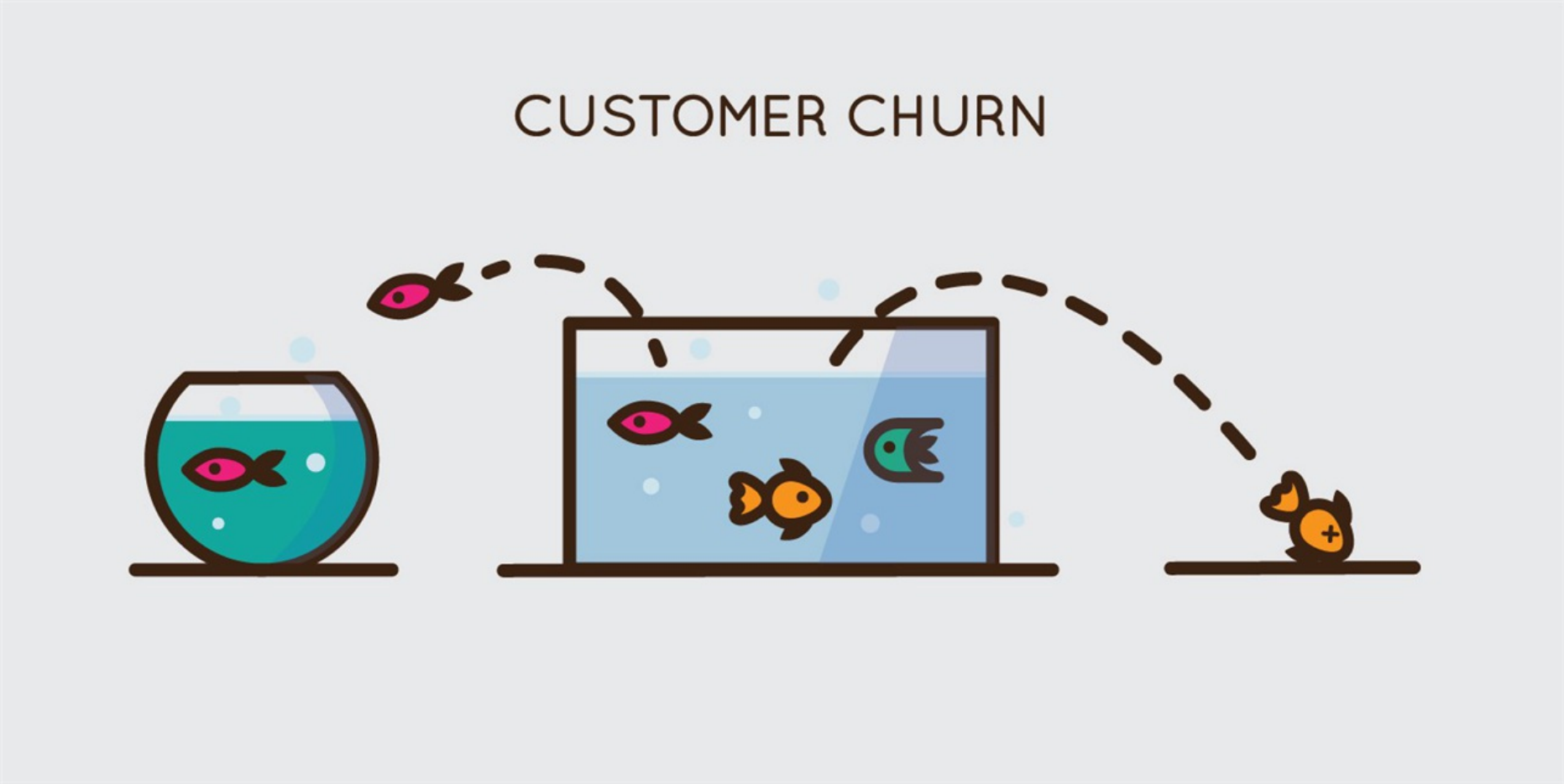
Churn Analysis

Churn Analysis	Agenda	Cursory Recommendations	Data Source: Kaggle	Data Prep: Yes/No to 0/1. One-hot-encoding. Tier columns. Columns with Nu..



Churn Analysis

Churn Analysis	Agenda	Cursory Recommendations	Data Source: Kaggle	Data Prep: Yes/No to 0/1. One-hot-encoding. Tier columns. Columns with Nu..

