CROSS VALIDATION 5 fold

correlation 0.9
p-value 0.05

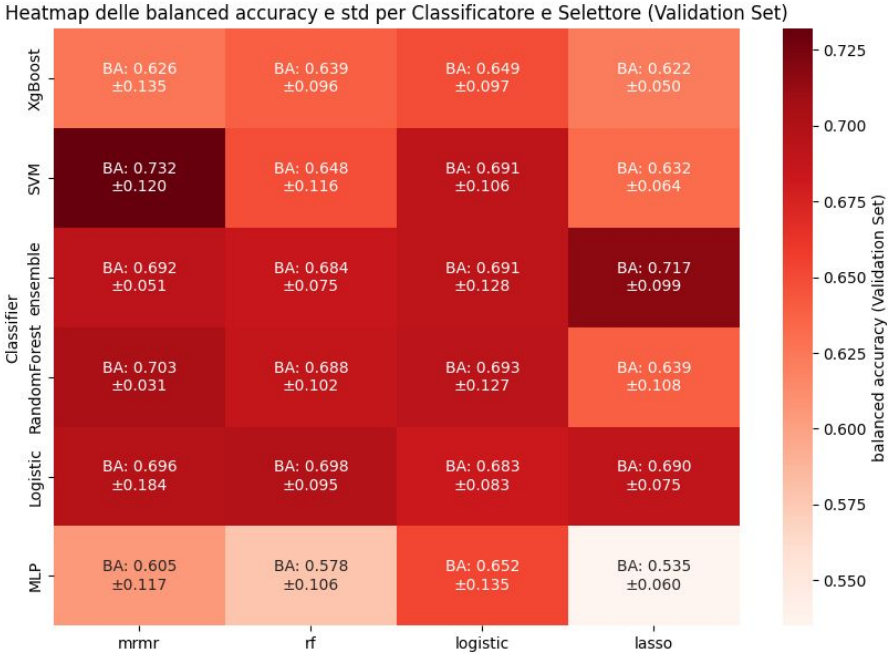
classifiers=['XgBoost', 'SVM', 'ensemble','RandomForest', 'Logistic', 'MLP']
selectors=['mrmr','rf', 'logistic', 'lasso']

Trovo la configurazione migliore basandomi su balanced accuracy e in caso di parità su roc_auc:

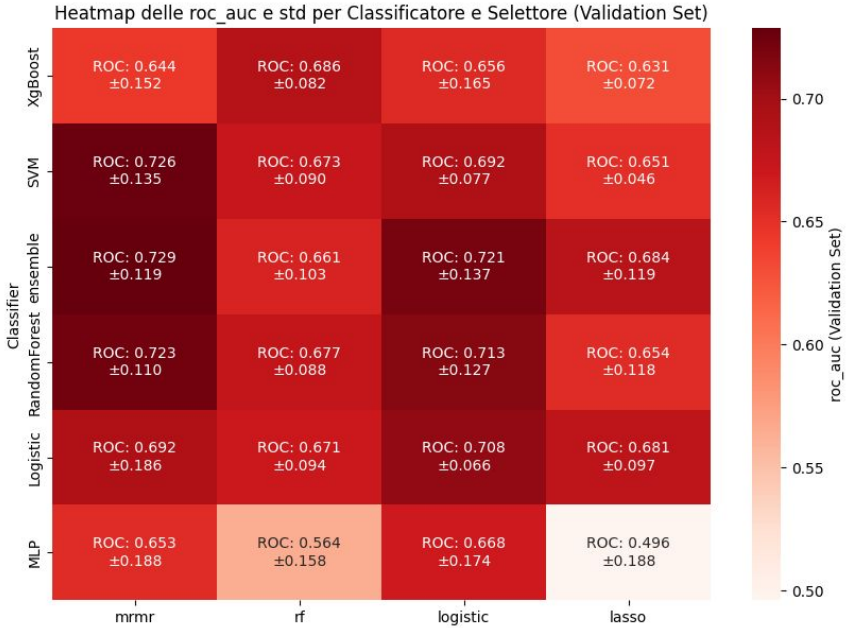
Poi rialleno il test in due casi:

- con selector e num_features /alpha migliore trovato
- con le feature selezionate dal validation
    - in 4 modi: ['Only the features in every fold', 'All the features', 'Features in at least 3 folds', 'Features in the best fold']

RADIOMICA Validation



Balanced accuracy



Roc Auc

Risultati Radiomica

type of features	Classifier	Selector	number features	roc auc val avg	bal accuracy val avg	roc auc test	bal accuracy test	f1 test	accuracy	confusion matrix test
Radiomica Wavelet Numero fisso	SVM	mrmr	4	0.726(std= 0.134)	0.732 (std = 0.12)	0.62	0.532	0.3	0.532	[[22 5] [9 3]]

type of features	Classifier	Selector	number features	roc auc val avg	bal accuracy val avg	roc auc test	bal accuracy test	f1 test	accuracy	confusion matrix test
Radiomica Wavelet features fisse	SVM	mrmr	4	0.726(std= 0.134)	0.732 (std = 0.12)	0.62	0.532	0.3	0.532	[[22 5] [9 3]]

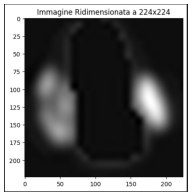
MODALITA DI TEST EFFETTUATI:

2 tipi di encoder:

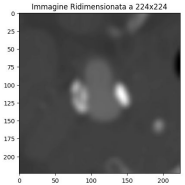
1) Allenato su Imagenet
2) Allenato su immagini mediche

3 tipi di immagini:

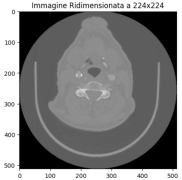
a) Annerita intorno alla roi



b) Non annerita intorno alla roi



c) Non tagliata



MODALITA DI TEST EFFETTUATI per il combinato Deep + Radiomica:

Come abbiamo effettuato i test:

- Per ogni rete, prendo le features trovate dal (classificatore, selector, num_features) migliore ((quelli nelle tabelle))
  + quelle trovate per la Radiomica

- Attraverso l'uso di 1 validation trovo il classificatore migliore

- Alleno in due modalità:
  1) classificando il test con <u>tutte</u> le features deep + radiomica
  2) classificando il test selezionando le features per feature importance (tenendo quelle che hanno importance > 50% di quella più importante)

MODALITA DI TEST EFFETTUATI per l’ensemble:

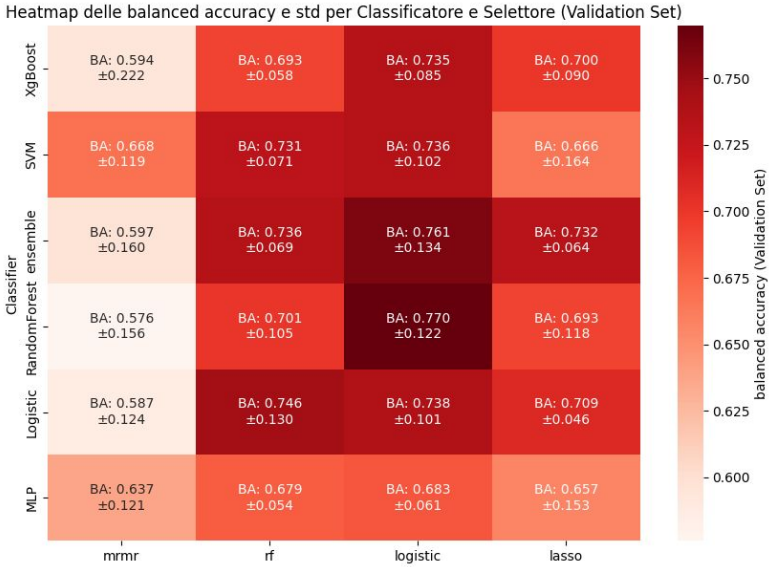
Come abbiamo effettuato i test:

- Hard voting classico

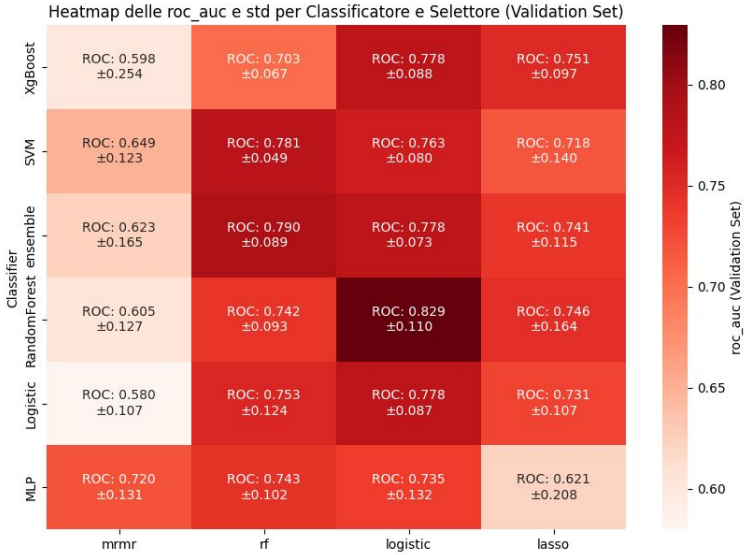
- Soft Voting con pesi uguali (1/3) per tutte e 3 le reti

- Soft Voting con pesi personalizzati che penalizzano i modelli con validation più basso e std più alta. Il peso viene calcolato come (balanced_val/1+std)/totale_delle_balanced

Resnet Validation 1) a)



Balanced accuracy



Roc Auc

CLASSIFICATORI MIGLIORI GLOBALI 1) a)

Dalla cross validation fisso selector e num_features/ alpha

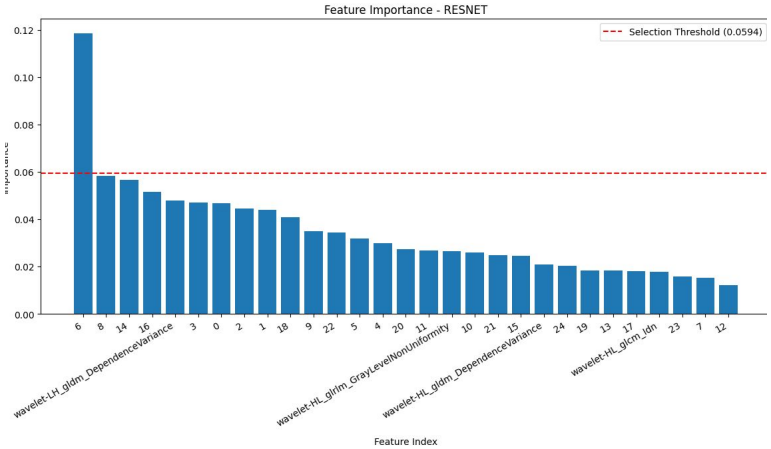
type of features	Classifier	Selector	number features	roc auc val avg	bal accuracy val avg	roc auc test	bal accuracy test	f1 test	accuracy	confusion matrix test
VGG19	ensemble	logistic	2	0.711 (std = 0.09)	0.724 (std = 0.11)	0.611	0.588	0.467	0.59	[[16 11] [5 7]]
Resnet50	Random Forest	logistic	25	0.829(std= 0.11)	0.77(std = 0.12)	0.745	0.731	0.625	0.692	[[17 10] [2 10]]
InceptionV3	XgBoost	lasso	9 (test) alpha = 0.189655 17241379 31	0.784(std= 009)	0.722 (std= 0.07)	0.42	0.431	0.3125	0.436	[[[12 15] [7 5]]

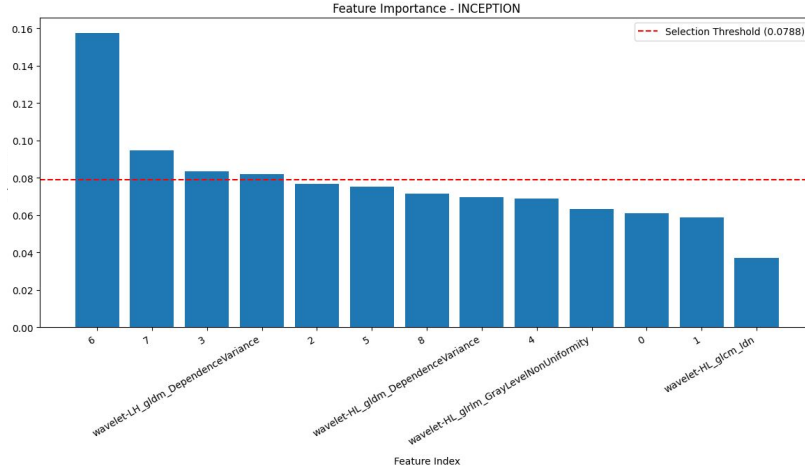
CLASSIFICATORI MIGLIORI GLOBALI 1) a)

