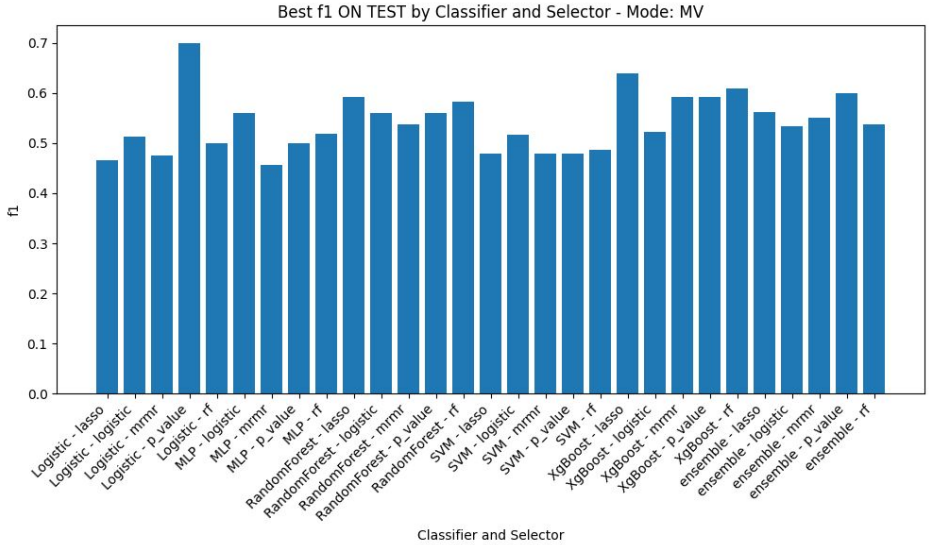
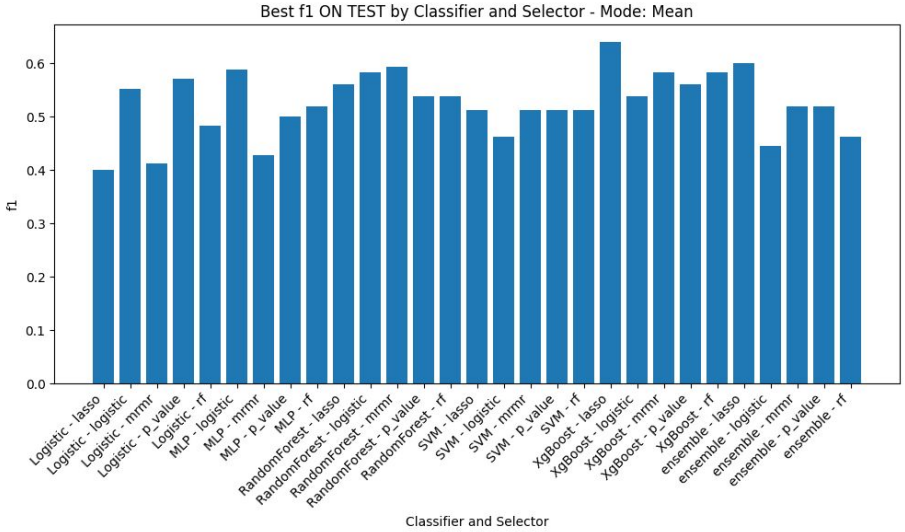
RADIOMICA 2.5 D

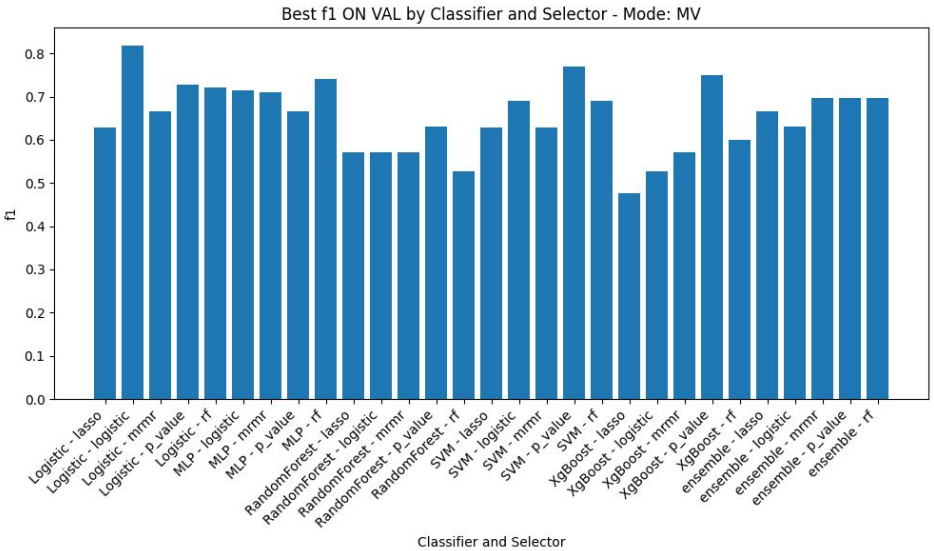
- 107 features di partenza
- correlation 0.9 (42)
- no p_value
- num_features con limit di 30
- tutte le slice