1. Cursory Recommendations

2. Data Source and Prep

3. Correlation Analysis in Excel to determine variables most correlated, negatively or positively, with Churn.

4. Decision Tree Analysis using Python (Jupyter) to identify customer segments which behave similarly.

5. Deeper Analysis using Tableau to identify subsegments, trends, and opportunities.

6. Predictive model: Logistic Regression

Churn Analysis

Cursory Recommendations

1. Incentivize customers to use Auto Bank Transfer payment method instead of e-check payment. Are delinquent payments an issue?

2. 26% of Month-to-Month customers leave before 3 months. Offer free Tech Support and other svcs if customer stays beyond 3 months?

3. 54.6% churn for Month-to-Month customers with Fiber optic Internet! Data shows that customers are slightly less likely to churn when they have additional services on top of Fiber optic Internet. Offer free Tech Support and other svcs if customer stays beyond 3 months?

4. Senior Customers are of special value. What more can be done to increase their loyalty? They are 16% of customer base, have 41.7% churn rate, 71% have M2M contract. They tend to have multiple lines more as well as full package subscr (Ph+Internet+StreamTV+StreamMovie)

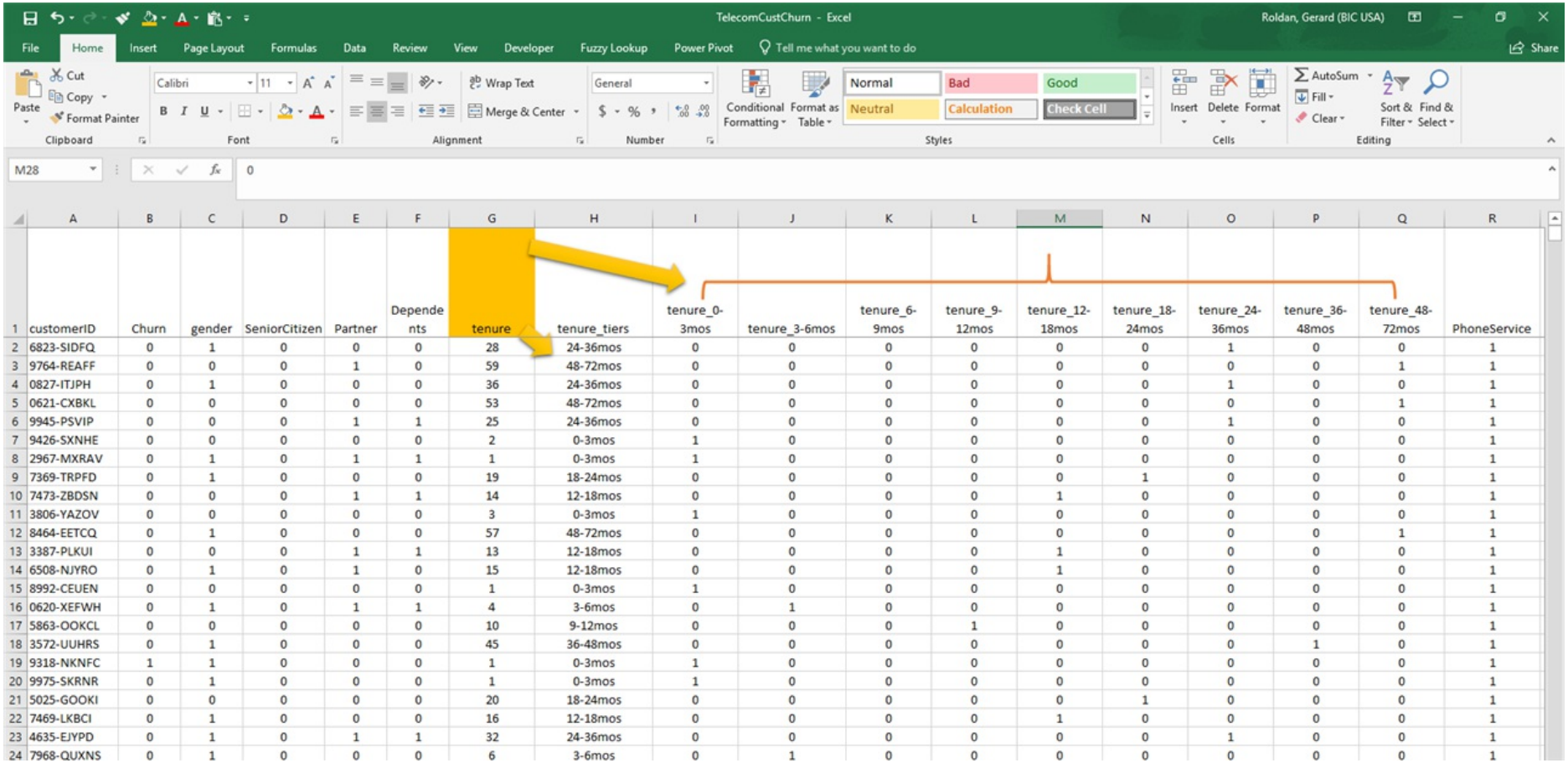
5. Logistic Regression Model (with Cross Validation) has a 77.9% prediction accuracy. Tune the model to be more accurate for predicting churners instead of non-churners. Also test other models: Decision Tree (Random Forest), Support Vector Machine, Naiive Bayes, etc.)

