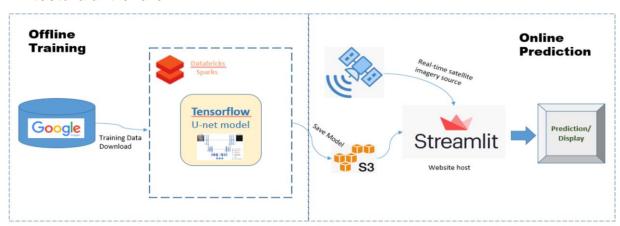
# Forest Fire Prediction - Assignment 01

**Paper 1**: "Forest Fire Prediction Using Image Processing And Machine Learning" - Mohana Kumar S, Sowmya B J, Pryanka S, Ruchita Sharma, Shivank Tej, Spoorthi Ashok Karani. Nat. Volatiles & Essent. Oils, 2021; 8(4): 13116-13134

**Set de date folosit**: Datele de intrare sunt in format de imagini satelitare cu paduri, autorii nu mentioneaza direct un set de date, doar spun ca folosesc "Google Images API" pentru a face rost de imagini, ceea ce ne face sa intelegem setul de date a fost creat manual. Autorii nu ne ofera setul de date in vreun format, deci setul de date folosit de acestia nu este disponibil, ca date de iesire avem masca de segmentare unde este posibil sa existe foc. Modelul mai poate prezice si dimensiunea in km^2 si nivelul total de dioxid de carbon emis, dar acest lucru posibil sa fie scos din masca de segmentare (nu este menționat).

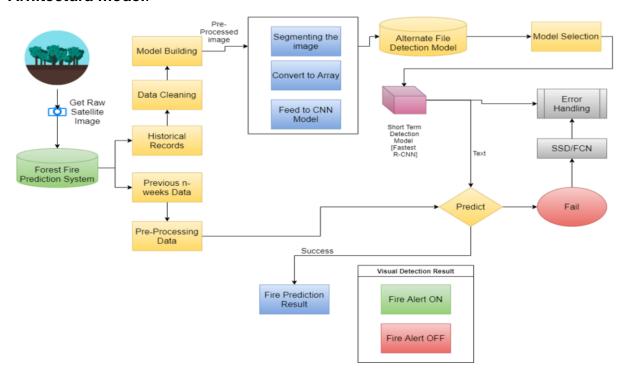
#### Arhitectura antrenare:



### Algoritmi folositi:

- Faster R-CNN (object detection model, cu mentiunea ca se poate folosi SSMD single shot multibox detector in cazul in care Faster R-CNN esueaza): folosit pentru "fire prediction result", in care sunt detectate zonele in care ar fi foc.
- SVM (masina cu suport vectorial): pentru prezicerea daca este un foc real sau nu. Autorii nu mentioneaza dimensiunea modelului / modul de hypertune a parametrilor.

#### Arhitectura model:



#### Metrici calculate si rezultate:

- Matricea de confuzie: pentru a identifica unde se "incurca" modelul.
- Acuratete: (total right predictions / total predictions) \* 100, rezultat: 92%
- Recall: TP / (TP + FN), rezultat: 97.5%
- Precizie: TP/(TP + FP), rezultat: 84.78%
- F-Measure: (2 \* Recall \* Precision) / (Recall + Precision), rezultat: 90.7%

**Review la paper**: un paper bun pentru a intelege approach-urile uzuale (are un review bun la state of the art), dar datele nu sunt clare, si nici arhitectura modelului.

Paper 2: "Prediction and data mining of burned areas of forest fires: Optimized data matching and mining algorithm provides valuable insight", David A. Wood

Algoritm folosit: TOB (Transparent Open Box) network

(Sursa: https://www.sciencedirect.com/science/article/pii/S2589721721000118).

Este o metodă bazată pe învățare automată folosită pentru a prezice suprafața arsă în funcție de variabile forestiere, meteorologice și de mediu, evitând folosirea de corelații, regresii sau relații statistice între variabile.

Algoritmul presupune două etape (1 și 2) și furnizează două estimări, a doua fiind optimizată. Compararea estimărilor în două etape cu subseturile de date de antrenare și testare ajută la identificarea și respingerea soluțiilor optimizate care se adaptează prea bine variabilelor de date subadicente (evită overfitting-ul). TOB stabilește cele mai bune (Q ≤ 10) potriviri de înregistrări de date într-un subset mare de date de antrenare (pentru fiecare înregistrare de date specifică în subseturi de date relativ mici de ajustare - între aproximativ 100 și 150 de înregistrări de date, bazate pe analiza sensibilității). Se compară sumele diferențelor de pătrate ale variabilelor (VSD − variable squared differences) pentru toate variabilele de intrare între înregistrările de date specifice din subsetul de ajustare cu toate înregistrările de date din baza de date mai mare a subsetului de date de antrenare.