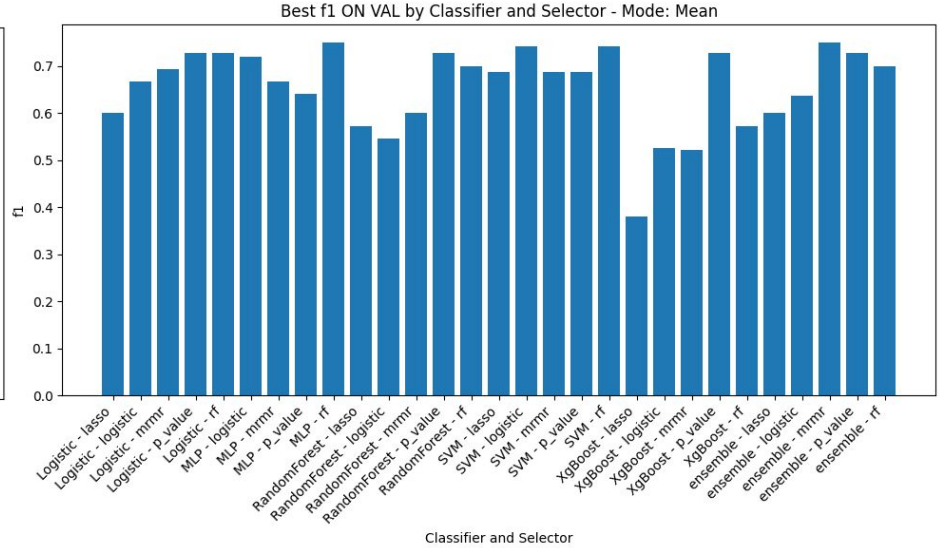
analisi f1 sul test



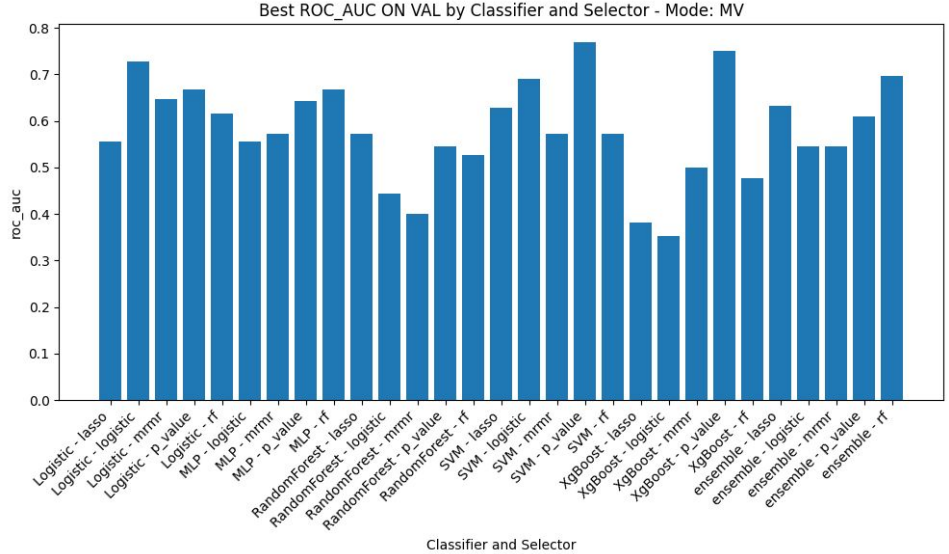


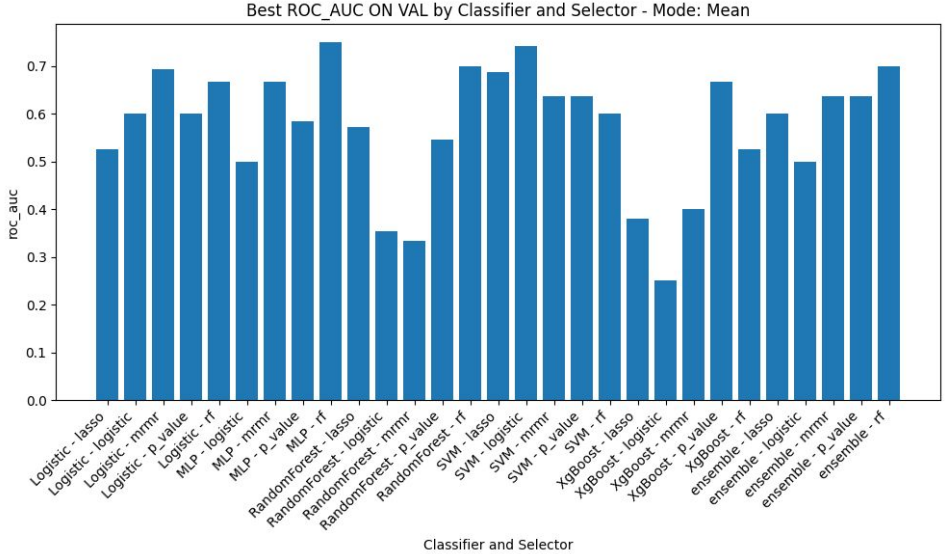
analisi f1 sul val



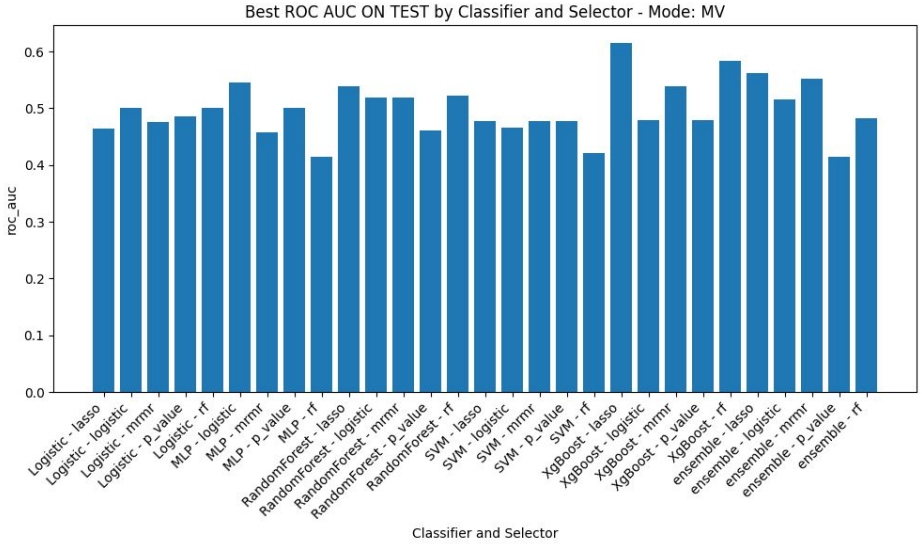


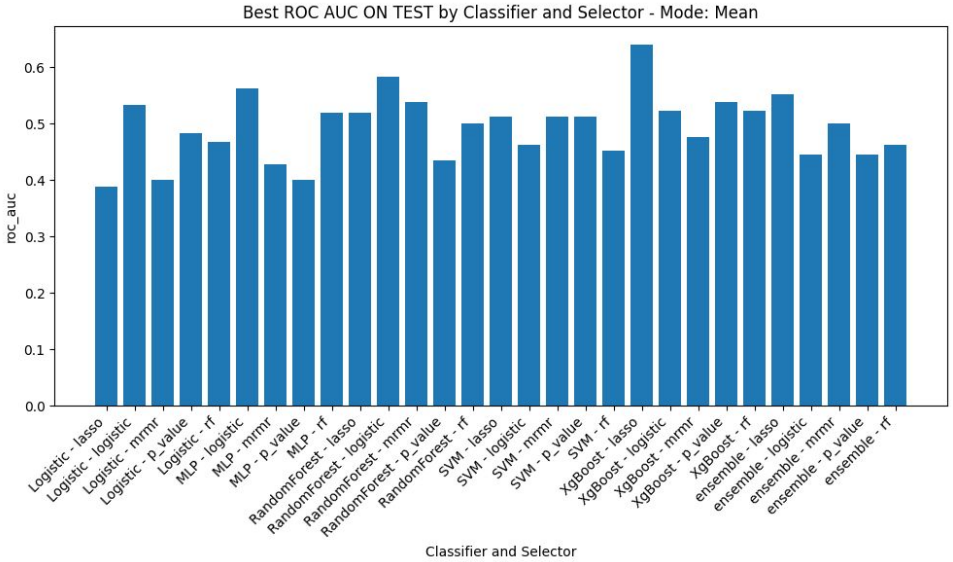
analisi roc sul val





analisi roc sul test





OSSERVAZIONI

- lasso non si puo usare per il test
- SVM e Logistic vanno male per il test
- Mean in generale sul test funziona meglio di MV

Selezione per f1

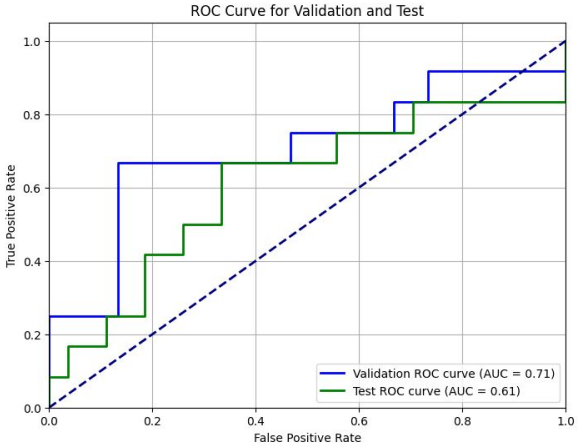
Classifier: RandomForest
Selector: p_value
Num Features: 18
Mode: Mean

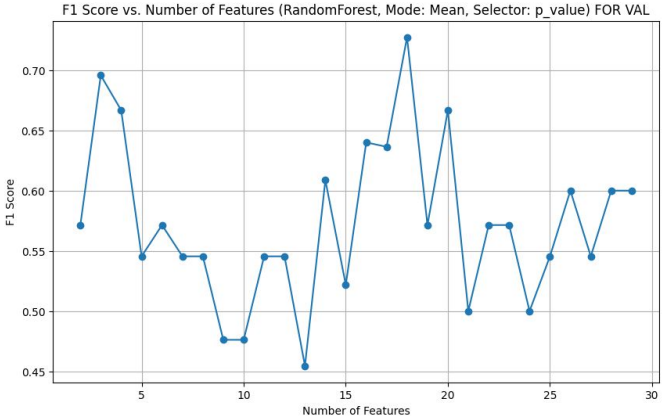
Validation Metrics:
- F1 Score: 0.727
- ROC AUC: 0.706
- PR AUC: 0.726
- Accuracy: 0.778
- Confusion Matrix:

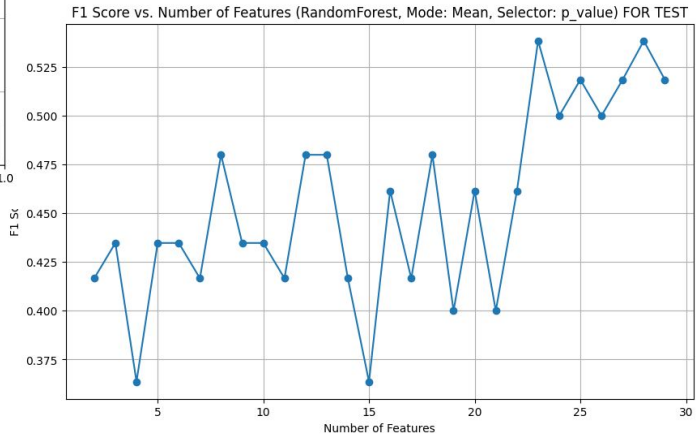
[[13 2]
 [4 8]]

