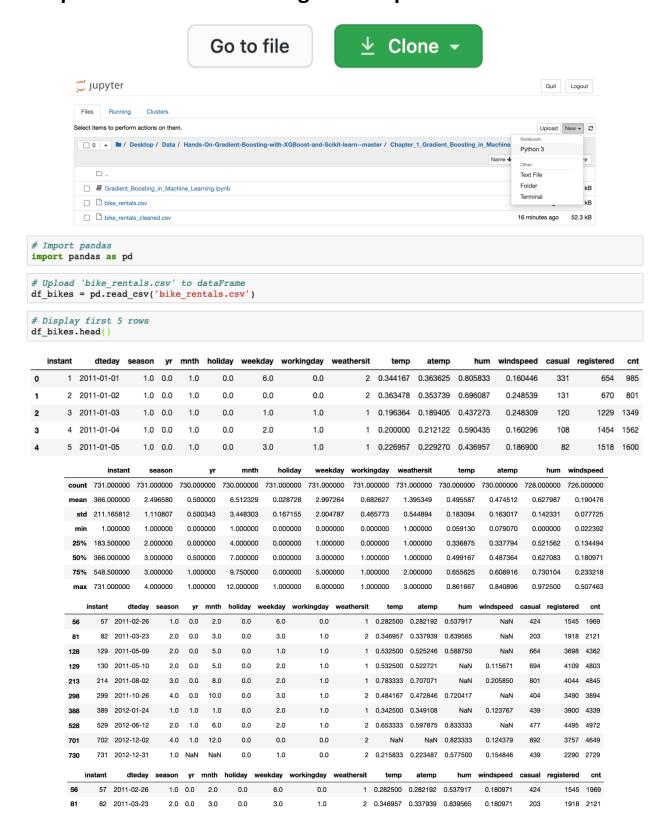
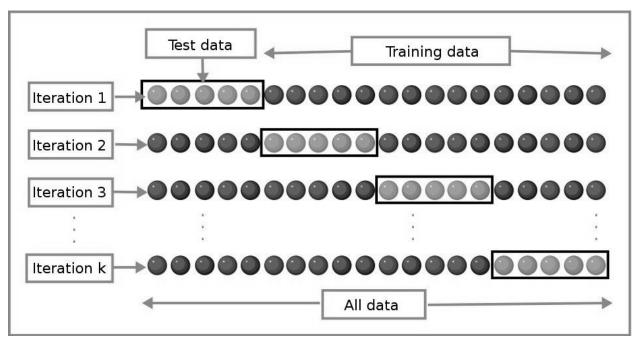
Chapter 1: Machine Learning Landscape



	ır	nstant	yr	mnth i	noliday	wee	kday w	orkingday	weathersit	temp	atem	p hun	n winds	peed casu	ial reg	istered	cnt
sea	son																
	1.0	366.0	0.5	2.0	0.0		3.0	1.0	1.0	0.285833	0.28282	1 0.54375	0.20	2750 218	3.0	1867.0 2	209.0
	2.0	308.5	0.5	5.0	0.0		3.0	1.0	1.0	0.562083	0.53821	2 0.64666	7 0.19	1546 867	.0	3844.0 4	941.5
	3.0	401.5	0.5	8.0	0.0		3.0	1.0	1.0	0.714583	0.65657	5 0.63583	3 0.16	5115 1050	1.5	4110.5 5	353.5
	4.0	493.0	0.5	11.0	0.0		3.0	1.0	1.0	0.410000	0.40970	8 0.66104	2 0.16	7918 544	.5	3815.0 4	634.5
	instant	: (dteday	seasor	n yr	mnth	holiday	weekday	workingday	weathers	sit temp	atemp	hum v	windspeed	casual	registered	d cnt
701	702	2012	-12-02	4.0	0 1.0	12.0	0.0	0.0	0.0)	2 NaN	NaN 0.	323333	0.124379	892	375	7 4649
	instant	: d	Iteday	season	yr	mnth	holiday	weekday	workingday	weathersit	temp	atemp	hum	windspeed	casual	registere	d cnt
726	727	2012-	-12-27	1.0	1.0	12	0.0	4.0	1.0	2	0.254167	0.226642	0.652917	0.350133	247	186	7 2114
727	728	2012	-12-28	1.0	1.0	12	0.0	5.0	1.0	2	0.253333	0.255046	0.590000	0.155471	644	245	1 3095
728	729	2012-	-12-29	1.0	1.0	12	0.0	6.0	0.0	2	0.253333	0.242400	0.752917	0.124383	159	118	2 1341
729	730	2012-	-12-30	1.0	1.0	12	0.0	0.0	0.0	1	0.255833	0.231700	0.483333	0.350754	364	143	2 1796
730	731	2012-	12-31	1.0	NaN	12	0.0	1.0	0.0	2	0.215833	0.223487	0.577500	0.154846	439	229	2729

```
# Initialize LinearRegression model
lin_reg = LinearRegression()
# Fit lin reg on training data
lin_reg.fit(X_train, y_train)
# Predict X test using lin reg
y pred = lin_reg.predict(X_test)
# Import mean squared error
from sklearn.metrics import mean squared error
# Import numpy
import numpy as np
# Compute mean squared error as mse
mse = mean_squared_error(y_test, y_pred)
# Compute root mean squared error as rmse
rmse = np.sqrt(mse)
# Display root mean squared error
print("RMSE: %0.2f" % (rmse))
```