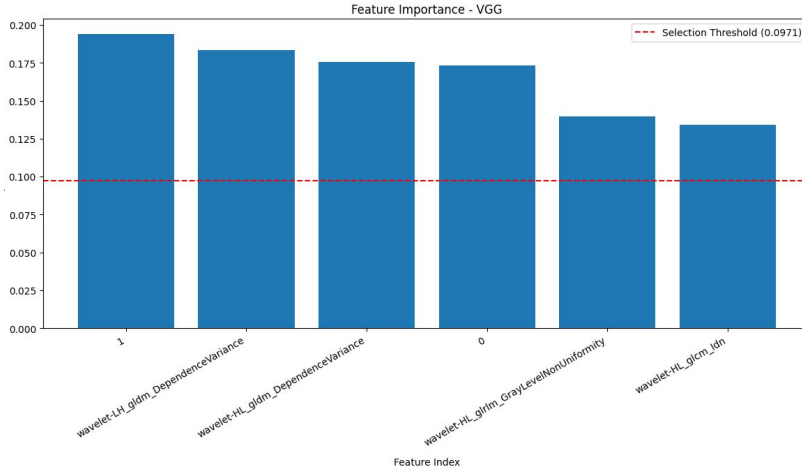
Dalla cross validation fisso le features in at least 3 fold

type of features	Classifier	Selector	number features	roc auc val avg	bal accuracy val avg	roc auc test	bal accuracy test	f1 test	accuracy	confusion matrix test
VGG19	ensemble	logistic	2	0.711 (std = 0.09)	0.724 (std = 0.11)	0.586	0.569	0.452	0.564	[[15 12] [5 7]]
Resnet50	Random Forest	logistic	17	0.829(std= 0.11)	0.77(std = 0.12)	0.704	0.611	0.5	0.59	[[15 12] [4 8]]
InceptionV3	XgBoost	lasso	6	0.784(std= 009)	0.722 (std= 0.07)	0.5	0.509	0.387	0.513	[[[14 13] [6 6]]

Importance caso 1) a) Numero fisso





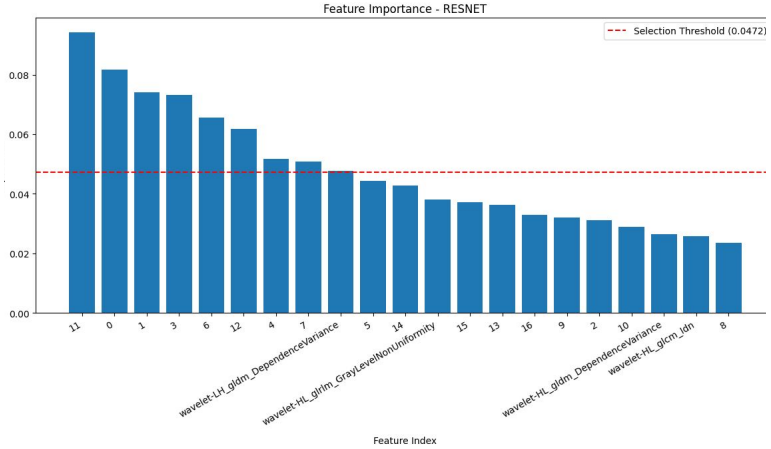


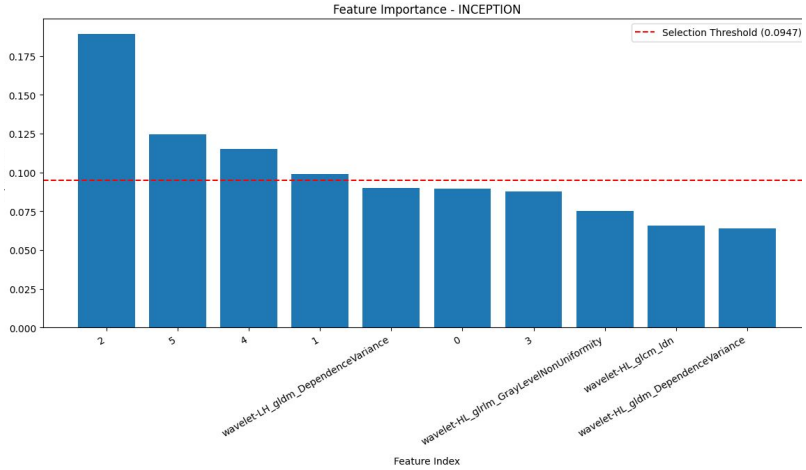
Combinazione Radiomica + PreTrainate caso 1) a)

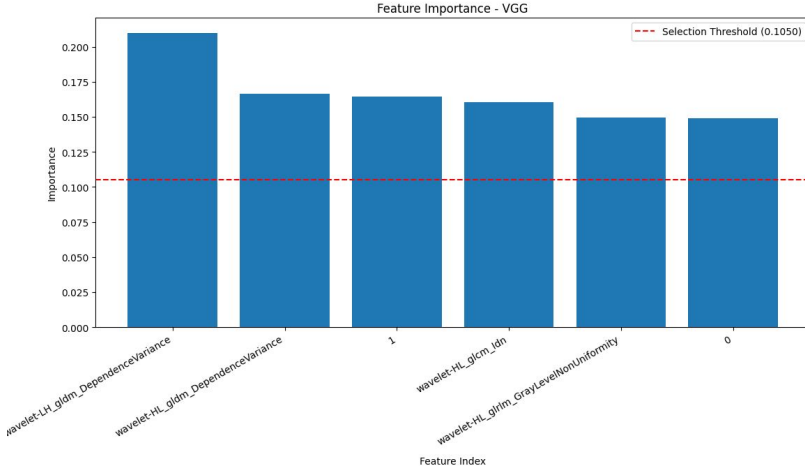
Solo Importance per tutti i casi

type of features	Classifier	Mode	number features	roc auc val avg	bal accuracy val avg	roc auc test	bal accuracy test	f1 test	accuracy	confusion matrix test
Resnet	ensemble	Numero fisso	1	0.883	0.850	0.696	0.611	0.50	0.59	[15 12 4 8]
VGG	SVM	Numero fisso	6	0.744	0.683	0.59	0.50	0.32	0.564	[18 9 8 4]
Inception	Xgboost	Numero fisso	4	0.822	0.733	0.466	0.431	0.313	0.434	[12 15 7 5]

Importance caso 1) a) Features fisse







Combinazione Radiomica + PreTrainate caso 1) a)

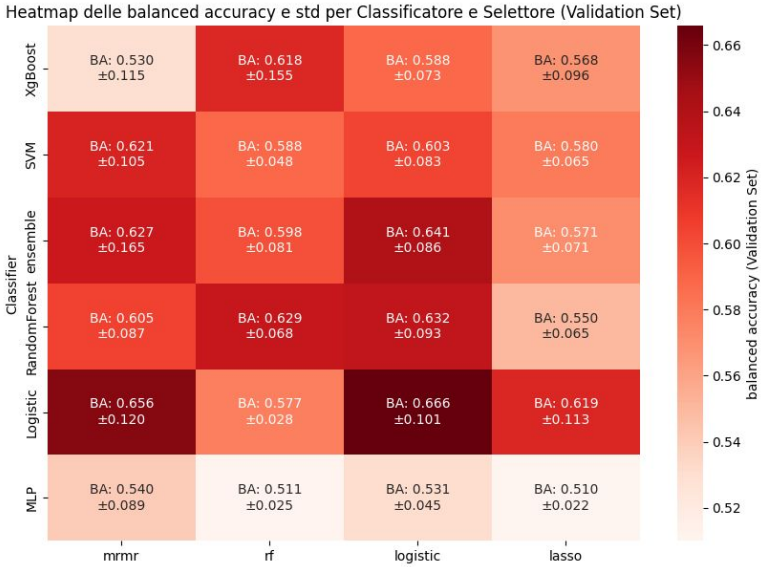
Solo Importance per tutti i casi

type of features	Classifier	Mode	number features	roc auc val avg	bal accuracy val avg	roc auc test	bal accuracy test	f1 test	accuracy	confusion matrix test
Resnet	Random Forest	features fisse	9	0.789	0.75	0.499	0.519	0.432	0.462	[10 17 4 8]
VGG	Logistic	features fisse	6	0.622	0.633	0.627	0.579	0.417	0.641	[20 7 7 5]
Inception	ensemble	features fisse	4	0.772	0.692	0.515	0.514	0.412	0.487	[12 15 5 7]

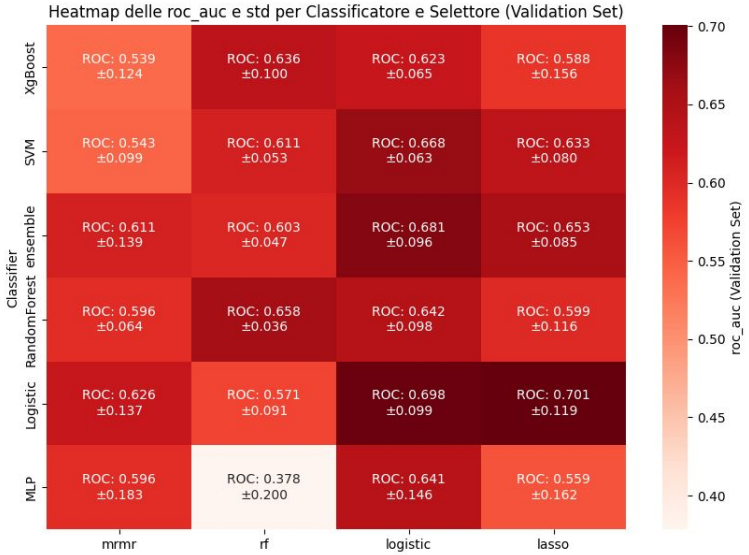
Ensemble dei 3 classificatori 1) a)

Tipo voting	Tipologia	Roc Auc	Bal Acc	F1	Accuracy	Conf Matrix
Hard	Numero features	Na	0.667	0.552	0.667	18 9 4 8
Hard	At least 3 fold	Na	0.606	0.483	0.615	17 10 5 7
Soft uguali	Numero features	0.59	0.551	0.438	0.538	14 13 5 7
Soft uguali	At least 3 fold	0.586	0.569	0.452	0.564	15 12 5 7
Soft bilanciato	Numero features	0.59	0.551	0.438	0.538	14 13 5 7
Soft bilanciato	At least 3 fold	0.586	0.569	0.452	0.564	15 12 5 7

Inception Validation 2) a)



Balanced accuracy



Roc Auc

CLASSIFICATORI MIGLIORI GLOBALI caso 2) a)

Dalla cross validation fisso selector e num_features/ alpha

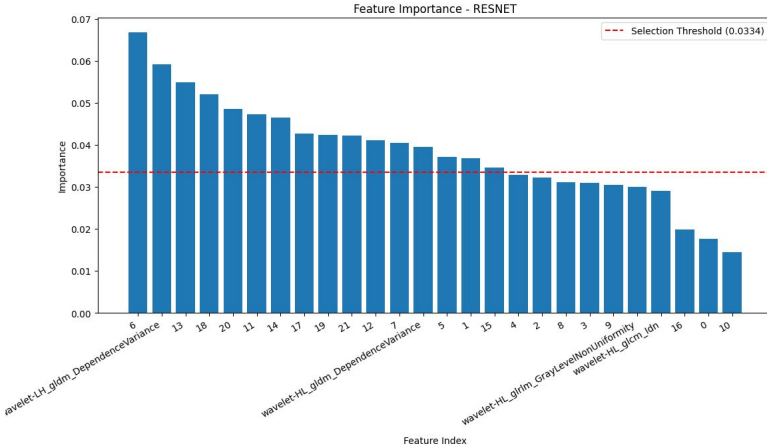
type of features	Classifier	Selector	number features	roc auc val avg	bal accuracy val avg	roc auc test	bal accuracy test	f1 test	accuracy	confusion matrix test
Inception	Logistic	logistic	25	0.698(std= 0.1)	0.666 (std = 0.1)	0.472	0.472	0.364	0.462	[[12 15] [6 6]]
Resnet	SVM	logistic	22	0.793 (std = 0.1)	0.778 (std = 0.09)	0.268	0.315	0.228	0.308	[[8 19] [8 4]]
Resnet Inception	XgBoost	logistic	23	0.783(std= 0.15)	0.717(std= 0.11)	0.469	0.463	0.296	0.513	[[16 11] [8 4]]