Churn Analysis

Agenda	Cursory Recommendations	Data Source: Kaggle	Data Prep: Yes/No to 0/1. One-hot-encoding. Tier columns. Columns with Null as 99 and Null as Blank. etc.	Correlation Analysis in Excel to determine variables most correlated, negatively or positively, with Churn.

Churn Analysis

Cursory Recommendations	Data Source: Kaggle	Data Prep: Yes/No to 0/1. One-hot-encoding. Tier columns. Columns with Null as 99 and Null as Blank. etc.	Correlation Analysis in Excel to determine variables most correlated, negatively or positively, with Churn.	Decision Tree Analysis (ran on 75% of data) using Python (Jupyter) to identify customer segments which behave similarly.



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	customerID	Churn	gender	SeniorCitizen	Partner	Dependents	tenure	tenure_tiers	tenure_0-3mos	tenure_3-6mos	tenure_6-9mos	tenure_9-12mos	tenure_12-18mos	tenure_18-24mos	tenure_24-36mos	tenure_36-48mos	tenure_48-72mos	PhoneService
2	6823-SIDFQ	0	1	0	0	0	28	24-36mos	0	0	0	0	0	0	1	0	0	1
3	9764-REAFF	0	0	0	1	0	59	48-72mos	0	0	0	0	0	0	0	0	1	1
4	0827-ITJPH	0	1	0	0	0	36	24-36mos	0	0	0	0	0	0	1	0	0	1
5	0621-CXBKL	0	0	0	0	0	53	48-72mos	0	0	0	0	0	0	0	0	1	1
6	9945-PSVIP	0	0	0	1	1	25	24-36mos	0	0	0	0	0	0	1	0	0	1
7	9426-SXNHE	0	0	0	0	0	2	0-3mos	1	0	0	0	0	0	0	0	0	1
8	2967-MXRAV	0	1	0	1	1	1	0-3mos	1	0	0	0	0	0	0	0	0	1
9	7369-TRPFD	0	1	0	0	0	19	18-24mos	0	0	0	0	0	1	0	0	0	1
10	7473-ZBDSN	0	0	0	1	1	14	12-18mos	0	0	0	0	1	0	0	0	0	1
11	3806-YAZOV	0	0	0	0	0	3	0-3mos	1	0	0	0	0	0	0	0	0	1
12	8464-EETCQ	0	1	0	0	0	57	48-72mos	0	0	0	0	0	0	0	0	1	1
13	3387-PLKUI	0	0	0	1	1	13	12-18mos	0	0	0	0	1	0	0	0	0	1
14	6508-NJYRO	0	1	0	1	0	15	12-18mos	0	0	0	0	1	0	0	0	0	1
15	8992-CEUEN	0	0	0	0	0	1	0-3mos	1	0	0	0	0	0	0	0	0	1
16	0620-XEFWH	0	1	0	1	1	4	3-6mos	0	1	0	0	0	0	0	0	0	1
17	5863-OOKCL	0	0	0	0	0	10	9-12mos	0	0	0	1	0	0	0	0	0	1
18	3572-UUHRS	0	1	0	0	0	45	36-48mos	0	0	0	0	0	0	0	1	0	1
19	9318-NKNFC	1	1	0	0	0	1	0-3mos	1	0	0	0	0	0	0	0	0	1
20	9975-SKRNR	0	1	0	0	0	1	0-3mos	1	0	0	0	0	0	0	0	0	1
21	5025-GOOKI	0	0	0	0	0	20	18-24mos	0	0	0	0	0	1	0	0	0	1
22	7469-LKBCI	0	1	0	0	0	16	12-18mos	0	0	0	0	1	0	0	0	0	1
23	4635-EJYPD	0	1	0	1	1	32	24-36mos	0	0	0	0	0	0	1	0	0	1
24	7968-QUXNS	0	1	0	0	0	6	3-6mos	0	1	0	0	0	0	0	0	0	1