RMSE: 898.21

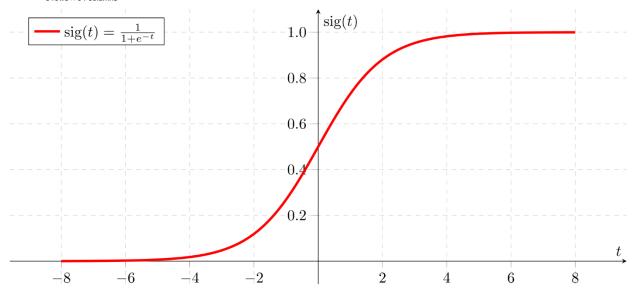


	39	State-g	jov	77516	Bachelors	13	Never-marrie	d Adm-d	clerical	Not-	in-family	White	Male	2174	0	40	United-States	<=50K
0	50	Self-emp-not-	inc	83311	Bachelors	13	Married-civ-spous	e Exec-mar	nagerial		Husband	White	Male	0	0	13	United-States	<=50K
1	38	Priva	ate 2	215646	HS-grad	9	Divorce	d Handlers-c	leaners	Not	-in-family	White	Male	0	0	40	United-States	<=50K
2	53	Priva	ate 2	234721	11th	7	Married-civ-spous	e Handlers-c	leaners		Husband	Black	Male	0	0	40	United-States	<=50K
3	28	Priva	ate 3	338409	Bachelors	13	Married-civ-spous	e Prof-s	oecialty		Wife	Black	Female	0	0	40	Cuba	<=50K
4	37	Priva	ate 2	284582	Masters	14	Married-civ-spous	e Exec-mar	nagerial		Wife	White	Female	0	0	40	United-States	<=50K
	0		1	2	3	4		5	6		7	8	9	10	11	12	13	14
0	39	State-	gov	77516	Bachelors	13	Never-marrie	d Adm	-clerical	Not-	in-family	White	Male	2174	0	40	United-States	<=50K
1	50	Self-emp-not-	-inc	83311	Bachelors	13	Married-civ-spous	e Exec-ma	nagerial	-	Husband	White	Male	0	0	13	United-States	<=50K
2	38	Priv	ate	215646	HS-grad	9	Divorce	d Handlers-d	cleaners	Not-	in-family	White	Male	0	0	40	United-States	<=50K
3	53	Priv	/ate	234721	11th	7	Married-civ-spous	e Handlers-c	eleaners	-	Husband	Black	Male	0	0	40	United-States	<=50K
4	28	Priv	ate	338409	Bachelors	13	Married-civ-spous	e Prof-s	pecialty		Wife	Black	Female	0	0	40	Cuba	<=50K
	age	workclass	fnlw	gt edu	cation edu	catio nu	on- marital- um status	occupation	relation	nship	race	sex	capital- gain	capital- loss		ho per-w	urs- native- reek country	income
0	39	State-gov	7751	16 Bac	helors		13 Never- married	Adm-clerical		ot-in- amily	White	Male	2174	C)		40 United- States	<=50K
1	50	Self-emp- not-inc	8331	11 Bac	helors		13 Married-civ- spouse	Exec- managerial	Hus	band	White	Male	0	c)		13 United- States	<=50K
2	38	Private	21564	46 HS	S-grad		9 Divorced	Handlers- cleaners	Ne f	ot-in- amily	White	Male	0	C)		40 United- States	<=50K
3	53	Private	23472	21	11th		7 Married-civ- spouse	Handlers- cleaners	Hus	band	Black	Male	0	c)		40 United- States	<=50K
4	28	Private	33840	09 Bac	helors		13 Married-civ-	Prof- specialty		Wife	Black	Female	0	c)		40 Cuba	<=50K