Test Metrics:
- F1 Score: 0.48
- ROC AUC: 0.608
- PR AUC: 0.483
- Accuracy: 0.66
- Confusion Matrix:

[[20 7]
 [6 6]]







CLASSIFICAZIONE “2.5D”

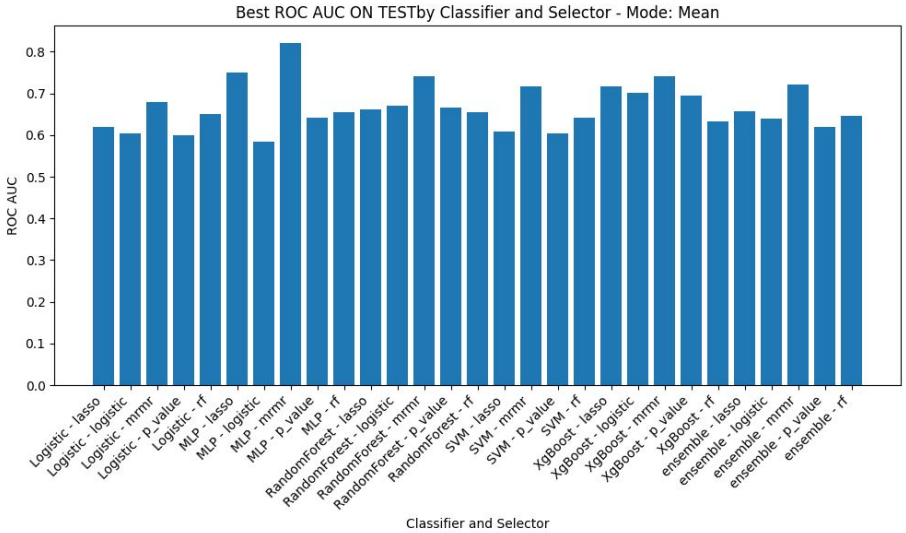
con encoder Rete pretrainata:

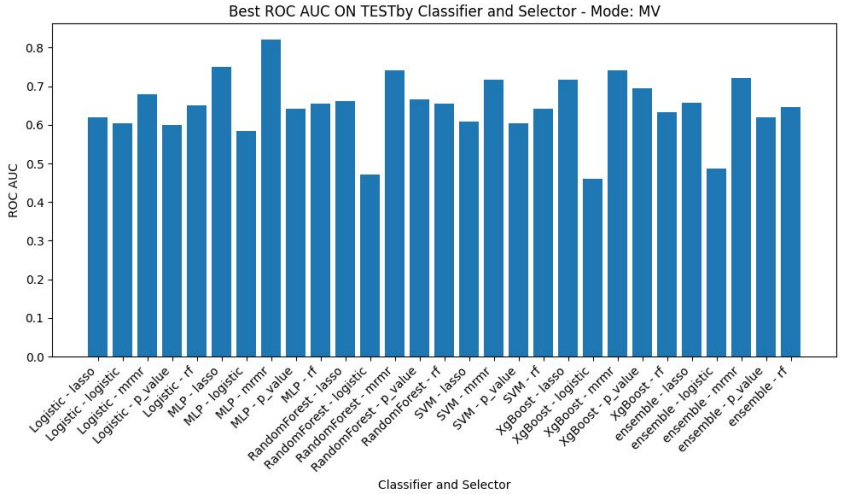
a) VGG19
b) Resnet 50
c) InceptionV3

Configurazione migliore trovata variando classifier, selector, num_features (/alpha) e Mode (majority voting o mean), threshold fissa a 0.5

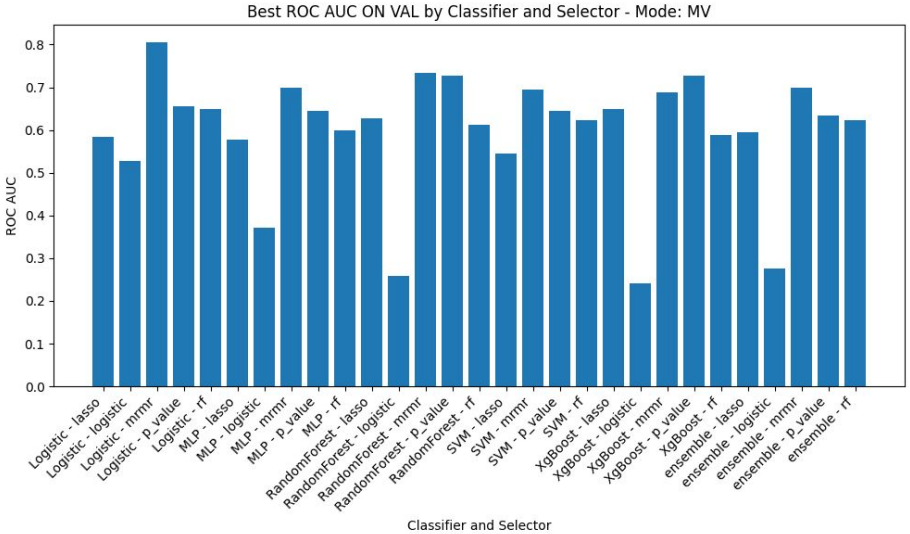
a) VGG19
   512 FEATURES
   correlation 0.8, p_value 0.01 e max 30 features

