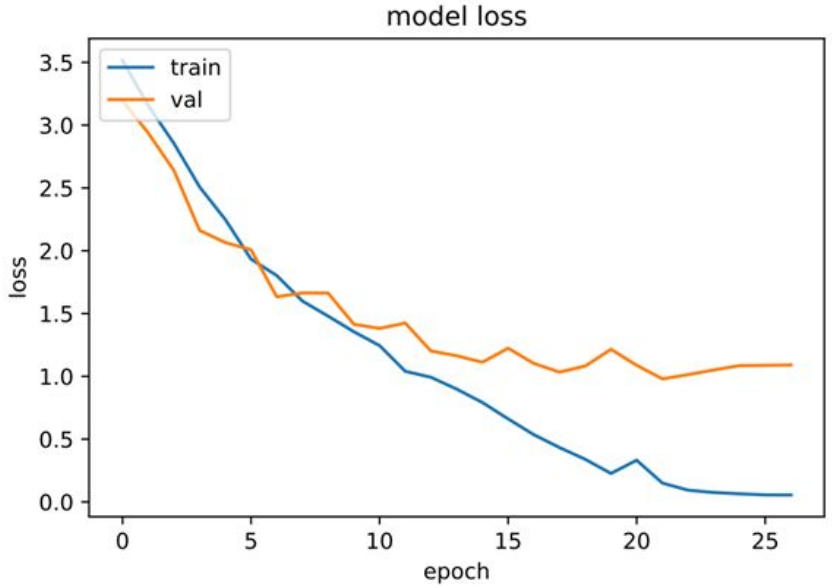
Activation Function: PReLu

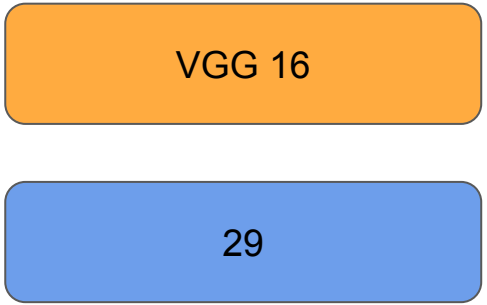
Frozen layers: 10

Drop out: No

Accuracy test: 72%


model accuracy
train
val
accuracy
epoch
0.0
0.2
0.4
0.6
0.8
1.0
0
5
10
15
20
25


model loss
train
val
loss
epoch
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
0
5
10
15
20
25

