Project Luther

Predicting movie opening income and best release season

https://github.com/gabll/Metis-Luther.git

Project Luther

Project details

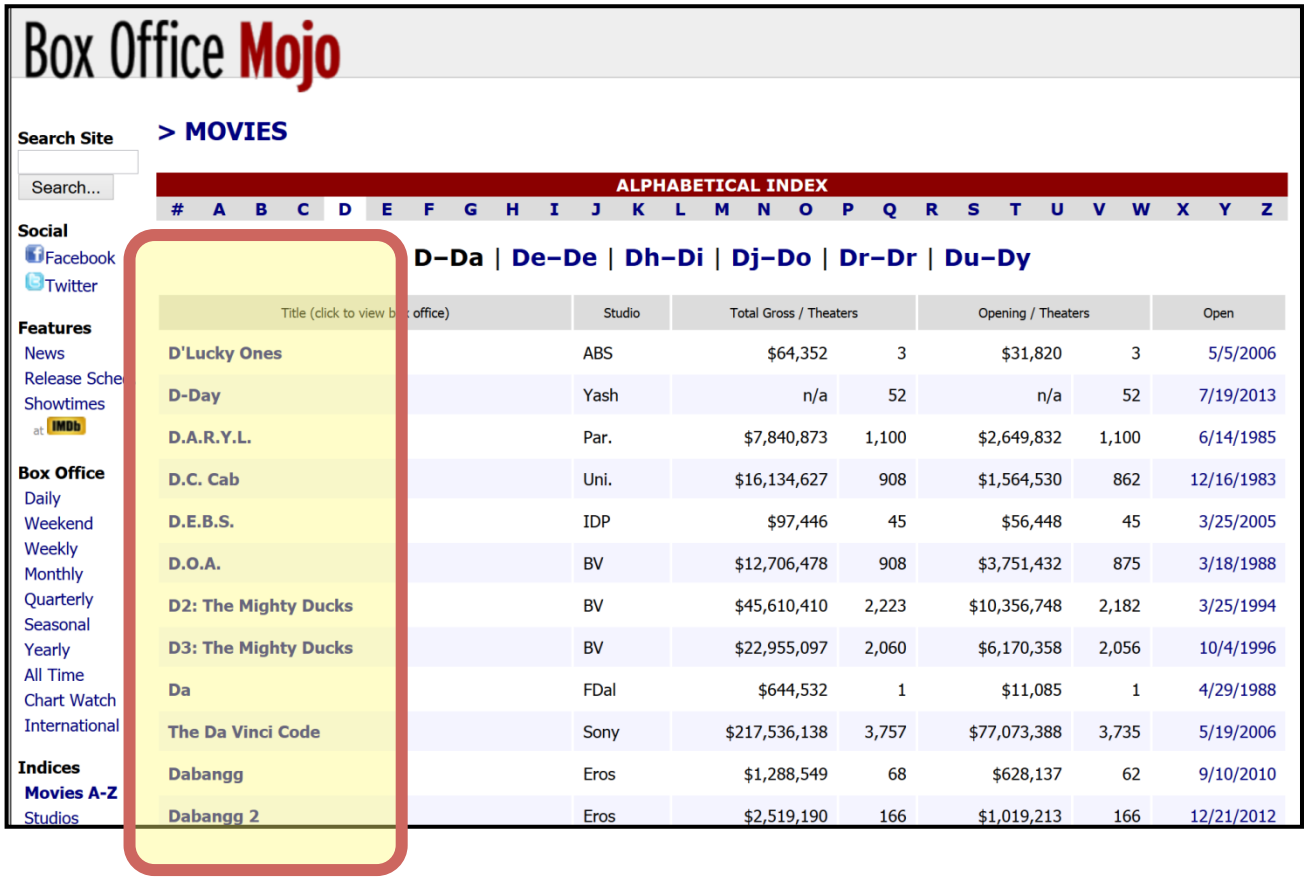
Client	Film distributor
Client's need	1. Predict the **movie opening income** in the first weekend 2. Find the **best season** for releasing a new movie

Project Luther

Why predict opening income?

Data source

http://www.boxofficemojo.com/



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Showtimes

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Daily

Weekend

Weekly

Monthly

Quarterly

Seasonal

Yearly

All Time

Chart Watch

International

Indices

Movies A-Z

Studios

> MOVIES

ALPHABETICAL INDEX

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

D–Da | De–De | Dh–Di | Dj–Do | Dr–Dr | Du–Dy

Title (click to view b office)	Studio	Total Gross / Theaters		Opening / Theaters		Open
D'Lucky Ones	ABS	$64,352	3	$31,820	3	5/5/2006
D-Day	Yash	n/a	52	n/a	52	7/19/2013
D.A.R.Y.L.	Par.	$7,840,873	1,100	$2,649,832	1,100	6/14/1985
D.C. Cab	Uni.	$16,134,627	908	$1,564,530	862	12/16/1983
D.E.B.S.	IDP	$97,446	45	$56,448	45	3/25/2005
D.O.A.	BV	$12,706,478	908	$3,751,432	875	3/18/1988
D2: The Mighty Ducks	BV	$45,610,410	2,223	$10,356,748	2,182	3/25/1994
D3: The Mighty Ducks	BV	$22,955,097	2,060	$6,170,358	2,056	10/4/1996
Da	FDal	$644,532	1	$11,085	1	4/29/1988
The Da Vinci Code	Sony	$217,536,138	3,757	$77,073,388	3,735	5/19/2006
Dabangg	Eros	$1,288,549	68	$628,137	62	9/10/2010
Dabangg 2	Eros	$2,519,190	166	$1,019,213	166	12/21/2012