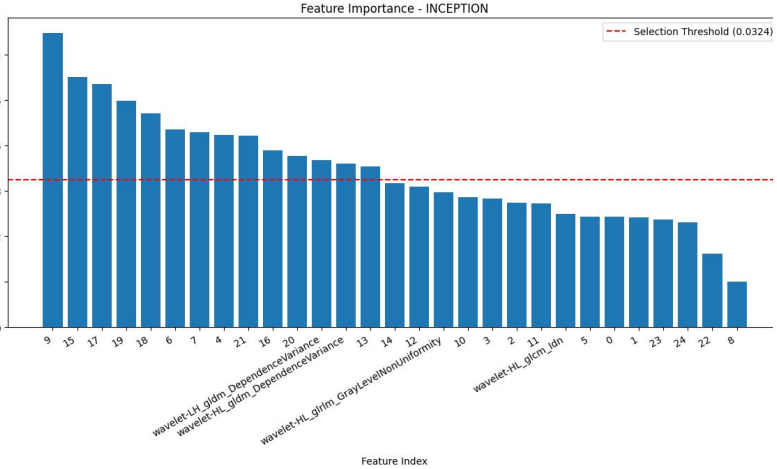
CLASSIFICATORI MIGLIORI GLOBALI caso 2) a)

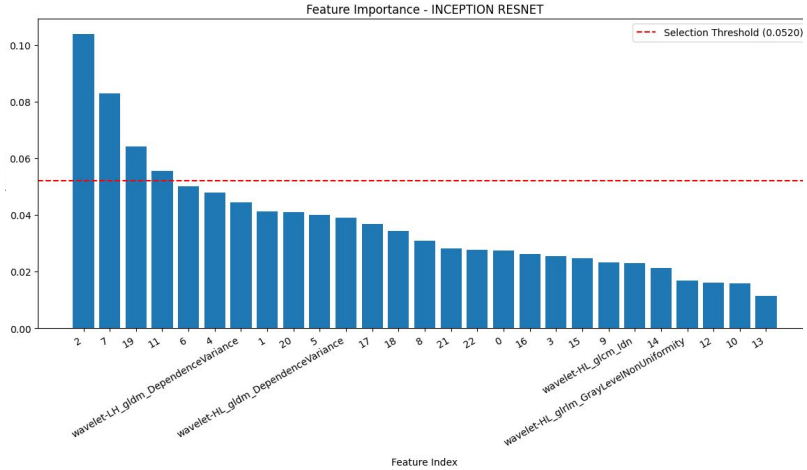
Dalla cross validation fisso le features in AT LEAST 3 FOLD

type of features	Classifier	Selector	number features	roc auc val avg	bal accuracy val avg	roc auc test	bal accuracy test	f1 test	accuracy	confusion matrix test
Inception	Logistic	logistic	20	0.698(std= 0.1)	0.666 (std = 0.1)	0.497	0.514	0.412	0.487	[[12 15] [5 7]]
Resnet	SVM	logistic	21	0.793 (std = 0.1)	0.778 (std = 0.09)	0.318	0.426	0.276	0.462	[[14 13] [8 4]]
Resnet Inception	XgBoost	logistic	19	0.783(std= 0.15)	0.717(std= 0.11)	0.475	0.426	0.276	0.475	[[14 13] [8 4]]

Importance caso 2) a) Numero fisso





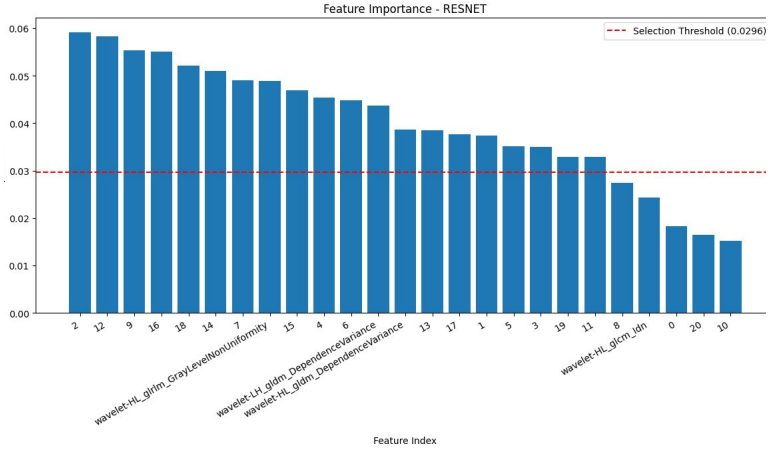


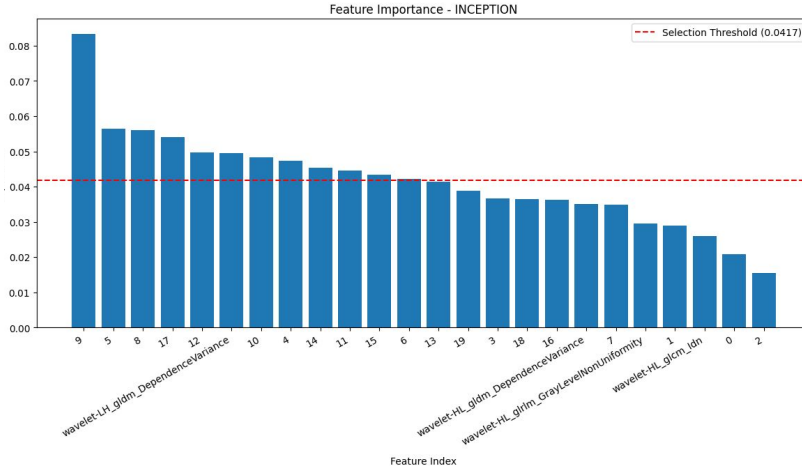
Combinazione Radiomica + PreTrainate caso 2) a)

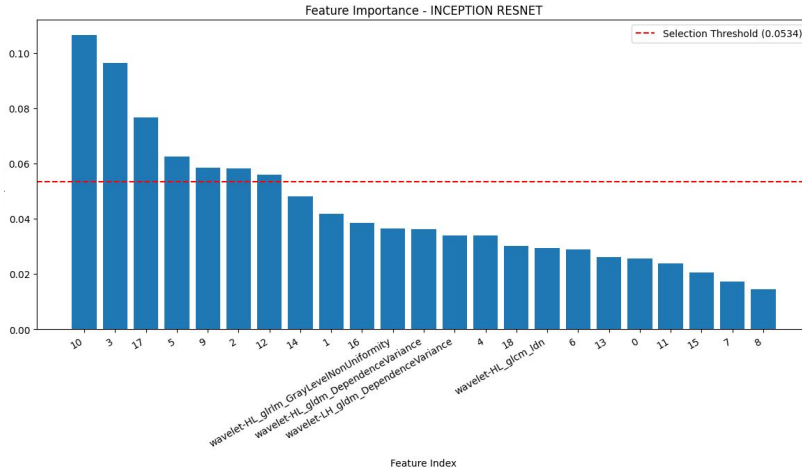
Solo Importance per tutti i casi

type of features	Classifier	Mode	number features	roc auc val avg	bal accuracy val avg	roc auc test	bal accuracy test	f1 test	accuracy	confusion matrix test
Resnet	Logistic	Numero fisso	16	0.922	0.85	0.37	0.310	0.188	0.333	[10 17 9 3]
INCRES	Random Forest	Numero fisso	4	0.694	0.658	0.389	0.412	0.303	0.410	[11 16 7 5]
Inception	Logistic	Numero fisso	14	0.733	0.65	0.407	0.403	0.222	0.462	[15 12 9 3]

Importance caso 2) a) Features fisse







Combinazione Radiomica + PreTrainate caso 2) a)

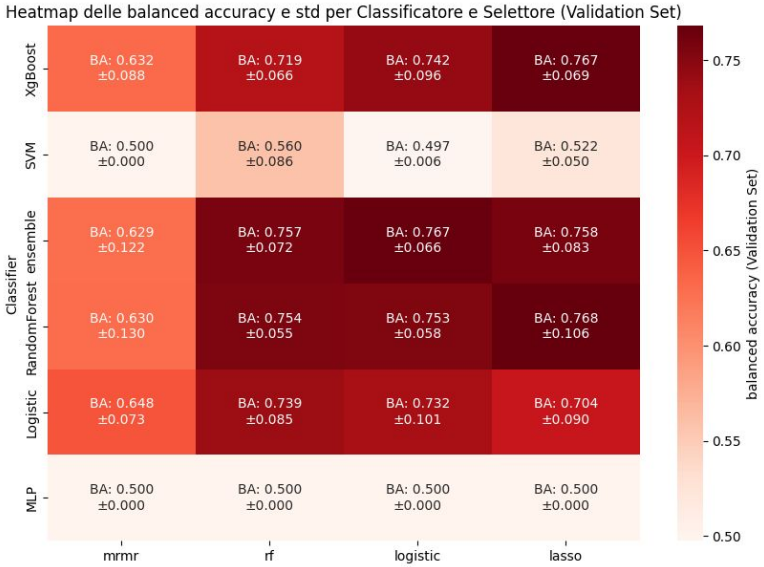
Solo Importance per tutti i casi

type of features	Classifier	Mode	number features	roc auc val avg	bal accuracy val avg	roc auc test	bal accuracy test	f1 test	accuracy	confusion matrix test
Resnet	Random Forest	features fisse	20	0.95	0.925	0.34	0.366	0.207	0.41	[13 14 9 3]
INCEPTION RESNET	XgBoost	features fisse	7	0.833	0.733	0.50	0.4722	0.264	0.462	[12 15 6 6]
Inception	Logistic	features fisse	12	0.728	0.692	0.426	0.509	0.387	0.513	[14 13 6 6]

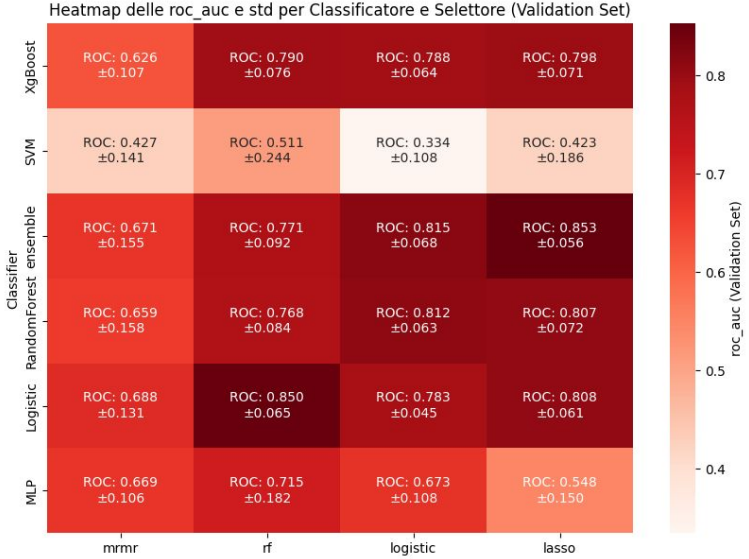
Ensemble dei 3 classificatori 2) a)

Tipo voting	Tipologia	Roc Auc	Bal Acc	F1	Accuracy	Conf Matrix
Hard	Numero features	Na	0.312	0.242	0.359	10 17 8 4
Hard	At least 3 fold	Na	0.509	0.387	0.513	14 13 6 6
Soft uguali	Numero features	0.284	0.31	0.188	0.333	10 17 9 3
Soft uguali	At least 3 fold	0.33	0.352	0.242	0.359	10 17 8 4
Soft bilanciato	Numero features	0.290	0.31	0.188	0.333	10 17 9 3
Soft bilanciato	At least 3 fold	0.312	0.352	0.242	0.359	10 17 8 4

Resnet Validation 1) b)



Balanced accuracy



Roc Auc

CLASSIFICATORI MIGLIORI GLOBALI caso 1) b)