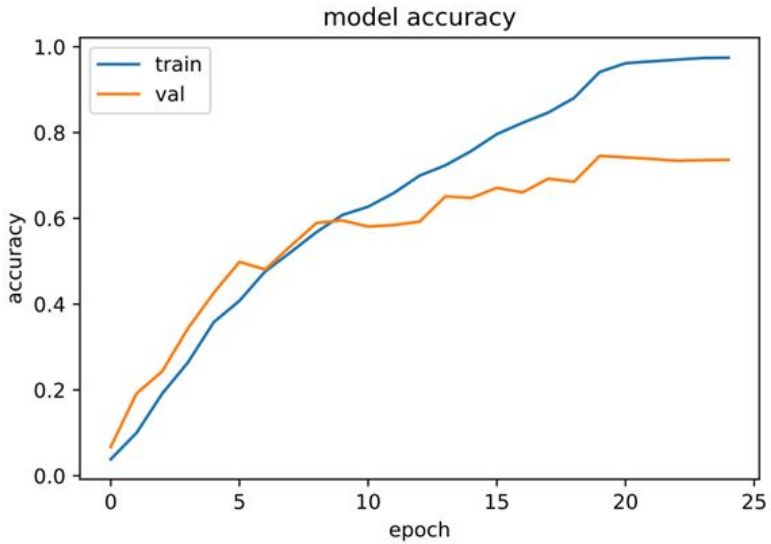


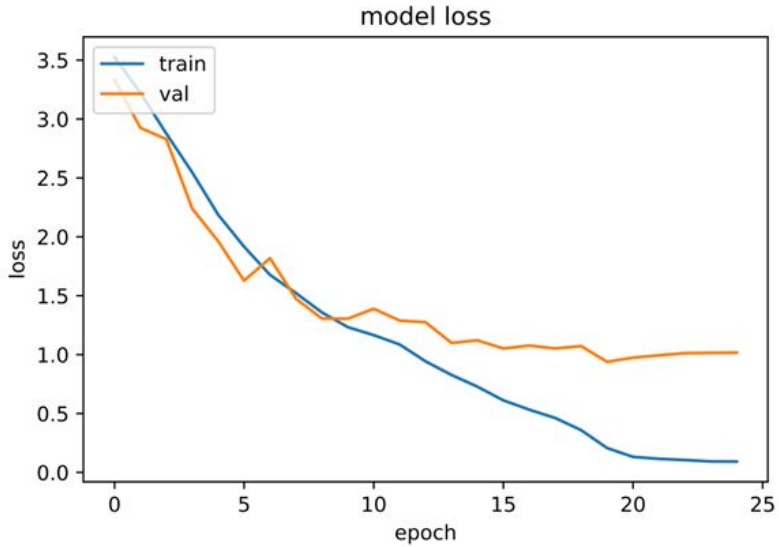
Activation Function: PReLu

Frozen layers: 10

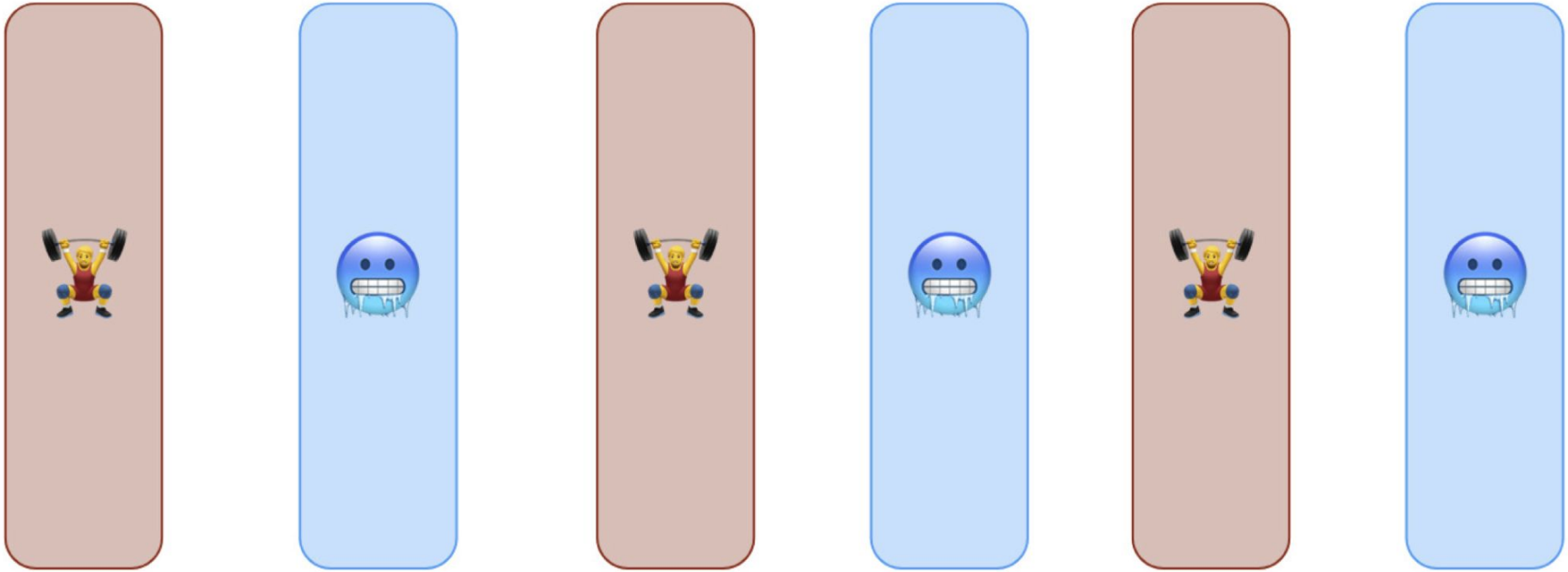
Drop out: No

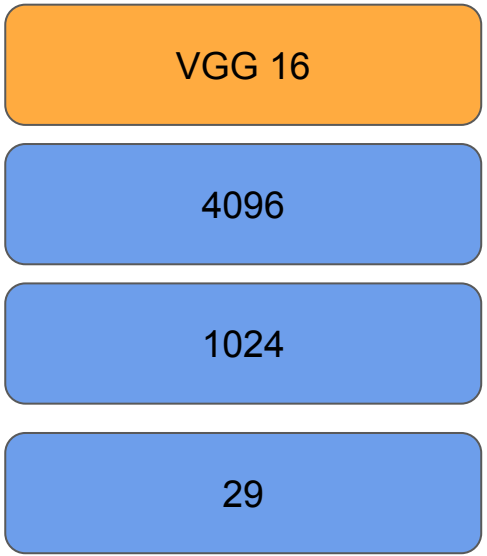
Accuracy test: 73%


model accuracy
train
val
accuracy
epoch
0.0
0.2
0.4
0.6
0.8
1.0
0
5
10
15
20
25


model loss
train
val
loss
epoch
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
0
5
10
15
20
25