Data source

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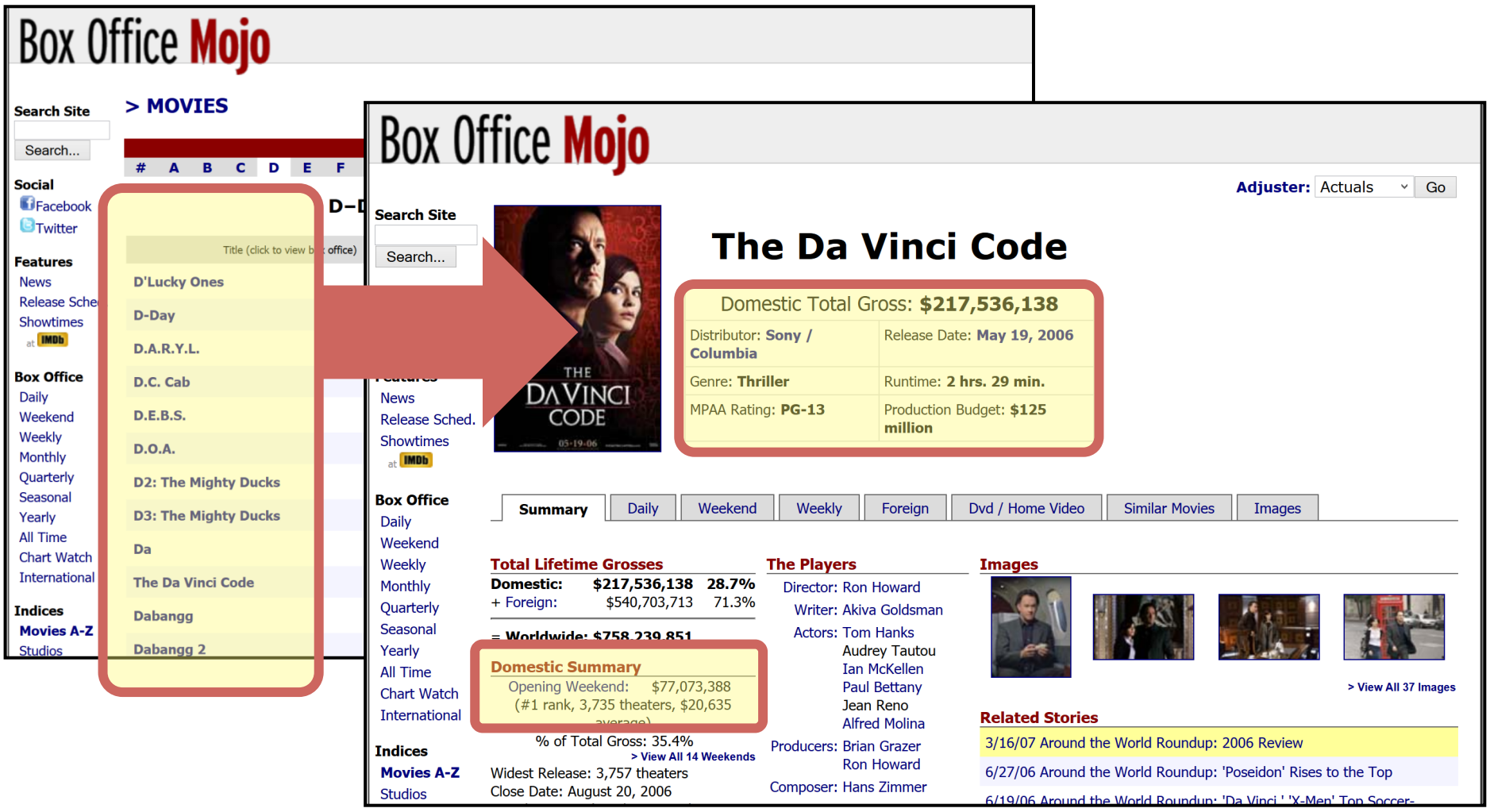