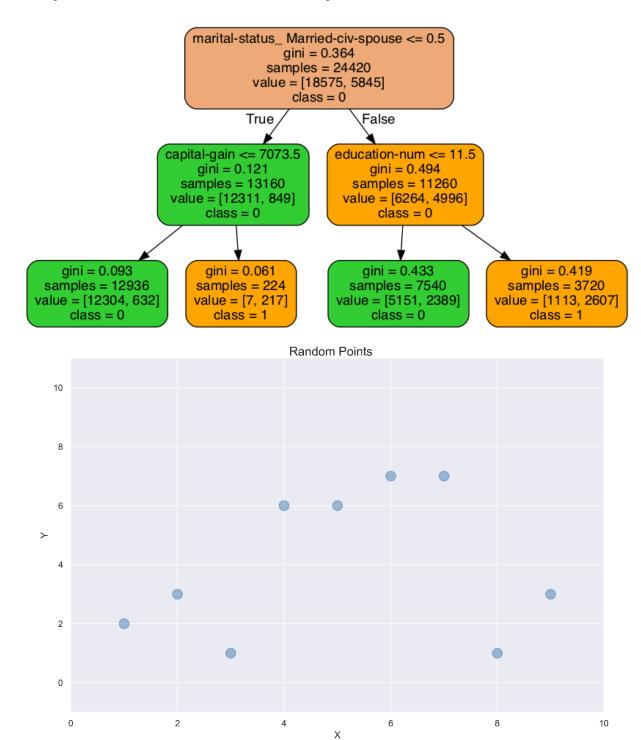
	Book Types		hardback	paperback	ebook
0	hardback	0	1	0	0
1	paperback	1	0	1	0
2	ebook	2	0	0	1

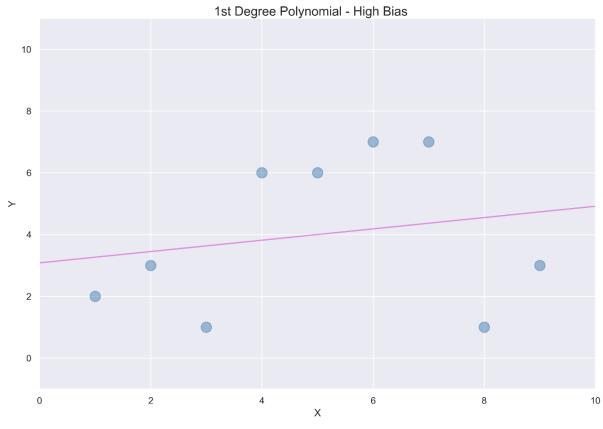
	age	fnlwgt	education- num	capital- gain	capital- loss	hours- per- week	workclass_	workclass_ Federal- gov	workclass_ Local-gov	workclass_ Never- worked	 native- country_ Scotland	native- country_ South	native- country_ Taiwan	native- country_ Thailand	native-cc Trinadad&1
0	39	77516	13	2174	0	40	0	0	0	0	 0	0	0	0	
1	50	83311	13	0	0	13	0	0	0	0	 0	0	0	0	
2	38	215646	9	0	0	40	0	0	0	0	 0	0	0	0	
3	53	234721	7	0	0	40	0	0	0	0	 0	0	0	0	
4	28	338409	13	0	0	40	0	0	0	0	 0	0	0	0	