Changing the Frozen layers



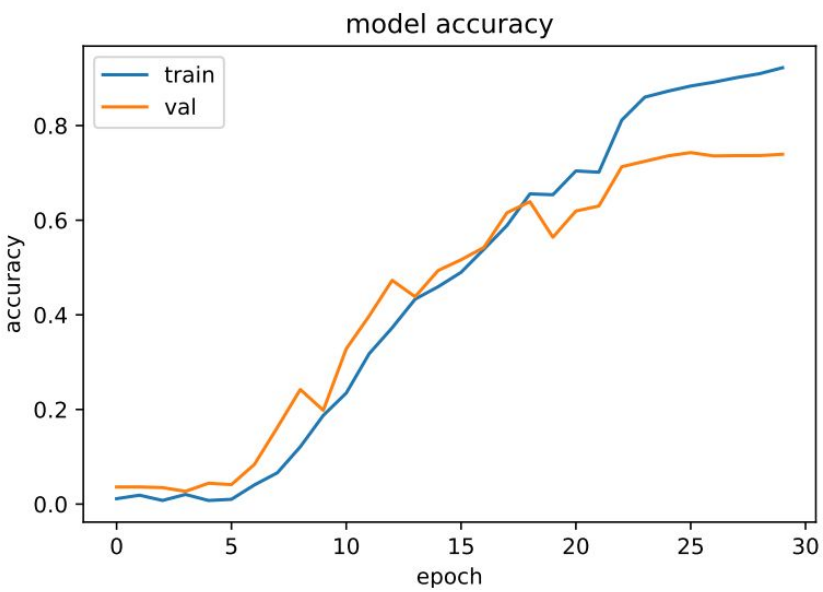


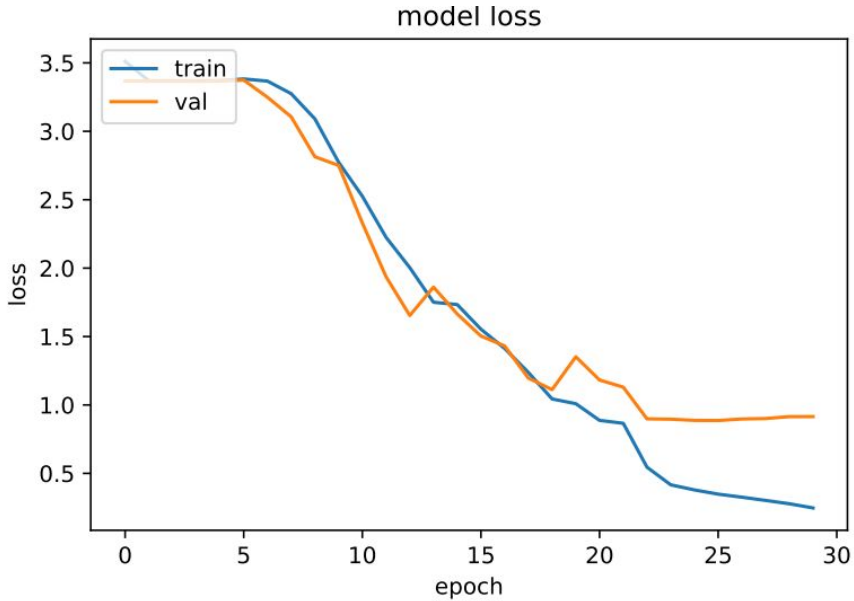
Activation Function: PReLu

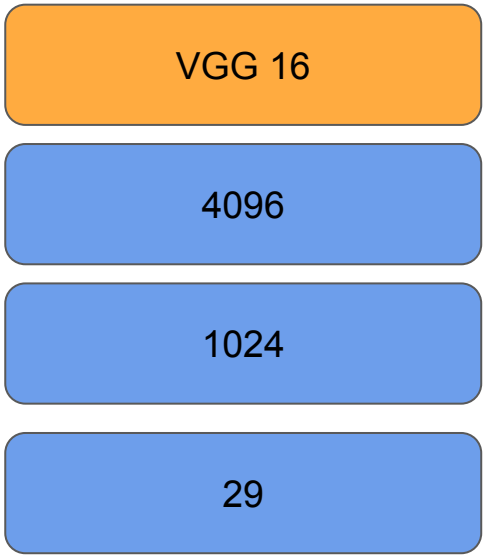
Frozen layers: 6

Drop out: No

Accuracy in test : 72%


model accuracy
train
val
accuracy
epoch
0.0
0.2
0.4
0.6
0.8
0
5
10
15
20
25
30


model loss
train
val
loss
epoch
0.5
1.0
1.5
2.0
2.5