Dalla cross validation fisso selector e num_features/ alpha

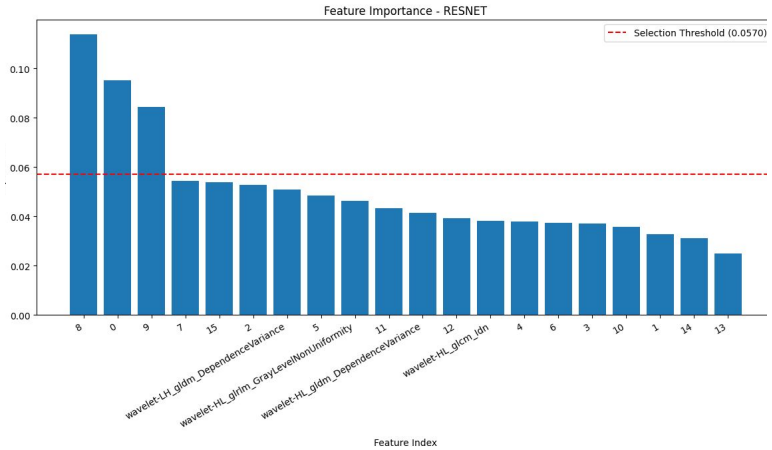
type of features	Classifier	Selector	number features	roc auc val avg	bal accuracy val avg	roc auc test	bal accuracy test	f1 test	accuracy	confusion matrix test
VGG	Logistic	lasso	6	0.703(std= 0.121)	0.657 (std = 0.05)	0.858	0.5	0	0.692	[[27 0] [12 0]]
Resnet	ensemble	logistic	16	0.815 (std = 0.07)	0.767 (std = 0.07)	0.701	0.657	0.522	0.718	[[22 5] [6 6]]
Inception	XgBoost	rf	13	0.701(std= 0.104)	0.726(std= 0.08)	0.685	0.588	0.467	0.59	[[16 11] [5 7]]

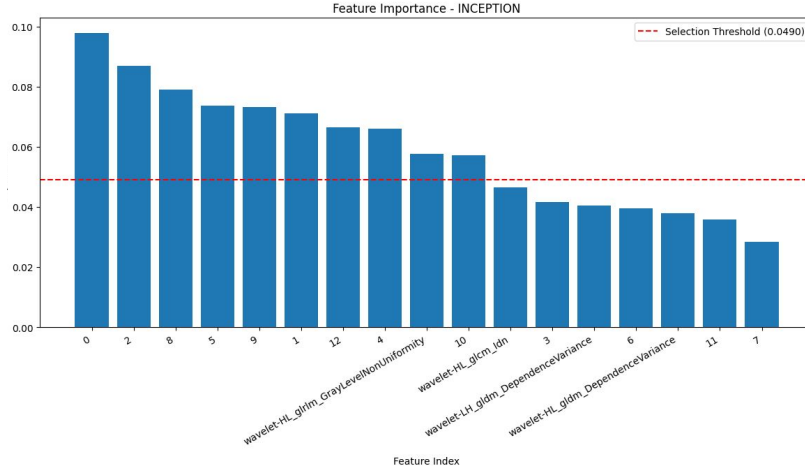
CLASSIFICATORI MIGLIORI GLOBALI caso 1) b)

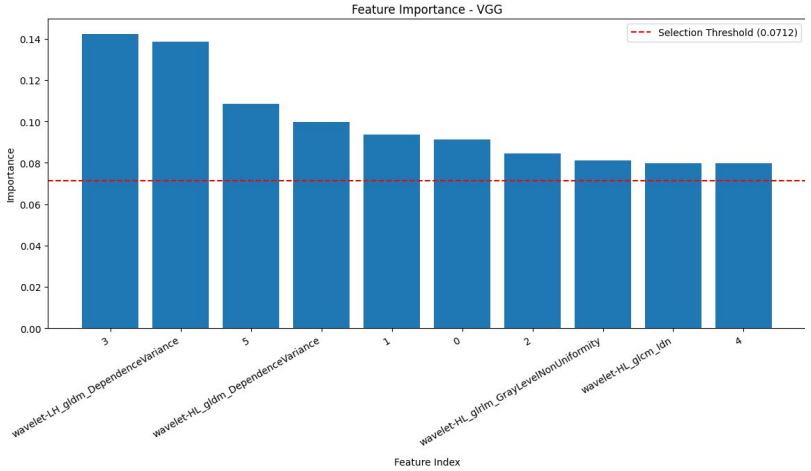
Dalla cross validation fisso le features in AT LEAST 3 FOLD

type of features	Classifier	Selector	number features	roc auc val avg	bal accuracy val avg	roc auc test	bal accuracy test	f1 test	accuracy	confusion matrix test
VGG	Logistic	lasso	6	0.703(std= 0.121)	0.657 (std = 0.05)	0.858	0.5	0	0.692	[[27 0] [12 0]]
Resnet	ensemble	logistic	14	0.815 (std = 0.07)	0.767 (std = 0.07)	0.728	0.699	0.583	0.744	[[22 5] [5 7]]
Inception	XgBoost	rf	4	0.701(std= 0.104)	0.726(std= 0.08)	0.512	0.491	0.375	0.487	[[13 14] [6 6]]

Importance caso 1) b) Numero fisso





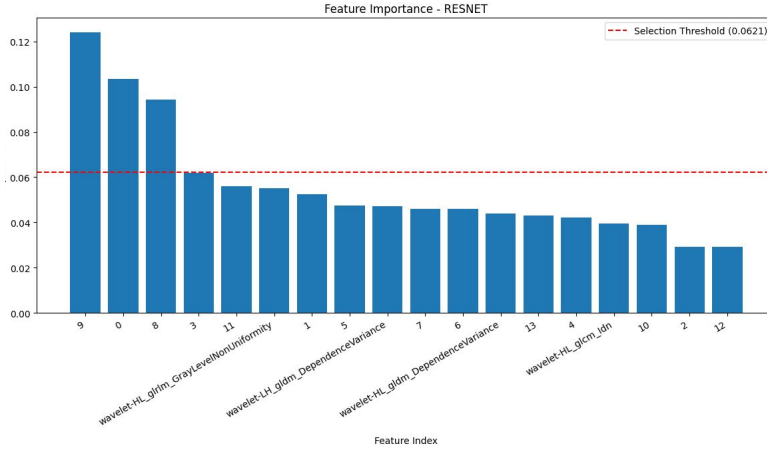


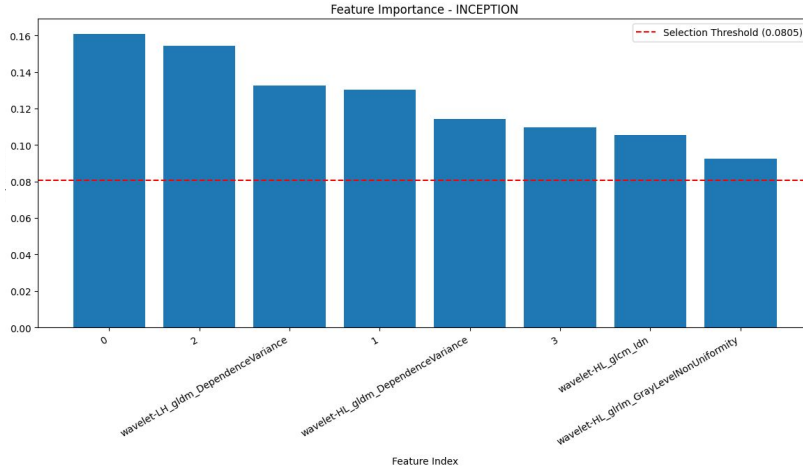
Combinazione Radiomica + PreTrainate caso 1) b)

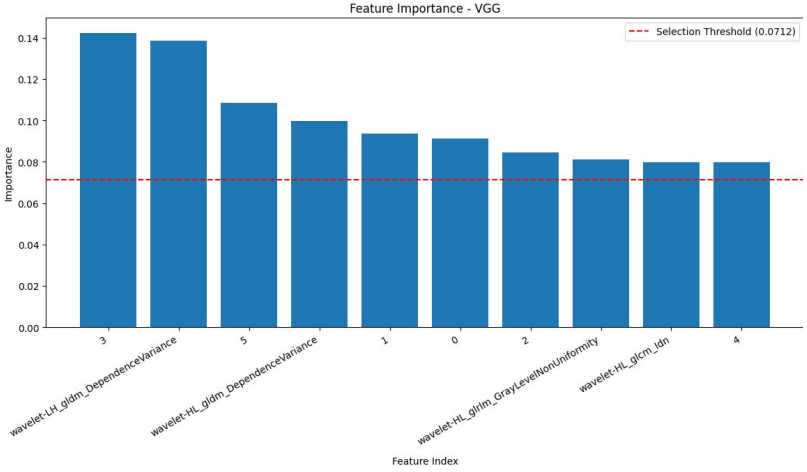
Solo Importance per tutti i casi

type of features	Classifier	Mode	number features	roc auc val avg	bal accuracy val avg	roc auc test	bal accuracy test	f1 test	accuracy	confusion matrix test
Resnet	ensemble	Numero fisso	3	0.706	0.658	0.728	0.644	0.519	0.667	[19 8 5 7]
VGG	Ensemble	Numero fisso	10	0.683	0.658	0.667	0.653	0.546	0.615	[15 12 3 9]
Inception	Logistic	Numero fisso	10	0.694	0.617	0.657	0.593	0.4	0.692	[23 4 8 4]

Importance caso 1) b) Features fisse







Combinazione Radiomica + PreTrainate caso 1) b)

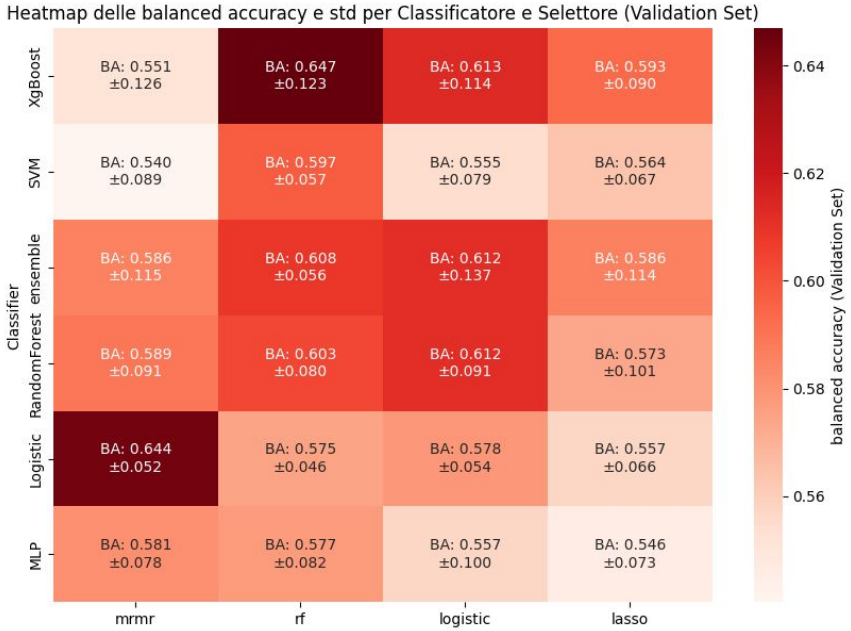
Solo Importance per tutti i casi

type of features	Classifier	Mode	number features	roc auc val avg	bal accuracy val avg	roc auc test	bal accuracy test	f1 test	accuracy	confusion matrix test
Resnet	XgBoost	features fisse	3	0.744	0.70	0.688	0.528	0.40	0.539	[15 12 6 6]
VGG	ensemble	features fisse	10	0.683	0.658	0.667	0.653	0.546	0.615	[15 12 3 9]
Inception	ensemble	features fisse	8	0.683	0.608	0.599	0.523	0.370	0.564	[17 10 7 5]

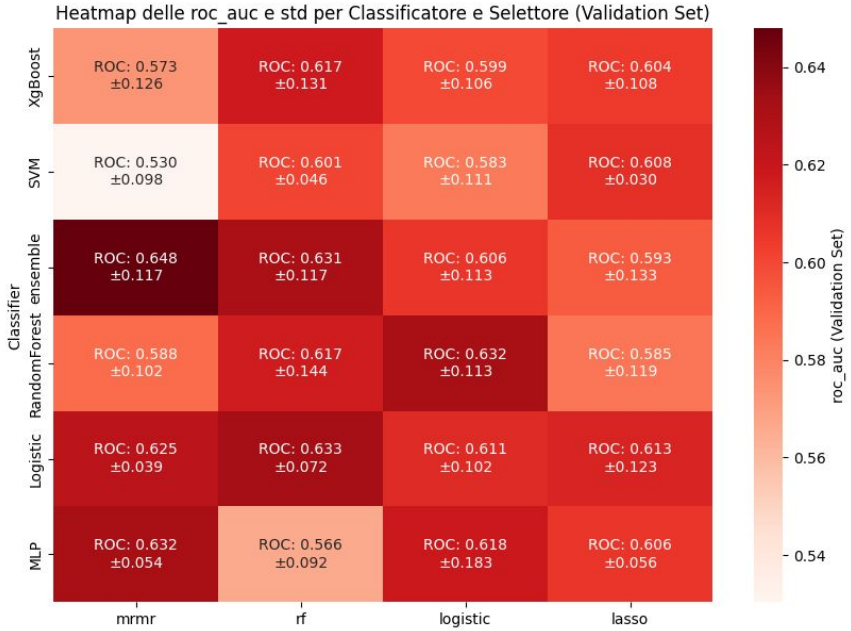
Ensemble dei 3 classificatori 1) b)