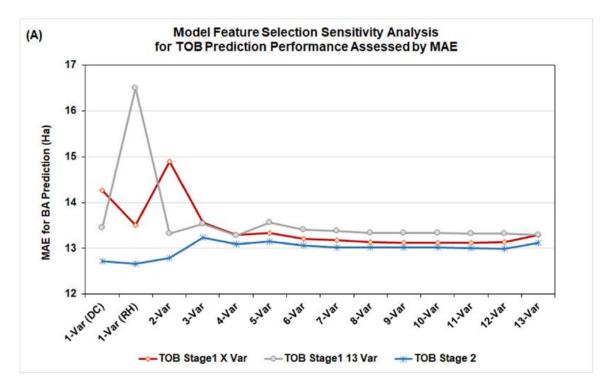
**Dataset**: forest-fire dataset from Portugal Montesinho Natural Park (<a href="https://archive.ics.uci.edu/dataset/162/forest+fires">https://archive.ics.uci.edu/dataset/162/forest+fires</a>)

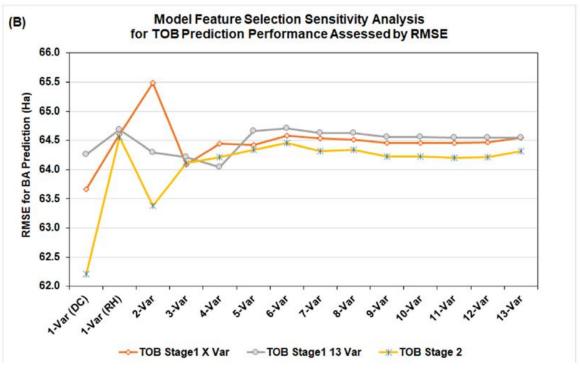
Conține 13 variabile ca input (conțin factori spațiali, temporali și meteorologici) adunate în urma analizării a 517 incendii din Portugal Montesinho Natural Park.

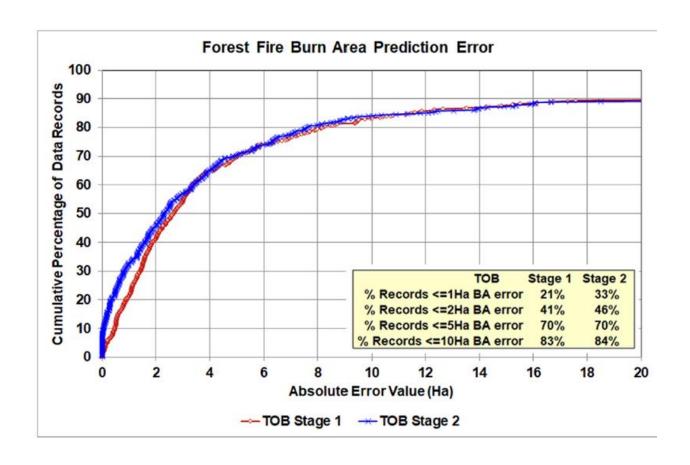
#### Metricile calculate:

- MSE (mean squared error)
- MAE (mean absolute error)
- RMSE (root mean squared error)
- PD (Procent deviation)
- APD (Average Procent deviation)
- AAPD (Absolute Average Procent deviation)
- SD (Standard Deviation)
- R (Correlation coefficient)

## Rezultate:







Prediction accuracies achieved for independent testing subsets									
Statistics for solutions from 50 (100-record) tuned subsets	TOB Stage 2 solution: Optimized for RMSE		TOB stage 1 solution	TOB stage 2 solution: optimized for MAE					
	MAE (Ha)	RMSE (Ha)	MAE (Ha)	RMSE (Ha)	MAE (Ha)	RMSE (Ha)			
			5.992	11.75					
Minimum	4.603	9.11	← Best Case →		4.433	9.06			
25 Percentile	4.854	9.86	All solutions tested with 100-data record independent testing		5.317	11.57			
50 Percentile	5.597	11.95	subsets		6.344	12.72			
Mean	5.758	11.79			6.037	13.08			
75 Percentile	6.378	13.42			6.856	15.27			
Maximum	7.576	17.92			7.623	19.89			
Standard deviation	0.849	2.097			0.965	2.763			