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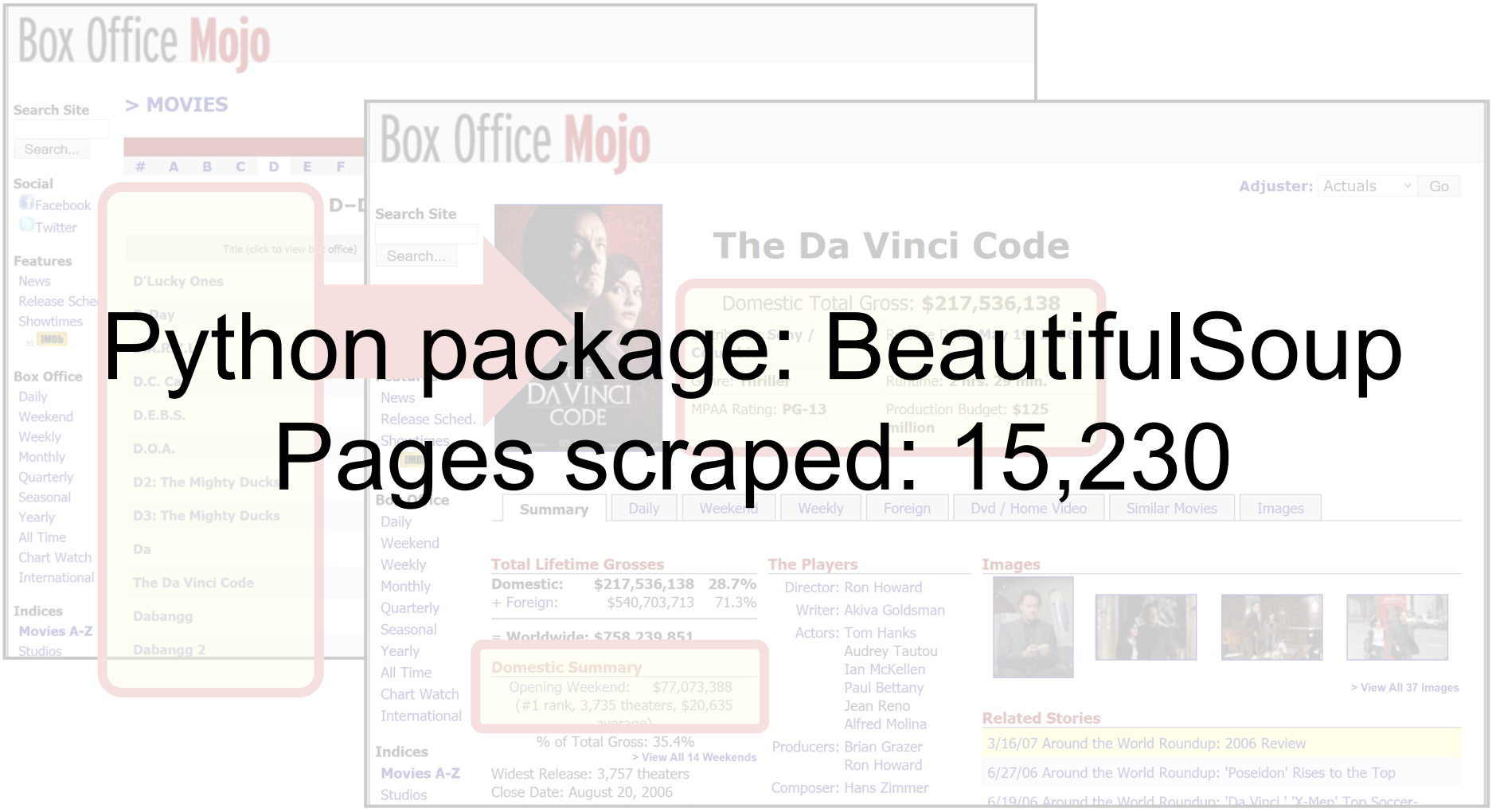
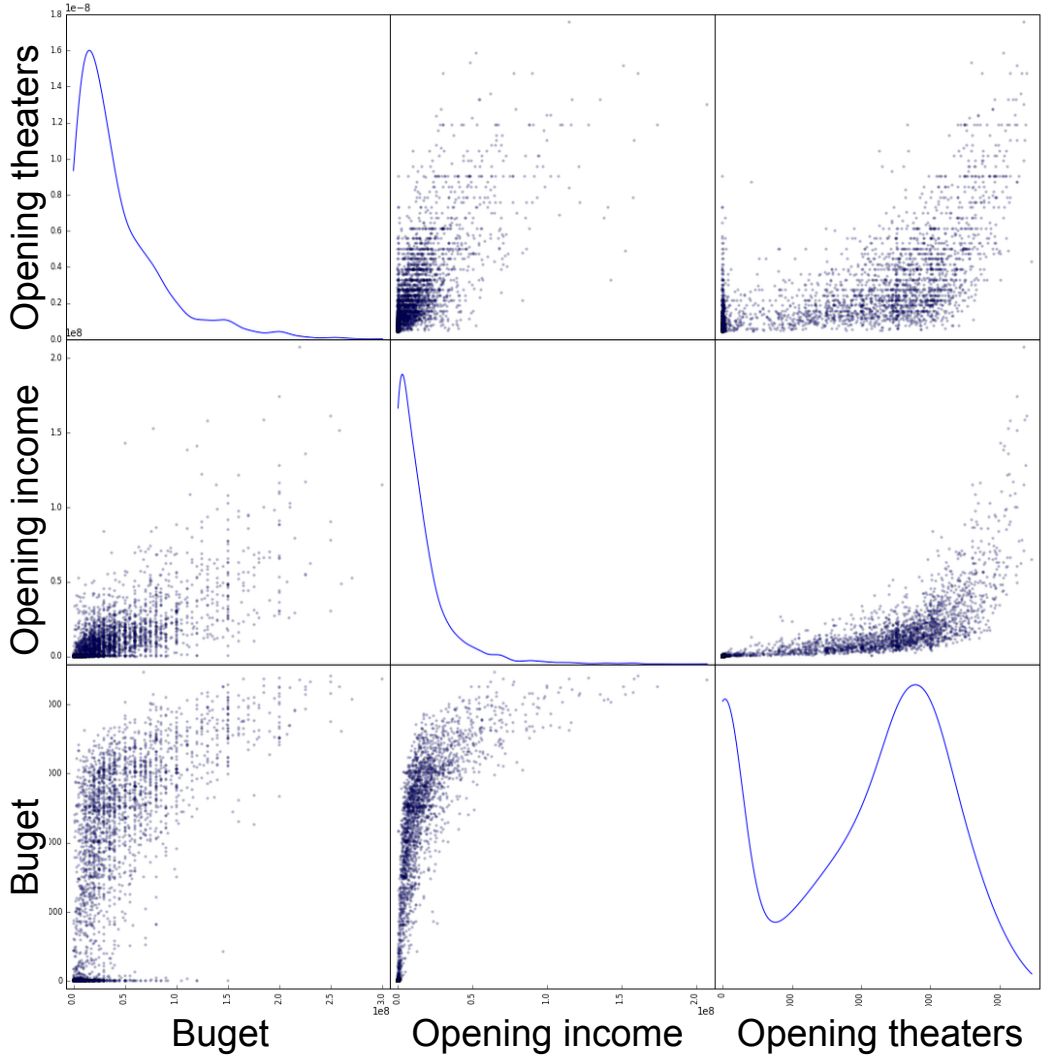