Tipo voting	Tipologia	Roc Auc	Bal Acc	F1	Accuracy	Conf Matrix
Hard	Numero features	Na	0.653	0.5	0.744	24 3 7 5
Hard	At least 3 fold	Na	0.634	0.476	0.718	23 4 7 5
Soft uguali	Numero features	0.725	0.644	0.519	0.667	19 8 5 7
Soft uguali	At least 3 fold	0.559	0.468	0.333	0.487	14 13 7 5
Soft bilanciato	Numero features	0.728	0.644	0.519	0.667	19 8 5 7
Soft bilanciato	At least 3 fold	0.559	0.486	0.345	0.513	15 12 7 5

Resnet Balanced Accuracy caso 2) b)



Balanced accuracy



Roc Auc

CLASSIFICATORI MIGLIORI GLOBALI caso 2) b)

Dalla cross validation fisso selector e num_features/ alpha

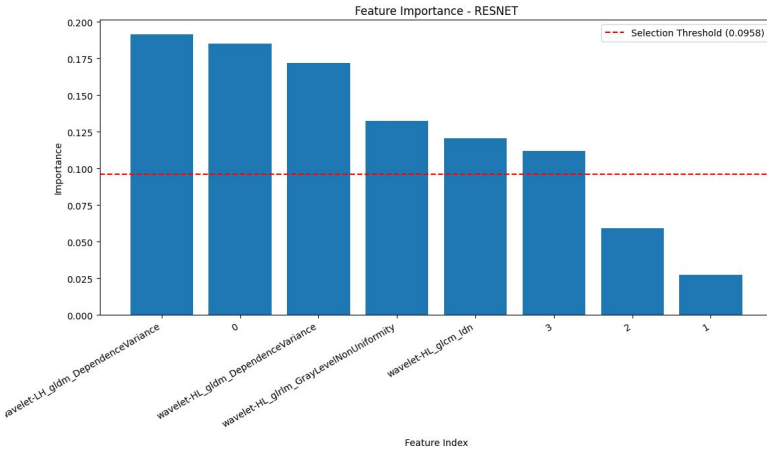
type of features	Classifier	Selector	number features	roc auc val avg	bal accuracy val avg	roc auc test	bal accuracy test	f1 test	accuracy	confusion matrix test
Inception	Logistic	rf	2	0.755(std= 0.12)	0.679 (std = 0.08)	0.775	0.75	0.667	0.846	[[27 0] [6 6]]
Resnet	Logistic	mrmr	4	0.625 (std = 0.04)	0.644 (std = 0.05)	0.873	0.833	0.8	0.897	[[27 0] [4 8]]
Resnet Inception	Random Forest	logistic	26	0.756(std= 0.13)	0.724(std= 0.15)	0.821	0.769	0.667	0.744	[[19 8] [2 10]]

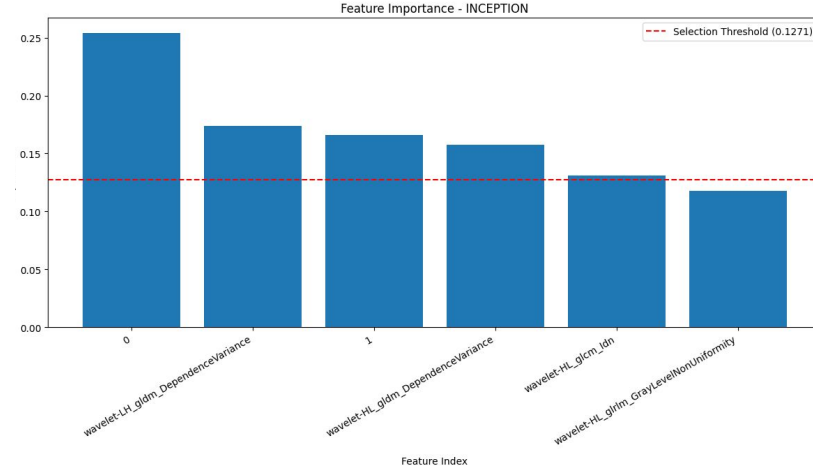
CLASSIFICATORI MIGLIORI GLOBALI caso 2) b)

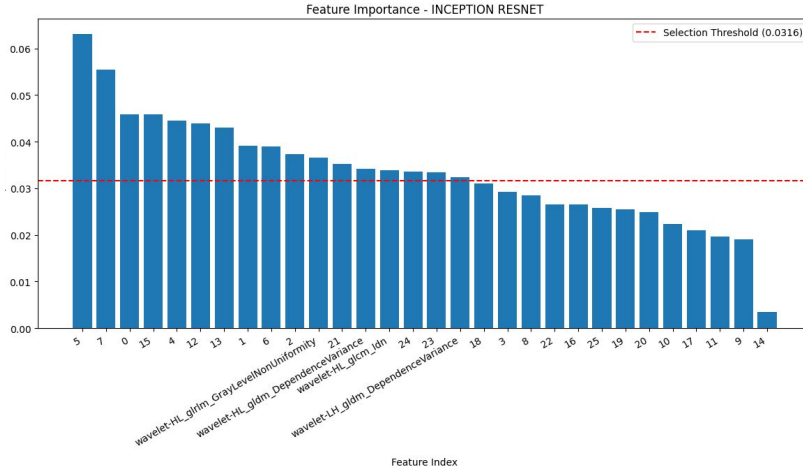
Dalla cross validation fisso le features in AT LEAST 3 FOLD

type of features	Classifier	Selector	number features	roc auc val avg	bal accuracy val avg	roc auc test	bal accuracy test	f1 test	accuracy	confusion matrix test
Inception	Logistic	rf	1	0.755(std= 0.12)	0.679 (std = 0.08)	0.784	0.667	0.5	0.795	[[27 0] [8 4]]
Resnet	Logistic	mrmr	1	0.625 (std = 0.04)	0.644 (std = 0.05)	0.853	0.819	0.75	0.846	[[24 3] [3 9]]
Resnet Inception	Random Forest	logistic	19	0.756(std= 0.13)	0.724(std= 0.15)	0.807	0.787	0.69	0.769	[[20 7] [2 10]]

Importance caso 2) b) Numero fisso





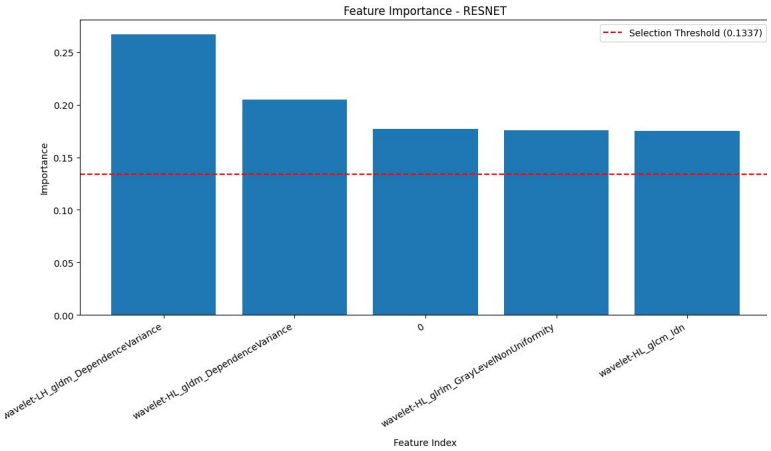


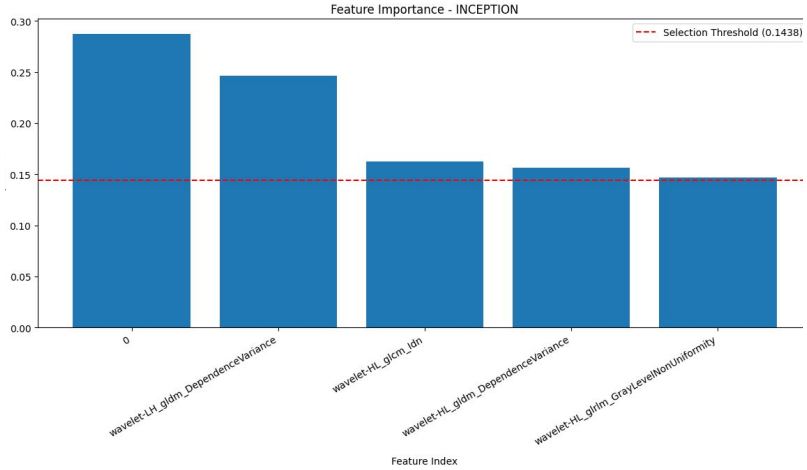
Combinazione Radiomica + PreTrainate caso 2) b)

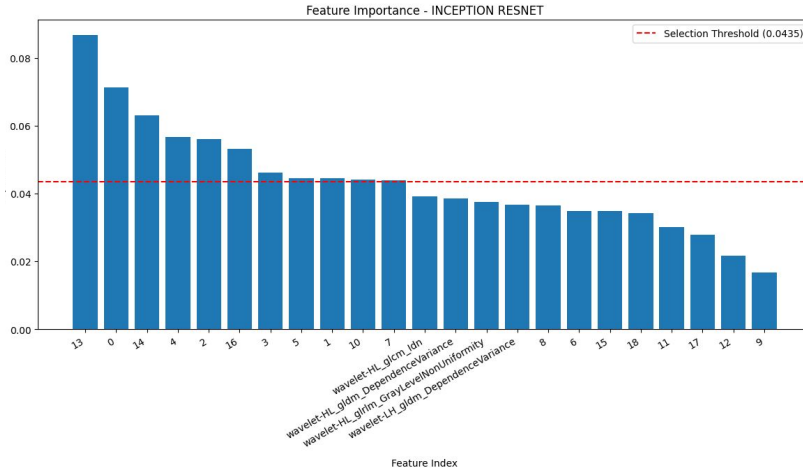
Solo Importance per tutti i casi

type of features	Classifier	Mode	number features	roc auc val avg	bal accuracy val avg	roc auc test	bal accuracy test	f1 test	accuracy	confusion matrix test
Resnet	ensemble	Numero fisso	6	0.689	0.617	0.735	0.699	0.583	0.744	[22 5 5 7]
INCRES	XgBoost	Numero fisso	17	0.822	0.767	0.799	0.745	0.643	0.744	[20 7 3 9]
Inception	Random Forest	Numero fisso	5	0.608	0.717	0.676	0.671	0.563	0.641	[16 11 3 9]

Importance caso 2) b) Features fisse







Combinazione Radiomica + PreTrainate caso 2) b)