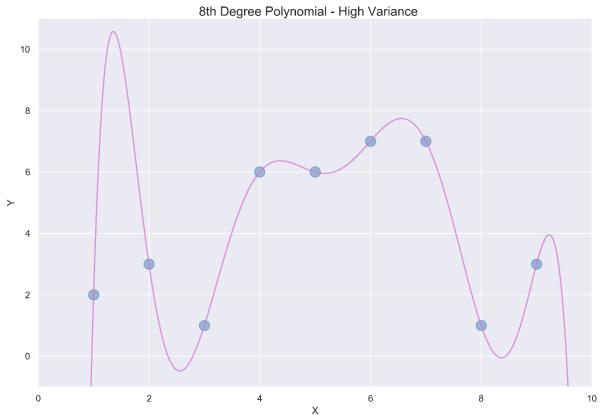
5 rows × 94 columns

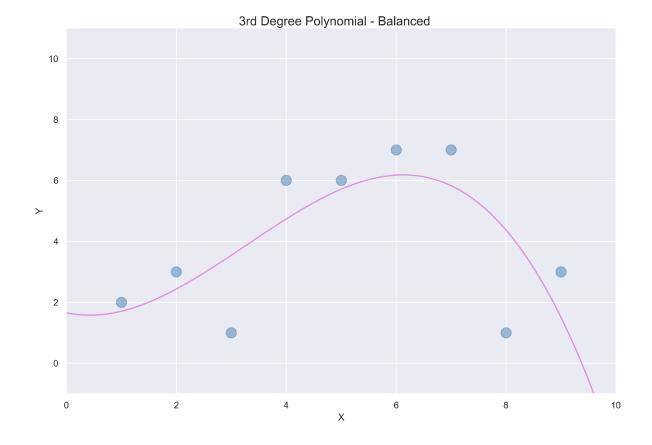


Chapter 2: Decision Trees in Depth









sklearn.tree.DecisionTreeRegressor

class sklearn.tree. DecisionTreeRegressor(criterion='mse', splitter='best', max_depth=None, min_samples_split=2, min_samples_leaf=1, min_weight_fraction_leaf=0.0, max_features=None, random_state=None, max_leaf_nodes=None, min_impurity_decrease=0.0, min_impurity_split=None, presort='deprecated', ccp_alpha=0.0) [source]

A decision tree regressor.

Read more in the User Guide.

Parameters:

criterion: {"mse", "friedman_mse", "mae"}, default="mse"

The function to measure the quality of a split. Supported criteria are "mse" for the mean squared error, which is equal to variance reduction as feature selection criterion and minimizes the L2 loss using the mean of each terminal node, "friedman_mse", which uses mean squared error with Friedman's improvement score for potential splits, and "mae" for the mean absolute error, which minimizes the L1 loss using the median of each terminal node.

New in version 0.18: Mean Absolute Error (MAE) criterion.

splitter: {"best", "random"}, default="best"

The strategy used to choose the split at each node. Supported strategies are "best" to choose the best split and "random" to choose the best random split.

max_depth : int, default=None

The maximum depth of the tree. If None, then nodes are expanded until all leaves are pure or until all leaves contain less than min_samples_split samples.

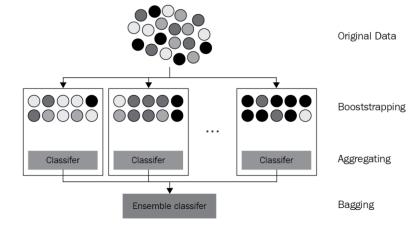
min_samples_split : int or float, default=2

The minimum number of samples required to split an internal node:

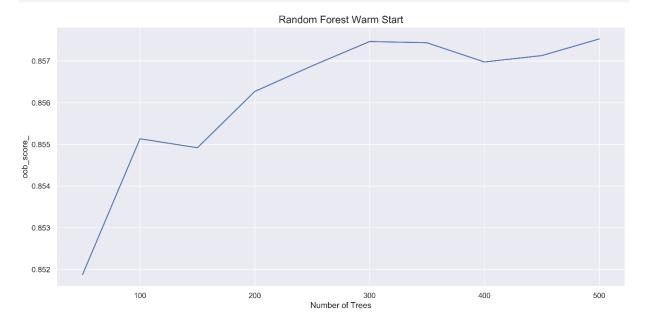
- If int, then consider min_samples_split as the minimum number.
- If float, then min_samples_split is a fraction and ceil(min_samples_split * n_samples) are the

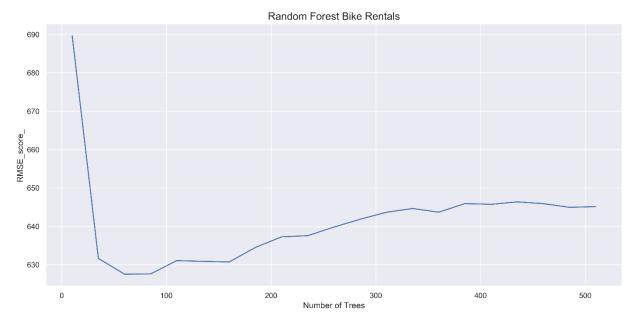
	age	sex	ср	trestbps	chol	fbs	restecg	thalach	exang	oldpeak	slope	ca	thal	target
0	63	1	3	145	233	1	0	150	0	2.3	0	0	1	1
1	37	1	2	130	250	0	1	187	0	3.5	0	0	2	1
2	41	0	1	130	204	0	0	172	0	1.4	2	0	2	1
3	56	1	1	120	236	0	1	178	0	0.8	2	0	2	1
4	57	0	0	120	354	0	1	163	1	0.6	2	0	2	1