Python package: BeautifulSoup
Pages scraped: 15,230

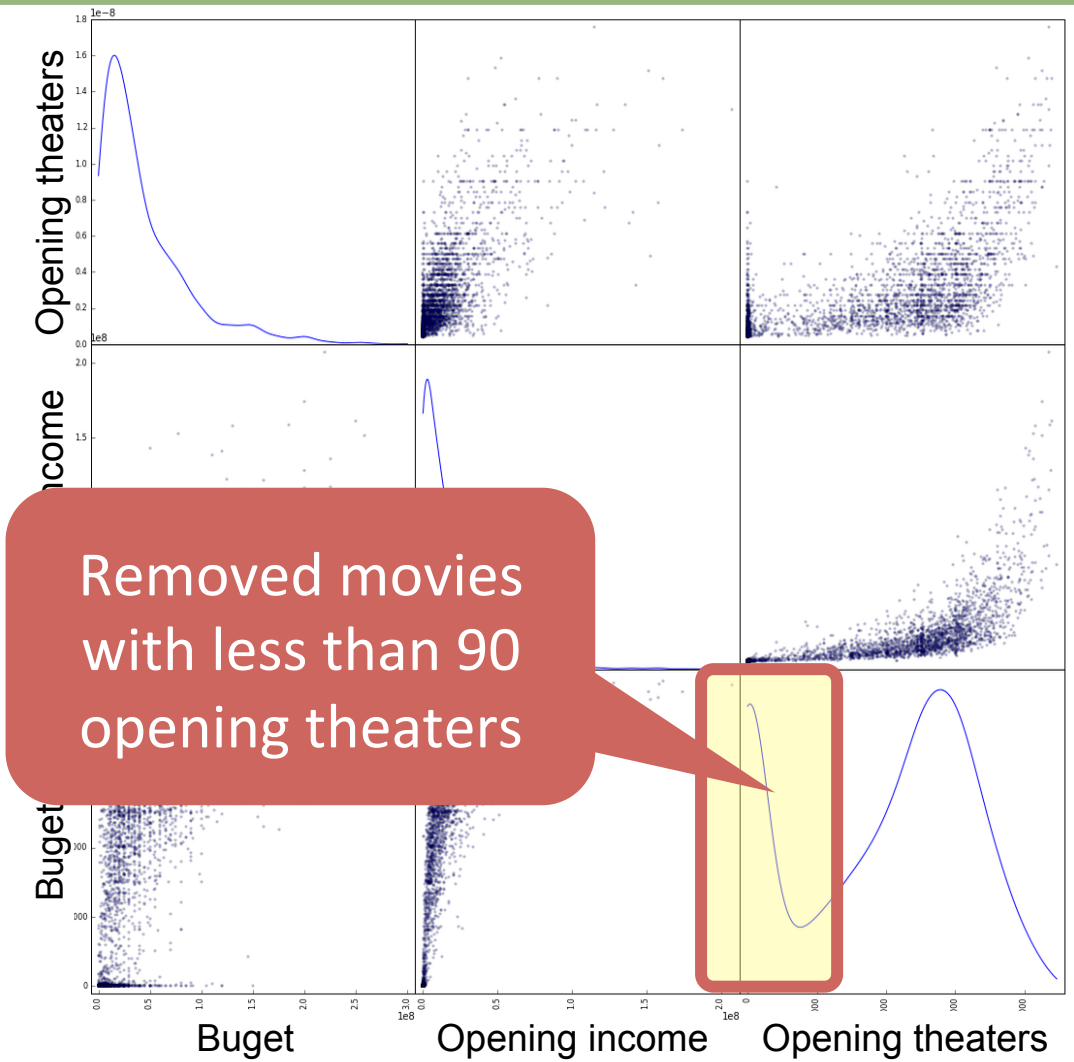
1. Predict opening income

Exploratory Data Analysis



1. Predict opening income

Exploratory Data Analysis



1. Predict opening income

Model statement

$$\log(Y) = \beta_0 + \beta_1 \log(X_{budget}) + \beta_2 X_{opening\_theaters}$$

1. Predict opening income