	ient variable Pr	rediction Value	Calculate	d for Data R	ecord # 369	
Rank of Top-Matching Data Records	Top-ranking Matched Records in Training Subset	Dependent Variable Normalized Value (BA Ln)	Sum of Weighted Squared Errors (SumE)	Relative Magnitude of Contribution to Prediction	Relative Contribution fraction	Contributions to Prediction Components
TOB Stage			, ,			
Equal Weights & Q=10		$W_N = 0.5$	TOB Stage 1 Prediction for Test Re			cord # 369
Testing Subset Record Case #1A:	369	-0.2530	SumE	Y = Total (X)/ Sum E	F= Y/ Total (Z)	Predicted Value F*BA(Ln)
1 (1st ranking match)	506	-0.4520	1.000E-07	158.9626	0.3017	-0.1364
2	424	-0.8450	1.000E-07	158.9626	0.3017	-0.2550
3	376	0.0571	1.000E-07	158.9626	0.3017	0.0172
4	348	-1.0000	2.228E-06	7.1346	0.0135	-0.0135
5	349	-1.0000	2.228E-06	7.1346	0.0135	-0.0135
6	357	-0.7669	2.228E-06	7.1346	0.0135	-0.0104
7	350	-0.7225	2.228E-06	7.1346	0.0135	-0.0098
8	354	-0.7139	2.228E-06	7.1346	0.0135	-0.0097
9	353	-0.6831	2.228E-06	7.1346	0.0135	-0.0093
10 (10th rankingMatch)	351	-0.5570	2.228E-06	7.1346	0.0135	-0.0075
			1.590E-05	526.8304	1.0000	-0.4478
The top three ranking ma	atches contribute		2042-102-10333333			Normalized
91% to the TOB Stage 1			Total (X)	Total (Z)	Sum of F	Prediction =
or to the rob otage i	predicted value					Sum (F*BA Ln)
		Mir	Dependent \	/ariable Actual \	Jalua (BA La)	0.0000
			Dependent	Variable Actual	value (DA LII).	0.0000
		Mir	Dependent \	/ariable Actual \	Value (BA Ln):	6.9956
Stage 1 Provision	onal Prediction of	Mir Dependent Varia	Dependent \ ble (BA Ln) \	/ariable Actual \ /alue for Data	Value (BA Ln): Record: #369	6.9956
Stage 1 Provision	Actual Record	Mir Dependent Varia ed Dependent Va	Dependent \ ble (BA Ln) \ riable Value (B	/ariable Actual \ <b>/alue for Data</b> BA Ln) for Data	Value (BA Ln): Record: #369 Record: #369	6.9956 1.9315 2.6130
	Actual Record Difference	Mir Dependent Varia	Dependent \ ble (BA Ln) \ riable Value (B	/ariable Actual \ <b>/alue for Data</b> BA Ln) for Data ge 1 Predicted I	Value (BA Ln): Record: #369 Record: #369 BA (Ln) Value:	6.9956 1.9315 2.6130 0.6815
Stage 1 Provision	Actual Record Difference	Mir Dependent Varia ed Dependent Varia e between Actual	Dependent \ ble (BA Ln) \ riable Value (Band TOB Stage	Variable Actual Value for Data BA Ln) for Data ge 1 Predicted I	Value (BA Ln): Record: #369 Record: #369 BA (Ln) Value: F=	6.9956 1.9315 2.6130 0.6815 Predicted
	Actual Record Difference mized Weights	Mir Dependent Varia ed Dependent Va	Dependent \ ble (BA Ln) \ riable Value (B	/ariable Actual \ <b>/alue for Data</b> BA Ln) for Data ge 1 Predicted I	Value (BA Ln): Record: #369 Record: #369 BA (Ln) Value: F= Y/	6.9956 1.9315 2.6130 0.6815 Predicted Value
TOB Stage 2 with Opti	Actual Record Difference mized Weights	Mir Dependent Varia ed Dependent Varia e between Actual	Dependent \ ble (BA Ln) \ riable Value (Band TOB Stage	Variable Actual Value for Data BA Ln) for Data ge 1 Predicted I Y = Total (X)/	Value (BA Ln): Record: #369 Record: #369 BA (Ln) Value: F=	6.9956 1.9315 2.6130 0.6815 Predicted
TOB Stage 2 with Option	Actual Record Difference mized Weights nized Q = 6  506 424	Mir Dependent Varia ed Dependent Varia e between Actual BA (Ln)	Dependent \ ble (BA Ln) \ riable Value (I and TOB Stag	Variable Actual Value for Data BA Ln) for Data ge 1 Predicted I Y = Total (X)/ Sum E	Value (BA Ln): Record: #369 Record: #369 BA (Ln) Value: F= Y/ Total (Z)	6.9956 1.9315 2.6130 0.6815 Predicted Value F*BA(Ln)