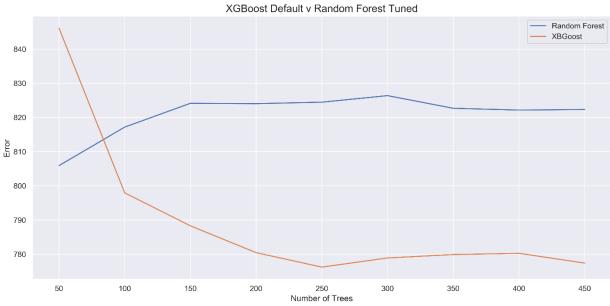
Chapter 3: Bagging with Random Forests



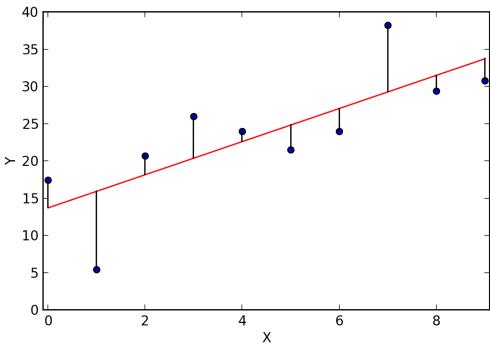
	instant	season	yr	mnth	holiday	weekday	workingday	weathersit	temp	atemp	hum	windspeed	cnt
0	1	1.0	0.0	1.0	0.0	6.0	0.0	2	0.344167	0.363625	0.805833	0.160446	985
1	2	1.0	0.0	1.0	0.0	0.0	0.0	2	0.363478	0.353739	0.696087	0.248539	801
2	3	1.0	0.0	1.0	0.0	1.0	1.0	1	0.196364	0.189405	0.437273	0.248309	1349
3	4	1.0	0.0	1.0	0.0	2.0	1.0	1	0.200000	0.212122	0.590435	0.160296	1562
4	5	1.0	0.0	1.0	0.0	3.0	1.0	1	0.226957	0.229270	0.436957	0.186900	1600



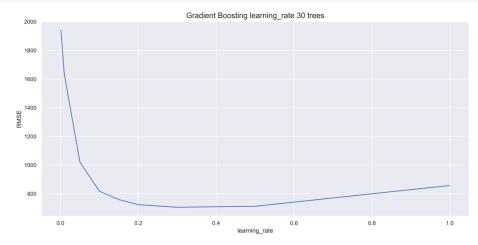


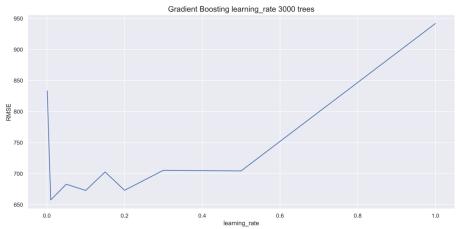


Chapter 4: From Gradient Boosting to XGBoost



	instant	season	yr	mnth	holiday	weekday	workingday	weathersit	temp	atemp	hum	windspeed	cnt
0	1	1.0	0.0	1.0	0.0	6.0	0.0	2	0.344167	0.363625	0.805833	0.160446	985
1	2	1.0	0.0	1.0	0.0	0.0	0.0	2	0.363478	0.353739	0.696087	0.248539	801
2	3	1.0	0.0	1.0	0.0	1.0	1.0	1	0.196364	0.189405	0.437273	0.248309	1349
3	4	1.0	0.0	1.0	0.0	2.0	1.0	1	0.200000	0.212122	0.590435	0.160296	1562
4	5	1.0	0.0	1.0	0.0	3.0	1.0	1	0.226957	0.229270	0.436957	0.186900	1600