3.0
3.5
0
5
10
15
20
25
30

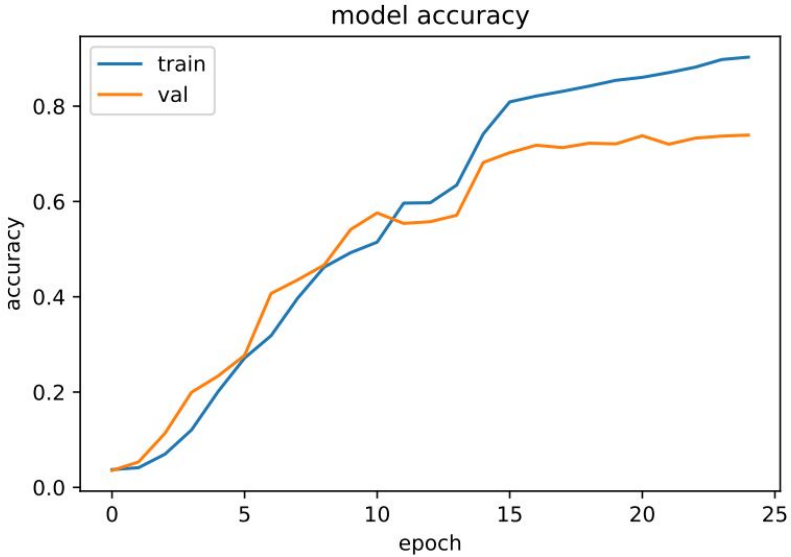


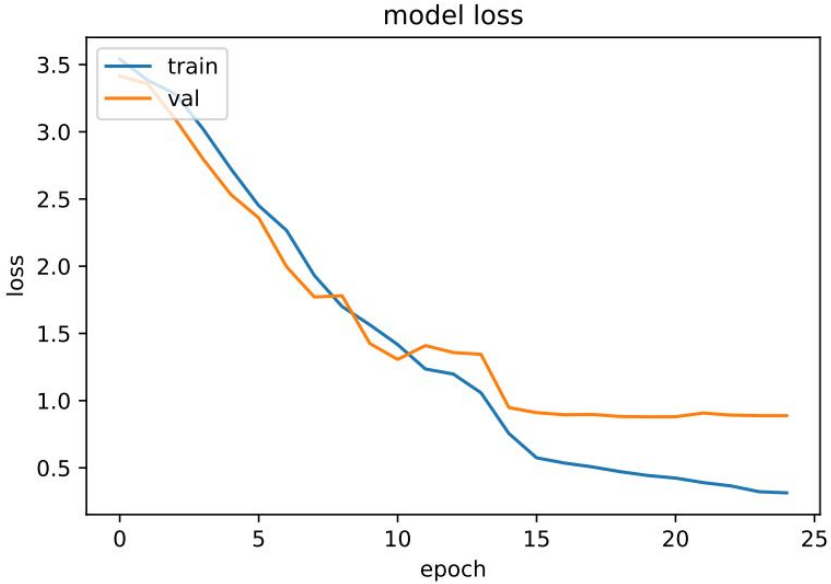
Activation Function: PReLu

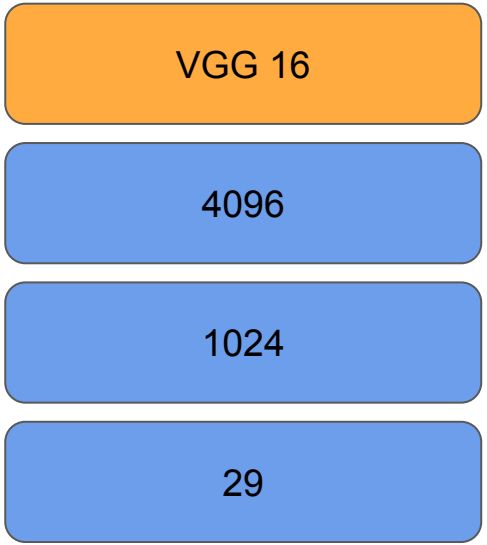
Frozen layers: 8

Drop out: No

Accuracy in test : 72%


model accuracy
train
val
accuracy
epoch
0.0
0.2
0.4
0.6
0.8
0
5
10
15
20
25


model loss
train
val
loss
epoch
0.5
1.0
1.5
2.0
2.5
3.0
3.5