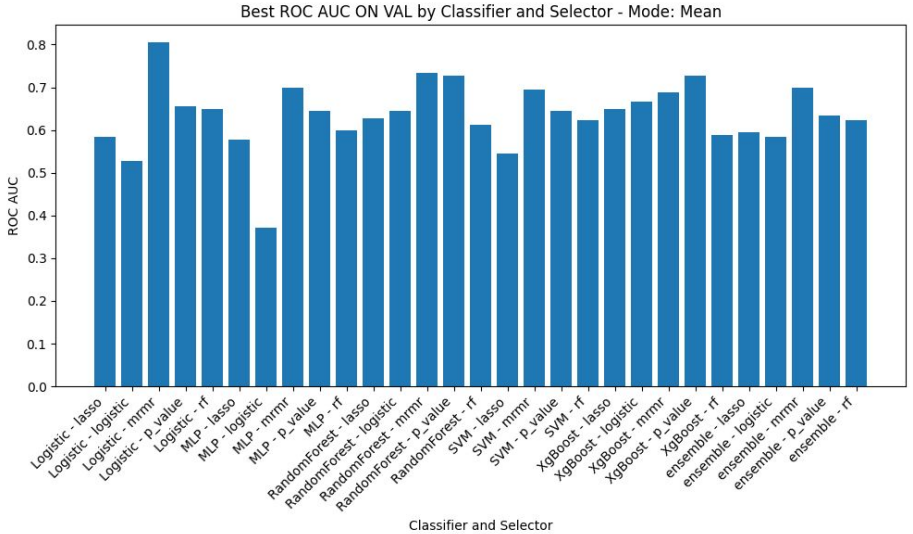
analisi roc sul test



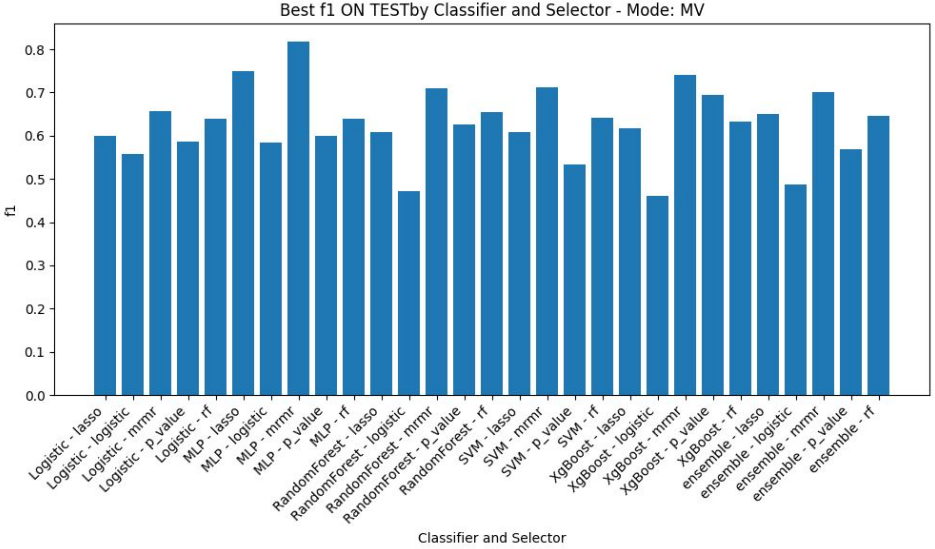


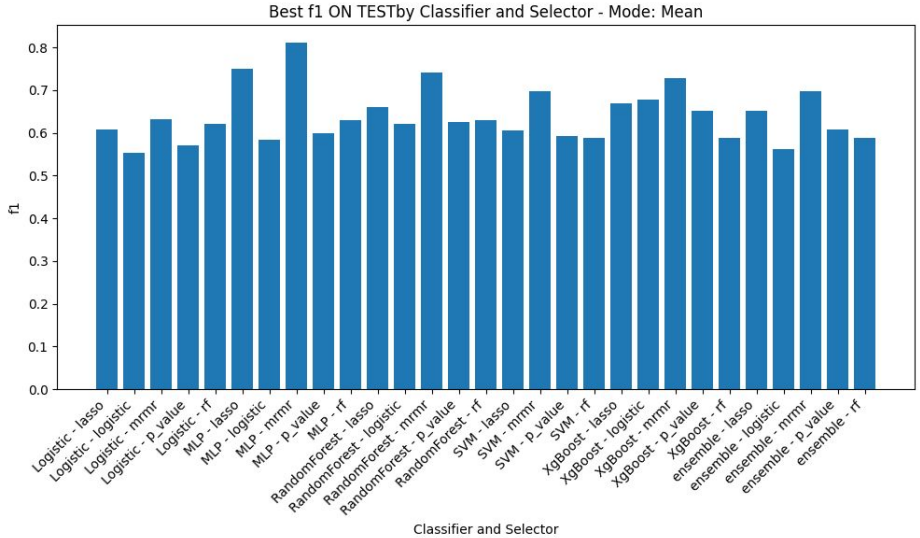
analisi roc sul val



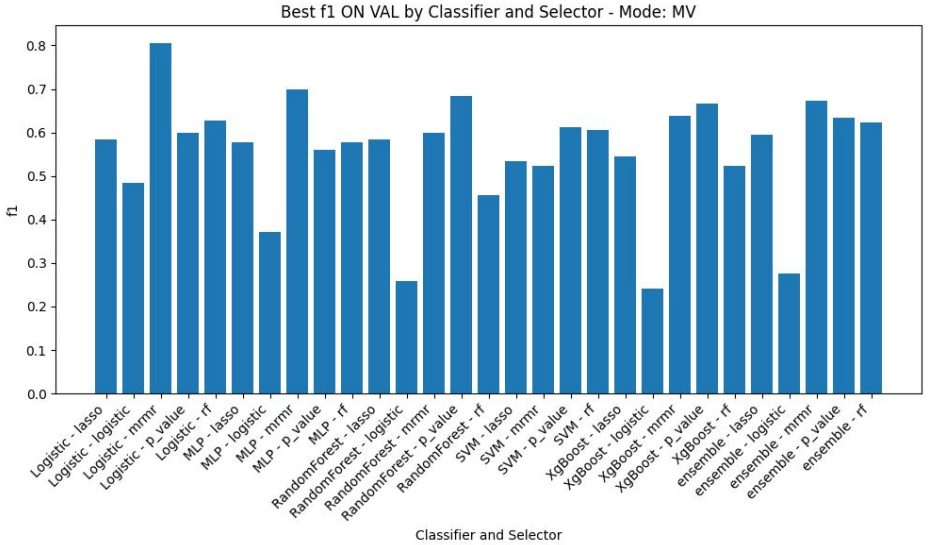


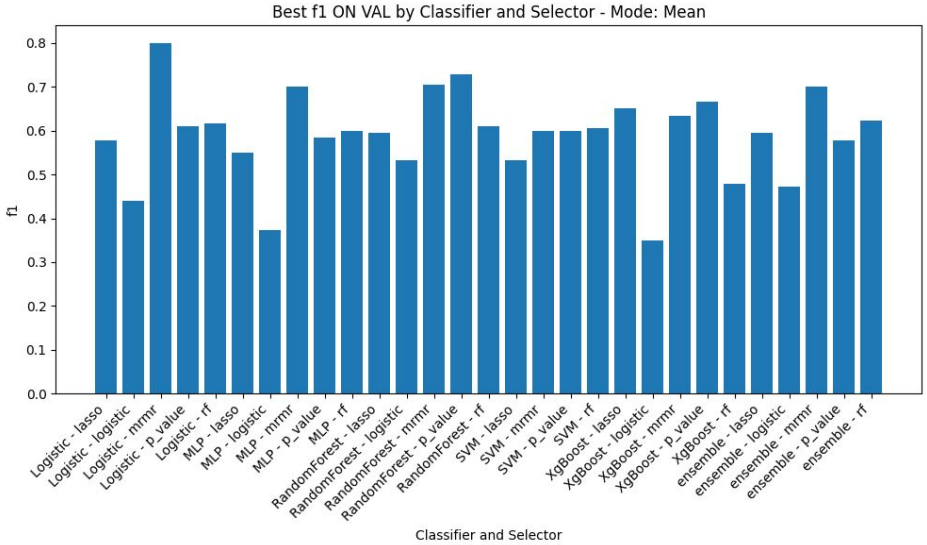
analisi f1 sul test





analisi f1 sul val





OSSERVAZIONI:

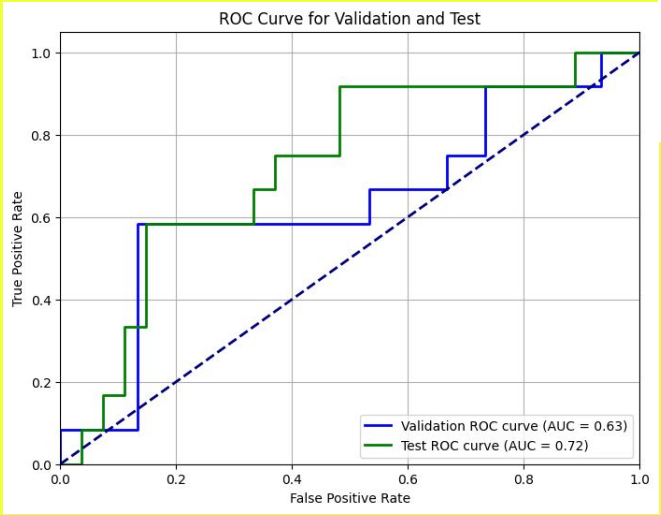
- sul validation selector logistic funziona molto male
- mrmr è il selector che per il test funziona meglio e stessa cosa per il val -> DECISO IL SELECTOR
- MLP mrmr è il caso che ha la roc_auc migliore per test sia per Mean che per MV
- il caso che funziona meglio per roc_auc per val è Logistic mrmr
- Mean funziona meglio di MV