	LABEL	FLUX.1	FLUX.2	FLUX.3	FLUX.4	FLUX.5	FLUX.6	FLUX.7	FLUX.8	FLUX.9
0	2	93.85	83.81	20.10	-26.98	-39.56	-124.71	-135.18	-96.27	-79.89
1	2	-38.88	-33.83	-58.54	-40.09	-79.31	-72.81	-86.55	-85.33	-83.97
2	2	532.64	535.92	513.73	496.92	456.45	466.00	464.50	486.39	436.56
3	2	326.52	347.39	302.35	298.13	317.74	312.70	322.33	311.31	312.42
4	2	-1107.21	-1112.59	-1118.95	-1095.10	-1057.55	-1034.48	-998.34	-1022.71	-989.57

5 rows × 3198 columns

Chapter 5: XGBoost Unveiled

	sepal length (cm)	sepal width (cm)	petal length (cm)	petal width (cm)	target
0	5.1	3.5	1.4	0.2	0.0
1	4.9	3.0	1.4	0.2	0.0
2	4.7	3.2	1.3	0.2	0.0
3	4.6	3.1	1.5	0.2	0.0
4	5.0	3.6	1.4	0.2	0.0

0

 count
 442.000000

 mean
 152.133484

 std
 77.093005

 min
 25.000000

 25%
 87.000000

 50%
 140.500000

 75%
 211.500000

max 346.000000

PRI_jet_leading_phi	PRI_jet_subleading_pt	PRI_jet_subleading_eta	PRI_jet_subleading_phi	PRI_jet_all_pt	Weight	Label	KaggleSet	KaggleWeight
0.444	46.062	1.24	-2.475	113.497	0.000814	s	t	0.002653
1.158	-999.000	-999.00	-999.000	46.226	0.681042	b	t	2.233584
-2.028	-999.000	-999.00	-999.000	44.251	0.715742	b	t	2.347389
-999.000	-999.000	-999.00	-999.000	-0.000	1.660654	b	t	5.446378
-999.000	-999.000	-999.00	-999.000	0.000	1.904263	b	t	6.245333

	Eventid	DER_mass_wiviC	DER_mass_transverse_met_lep	DER_mass_vis	DEK_Pt_n	DER_deltaeta_jet_jet	DER_mass_jet_jet	DER_prodeta_jet_jet	DER_deltar_
0	100000	138.470	51.655	97.827	27.980	0.91	124.711	2.666	
1	100001	160.937	68.768	103.235	48.146	-999.00	-999.000	-999.000	
2	100002	-999.000	162.172	125.953	35.635	-999.00	-999.000	-999.000	
3	100003	143.905	81.417	80.943	0.414	-999.00	-999.000	-999.000	
4	100004	175.864	16.915	134.805	16.405	-999.00	-999.000	-999.000	

5 rows × 33 columns

Chapter 6: Machine Learning Landscape

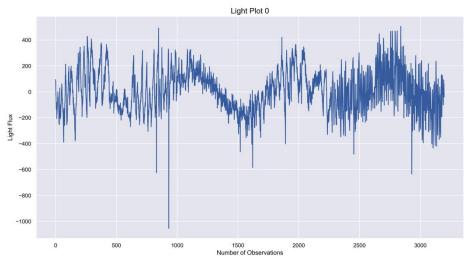
	age	sex	ср	trestbps	chol	fbs	restecg	thalach	exang	oldpeak	slope	ca	thal	target
0	63	1	3	145	233	1	0	150	0	2.3	0	0	1	1
1	37	1	2	130	250	0	1	187	0	3.5	0	0	2	1
2	41	0	1	130	204	0	0	172	0	1.4	2	0	2	1
3	56	1	1	120	236	0	1	178	0	0.8	2	0	2	1
4	57	0	0	120	354	0	1	163	1	0.6	2	0	2	1