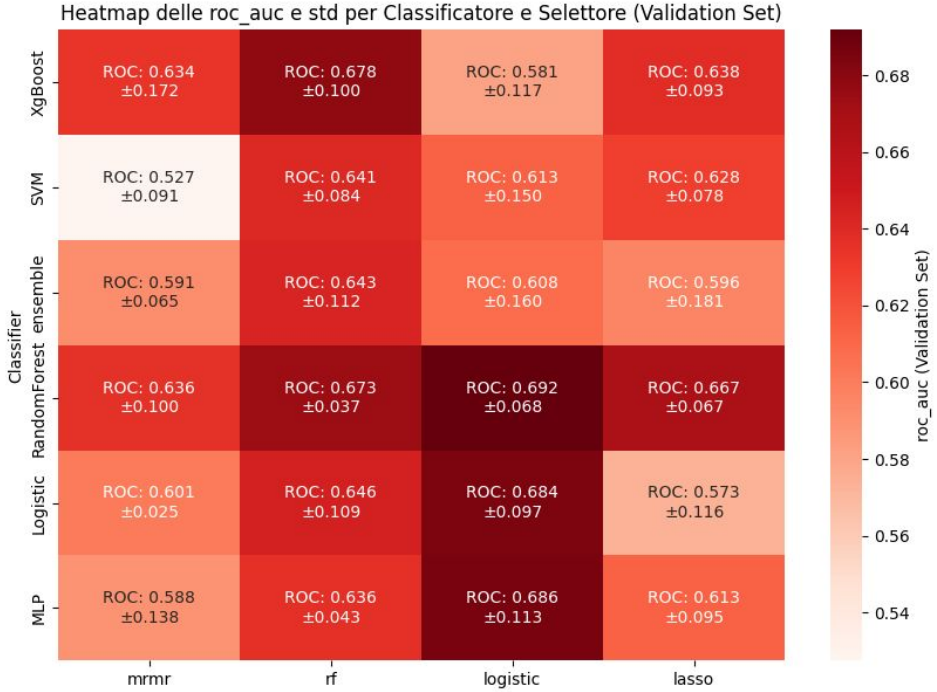
Solo Importance per tutti i casi

type of features	Classifier	Mode	number features	roc auc val avg	bal accuracy val avg	roc auc test	bal accuracy test	f1 test	accuracy	confusion matrix test
Resnet	Logistic	features fisse	5	0.628	0.625	0.775	0.667	0.552	0.667	[18 9 4 8]
INCEPTION RESNET	XgBoost	features fisse	11	0.811	0.742	0.698	0.583	0.444	0.615	[18 9 6 6]
Inception	Ensemble	features fisse	5	0.644	0.742	0.661	0.639	0.5	0.692	[21 6 6 6]

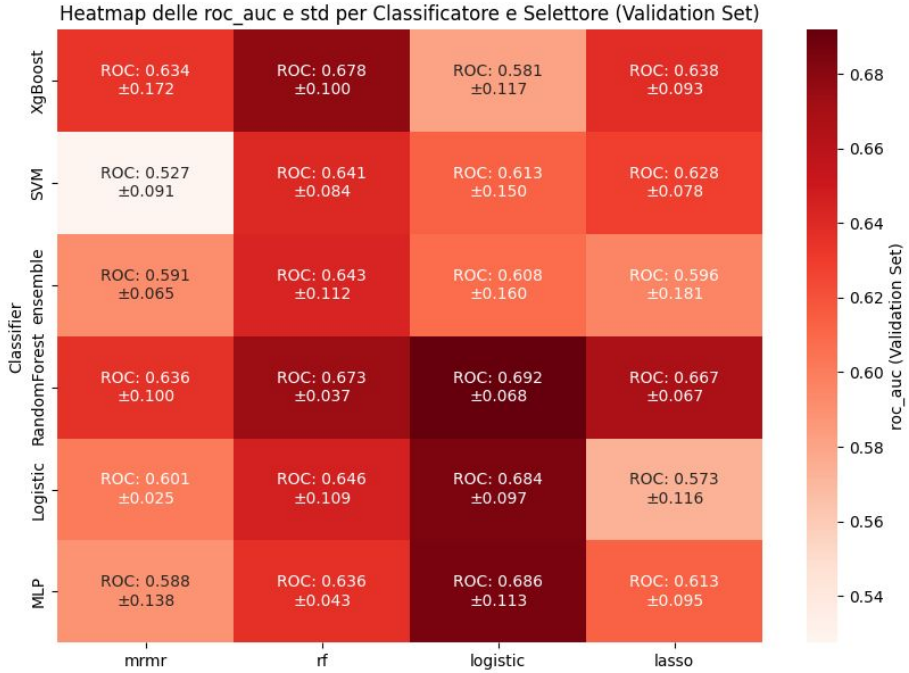
Ensemble dei 3 classificatori 2) b)

Tipo voting	Tipologia	Roc Auc	Bal Acc	F1	Accuracy	Conf Matrix
Hard	Numero features	Na	0.833	0.8	0.897	27 0 4 8
Hard	At least 3 fold	Na	0.856	0.818	0.897	26 1 3 9
Soft uguali	Numero features	0.849	0.759	0.667	0.795	23 4 4 8
Soft uguali	At least 3 fold	0.846	0.819	0.75	0.846	24 3 3 9
Soft bilanciato	Numero features	0.849	0.759	0.667	0.795	23 4 4 8
Soft bilanciato	At least 3 fold	0.849	0.819	0.75	0.846	24 3 3 9

Resnet Balanced Accuracy caso 1) c)



Balanced accuracy



Roc Auc

CLASSIFICATORI MIGLIORI GLOBALI caso 1) c)

Dalla cross validation fisso selector e num_features/ alpha

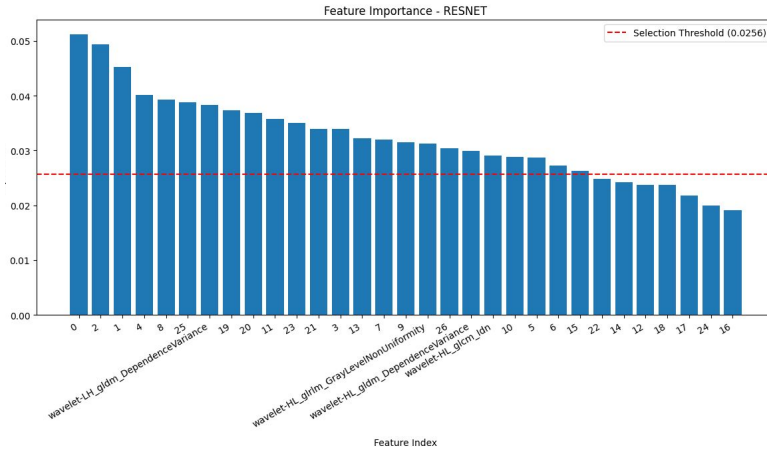
type of features	Classifier	Selector	number features	roc auc val avg	bal accuracy val avg	roc auc test	bal accuracy test	f1 test	accuracy	confusion matrix test
VGG	Random Forest	mrmr	21	0.713(std= 0.08)	0.752 (std = 0.07)	0.887	0.806	0.714	0.795	[[21 6] [2 10]]
Resnet	Random Forest	rf	27	0.673 (std = 0.03)	0.69 (std = 0.07)	0.878	0.838	0.783	0.872	[[25 2] [3 9]]
Inception	ensemble	logistic	15	0.746(std= 0.06)	0.723(std= 0.05)	0.852	0.80	0.72	0.821	[[23 4] [3 9]]

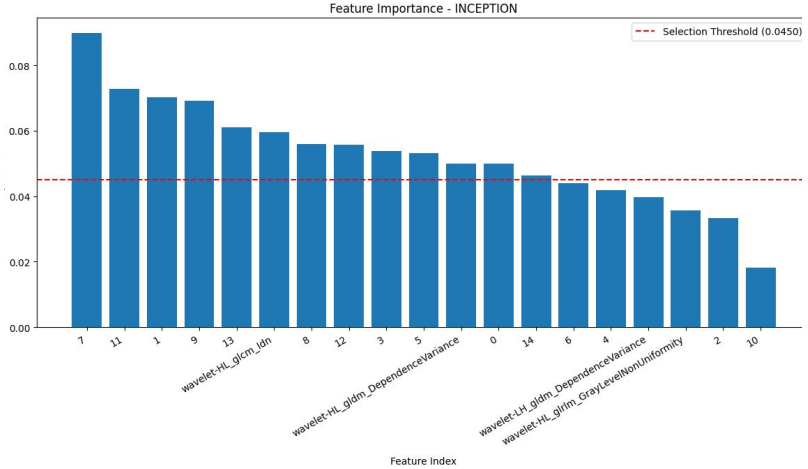
CLASSIFICATORI MIGLIORI GLOBALI caso 1) c)

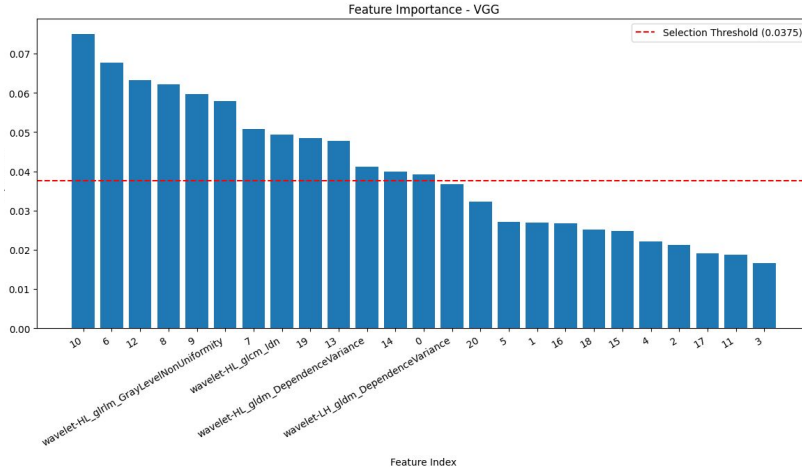
Dalla cross validation fisso le features in AT LEAST 3 FOLD

type of features	Classifier	Selector	number features	roc auc val avg	bal accuracy val avg	roc auc test	bal accuracy test	f1 test	accuracy	confusion matrix test
VGG	Random Forest	mrmr	18	0.713(std= 0.08)	0.752 (std = 0.07)	0.870	0.824	0.740	0.821	[[22 5] [2 10]]
Resnet	Random Forest	rf	20	0.673 (std = 0.03)	0.69 (std = 0.07)	0.864	0.764	0.667	0.769	[[21 6] [3 9]]
Inception	ensemble	logistic	10	0.746(std= 0.06)	0.723(std= 0.05)	0.821	0.69	0.58	0.667	[[17 10] [3 9]]

Importance caso 1) c) Numero fisso





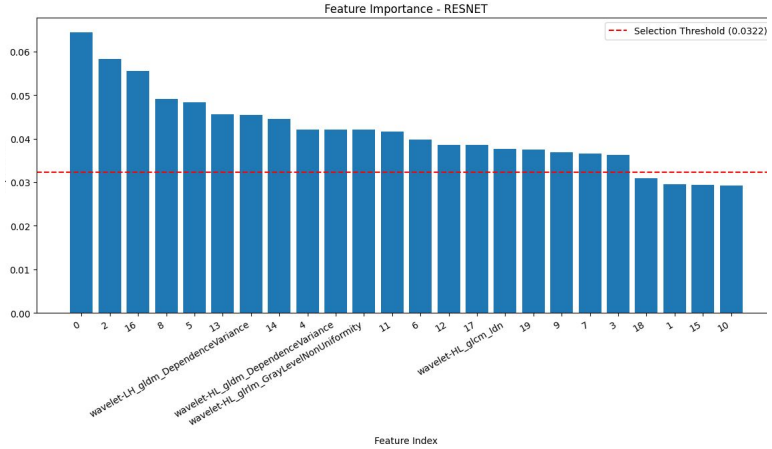


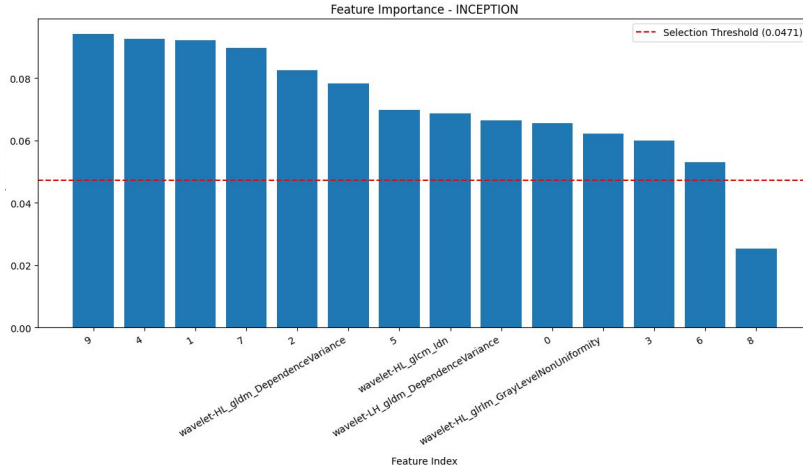
Combinazione Radiomica + PreTrainate caso 1) c)