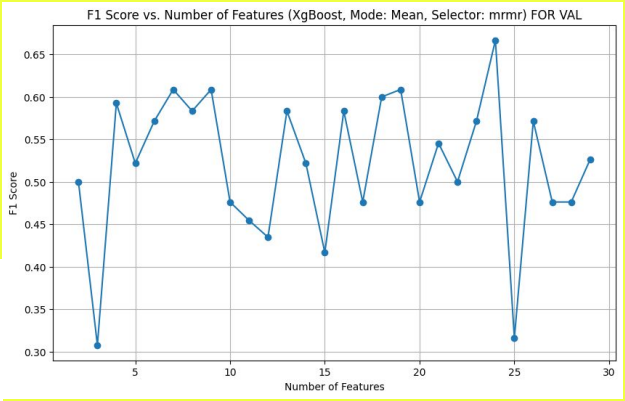
Selezione per f1

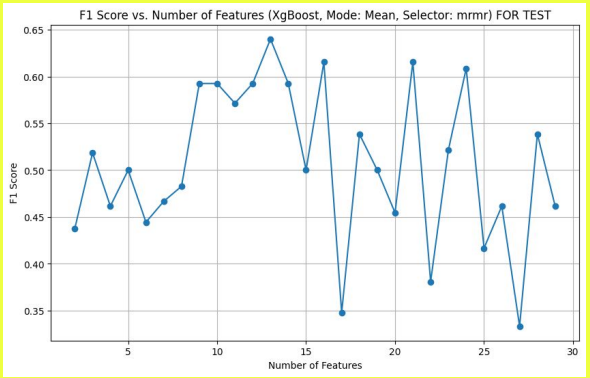
Selector: mrmr
Classifier: XgBoost
Num Features: 24
Mode: Mean

Validation Metrics:
- F1 Score: 0.667
- ROC AUC: 0.633
- PR AUC: 0.618
- accuracy: 0.741
- Confusion Matrix:
[[13 2]
 [5 7]]

Test Metrics:
- F1 Score: 0.609
- ROC AUC: 0.722
- PR AUC: 0.503
- accuracy: 0.769
- Confusion Matrix:
[[23 4]
 [5 7]]







b) Resnet50

Classifier: SVM, Selector: mrmr, Mode: Mean
Risultati sul validation set:
F1 Score: 0.632
PR AUC: 0.796
Accuracy: 0.741
ROC AUC: 0.794

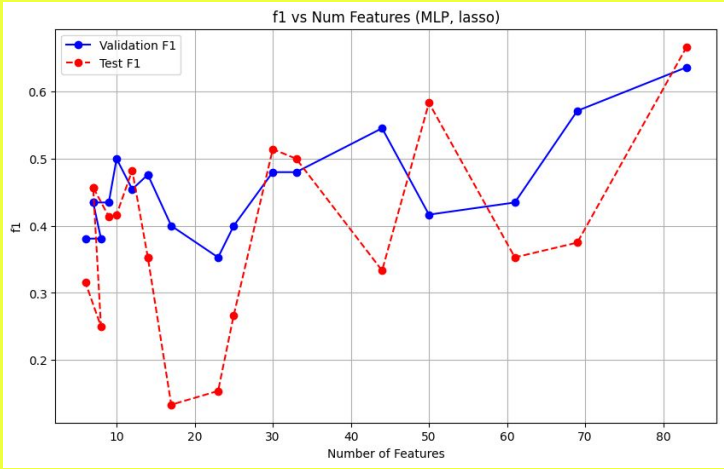
Numero di features: 3
Risultati sul test set:
F1 Score: 0.593
Precision: 0.533
Recall: 0.667
Accuracy: 0.718
PR AUC: 0.603
ROC AUC: 0.793
Confusion Matrix:
[20 7]
[4 8]

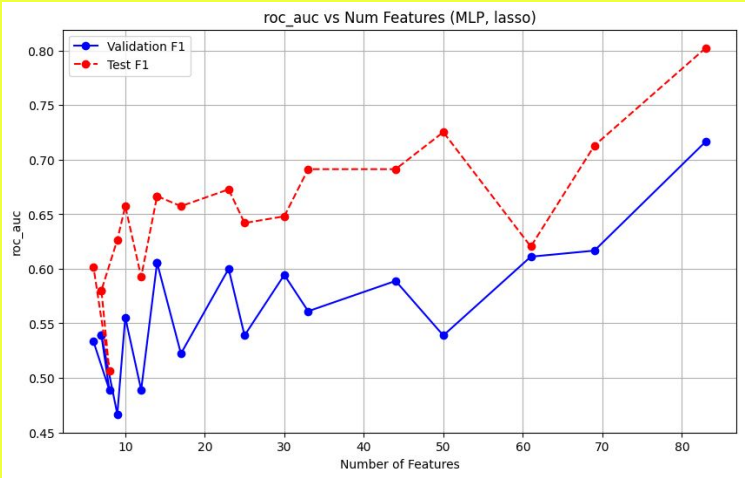
- Pvalue 0.01
- Corr 0.8
- Circa 900 features tra cui ne sceglie 30 massime
- 0.3 test
- Migliore per roc_auc e pr_auc

b) Resnet50 2.5

```
Classifier: MLP
Selector: lasso
Alpha: 0.05
Num Features: 83.0
Mode: Mean
ROC AUC (Test): 0.8025
PR AUC (Test): 0.6657
F1 Score (Test): 0.6897
Accuracy (Test): 0.7692
Confusion Matrix (Test):
[[20  7]
 [ 2 10]]

Corresponding Validation Metrics:
ROC AUC (Validation): 0.7167
PR AUC (Validation): 0.6560
F1 Score (Validation): 0.6364
Accuracy (Validation): 0.7037
Confusion Matrix (Validation):
[[12  3]
 [ 5  7]]
```

- Pvalue 0.01
- Corr 0.8
- Circa 900 features tra cui ne sceglie 30 massime
- 0.3 test
- Migliore per f1





c) InceptionV3

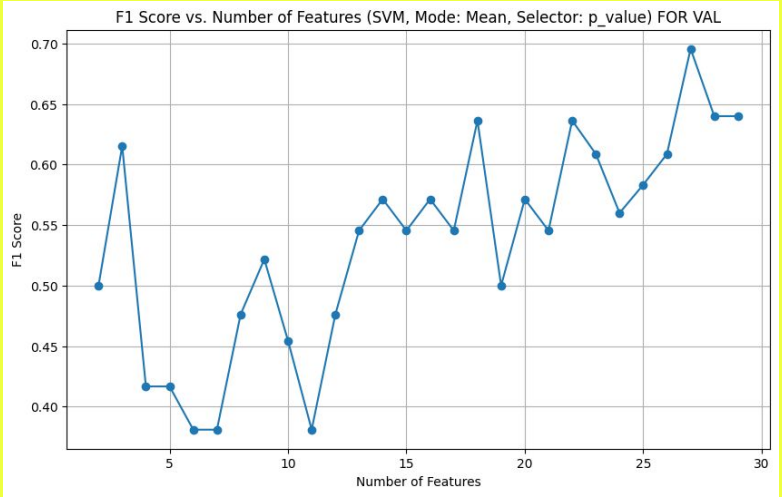
Selector: p_value
Classifier: SVM
Num Features: 27
Mode: Mean

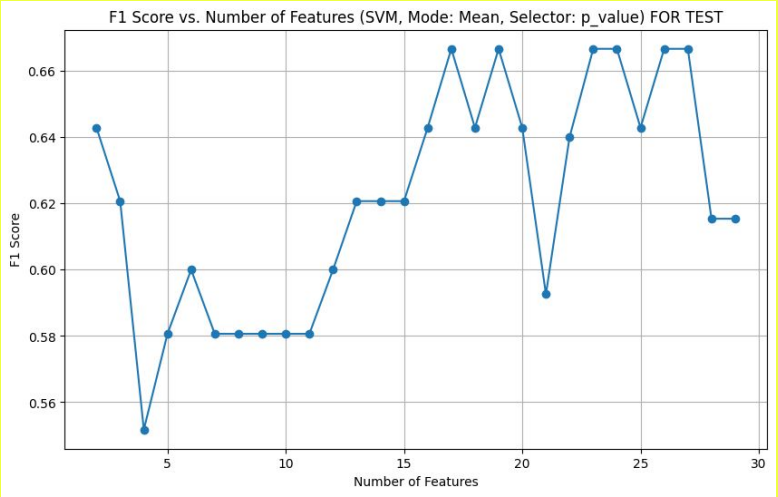
Validation Metrics:
- F1 Score: 0.696
- ROC AUC: 0.628
- PR AUC: 0.635
- Accuracy: 0.741