0
5
10
15
20
25

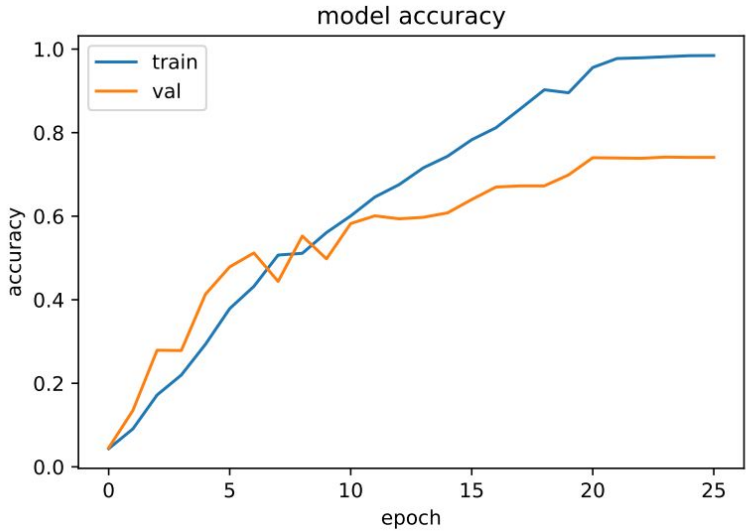


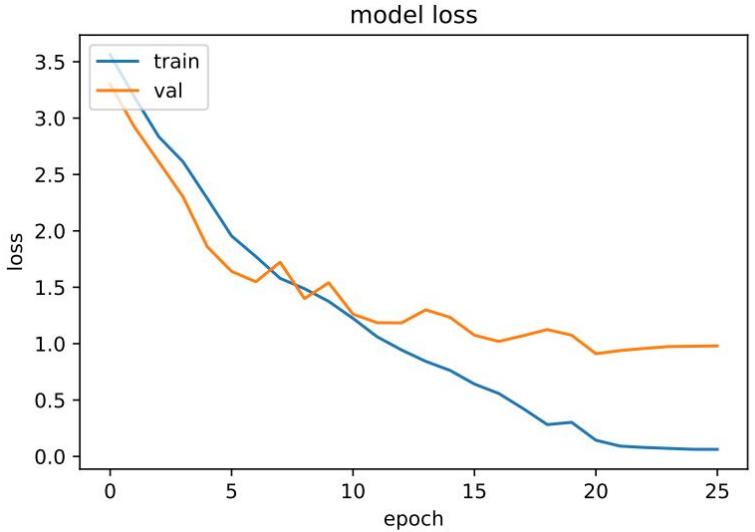
Activation Function: PReLu

Frozen layers: 12

Drop out: No

Accuracy in test : 74%


model accuracy
train
val
accuracy
epoch
0.0
0.2
0.4
0.6
0.8
1.0
0
5
10
15
20
25


model loss
train
val
loss
epoch
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
0
5
10
15
20
25