Linear Regression

$$\log(Y) = \beta_0 + \beta_1 \log(X_{budget}) + \beta_2 X_{opening\_theaters}$$

11.8429 0.1261 0.0009

***O**rdinary*
***L**east*
***S**quares*

$R^2 = 0.69$

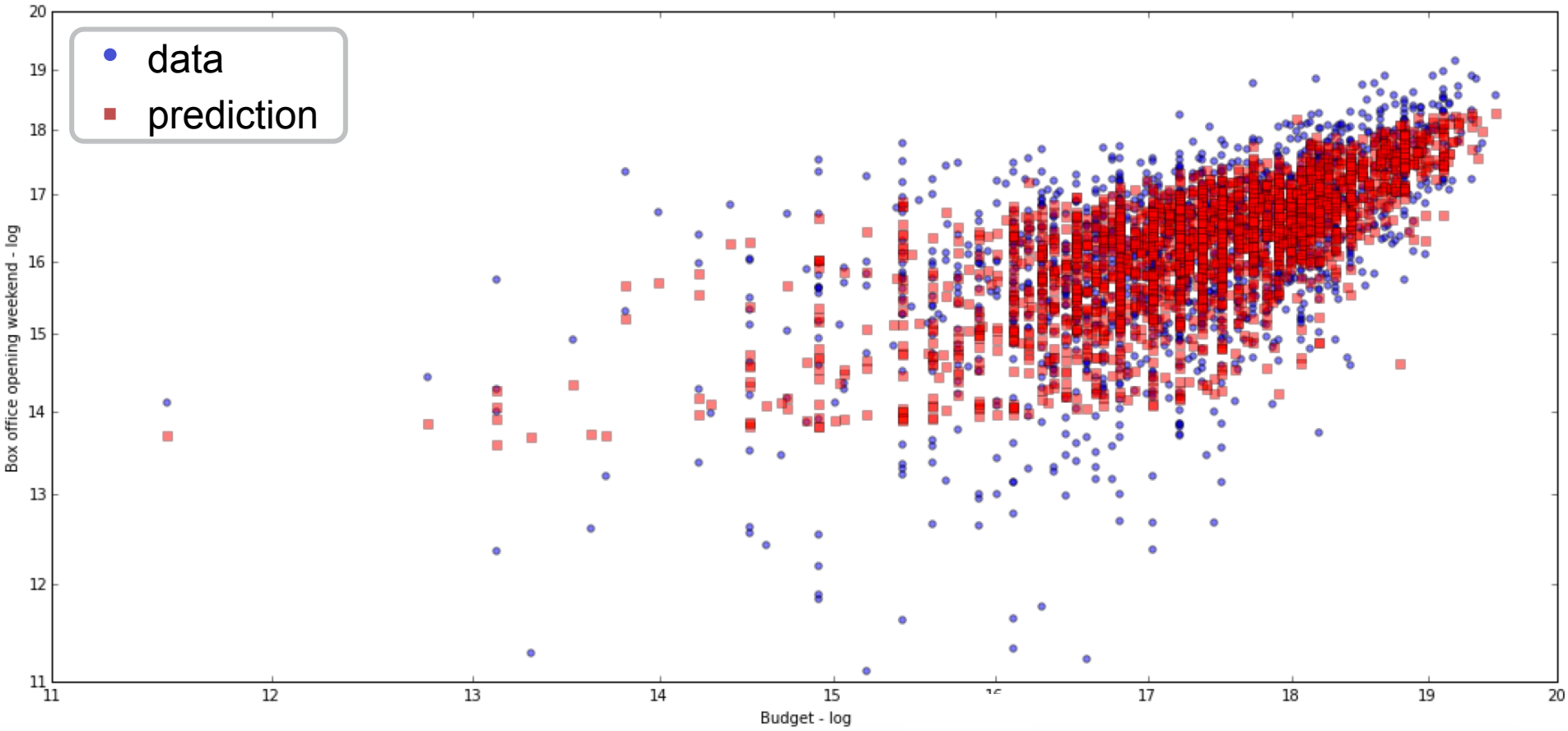
≈70% of variation explained by the model

Other features (runtime, first week competition, MPAA rating, etc.) don't improve significantly the value of R^2