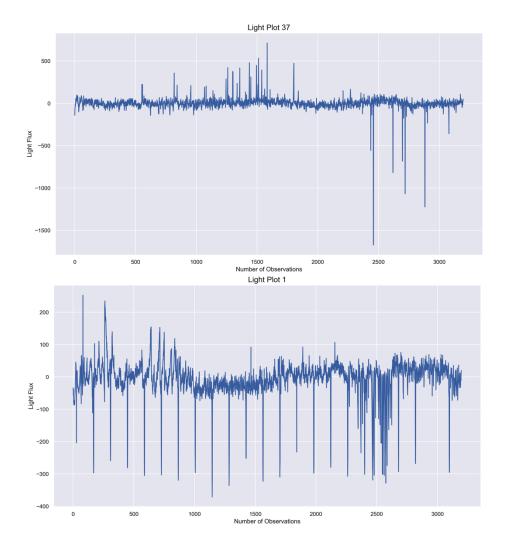
Name	Default	Range	Effect	Notes/Tips
n_estimators	100	[1, inf)	Increasing may improve scores with large data.	The number of trees in the ensemble.
learning_rate alias:eta	0.3	[0, inf)	Decreasing prevents overfitting.	Shrinks the tree weights in each round of boosting.
max_depth	6	[0, inf)	Decreasing prevents overfitting.	The depth of the tree. 0 is an option in a loss-guided growing policy.
gamma alias: min_split_loss	0	[0, inf)	Increasing prevents overfitting.	Low values, usually lower than 10, are standard.
min_child_weight	1	[0, inf)	Increasing prevents overfitting.	The minimum sum of weights required for a node to split.
subsample	1	(0, 1]	Decreasing prevents overfitting.	Limits the percentage of training rows for each boosting round.
colsample_bytree	1	(0, 1]	Decreasing prevents overfitting.	Limits the percentage of training columns for each boosting round.
colsample_bylevel	1	(0, 1]	Decreasing prevents overfitting.	Limits the percentage of columns for each depth level of the tree.
colsample_bynode	1	(0, 1]	Decreasing prevents overfitting.	Limits the percentage of columns to evaluate splits.
scale_pos_weight	1	(0, inf)	Sum(negatives)/ Sum(positives) balances data.	Used for imbalanced datasets. See Chapter 5, XGBoost Unveiled, and Chapter 7, Discovering Exoplanets with XGBoost.
max_delta_step	0	[0, inf)	Increasing prevents overfitting.	Only recommended for extremely imbalanced datasets.
lambda	1	[0, inf)	Increasing prevents overfitting.	L2 regularization of weights.
alpha	0	[0, inf)	Increasing prevents overfitting.	L1 regularization of weights.
missing	None	(-inf, inf)	Finds optimal null values.	Replace null values with numerical value like -999.0, then set equal to -999.0. See Chapter 5, XGBoost Unveiled.

Chapter 7: Discovering Exoplanets with XGBoost

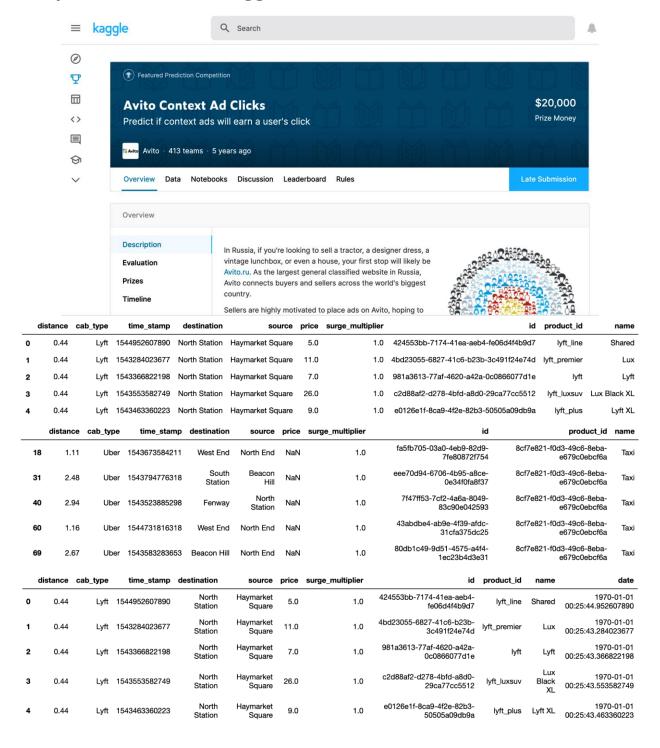
	LABEL	FLUX.1	FLUX.2	FLUX.3	FLUX.4	FLUX.5	FLUX.6	FLUX.7	FLUX.8	FLUX.9	 FLUX.3188	FLUX.3189	FLUX.3190	FLUX.3191	FLUX.3192
0	2	93.85	83.81	20.10	-26.98	-39.56	-124.71	-135.18	-96.27	-79.89	 -78.07	-102.15	-102.15	25.13	48.57
1	2	-38.88	-33.83	-58.54	-40.09	-79.31	-72.81	-86.55	-85.33	-83.97	 -3.28	-32.21	-32.21	-24.89	-4.86
2	2	532.64	535.92	513.73	496.92	456.45	466.00	464.50	486.39	436.56	 -71.69	13.31	13.31	-29.89	-20.88
3	2	326.52	347.39	302.35	298.13	317.74	312.70	322.33	311.31	312.42	 5.71	-3.73	-3.73	30.05	20.03
4	2	-1107.21	-1112.59	-1118.95	-1095.10	-1057.55	-1034.48	-998.34	-1022.71	-989.57	 -594.37	-401.66	-401.66	-357.24	-443.76