Feature Extraction

All layers Batch Size 16

	precision	recall	f1-score	support
0	0.96	0.97	0.97	700
1	0.79	0.72	0.75	700
2	0.81	0.76	0.78	700
3	0.82	0.88	0.85	313
4	0.76	0.77	0.76	700
5	0.77	0.71	0.74	700
6	0.85	0.80	0.83	700
7	0.82	0.77	0.79	700
8	0.86	0.89	0.87	700
9	0.73	0.94	0.82	188
10	0.96	0.98	0.97	328
11	0.95	0.97	0.96	584
12	0.67	0.85	0.75	265
13	0.74	0.69	0.72	572
14	0.78	0.74	0.76	700
15	0.86	0.75	0.80	700
16	0.54	0.77	0.63	257
17	0.81	0.76	0.78	700
18	0.78	0.88	0.82	286
19	0.56	0.64	0.60	375
20	0.85	0.91	0.88	700
21	0.28	0.72	0.41	95
22	0.83	0.78	0.80	700
23	0.69	0.94	0.79	133
24	0.78	0.71	0.74	700
25	0.70	0.83	0.76	361
26	0.93	0.92	0.92	700
27	0.91	0.89	0.90	700
28	0.88	0.70	0.78	700

accuracy			0.81	15657
macro avg	0.78	0.81	0.79	15657
weighted avg	0.82	0.81	0.81	15657

All layers Batch Size 32

	precision	recall	f1-score	support
0	0.96	0.97	0.97	700
1	0.79	0.72	0.75	700
2	0.81	0.76	0.78	700
3	0.82	0.88	0.85	313
4	0.76	0.77	0.76	700
5	0.77	0.71	0.74	700
6	0.85	0.80	0.83	700
7	0.82	0.77	0.79	700
8	0.85	0.89	0.87	700
9	0.73	0.94	0.82	188
10	0.96	0.98	0.97	328
11	0.95	0.97	0.96	584
12	0.67	0.84	0.75	265
13	0.75	0.69	0.72	572
14	0.78	0.74	0.76	700
15	0.86	0.74	0.80	700
16	0.54	0.77	0.63	257
17	0.81	0.76	0.78	700
18	0.78	0.88	0.82	286
19	0.55	0.65	0.60	375
20	0.85	0.91	0.88	700
21	0.29	0.72	0.41	95
22	0.83	0.78	0.80	700
23	0.68	0.93	0.79	133
24	0.78	0.71	0.74	700
25	0.70	0.83	0.76	361
26	0.93	0.92	0.92	700
27	0.91	0.89	0.90	700
28	0.88	0.70	0.78	700

accuracy			0.81	15657
macro avg	0.78	0.81	0.79	15657
weighted avg	0.82	0.81	0.81	15657

Eliminating last layer of each bloc

Batch Size 16

	precision	recall	f1-score	support
0	0.96	0.97	0.97	700
1	0.75	0.69	0.72	700
2	0.79	0.73	0.76	700
3	0.80	0.85	0.83	313
4	0.72	0.73	0.73	700
5	0.73	0.68	0.71	700
6	0.82	0.78	0.80	700
7	0.78	0.75	0.77	700
8	0.85	0.87	0.86	700
9	0.73	0.91	0.81	188
10	0.95	0.98	0.96	328
11	0.95	0.96	0.96	584
12	0.66	0.79	0.72	265
13	0.70	0.67	0.69	572
14	0.76	0.72	0.74	700
15	0.83	0.73	0.78	700
16	0.51	0.71	0.59	257
17	0.81	0.73	0.77	700
18	0.74	0.87	0.80	286
19	0.52	0.64	0.58	375
20	0.85	0.89	0.87	700
21	0.28	0.71	0.40	95
22	0.79	0.75	0.77	700
23	0.63	0.93	0.75	133
24	0.76	0.67	0.72	700
25	0.66	0.79	0.72	361
26	0.91	0.90	0.91	700
27	0.90	0.87	0.88	700
28	0.86	0.67	0.75	700

accuracy			0.78	15657
macro avg	0.76	0.79	0.77	15657
weighted avg	0.79	0.78	0.79	15657