1. Predict opening income

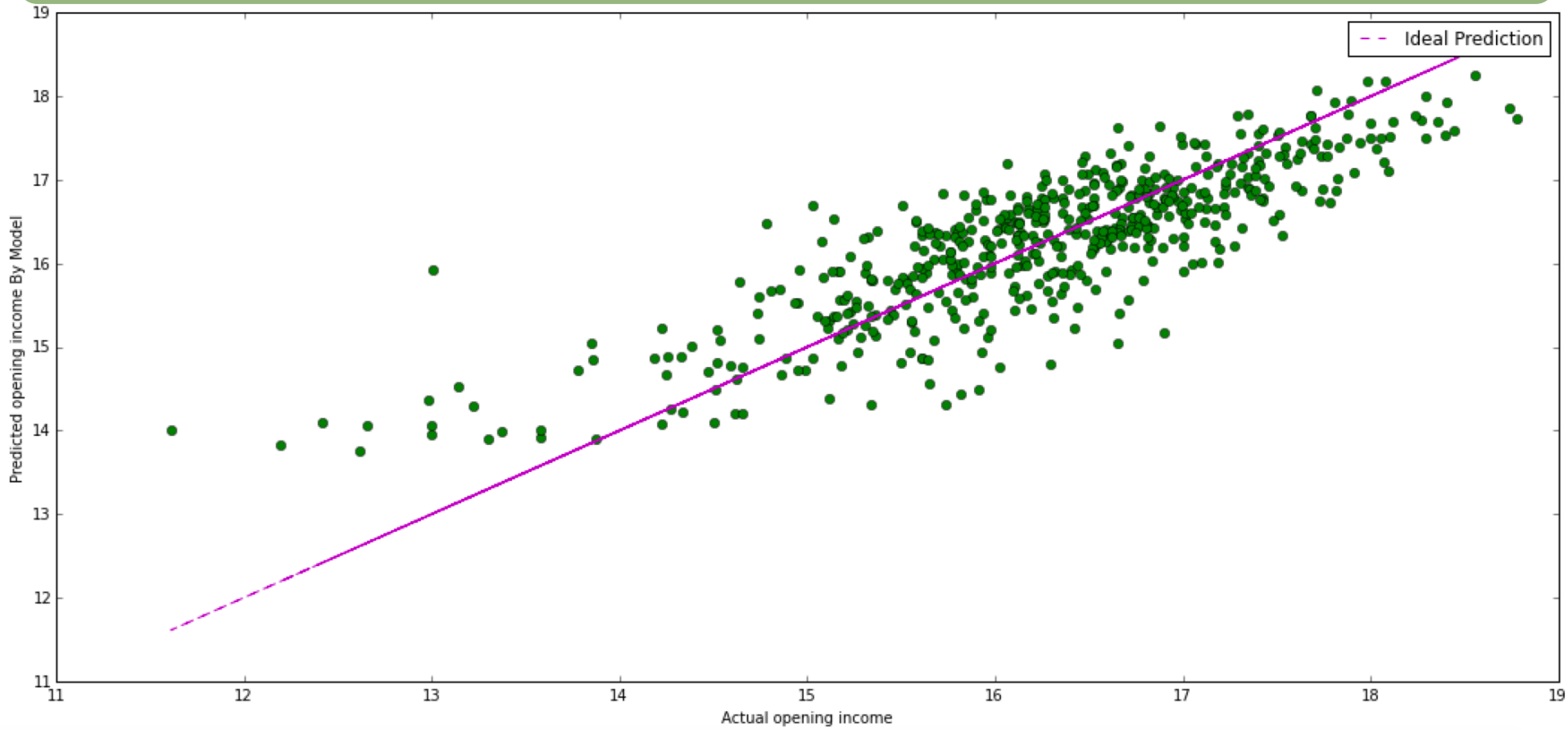
Linear Regression

$$\log(Y) = \beta_0 + \beta_1 \log(X_{budget}) + \beta_2 X_{opening\_theaters}$$



1. Predict opening income

Model evaluation

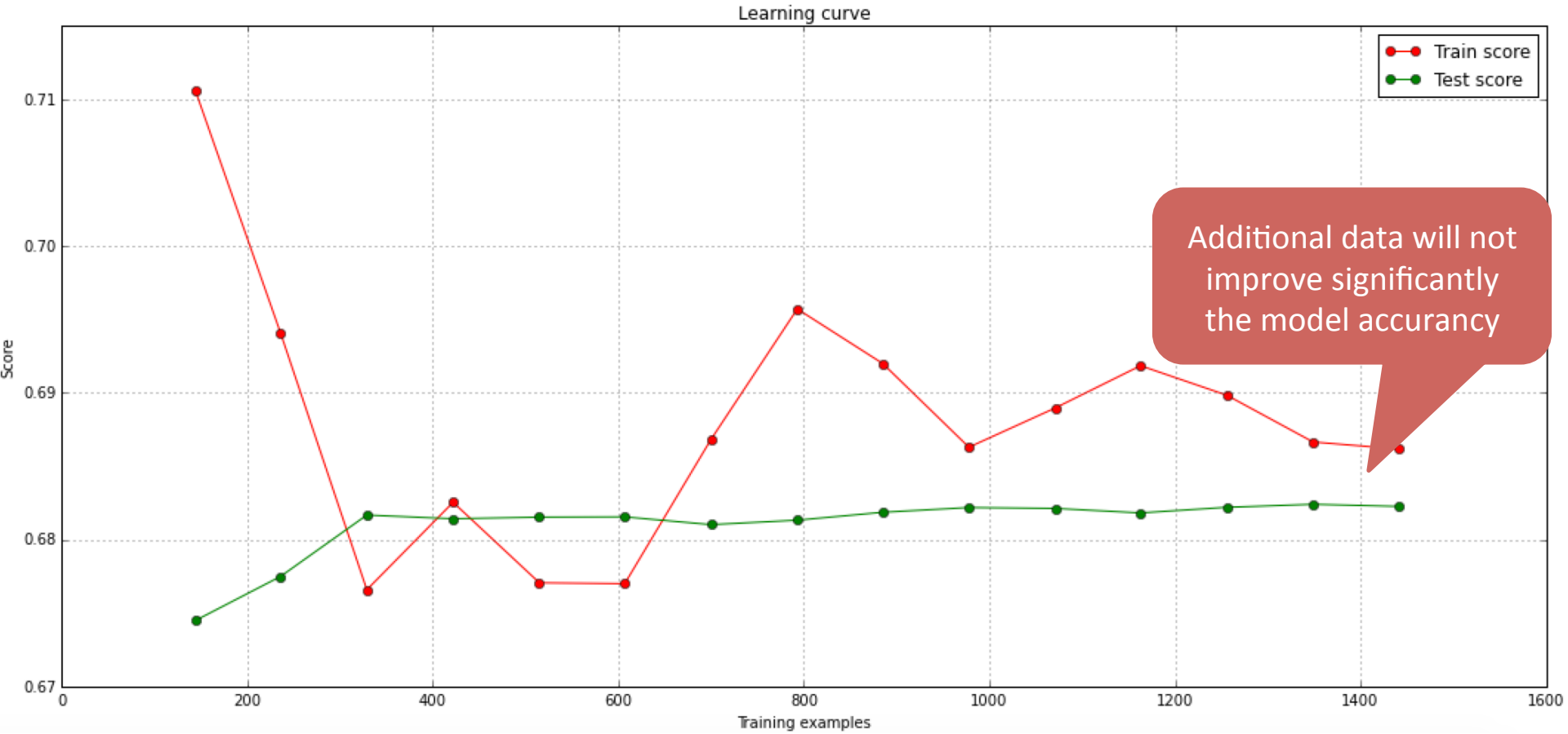


Training set = 75%
Testing set = 25%

Mean Squared Error = 0.34

1. Predict opening income

Model evaluation



2. Find the best season

Additional variables

	release_date	BOM_id	budget	domestic_total_gros	genre	movie_title	opening_income_wend	opening_theaters	rating	runtime_mins	release_weekend	release_season
10	2013-07-19	conjuring	20000000	137400141	horror	The Conjuring	41855326	2903	R	112	201329	Summer
23	2003-12-05	lastsamurai	140000000	111127263	war	The Last Samurai	24271354	2908	R	154	200349	Holiday
25	2012-09-21	houseattheendofthestreet	10000000	31611916	thriller	House at the End of The Street	12287234	3083	PG	101	201238	Fall
33	2007-06-08	hostel2	10200000	17609452	horror	Hostel Part II	8203391	2350	R	94	200723	Summer
37	2010-04-22	oceans	80000000	19422319	documentary	Oceans	6058958	1206	G	103	201016	Spring
39	2014-03-14	veronicamars	6000000	3322127	comedy	Veronica Mars	1988351	291	PG	107	201411	Spring
52	2010-05-14	nottingham	200000000	105269730	adventure	Robin Hood	36063385	3503	PG	148	201019	Summer
64	2011-08-05	tunnel11	135000	1532	horror	The Tunnel	507	1	None	90	201131	Summer
67	2000-01-28	instshegreat	44000000	2962465	comedy	Isn't She Great	1368705	750	R	96	200004	Winter
70	2006-08-11	pulse	20500000	20264436	horror	Pulse	8203822	2323	PG	90	200632	Summer