5 rows × 3198 columns

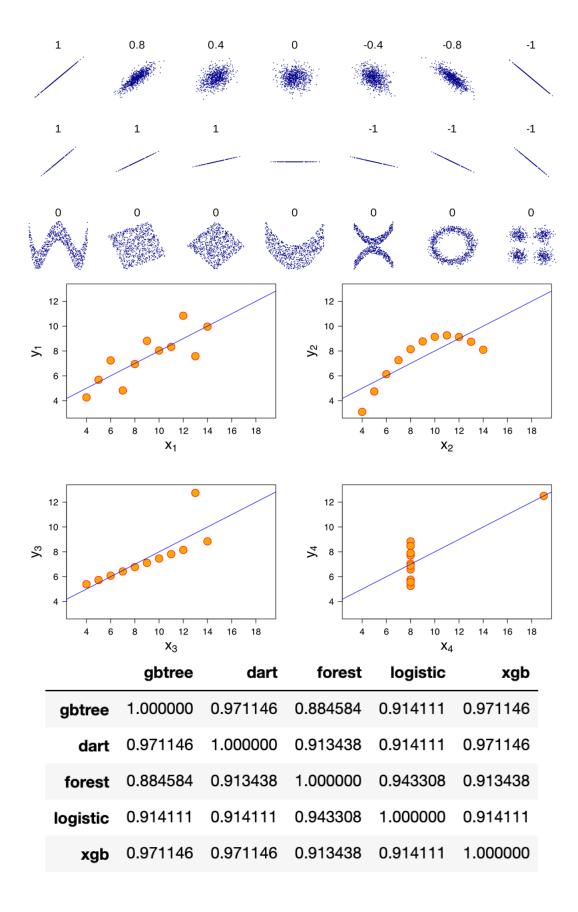




Chapter 9: XGBoost Kaggle Masters



distar	nce	cab_type	time	_stamp	destina	ation	sou	ırce pric	ce su	urge_mult	tiplier			id	proc	duct_id	nam	е	date
o 0	.44	Lyft	1544952	607890		lorth ation	Hayma Squ	rket uare 5	.0		1.0	4245	53bb-7174-4 fe0	11ea-aeb4- 6d4f4b9d7	ı	lyft_line	Share		018-12-16 :30:07.890
1 0).44	Lyft	1543284	023677		lorth ation	Hayma Squ	rket uare 11	.0		1.0	4bd2	3055-6827-4 3c4	1c6-b23b- 91f24e74d	lyft_	premier	Lu		018-11-27 :00:23.677
2 0	.44	Lyft	1543366	822198		lorth ation	Hayma Squ	rket 7 uare 7	.0		1.0	981	a3613-77af-4 0c0	1620-a42a- 866077d1e		lyft	Ly		018-11-28 :00:22.198
3 0).44	Lyft	1543553	582749		lorth ation	Hayma Squ	rket 26 uare	.0		1.0	c2d	88af2-d278- 29c	4bfd-a8d0- a77cc5512	lyft _.	_luxsuv	Lu Blac X	k na	018-11-30 :53:02.749
4 0	.44	Lyft	1543463	360223		lorth ation	Hayma Squ	rket 9	.0		1.0	e01	26e1f-8ca9-	4f2e-82b3- 05a09db9a	ly	/ft_plus	Lyft X		018-11-29 :49:20.223
me_stamp	des	tination	sourc	e price	surge	_multiplier		id	p	oroduct_ic	l n	ame	date	month	hour	dayofv	reek we	ekend	rush_hour
04379037		Fenway	Nort Statio			1.0	f9	934d2fbe- 978-4495- 9786- 4dd21107	е	997acbb5- 102-41e1- b155- 7de0a73f2	Uber	Pool	2018-11-29 15:12:59.037		15		3	0	1
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07083241		Fenway	Nort Statio			1.0	55	3c5db97- 54b-47bf- 908b- 80e86103	4	dfc5-27f1 2e8-84db 7a75f6969	- Ub	erXL	2018-11-28 12:11:23.241		12		2	0	0
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Chapter 10: XGBoost Model Deployment

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