TOB Stage 2 with Option Stage 2 TOB Option 6	Actual Record Difference mized Weights nized Q = 6 506	Mir Dependent Varia ed Dependent Var e between Actual  BA (Ln)  -0.4520	Dependent \ ble (BA Ln) \ riable Value (Band TOB Stage SumE  8.232E-01	Variable Actual Value for Data BA Ln) for Data ge 1 Predicted I Y = Total (X)/ Sum E 2.0910	Value (BA Ln): Record: #369 Record: #369 BA (Ln) Value: F= Y/ Total (Z) 0.0184	6.9956 1.9315 2.6130 0.6815 Predicted Value F*BA(Ln) -0.0083
TOB Stage 2 with Option Stage 2 TOB Option 6 5	Actual Record Difference mized Weights nized Q = 6  506 424 376 348	Mir Dependent Varia ed Dependent Var e between Actual  BA (Ln)  -0.4520 -0.8450	Dependent \ ble (BA Ln) \ riable Value (Band TOB Star  SumE  8.232E-01 3.319E-01	Variable Actual Value for Data BA Ln) for Data BA Ln) for Data GE 1 Predicted If Y = Total (X)/ Sum E 2.0910 5.1867 73.5913 6.1067	Value (BA Ln): Record: #369 Record: #369 BA (Ln) Value: F= Y/ Total (Z) 0.0184 0.0458 0.6492 0.0539	6.9956 1.9315 2.6130 0.6815 Predicted Value F*BA(Ln) -0.0083 -0.0387 0.0371 -0.0539
TOB Stage 2 with Option  Stage 2 TOB Option  6  5  1 (Best)  4  3	Actual Record Difference mized Weights nized Q = 6  506 424 376 348 349	Mir Dependent Varia ed Dependent Varia e between Actual BA (Ln) -0.4520 -0.8450 0.0571 -1.0000 -1.0000	Begin Dependent \ ble (BA Ln) \ riable Value (Band TOB Stage   SumE    8.232E-01 3.319E-01 2.339E-02 2.819E-01 1.322E-01	Variable Actual Value for Data BA Ln) for Data BA Ln) for Data GE 1 Predicted If Y = Total (X)/ Sum E 2.0910 5.1867 73.5913 6.1067 13.0179	Value (BA Ln): Record: #369 Record: #369 BA (Ln) Value: F= Y/ Total (Z) 0.0184 0.0458 0.6492 0.0539 0.1148	6.9956 1.9315 2.6130 0.6815 Predicted Value F*BA(Ln) -0.0083 -0.0387 0.0371 -0.0539 -0.1148
TOB Stage 2 with Option  Stage 2 TOB Option  6  5  1 (Best)  4  3  2	Actual Record	Mir Dependent Varia ed Dependent Varia ed between Actual BA (Ln) -0.4520 -0.8450 0.0571 -1.0000 -1.0000 -0.7669	B.232E-01 3.319E-01 1.322E-01 1.288E-01	Variable Actual Value for Data BA Ln) for Data BA Ln) for Data BA Ln) for Data GE 1 Predicted If Y = Total (X)/ Sum E 2.0910 5.1867 73.5913 6.1067 13.0179 13.3687	Value (BA Ln): Record: #369 Record: #369 BA (Ln) Value: F= Y/ Total (Z) 0.0184 0.0458 0.6492 0.0539 0.1148 0.1179	6.9956 1.9315 2.6130 0.6815 Predicted Value F*BA(Ln) -0.0083 -0.0387 0.0371 -0.0539 -0.1148 -0.0904
TOB Stage 2 with Option  Stage 2 TOB Option  6 5 1 (Best) 4 3 2 N/A	Actual Record	Mir Dependent Varia ed Dependent Val e between Actual BA (Ln) -0.4520 -0.8450 0.0571 -1.0000 -1.0000 -0.7669 -0.7225	B.232E-01 3.319E-01 2.339E-02 2.819E-01 1.288E-01 0.000E+00	Variable Actual Value for Data BA Ln) for Data BA Ln) for Data BE 1 Predicted If Y = Total (X)/ Sum E 2.0910 5.1867 73.5913 6.1067 13.0179 13.3687 0.0000	Value (BA Ln): Record: #369 Record: #369 BA (Ln) Value: F= Y/ Total (Z) 0.0184 0.0458 0.6492 0.0539 0.1148 0.1179 0.0000	6.9956 1.9315 2.6130 0.6815 Predicted Value F*BA(Ln) -0.0083 -0.0387 0.0371 -0.0539 -0.1148 -0.0904 0.0000
TOB Stage 2 with Option  Stage 2 TOB Option  6 5 1 (Best) 4 3 2 N/A N/A	Actual Record	Mir Dependent Varia ded Dependent Varia de between Actual BA (Ln) -0.4520 -0.8450 0.0571 -1.0000 -1.0000 -0.7669 -0.7225 -0.7139	B.232E-01 3.319E-01 2.339E-02 2.819E-01 1.288E-01 0.000E+00 0.000E+00	Variable Actual Value for Data BA Ln) for Data BA Ln) for Data BE 1 Predicted If Y = Total (X)/ Sum E 2.0910 5.1867 73.5913 6.1067 13.0179 13.3687 0.0000 0.0000	Value (BA Ln): Record: #369 Record: #369 BA (Ln) Value: F= Y/ Total (Z) 0.0184 0.0458 0.6492 0.0539 0.1148 0.1179 0.0000 0.0000	6.9956 1.9315 2.6130 0.6815 Predicted Value F*BA(Ln) -0.0083 -0.0387 0.0371 -0.0539 -0.1148 -0.0904 0.0000 0.0000