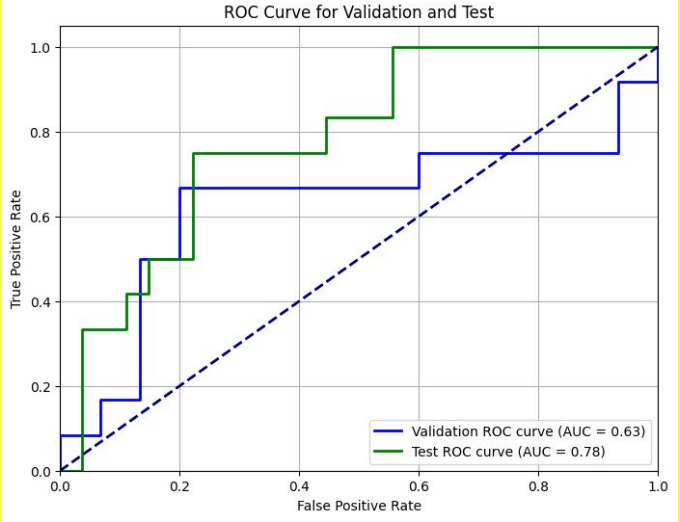
Test Metrics:
- F1 Score: 0.667
- ROC AUC: 0.781
- PR AUC: 0.581
- Accuracy: 0.769
- Confusion Matrix:

```
[[21  6]
 [ 3  9]]
```

- Pvalue 0.01
- Corr 0.8
- max 30 features
- 0.3 test
- Migliore per f1 e pr_auc


F1 Score vs. Number of Features (SVM, Mode: Mean, Selector: p_value) FOR VAL
F1 Score
Number of Features

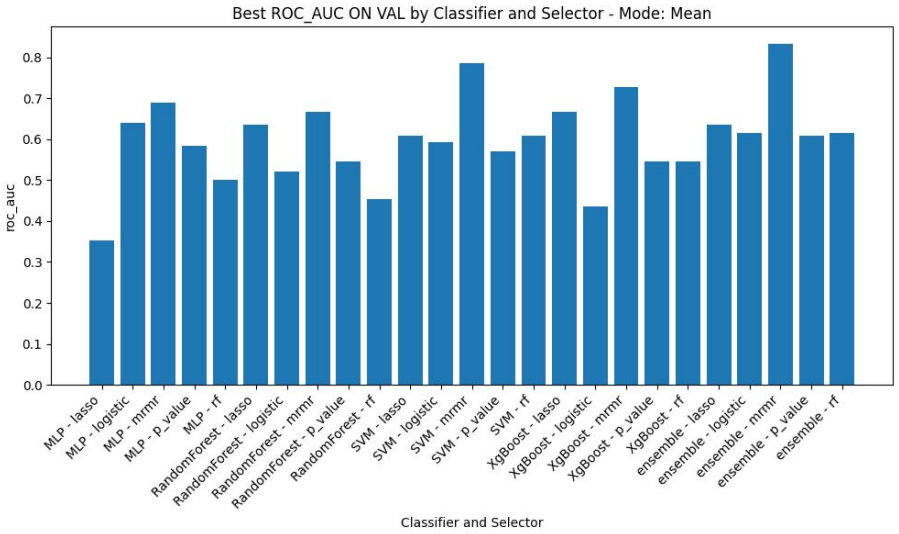

F1 Score vs. Number of Features (SVM, Mode: Mean, Selector: p_value) FOR TEST
F1 Score
Number of Features

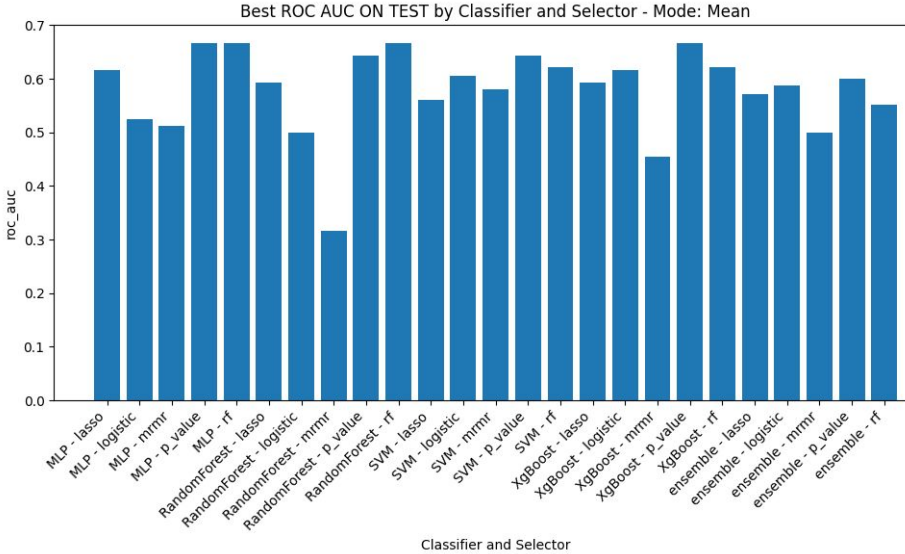

ROC Curve for Validation and Test
True Positive Rate
False Positive Rate
Validation ROC curve (AUC = 0.63)
Test ROC curve (AUC = 0.78)

c) InceptionV3 2.5

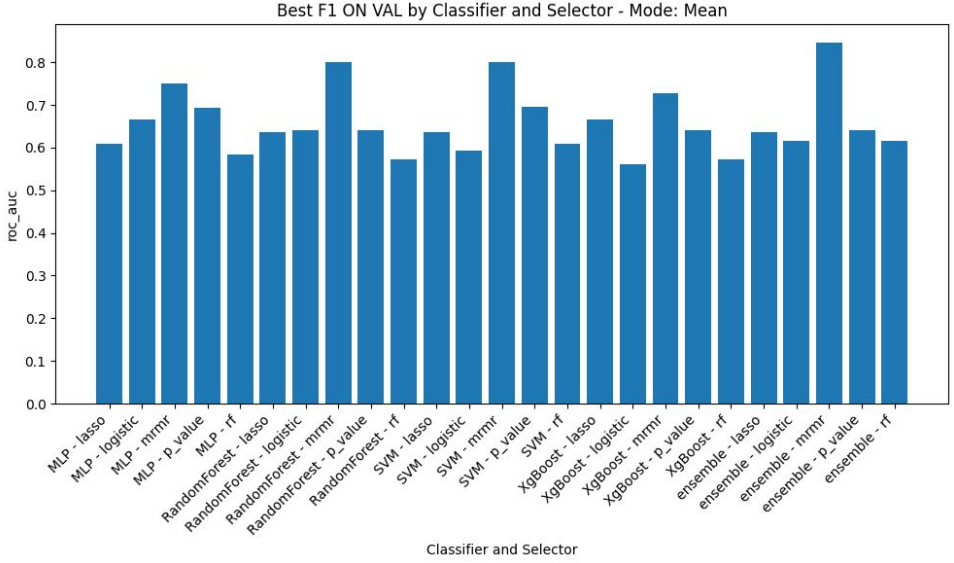
```
Classifier: MLP
Selector: p_value
Num Features: 18.0
Mode: MV
ROC AUC (Test): 0.7685
PR AUC (Test): 0.5843
F1 Score (Test): 0.7200
Accuracy (Test): 0.8205
Confusion Matrix (Test):
[[23  4]
 [ 3  9]]

Corresponding Validation Metrics:
ROC AUC (Validation): 0.6778
PR AUC (Validation): 0.6183
F1 Score (Validation): 0.5833
Accuracy (Validation): 0.6296
Confusion Matrix (Validation):
[[10  5]
 [ 5  7]]
```