Movie genre (binned from boxofficemojo)

Release season (binned from boxofficemojo)

Dummy variables

2. Find the best season

Feature selection

$$\log(Y) = \beta_0 + \beta_1 (X_{opening\_theaters}) + \beta_{2i} X_{genre\text{-}season\_i}$$

OLS Regression Results

Dep. Variable:	y	**R-squared:**	0.731
Model:	OLS	**Adj. R-squared:**	0.726
Method:	Least Squares	**F-statistic:**	166.6
Date:	Thu, 29 Jan 2015	**Prob (F-statistic):**	0.00
Time:	23:50:15	**Log-Likelihood:**	-4525.6
No. Observations:	4372	**AIC:**	9193.
Df Residuals:	4301	**BIC:**	9646.
Df Model:	70		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[95.0% Conf. Int.]
opening_theaters	0.0011	1.08e-05	100.076	0.000	0.001 0.001
action-Fall	0.1113	0.068	1.625	0.104	-0.023 0.246
action-Holiday				0.000	0.277 0.593
action-Spring				0.001	0.093 0.367
action-Summer				0.000	0.385 0.579
action-Winter	0.2637	0.070	3.748	0.000	0.126 0.402
adventure-Fall	0.1149	0.144	0.800	0.424	-0.167 0.397
adventure-Holiday				0.000	0.218 0.559
adventure-Spring				0.027	0.025 0.401
adventure-Summe				0.000	0.235 0.476
adventure-Winter				0.017	0.057 0.579
animation-Fall	0.0890	0.125	0.714	0.475	-0.155 0.333
animation-Holiday	0.0502	0.092	0.548	0.584	-0.129 0.230
animation-Spring	-0.1272	0.106		0.229	-0.334 0.080
animation-Summe				0.583	-0.112 0.199
animation-Winter				0.001	-0.792 -0.203
comedy-Fall				0.058	-0.003 0.204
comedy-Holiday	0.3159	0.051	6.245	0.000	0.217 0.415
comedy-Spring	0.2416	0.046	5.216	0.000	0.151 0.332