TOB Stage 2 with Option  Stage 2 TOB Option  6 5 1 (Best) 4 3 2 N/A N/A N/A	Actual Record Difference mized Weights nized Q = 6  506 424 376 348 349 357 350 354 353	Mir Dependent Varia ed Dependent Varia ed between Actual BA (Ln) -0.4520 -0.8450 0.0571 -1.0000 -1.0000 -0.7669 -0.7225 -0.7139 -0.6831	B.232E-01 3.319E-01 2.339E-02 2.819E-01 1.288E-01 0.000E+00 0.000E+00	Variable Actual Value for Data BA Ln) for Data BA Ln) for Data ge 1 Predicted If Y = Total (X)/ Sum E 2.0910 5.1867 73.5913 6.1067 13.0179 13.3687 0.0000 0.0000 0.0000	Value (BA Ln): Record: #369 Record: #369 BA (Ln) Value: F= Y/ Total (Z) 0.0184 0.0458 0.6492 0.0539 0.1148 0.1179 0.0000 0.0000 0.0000	6.9956 1.9315 2.6130 0.6815 Predicted Value F*BA(Ln) -0.0083 -0.0371 -0.0539 -0.1148 -0.0904 0.0000 0.0000 0.0000
TOB Stage 2 with Option  Stage 2 TOB Option  6 5 1 (Best) 4 3 2 N/A N/A	Actual Record	Mir Dependent Varia ded Dependent Varia de between Actual BA (Ln) -0.4520 -0.8450 0.0571 -1.0000 -1.0000 -0.7669 -0.7225 -0.7139 -0.6831 -0.5570	Begins of the control	Variable Actual Value for Data BA Ln) for Data BA Ln) for Data BE 1 Predicted If Y = Total (X)/ Sum E 2.0910 5.1867 73.5913 6.1067 13.0179 13.3687 0.0000 0.0000 0.0000 0.0000	Value (BA Ln): Record: #369 Record: #369 BA (Ln) Value: F= Y/ Total (Z) 0.0184 0.0458 0.6492 0.0539 0.1148 0.1179 0.0000 0.0000 0.0000 0.0000	6.9956 1.9315 2.6130 0.6815 Predicted Value F*BA(Ln) -0.0083 -0.0387 0.0371 -0.0539 -0.1148 -0.0904 0.0000 0.0000 0.0000 0.0000
TOB Stage 2 with Option  Stage 2 TOB Option  6 5 1 (Best) 4 3 2 N/A N/A N/A N/A N/A	Actual Record Difference mized Weights nized Q = 6  506 424 376 348 349 357 350 354 353 351	Mir Dependent Varia led Dependent Varia led Dependent Varia led Dependent Varia led Dependent Varia BA (Ln) -0.4520 -0.8450 0.0571 -1.0000 -1.0000 -0.7669 -0.7225 -0.7139 -0.6831 -0.5570 Solution 1-Var	B.232E-01 3.319E-01 2.339E-02 2.819E-01 1.288E-01 0.000E+00 0.000E+00	Variable Actual Value for Data BA Ln) for Data BA Ln) for Data ge 1 Predicted If Y = Total (X)/ Sum E 2.0910 5.1867 73.5913 6.1067 13.0179 13.3687 0.0000 0.0000 0.0000	Value (BA Ln): Record: #369 Record: #369 BA (Ln) Value: F= Y/ Total (Z) 0.0184 0.0458 0.6492 0.0539 0.1148 0.1179 0.0000 0.0000 0.0000	6.9956 1.9315 2.6130 0.6815 Predicted Value F*BA(Ln) -0.0083 -0.0387 0.0371 -0.0539 -0.1148 -0.0904 0.0000 0.0000 0.0000 0.0000 -0.2691
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TOB Stage 2 with Option  Stage 2 TOB Option  6 5 1 (Best) 4 3 2 N/A N/A N/A N/A N/A The three records with the contribute 88% to the	Actual Record	Mir Dependent Varia led Dependent Varia led Dependent Varia le between Actual BA (Ln) -0.4520 -0.8450 0.0571 -1.0000 -0.7669 -0.7225 -0.7139 -0.6831 -0.5570 Solution 1-Var (DC) All 517 Records	Begins of the control	Variable Actual Value for Data BA Ln) for Data BA Ln) for Data BE 1 Predicted If Y = Total (X)/ Sum E 2.0910 5.1867 73.5913 6.1067 13.0179 13.3687 0.0000 0.0000 0.0000 0.0000	Value (BA Ln): Record: #369 Record: #369 BA (Ln) Value: F= Y/ Total (Z) 0.0184 0.0458 0.6492 0.0539 0.1148 0.1179 0.0000 0.0000 0.0000 0.0000	6.9956 1.9315 2.6130 0.6815 Predicted Value F*BA(Ln) -0.0083 -0.0387 0.0371 -0.0539 -0.1148 -0.0904 0.0000 0.0000 0.0000 -0.0000 -0.0000 Normalized Prediction =