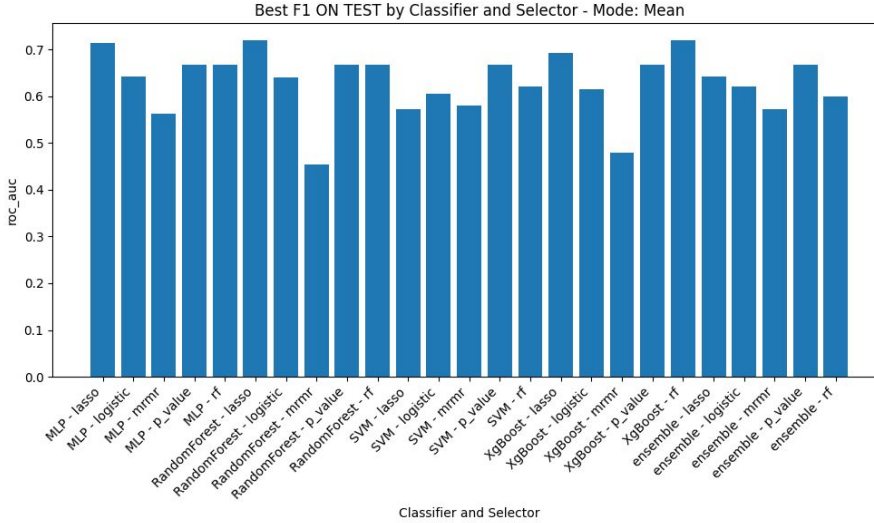
analisi roc_auc per test e val





analisi f1 per test e val





CLASSIFICAZIONE 2D

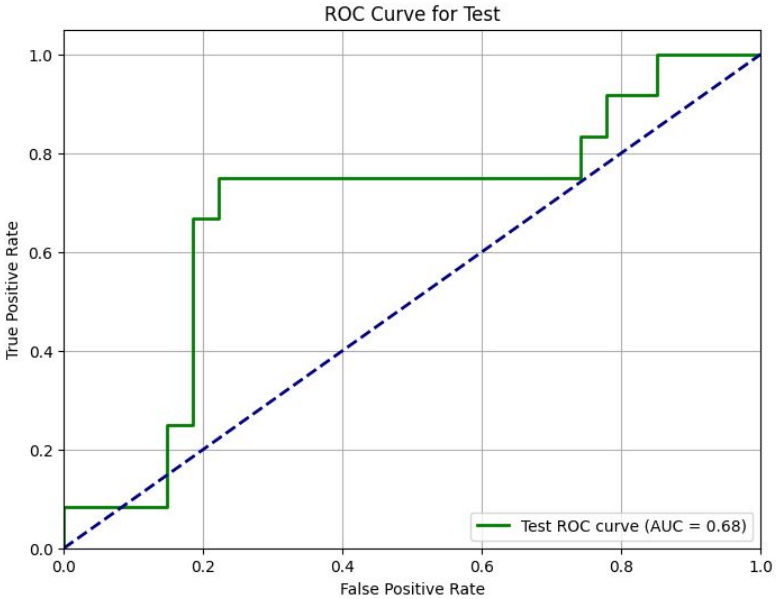
1) con encoder Rete pretrainata:
    a) VGG19
    b) Resnet 50
    c) InceptionV3

La rete estrae la feature map della slice con area maggiore per ogni placca

a) VGG19 slice maggiore

Classifier: SVM
Selector: lasso
Alpha: 0.006410256410256410
Performance medie sul val set:
F1 = 0.643 (std = 0.1576)
PR AUC = 0.7257 (std = 0.117)
ROC AUC = 0.763 (std = 0.087)
Accuracy = 0.7 (std = 0.108)

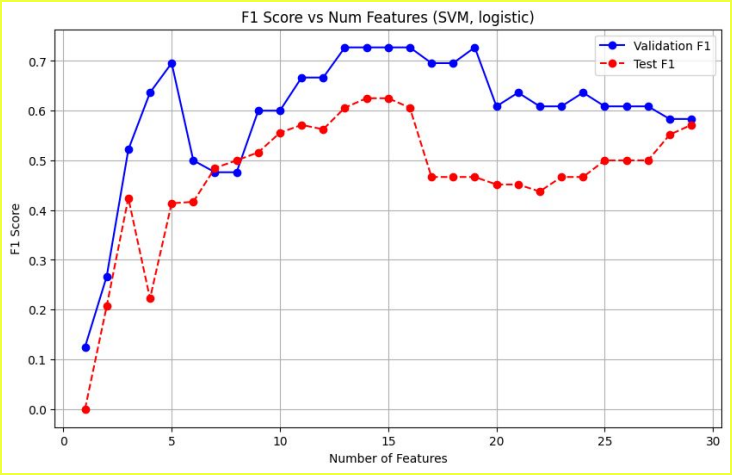
Metrics on the TEST set:
Precision-Recall AUC: 0.482
ROC AUC: 0.682
F1 Score: 0.621
Accuracy: 0.718
Confusion Matrix:
[[19 8]
 [3 9]]

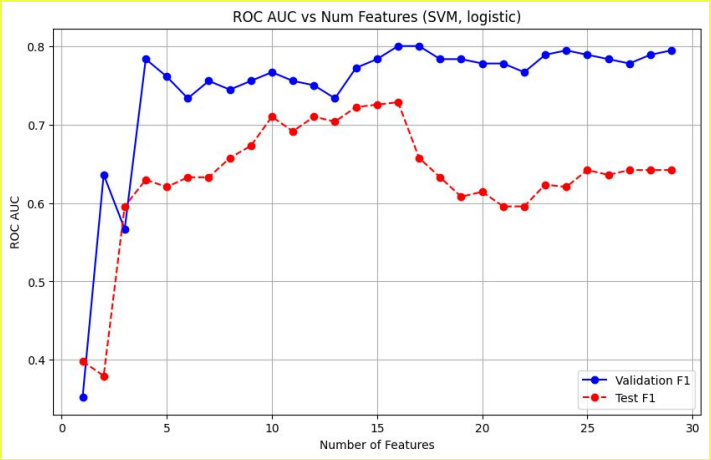


a) VGG19 slice maggiore

0.8, 0.05 (53) limit 30 (con nuovo train)

```
Classifier: SVM
Selector: logistic
Num Features: 15.0
ROC AUC (Test): 0.7253
F1 Score (Test): 0.6250
Accuracy (Test): 0.6923
Confusion Matrix (Test):
[[17 10]
 [ 2 10]]

Corresponding Validation Metrics:
ROC AUC (Validation): 0.7833
F1 Score (Validation): 0.7273
Accuracy (Validation): 0.7778
Confusion Matrix (Validation):
[[13  2]
 [ 4  8]]
```

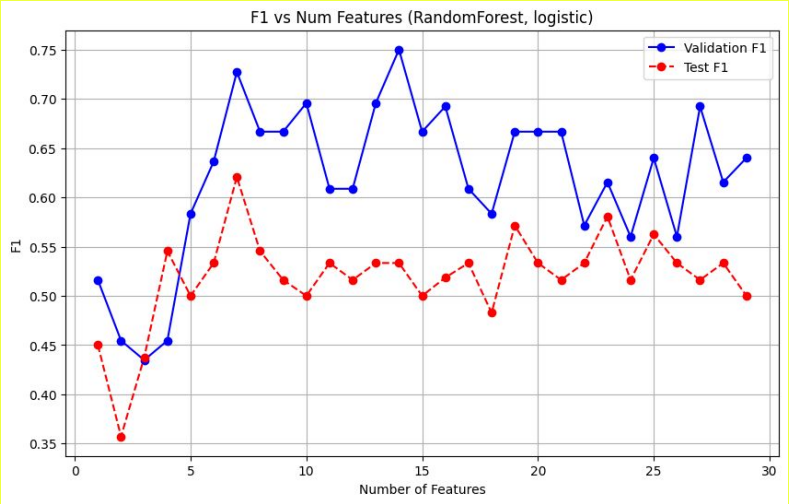


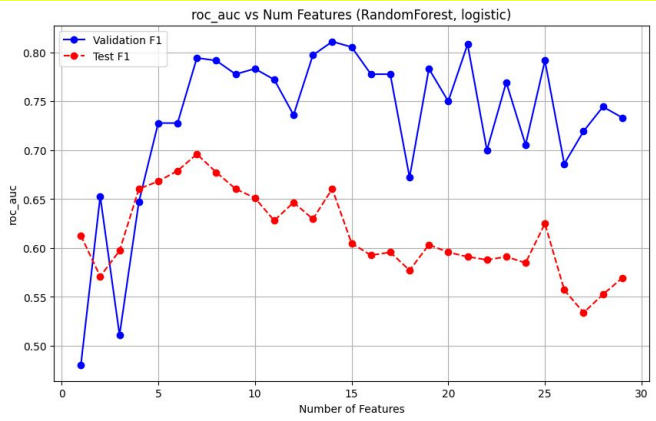


a) VGG19 slice maggiore

0.8, 0.05 (53) limit 30 (con stesso train)

```
Classifier: RandomForest
Selector: logistic
Num Features: 7.0
ROC AUC (Test): 0.6960
F1 Score (Test): 0.6207
Accuracy (Test): 0.7179
Confusion Matrix (Test):
[[19  8]
 [ 3  9]]

Corresponding Validation Metrics:
ROC AUC (Validation): 0.7944
F1 Score (Validation): 0.7273
Accuracy (Validation): 0.7778
Confusion Matrix (Validation):
[[13  2]
 [ 4  8]]
```





b) Resnet slice maggiore

Classifier: XgBoost
Selector: p_value
Num_features: 12
Performance medie sul val set:
F1 = 0.685 (std = 0.1462)
PR AUC = 0.733 (std = 0.137)
Accuracy = 0.711(std = 0.164)