Batch Size 32

	precision	recall	f1-score	support
0	0.96	0.97	0.97	700
1	0.75	0.69	0.72	700
2	0.79	0.73	0.76	700
3	0.80	0.85	0.83	313
4	0.72	0.73	0.73	700
5	0.73	0.68	0.71	700
6	0.82	0.78	0.80	700
7	0.78	0.75	0.77	700
8	0.85	0.87	0.86	700
9	0.73	0.91	0.81	188
10	0.95	0.98	0.96	328
11	0.95	0.96	0.96	584
12	0.67	0.79	0.72	265
13	0.70	0.67	0.69	572
14	0.76	0.72	0.74	700
15	0.83	0.73	0.78	700
16	0.51	0.72	0.60	257
17	0.81	0.73	0.77	700
18	0.74	0.87	0.80	286
19	0.52	0.65	0.58	375
20	0.85	0.89	0.87	700
21	0.28	0.71	0.40	95
22	0.78	0.75	0.77	700
23	0.63	0.93	0.75	133
24	0.76	0.68	0.72	700
25	0.66	0.79	0.72	361
26	0.91	0.90	0.91	700
27	0.90	0.87	0.88	700
28	0.86	0.67	0.75	700

accuracy			0.78	15657
macro avg	0.76	0.79	0.77	15657
weighted avg	0.79	0.78	0.79	15657

Eliminating fc layers

Batch Size 16

	precision	recall	f1-score	support
0	0.95	0.97	0.96	700
1	0.73	0.67	0.70	700
2	0.77	0.74	0.75	700
3	0.78	0.83	0.81	313
4	0.71	0.73	0.72	700
5	0.73	0.66	0.70	700
6	0.83	0.81	0.82	700
7	0.79	0.72	0.76	700
8	0.83	0.86	0.85	700
9	0.69	0.93	0.79	188
10	0.93	0.99	0.96	328
11	0.93	0.96	0.95	584
12	0.63	0.80	0.71	265
13	0.68	0.64	0.66	572
14	0.75	0.69	0.72	700
15	0.83	0.71	0.76	700
16	0.52	0.73	0.61	257
17	0.81	0.71	0.76	700
18	0.77	0.88	0.82	286
19	0.47	0.62	0.54	375
20	0.87	0.87	0.87	700
21	0.25	0.62	0.36	95
22	0.76	0.74	0.75	700
23	0.66	0.91	0.76	133
24	0.74	0.67	0.71	700
25	0.65	0.81	0.72	361
26	0.93	0.90	0.92	700
27	0.89	0.87	0.88	700
28	0.84	0.65	0.73	700

accuracy			0.77	15657
macro avg	0.75	0.78	0.76	15657
weighted avg	0.79	0.77	0.78	15657

Batch Size 32

	precision	recall	f1-score	support
0	0.95	0.97	0.96	700
1	0.73	0.67	0.70	700
2	0.77	0.74	0.75	700
3	0.78	0.83	0.81	313
4	0.71	0.73	0.72	700
5	0.73	0.66	0.70	700
6	0.83	0.81	0.82	700
7	0.79	0.72	0.76	700
8	0.83	0.86	0.85	700
9	0.69	0.93	0.79	188
10	0.93	0.99	0.96	328
11	0.93	0.96	0.95	584
12	0.63	0.79	0.70	265
13	0.68	0.64	0.66	572
14	0.75	0.68	0.72	700
15	0.83	0.71	0.76	700
16	0.52	0.73	0.61	257
17	0.81	0.71	0.76	700
18	0.77	0.88	0.82	286
19	0.47	0.62	0.53	375
20	0.87	0.87	0.87	700
21	0.25	0.62	0.36	95
22	0.76	0.74	0.75	700
23	0.66	0.91	0.77	133
24	0.74	0.68	0.71	700
25	0.65	0.81	0.72	361
26	0.93	0.90	0.92	700
27	0.89	0.87	0.88	700
28	0.84	0.65	0.73	700

accuracy			0.77	15657
macro avg	0.75	0.78	0.76	15657
weighted avg	0.79	0.77	0.78	15657