TOB Stage 2 with Option  Stage 2 TOB Option  6 5 1 (Best) 4 3 2 N/A N/A N/A N/A N/A The three records with the	Actual Record	Mir Dependent Varia ded Dependent Varia de between Actual BA (Ln) -0.4520 -0.8450 0.0571 -1.0000 -0.7669 -0.7225 -0.7139 -0.6831 -0.5570 Solution 1-Var (DC) All 517 Records Applied	Begins of the control	Variable Actual Value for Data BA Ln) for Data BA Ln) for Data ge 1 Predicted if Y = Total (X)/ Sum E 2.0910 5.1867 73.5913 6.1067 13.0179 13.3687 0.0000 0.0000 0.0000 113.3623 Total (Z)	Value (BA Ln): Record: #369 Record: #369 BA (Ln) Value: F= Y/ Total (Z) 0.0184 0.0458 0.6492 0.0539 0.1148 0.1179 0.0000 0.0000 0.0000 1.0000 Sum of F	6.9956 1.9315 2.6130 0.6815 Predicted Value F*BA(Ln) -0.0083 -0.0387 0.0371 -0.0539 -0.1148 -0.0904 0.0000 0.0000 0.0000 -0.2691 Normalized Prediction = Sum (F*BA Ln)
TOB Stage 2 with Option  Stage 2 TOB Option  6 5 1 (Best) 4 3 2 N/A N/A N/A N/A N/A The three records with the contribute 88% to the	Actual Record	Mir Dependent Varia ded Dependent Varia ded Dependent Varia de between Actual de be	Bependent \ ble (BA Ln) \ riable (BA Ln) \  iable (BA Ln)	/ariable Actual \( \forall \) /alue for Data \( \text{BA Ln} \) for Data \( \text{ge 1 Predicted B} \) \( \text{Y = Total (X)} \) \( \text{Sum E} \) \( 2.0910 \) \( 5.1867 \) \( 73.5913 \) \( 6.1067 \) \( 13.0179 \) \( 13.3687 \) \( 0.0000 \) \( 0.0000 \) \( 0.0000 \) \( 0.0000 \) \( 0.0000 \) \( 0.0000 \) \( 113.3623 \) \( \text{Total (Z)} \)	Value (BA Ln): Record: #369 Record: #369 BA (Ln) Value: F= Y/ Total (Z) 0.0184 0.0458 0.6492 0.0539 0.1148 0.1179 0.0000 0.0000 0.0000 1.0000 Sum of F	6.9956 1.9315 2.6130 0.6815 Predicted Value F*BA(Ln) -0.0083 -0.0387 0.0371 -0.0539 -0.1148 -0.0904 0.0000 0.0000 0.0000 -0.2691 Normalized Prediction = Sum (F*BA Ln) 0.0000
TOB Stage 2 with Option  Stage 2 TOB Option  6 5 1 (Best) 4 3 2 N/A N/A N/A N/A N/A The three records with the contribute 88% to the predicted value.	Actual Record	Mir Dependent Varia ded Dependent Varia ded Dependent Varia de between Actual de be	Bependent \ ble (BA Ln) \ riable (BA Ln)	/ariable Actual \( \frac{\partial Value for Data}{\partial ALn} \) for Data \( \frac{\partial ALn}{\partial Formula CAL} \) for Data \( \frac{\partial CAL}{\partial CAL} \) for Data \( \frac{\partial CAL}{\partial CAL} \) for Data \( \frac{\partial CAL}{\partial CAL} \) \( \frac{\partial CAL}{\partial CAL} \) for Data \( \p	Value (BA Ln): Record: #369 Record: #369 BA (Ln) Value: F= Y/ Total (Z) 0.0184 0.0458 0.6492 0.0539 0.1148 0.1179 0.0000 0.0000 0.0000 1.0000 Sum of F	6.9956 1.9315 2.6130 0.6815 Predicted Value F*BA(Ln) -0.0083 -0.0387 0.0371 -0.0539 -0.1148 -0.0904 0.0000 0.0000 0.0000 -0.2691 Normalized Prediction = Sum (F*BA Ln) 0.0000 6.9956