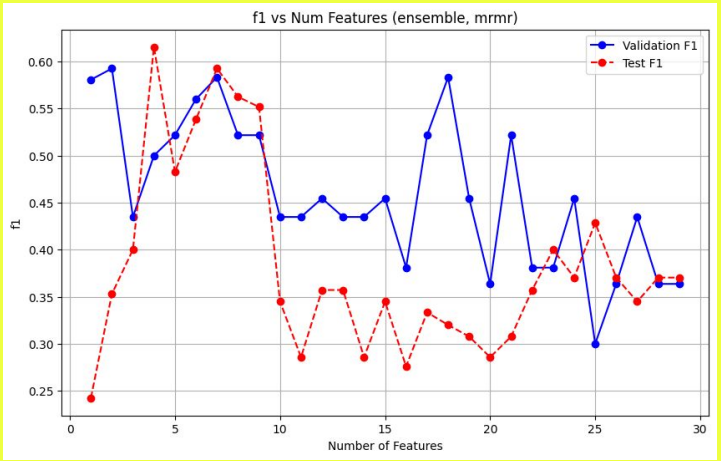
Metrics on the TEST set:
Precision-Recall AUC: 0.345
ROC AUC: 0.614
F1 Score: 0.562
Accuracy: 0.641
Confusion Matrix:
[[16 11]
 [3 9]]

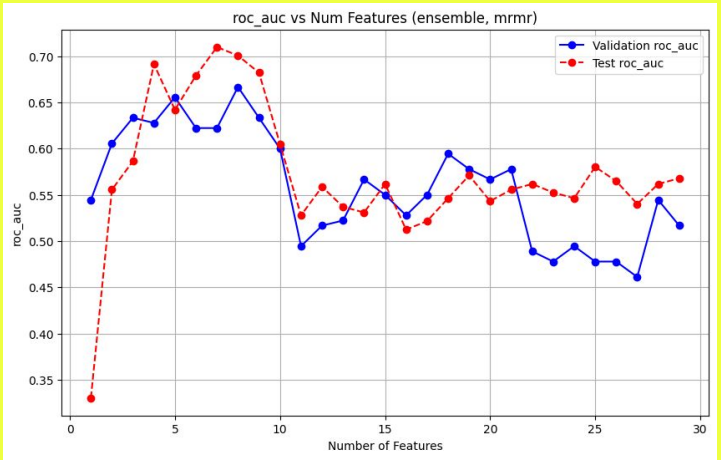
- correlation: 0.8
- p_value: 0.05
- cross val: 5 fold
- split: 0.3 test
- Migliore in base a roc auc e pr auc

b) Resnet slice maggiore stesso train

```
Classifier: ensemble
Selector: mrmr
Num Features: 7.0
ROC AUC (Test): 0.7099
F1 Score (Test): 0.5926
Accuracy (Test): 0.7179
Confusion Matrix (Test):
[[20  7]
 [ 4  8]]

Corresponding Validation Metrics:
ROC AUC (Validation): 0.6222
F1 Score (Validation): 0.5833
Accuracy (Validation): 0.6296
Confusion Matrix (Validation):
[[10  5]
 [ 5  7]]
```

- correlation: 0.8
- p_value: 0.05
- split: 0.3 test
- Migliore in base a f1





c) InceptionV3 slice maggiore

Classifier: RandomForest
Selector: logistic
Num_features: 17
Threshold: 0.5
Performance medie sul val set:
F1 = 0.724 (std = 0.102)
PR AUC = 0.649 (std = 0.078)
Accuracy = 0.744 (std = 0.063)

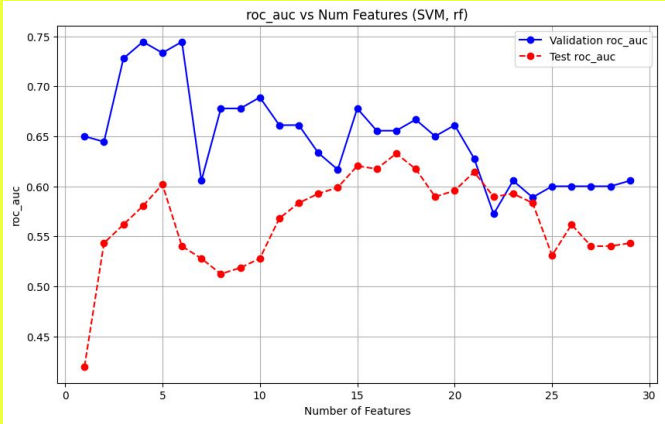
Metrics on the TEST set:
Precision-Recall AUC: 0.379
ROC AUC: 0.64
F1 Score: 0.533
Accuracy: 0.641
Confusion Matrix:
[[17 10]
 [4 8]]

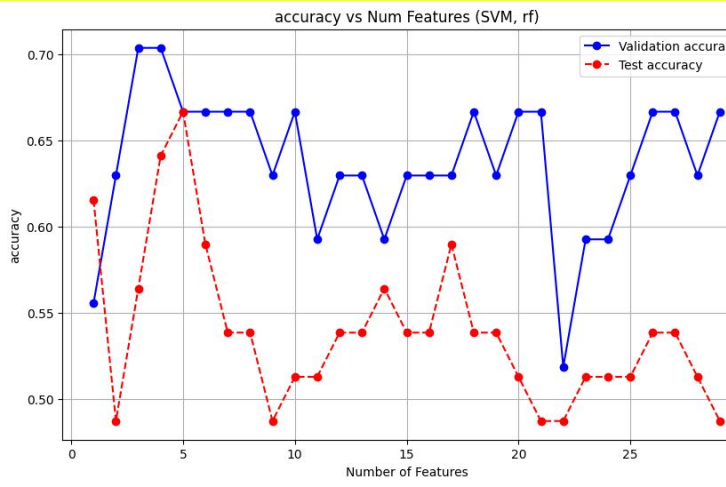
- correlation: 0.8
- p_value: 0.05
- cross val: 5 fold
- split: 0.3 test
- Migliore in base a roc auc e pr auc

c) InceptionV3 slice maggiore nuovo test

```
Test Metrics:
Classifier: SVM
Selector: rf
Num Features: 5.0
ROC AUC (Test): 0.6019
F1 Score (Test): 0.4800
Accuracy (Test): 0.6667
Confusion Matrix (Test):
[[20  7]
 [ 6  6]]

Corresponding Validation Metrics:
ROC AUC (Validation): 0.7333
F1 Score (Validation): 0.6087
Accuracy (Validation): 0.6667
Confusion Matrix (Validation):
[[11  4]
 [ 5  7]]
```

- correlation: 0.8
- p_value: 0.05
- cross val: 5 fold
- split: 0.3 test
- Migliore in base a roc auc e accuracy
- (f1 max per il test è 0.55)





Radiomica 2D

```
--- Test Metrics for Classifier: RandomForest,
Selector: logistic ---
Num Features: 10.0
ROC AUC (Test): 0.6975
F1 Score (Test): 0.6154
Accuracy (Test): 0.7436
Confusion Matrix (Test):
[[21  6]
 [ 4  8]]

--- Validation Metrics for Classifier:
RandomForest, Selector: logistic ---
Num Features: 10.0
ROC AUC (Validation): 0.7722
F1 Score (Validation): 0.8000
Accuracy (Validation): 0.8148
Confusion Matrix (Validation):
[[12  3]
 [ 2 10]]
```