Not relevant feature

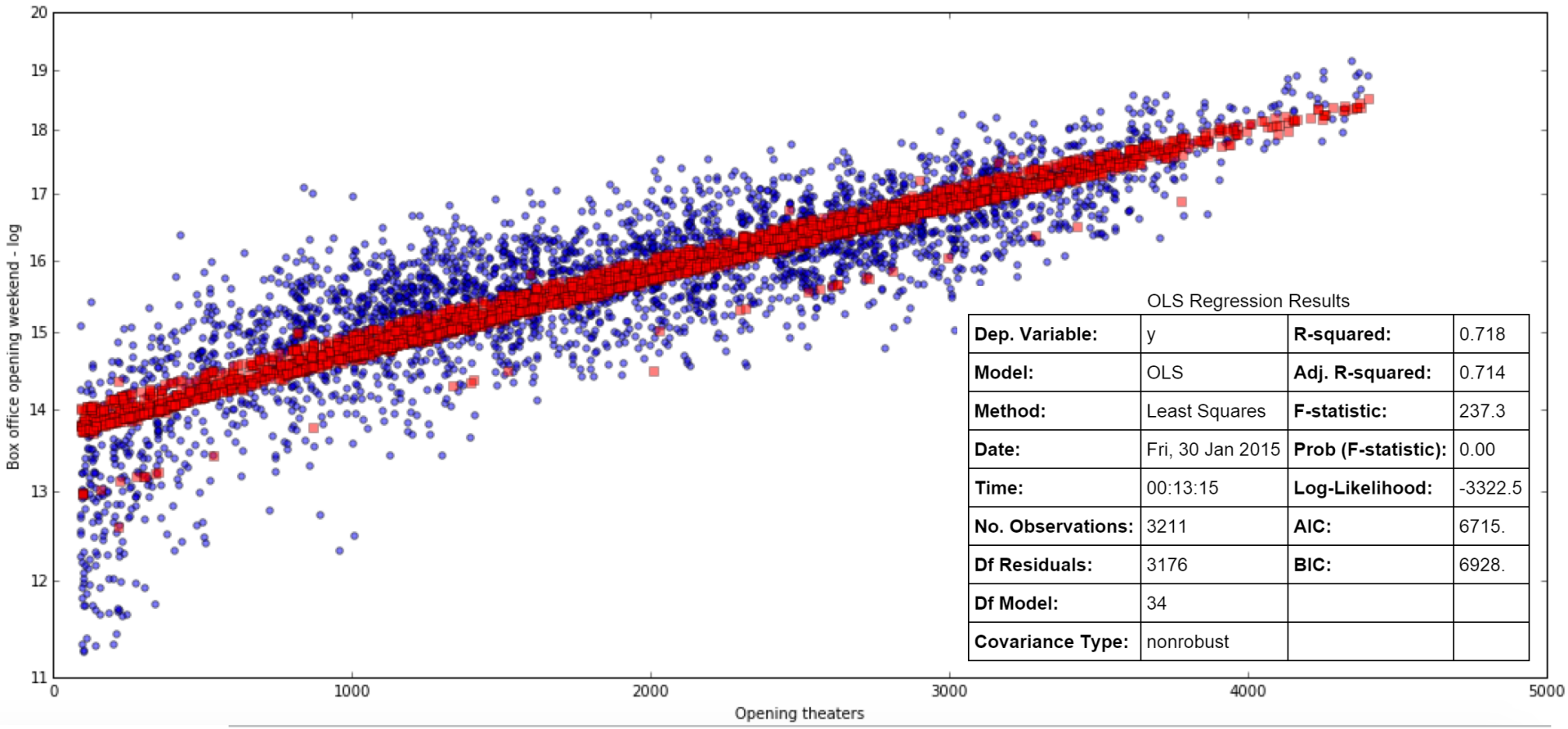
Not relevant feature

Not relevant feature

2. Find the best season

Feature selection – second iteration

$$\log(Y) = \beta_0 + \beta_1 (X_{opening\_theaters}) + \beta_{2i} X_{genre\text{-}season\_i}$$



OLS Regression Results

Dep. Variable:	y	**R-squared:**	0.718
Model:	OLS	**Adj. R-squared:**	0.714
Method:	Least Squares	**F-statistic:**	237.3
Date:	Fri, 30 Jan 2015	**Prob (F-statistic):**	0.00
Time:	00:13:15	**Log-Likelihood:**	-3322.5
No. Observations:	3211	**AIC:**	6715.
Df Residuals:	3176	**BIC:**	6928.
Df Model:	34		
Covariance Type:	nonrobust		

2. Find the best season

Feature selection – second iteration

$$\log(Y) = \beta_0 + \beta_1 (X_{opening\_theaters}) + \beta_{2i} X_{genre\text{-}season\_i}$$

Action	coef
Holiday	0.5383
Winter	0.3658
Spring	0.3345
Summer	0.5894

Adventure	coef
Holiday	0.4964
Winter	0.4238
Spring	0.3226
Summer	0.4687

Drama	coef
Holiday	0.6453
Winter	0.4226
Spring	0.3570
Summer	0.4696

Comedy	coef
Holiday	0.4170
Winter	0.4329
Spring	0.3387
Summer	0.4107

Thriller	coef
Fall	0.2886
Holiday	0.4849
Summer	0.5799

Fantasy	coef
Holiday	0.5887
Spring	0.6123
Summer	0.5512

2. Find the best season

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Holiday doesn't represent the *best season* for a bunch of genres

2. Find the best season

Example

Genre: **action**

Released: **Winter 2014**

Actual opening	39.2 millions
Predicted opening	33 millions
Predicted opening in **summer season**	**54.7 millions**

Project Luther

Thank you

https://github.com/gabll/Metis-Luther.git