TOB Stage 2 with Option  Stage 2 TOB Option  6 5 1 (Best) 4 3 2 N/A N/A N/A N/A N/A The three records with the contribute 88% to the predicted value.	Actual Record	Mir Dependent Varia ded Dependent Varia ded Dependent Varia de between Actual BA (Ln)  -0.4520 -0.8450 -0.0571 -1.0000 -1.0000 -0.7669 -0.7225 -0.7139 -0.6831 -0.5570  Solution 1-Var (DC) All 517 Records Applied  Mir Mir Dependent Varia	Bependent \ ble (BA Ln) \ riable (BA Ln) \ 8.232E-01 \ 3.319E-01 \ 2.339E-02 \ 2.819E-01 \ 1.322E-01 \ 1.288E-01 \ 0.000E+00 \ 0.000E+00 \ 0.000E+00 \ 1.721E+00 \ Total (X) \ Dependent \ Depen	/ariable Actual \( \frac{\partial Value for Data}{\partial ALn) for Data} \)  BA Ln) for Data  ge 1 Predicted if \( \frac{\partial Y = \cdot \text{Total (X)} \)  Sum E  2.0910 5.1867 73.5913 6.1067 13.0179 13.3687 0.0000 0.0000 0.0000 0.0000 113.3623  Total (Z)  //ariable Actual \( \frac{\partial Y \text{ALn} \) for Data	Value (BA Ln): Record: #369 Record: #369 BA (Ln) Value: F= Y/ Total (Z) 0.0184 0.0458 0.6492 0.0539 0.1148 0.1179 0.0000 0.0000 0.0000 1.0000 Sum of F  Value (BA Ln): Value (BA Ln): Record: #369	6.9956 1.9315 2.6130 0.6815 Predicted Value F*BA(Ln) -0.0083 -0.0387 0.0371 -0.0539 -0.1148 -0.0904 0.0000 0.0000 0.0000 -0.2691 Normalized Prediction = Sum (F*BA Ln) 0.0000 6.9956 2.5567
TOB Stage 2 with Option  Stage 2 TOB Option  6 5 1 (Best) 4 3 2 N/A N/A N/A N/A N/A The three records with the contribute 88% to the predicted value.	Actual Record Difference mized Weights nized Q = 6  506 424 376 348 349 357 350 354 353 351  he lowest SumE TOB Stage 2 alue  zed Prediction of Actual Record	Mir Dependent Varia ded Dependent Varia ded Dependent Varia de between Actual de between Actual de BA (Ln)  -0.4520 -0.8450 -0.0571 -1.0000 -1.0000 -0.7669 -0.7225 -0.7139 -0.6831 -0.5570  Solution 1-Var (DC) All 517 Records Applied  Mir Mir Dependent Varia ded Depe	Bependent \ ble (BA Ln) \ riable (Band TOB Stay  8.232E-01 3.319E-01 2.339E-02 2.819E-01 1.322E-01 1.288E-01 0.000E+00 0.000E+00 0.000E+00 1.721E+00  Total (X)  Dependent \ riable Value (Band Band Band Band Band Band Band Band	/ariable Actual \( \forall \) /alue for Data \( \text{BA Ln} \) for Data \( \text{ge 1 Predicted B} \) / Sum E \( \text{2.0910} \) 5.1867 \( 73.5913 \) 6.1067 \( 13.0179 \) 13.3687 \( 0.0000 \) 0.0000 \( 0.0000 \) 0.0000 \( 0.0000 \) 113.3623 \( \text{Total (Z)} \) /ariable Actual \( \text{A Ln} \) for Data \( \text{BA Ln} \) for Data	Value (BA Ln): Record: #369 Record: #369 BA (Ln) Value: F= Y/ Total (Z) 0.0184 0.0458 0.6492 0.0539 0.1148 0.1179 0.0000 0.0000 0.0000 1.0000 Sum of F  Value (BA Ln): Value (BA Ln): Record: #369 Record: #369	6.9956 1.9315 2.6130 0.6815 Predicted Value F*BA(Ln) -0.0083 -0.0387 0.0371 -0.0539 -0.1148 -0.0904 0.0000 0.0000 0.0000 -0.2691 Normalized Prediction = Sum (F*BA Ln) 0.0000 6.9956 2.5567 2.6130
TOB Stage 2 with Option  6 5 1 (Best) 4 3 2 N/A N/A N/A N/A The three records with the contribute 88% to the predicted value.	Actual Record Difference mized Weights nized Q = 6  506 424 376 348 349 357 350 354 353 351  he lowest SumE TOB Stage 2 alue  zed Prediction of Actual Record Difference	Mir Dependent Varia ded Dependent Varia ded Dependent Varia de between Actual  BA (Ln)  -0.4520 -0.8450 0.0571 -1.0000 -1.0000 -0.7669 -0.7225 -0.7139 -0.6831 -0.5570  Solution 1-Var (DC) All 517 Records Applied  Mir Dependent Varia ded Dependent Varia ded Dependent Varia de between Actual	Bependent \ ble (BA Ln) \ riable Value (Band TOB Stay  Bependent \ Dependent \ Dependent \ Dependent \ Dependent \ Stay  Depen	/ariable Actual \( \forall \) /alue for Data \( \text{BA Ln} \) for Data \( \text{ge 1 Predicted B} \) /Sum E \( \text{2.0910} \) 5.1867 \( 73.5913 \) 6.1067 \( 13.0179 \) 13.3687 \( 0.0000 \) 0.0000 \( 0.0000 \) 0.0000 \( 0.0000 \) 113.3623 \( \text{Total (Z)} \) /ariable Actual \( \text{A Ln} \) for Data \( \text{BA Ln} \) for Data \( \text{ge 2 Predicted} \)	Value (BA Ln): Record: #369 Record: #369 BA (Ln) Value: F= Y/ Total (Z) 0.0184 0.0458 0.6492 0.0539 0.1148 0.1179 0.0000 0.0000 0.0000 1.0000 Sum of F  Value (BA Ln): Value (BA Ln): Record: #369 BA(Ln) Value:	6.9956 1.9315 2.6130 0.6815 Predicted Value F*BA(Ln) -0.0083 -0.0387 0.0371 -0.0539 -0.1148 -0.0904 0.0000 0.0000 0.0000 -0.2691 Normalized Prediction = Sum (F*BA Ln) 0.0000 6.9956 2.5567 2.6130 0.0563