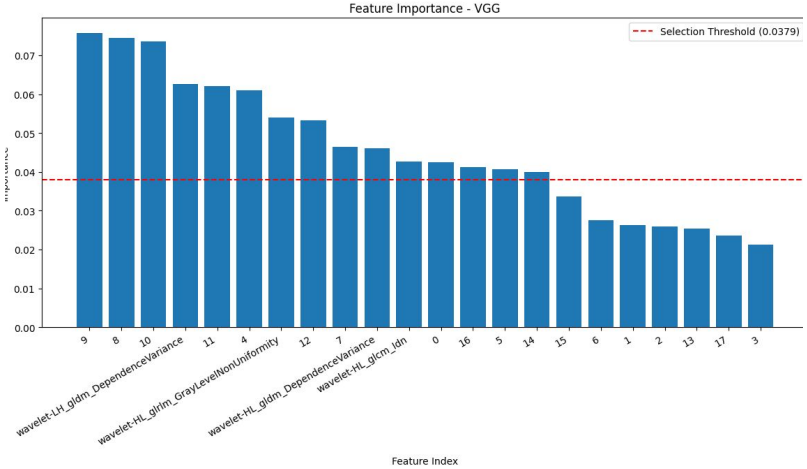
Solo Importance per tutti i casi

type of features	Classifier	Mode	number features	roc auc val avg	bal accuracy val avg	roc auc test	bal accuracy test	f1 test	accuracy	confusion matrix test
Resnet	Random Forest	Numero fisso	24	0.758	0.725	0.881	0.782	0.692	0.795	[22 5 3 9]
VGG	XgBoost	Numero fisso	13	0.606	0.617	0.836	0.787	0.69	0.769	[20 7 2 10]
Inception	XgBoost	Numero fisso	10	0.822	0.817	0.901	0.810	0.71	0.769	[19 8 1 11]

Importance caso 1) c) Features fisse







Combinazione Radiomica + PreTrainate caso 1) c)

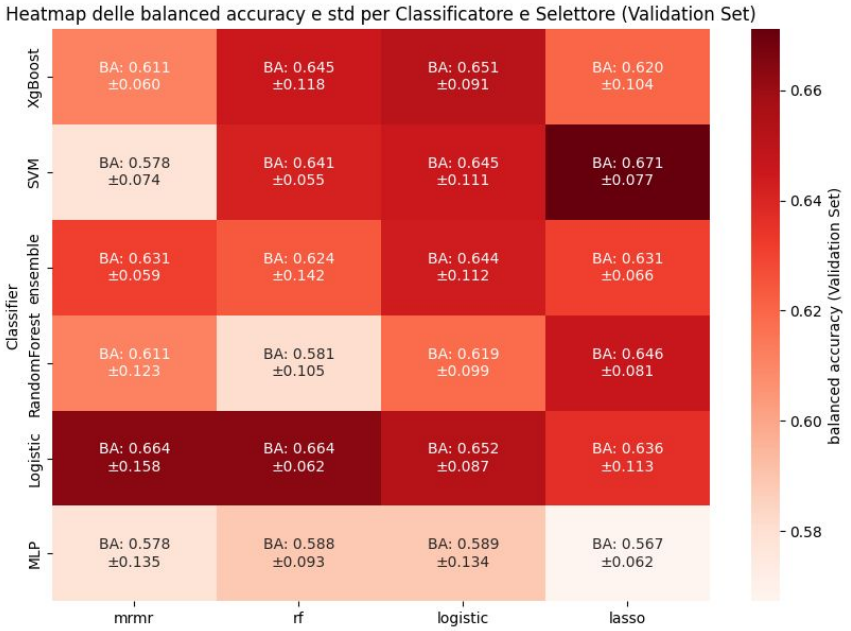
Solo Importance per tutti i casi

type of features	Classifier	Mode	number features	roc auc val avg	bal accuracy val avg	roc auc test	bal accuracy test	f1 test	accuracy	confusion matrix test
Resnet	Random Forest	features fisse	20	0.747	0.733	0.841	0.69	0.581	0.667	[17 10 3 9]
VGG	Logistic	features fisse	15	0.70	0.667	0.892	0.810	0.71	0.769	[19 8 1 11]
Inception	Logistic	features fisse	13	0.806	0.783	0.833	0.789	0.667	0.744	[19 8 2 10]

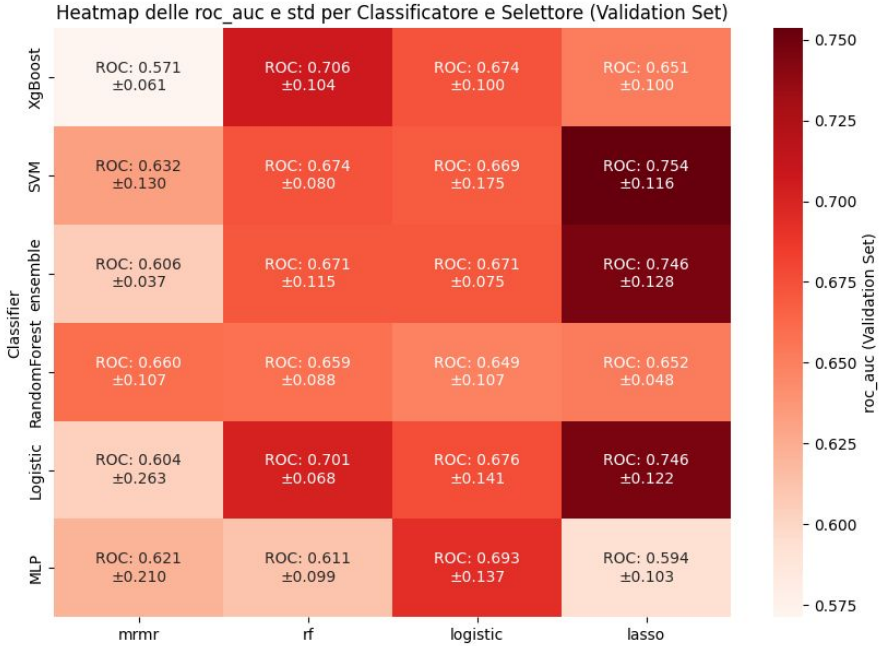
Ensemble dei 3 classificatori 1) c)

Tipo voting	Tipologia	Roc Auc	Bal Acc	F1	Accuracy	Conf Matrix
Hard	Numero features	Na	0.838	0.783	0.872	25 2 3 9
Hard	At least 3 fold	Na	0.764	0.667	0.769	21 6 3 9
Soft uguali	Numero features	0.892	0.838	0.783	0.872	25 2 3 9
Soft uguali	At least 3 fold	0.901	0.819	0.75	0.846	24 3 3 9
Soft bilanciato	Numero features	0.895	0.838	0.783	0.872	25 2 3 9
Soft bilanciato	At least 3 fold	0.901	0.819	0.75	0.846	24 3 3 9

Resnet Balanced Accuracy caso 2) c)



Balanced accuracy



Roc Auc

CLASSIFICATORI MIGLIORI GLOBALI caso 2) c)

Dalla cross validation fisso selector e num_features/ alpha

Normalizzando le immagini

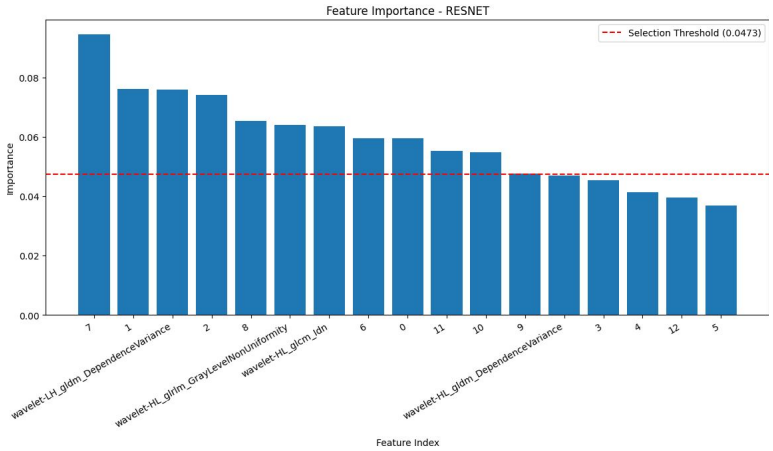
type of features	Classifier	Selector	number features	roc auc val avg	bal accuracy val avg	roc auc test	bal accuracy test	f1 test	accuracy	confusion matrix test
Resnet	SVM	lasso	13 (sul test) alpha= 0.015103 44827586 207	0.754(std= 0.11)	0.671 (std = 0.08)	0.926	0.768	0.667	0.744	[[19 8] [2 10]]
Inception	XgBoost	logistic	8	0.751 (std = 0.14)	0.739 (std = 0.13)	0.697	0.63	0.516	0.615	[[16 11] [4 8]]
Resnet Inception	XgBoost	lasso	19	0.661(std= 0.21)	0.6675(std= 0.191)	0.747	0.63	0.516	0.615	[[16 11] [4 8]]

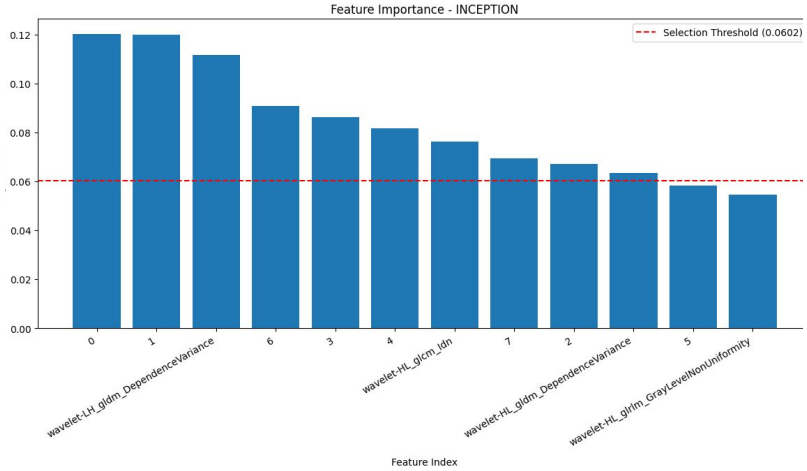
CLASSIFICATORI MIGLIORI GLOBALI caso 2) c)

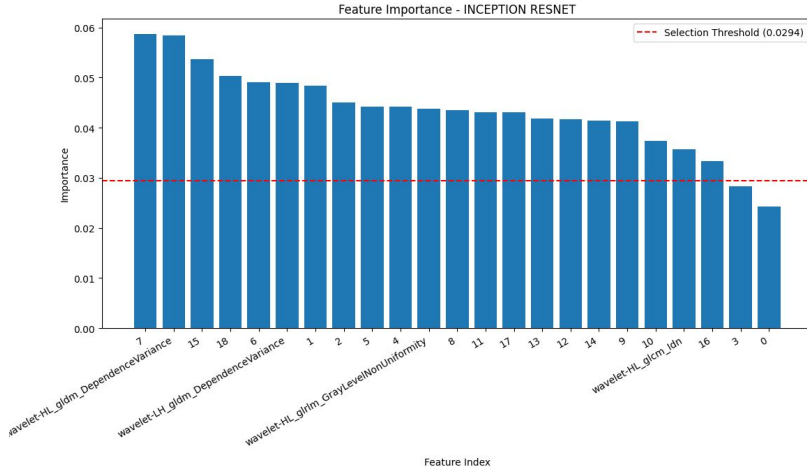
Dalla cross validation fisso le features in AT LEAST 3 FOLD

type of features	Classifier	Selector	number features	roc auc val avg	bal accuracy val avg	roc auc test	bal accuracy test	f1 test	accuracy	confusion matrix test
Resnet	SVM	lasso	12	0.754(std= 0.11)	0.671 (std = 0.08)	0.910	0.843	0.769	0.846	[[23 4] [2 10]]
Inception	XgBoost	logistic	5	0.751 (std = 0.14)	0.739 (std = 0.13)	0.503	0.491	0.375	0.487	[[13 14] [6 6]]
Resnet Inception	XgBoost	lasso	15	0.661(std= 0.21)	0.6675(std= 0.191)	0.617	0.593	0.485	0.564	[[14 13] [4 8]]