TOB Stage 2 with Optin  6 5 1 (Best) 4 3 2 N/A N/A N/A N/A The three records with the contribute 88% to the predicted value.  Stage 2 Optimin	Actual Record	Mir Dependent Varia ded Dependent Varia ded Dependent Varia de between Actual  BA (Ln)  -0.4520 -0.8450 0.0571 -1.0000 -1.0000 -0.7669 -0.7225 -0.7139 -0.6831 -0.5570  Solution 1-Var (DC) All 517 Records Applied  Mir Dependent Varia ded Dependent Varia ded Dependent Valual dent Variable Valual	Bependent \ ble (BA Ln) \ riable (Band TOB Stay)  8.232E-01 3.319E-01 2.339E-02 2.819E-01 1.288E-01 0.000E+00 0.000E+00 0.000E+00 1.721E+00  Total (X)  Dependent \ riable Value (Band TOB Stay) e (BA) for Day  e (BA) for Day	/ariable Actual \( \forall \) /alue for Data \( \text{BA Ln} \) for Data \( ge 1 Predicted B Pre	Value (BA Ln): Record: #369 Record: #369 Record: #369 BA (Ln) Value: F= Y/ Total (Z) 0.0184 0.0458 0.6492 0.0539 0.1148 0.1179 0.0000 0.0000 0.0000 1.0000 Sum of F  Value (BA Ln): Value (BA Ln): Record: #369 BA(Ln) Value: P = (e(BALn))-1:	6.9956 1.9315 2.6130 0.6815 Predicted Value F*BA(Ln) -0.0083 -0.0387 0.0371 -0.0539 -0.1148 -0.0904 0.0000 0.0000 0.0000 -0.2691 Normalized Prediction = Sum (F*BA Ln) 0.0000 6.9956 2.5567 2.6130
TOB Stage 2 with Optin  6 5 1 (Best) 4 3 2 N/A N/A N/A N/A The three records with the contribute 88% to the predicted value.  Stage 2 Optimic Actual Predicted TO	Actual Record Difference mized Weights nized Q = 6  506 424 376 348 349 357 350 354 353 351  he lowest SumE TOB Stage 2 alue  zed Prediction of Actual Record Difference	Mir Dependent Varia ded Dependent Varia ded Dependent Varia de between Actual  BA (Ln)  -0.4520 -0.8450 0.0571 -1.0000 -1.0000 -0.7669 -0.7225 -0.7139 -0.6831 -0.5570  Solution 1-Var (DC) All 517 Records Applied  Mir Dependent Varia ded Dependent Varia ded Dependent Valua dent Variable Valua	Bependent \ ble (BA Ln) \ riable (BA Ln) \ riable (BA Ln) \ riable Value (Band TOB Stay  8.232E-01 3.319E-01 2.339E-02 2.819E-01 1.322E-01 1.288E-01 0.000E+00 0.000E+00 0.000E+00 1.721E+00  Total (X)  Dependent \ ble Value (Band TOB Stay e (BA) for Day e (BA)	/ariable Actual \( \forall \) /alue for Data \( \text{BA Ln} \) for Data \( \text{ge 1 Predicted II} \) / Sum E \( \text{2.0910} \) 5.1867 \( 73.5913 \) 6.1067 \( 13.0179 \) 13.3687 \( 0.0000 \) 0.0000 \( 0.0000 \) 0.0000 \( 0.0000 \) 113.3623 \( \text{Total (Z)} \) /ariable Actual \( \text{A Ln} \) for Data \( \text{BA Ln} \) for Data \( \text{BA Ln} \) for Data \( \text{BA Ln} \) for Data \( \text{Total (Z)} \) /ariable Actual \( Variable Actual Yariable Actual Yari	Value (BA Ln): Record: #369 Record: #369 Record: #369 BA (Ln) Value: F= Y/ Total (Z) 0.0184 0.0458 0.6492 0.0539 0.1148 0.1179 0.0000 0.0000 0.0000 1.0000 Sum of F  Value (BA Ln): Value (BA Ln): Record: #369 BA(Ln) Value: 9 = (e(BALn))-1: 9 = (e(BALn))-1:	6.9956 1.9315 2.6130 0.6815 Predicted Value F*BA(Ln) -0.0083 -0.0387 0.0371 -0.0539 -0.1148 -0.0904 0.0000 0.0000 0.0000 -0.2691 Normalized Prediction = Sum (F*BA Ln) 0.0000 6.9956 2.5567 2.6130 0.0563