Importance caso 2) c) Numero fisso





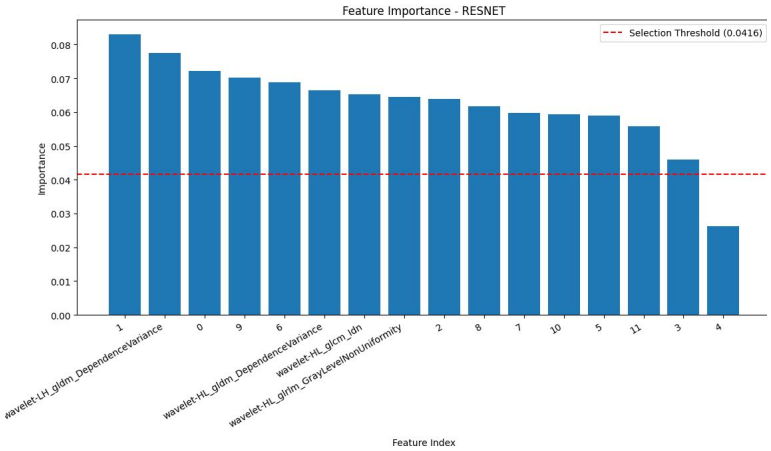


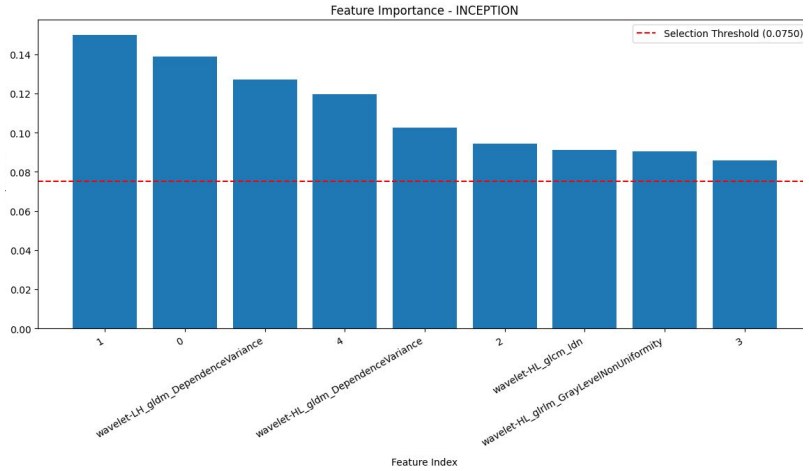
Combinazione Radiomica + PreTrainate caso 2) c)

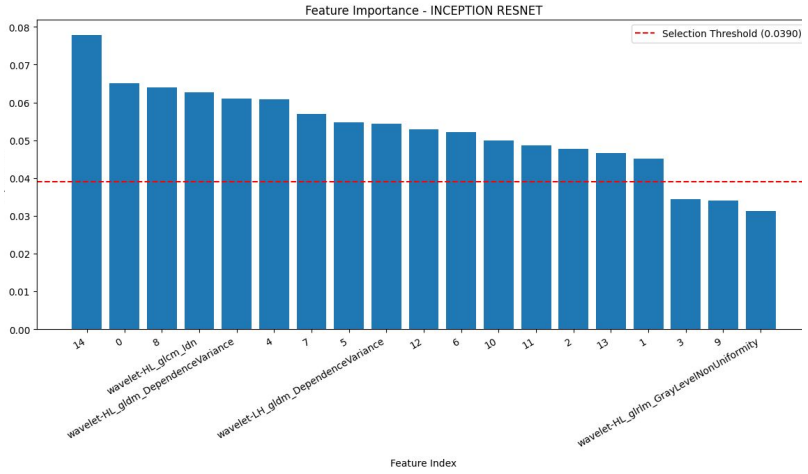
Solo Importance per tutti i casi

type of features	Classifier	Mode	number features	roc auc val avg	bal accuracy val avg	roc auc test	bal accuracy test	f1 test	accuracy	confusion matrix test
Resnet	Logistic	Numero fisso	12	0.861	0.725	0.830	0.764	0.667	0.764	[21 6 3 9]
INCRES	XgBoost	Numero fisso	21	0.656	0.683	0.781	0.667	0.552	0.667	[18 9 4 8]
Inception	XgBoost	Numero fisso	10	0.772	0.733	0.858	0.732	0.625	0.692	[17 10 2 10]

Importance caso 2) c) Features fisse







Combinazione Radiomica + PreTrainate caso 2) c)

Solo Importance per tutti i casi

type of features	Classifier	Mode	number features	roc auc val avg	bal accuracy val avg	roc auc test	bal accuracy test	f1 test	accuracy	confusion matrix test
Resnet	ensemble	features fisse	15	0.806	0.692	0.867	0.759	0.667	0.795	[23 4 4 8]
INCEPTION RESNET	XgBoost	features fisse	16	0.756	0.733	0.645	0.588	0.467	0.59	[16 11 5 7]
Inception	Random Forest	features fisse	9	0.644	0.742	0.661	0.639	0.5	0.692	[21 6 6 6]

Ensemble dei 3 classificatori 2) c)

Tipo voting	Tipologia	Roc Auc	Bal Acc	F1	Accuracy	Conf Matrix
Hard	Numero features	Na	0.759	0.667	0.795	23 4 4 8
Hard	At least 3 fold	Na	0.704	0.593	0.718	20 7 4 8
Soft uguali	Numero features	0.784	0.667	0.552	0.667	18 9 4 8
Soft uguali	At least 3 fold	0.700	0.611	0.5	0.59	15 12 4 8
Soft bilanciato	Numero features	0.802	0.63	0.516	0.615	16 11 4 8
Soft bilanciato	At least 3 fold	0.71	0.611	0.5	0.59	15 12 4 8

Tabella risultati migliori per le reti singole Prendendo la migliore sul validation

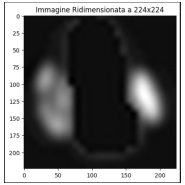
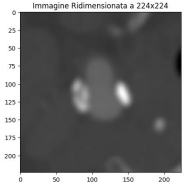
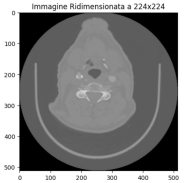
	a) 	b) 	c) 
1) Encoders allenati su imagenet	**RESNET** **Val:** ROC: 0.829 (std= 0.11) BA: 0.772 (std. 0.12) **Test num_features fisse:** ROC: 0.745 BA: 0.731 [[17 10] [2 10]] **Test features fisse:** ROC:0.704 BA: 0.611 [[15 12] [4 8]]	**RESNET** **Val:** ROC: 0.815 (std = 0.07) BA: 0.767 (std = 0.07) **Test num_features fisse:** ROC: 0.701 BA: 0.657 [[22 5] [6 6]] **Test features fisse:** ROC:0.728 BA: 0.699 [[22 5] [5 7]]	**VGG** **Val:** ROC: 0.713(std= 0.08) BA: 0.752 (std = 0.07) **Test num_features fisse:** ROC: 0.887 BA: 0.806 [[21 6] [2 10]] **Test features fisse:** ROC:0.87 BA: 0.824 [[22 5] [2 10]]
2) Encoders allenati su immagini mediche	**RESNET** **Val:** ROC: 0.793 (std = 0.1) BA: 0.778 (std = 0.09) **Test num_features fisse:** ROC: 0.268 BA: 0.315 [[8 19] [8 4]] **Test features fisse:** ROC:0.318 BA: 0.426 [[14 13] [8 4]]	**RESNET INCEPTION** **Val:** ROC: 0.756 (std= 0.13) BA: 0.724 (std= 0.15) **Test num_features fisse:** ROC: 0.821 BA: 0.769 [[19 8] [2 10]] **Test features fisse:** ROC:0.807 BA: 0.787 [[20 7] [2 10]]	**INCEPTION** **Val:** ROC: 0.751 (std = 0.14) BA: 0.739 (std = 0.13) **Test num_features fisse:** ROC: 0.697 BA: 0.63 [[16 11] [4 8]] **Test features fisse:** ROC:0.503 BA: 0.491 [[13 14] [6 6]]

Tabella risultati migliori per le reti COMBINATE
Prendendo la migliore sul validation
CASO NUM_FEATURES FISSE

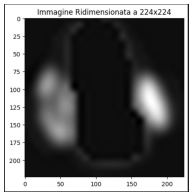
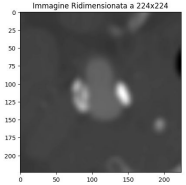
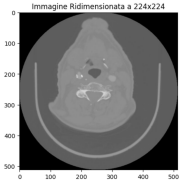
	a) 	b) 	c) 
1) Encoders allenati su imagenet	**RESNET** **Val:** ROC: 0.883 BA: 0.850 **Test:** ROC: 0.696 BA: 0.611 [15 12 4 8]	**RESNET** **Val:** ROC: 0.706 BA: 0.658 **Test:** ROC: 0.728 BA: 0.644 [19 8 5 7]	**INCEPTION** **Val:** ROC: 0.822 BA: 0.817 **Test:** ROC: 0.901 BA: 0.81 [19 8 1 11]
2) Encoders allenati su immagini mediche	**RESNET** **Val:** ROC: 0.922 BA: 0.85 **Test:** ROC: 0.37 BA: 0.31 [10 17 9 3]	**INCRES** **Val:** ROC: 0.822 BA: 0.767 **Test:** ROC: 0.799 BA: 0.745 [20 7 3 9]	**INCEPTION** **Val:** ROC: 0.772 BA: 0.733 **Test:** ROC: 0.858 BA: 0.732 [17 10 2 10]

Tabella risultati migliori per le reti COMBINATE
Prendendo la migliore sul validation
CASO FEATURES FISSE

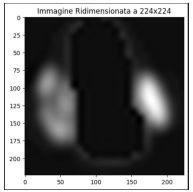
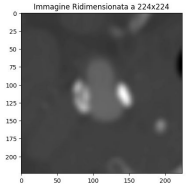
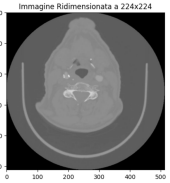
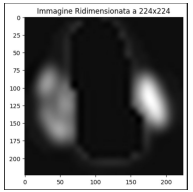
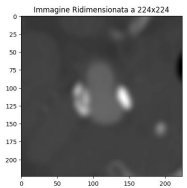
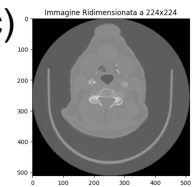
	a) 	b) 	c) 
1) Encoders allenati su imagenet	**RESNET** **Val:** ROC: 0.789 BA: 0.75 **Test:** ROC: 0.499 BA: 0.519 [10 17 4 8]	**RESNET** **Val:** ROC: 0.744 BA: 0.7 **Test:** ROC: 0.688 BA: 0.528 [15 12 6 6]	**INCEPTION** **Val:** ROC: 0.806 BA: 0.783 **Test:** ROC: 0.833 BA: 0.789 [19 8 2 10]
2) Encoders allenati su immagini mediche	**RESNET** **Val:** ROC: 0.95 BA: 0.925 **Test:** ROC: 0.34 BA: 0.366 [13 14 9 3]	**INCRES** **Val:** ROC: 0.811 BA: 0.742 **Test:** ROC: 0.698 BA: 0.583 [18 9 6 6]	**INCEPTION** **Val:** ROC: 0.644 BA: 0.742 **Test:** ROC: 0.661 BA: 0.639 [21 6 6 6]

Tabella risultati ensemble nel caso HARD VOTING dei 3 classificatori nei vari casi

	a) 	b) 	c) 
1) Encoders allenati su imagenet	**Numero fisso** BA: 0.667 [18 9 4 8] **At least 3 fold** BA: 0.606 [17 10 5 7]	**Numero fisso** BA: 0.653 [24 3 7 5] **At least 3 fold** BA:0.634 [23 4 7 5]	**Numero fisso** BA: 0.838 [25 2 3 9] **At least 3 fold** BA: 0.764 [21 6 3 9]
2) Encoders allenati su immagini mediche	**Numero fisso** BA: 0.312 [10 17 8 4] **At least 3 fold** BA: 0.509 [14 13 6 6]	**Numero fisso** BA: 0.833 [27 0 4 8] **At least 3 fold** BA:0.856 [26 1 3 9]	**Numero fisso** BA: 0.759 [23 4 4 8] **At least 3 fold** BA: 0.704 [20 7 4 8]

Conclusioni

- Nelle tabelle finali viene riportato solo l'hard voting che sembra funzionare meglio del soft voting che a questo punto scarterei direttamente.
- La scelta del miglior modello tra i 3 non permette di selezionare la resnet nel caso 2C ma ottiene comunque qualche risultato come nel caso 1C
- Il risultato ottenuto nel 2B risulta comunque il miglior risultato ottenuto ad oggi in termini di pazienti misclassificati (solamente 4) e con l'f1 più alto del resto (0.818)
- Potremmo anche provare alla stessa maniera un ensemble per le reti combinate o risulterebbe eccessivo?