Churn Analysis

Data Source: Kaggle	Data Prep: Yes/No to 0/1. One-hot-encoding. Tier columns. Columns with Null as 99 and Null as Blank. etc.	Correlation Analysis in Excel to determine variables most correlated, negatively or positively, with Churn.	Decision Tree Analysis (ran on 75% of data) using Python (Jupyter) to identify customer segments which behave similarly.	42.2% Churn for M2M customers. 54.5% Churn for M2M cust w Fiber Optic Internet, more when shorter tenure. 41.1% Churn for short term customers (<3.5mos).

Churn	Correlation	Bar	Correlation (Absolute Value)	My initial thoughts, questions, and comments
Contract_mon_to_mon	0.41		0.41	Customers can leave more easily since they are not locked into a long term contract. There is no penalty. Other telecom companies also give incentives to those who are already with another company. Is there a price increase after 3 months?
tenure	-0.35		0.35	The longer customers are with a company, the less likely they will churn. Most likely heavily related to one or two year contracts.
InternetService_FiberOp	0.31		0.31	Relatively high churn for Fiber Optic Internet Service Customers. Unsatisfied with the service and or too costly? Did the price increase after their contracts ended? Was the price not worth the additional speed?
Contract_twoyear	-0.30		0.30	Not too surprising here
PaymentMethod_echeck	0.30		0.30	This is interesting. I wonder if there was a problem in the payment process. Was this app payment related? Something to investigate
tenure_0-3mos	0.28		0.28	More churn for short term customers. Is this also related to customers who are month-to-month contract?
OnlineSecurity	-0.28		0.28	Less churn when a customer has additional services. I wonder what segments are present here. Those insecure with hacking and privacy issues? Families more represented here?
TechSupport	-0.27		0.27	Less churn when a customer has additional services. I wonder what segments are present here. Older customers? Do these customers have more products and services e.g Phone+Internet+TV ?
tenure_48-72mos	-0.26		0.26	Creatures of habit and familiarity

Churn Analysis

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jupyter _telecomcustchurn_analysis (autosaved) Logout

File Edit View Insert Cell Kernel Help Python 3

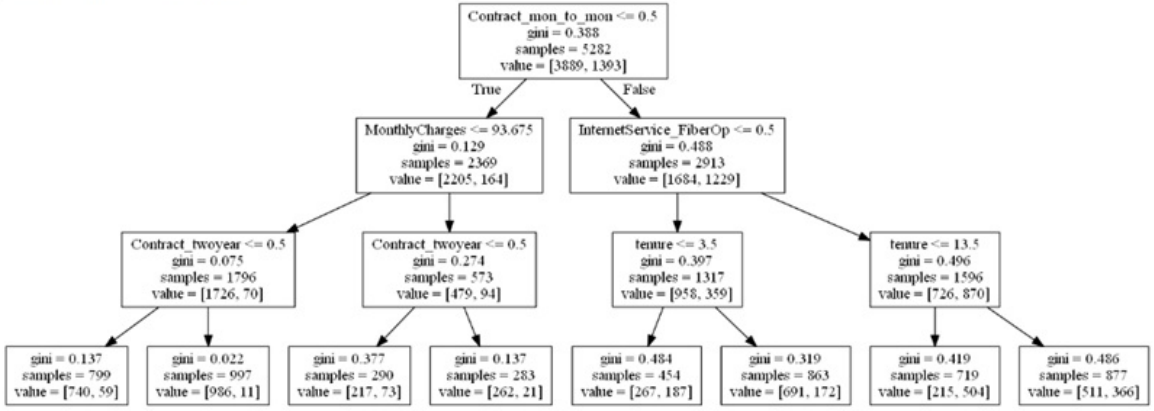
Code CellToolbar

In [7]:
```
clf=tree.DecisionTreeClassifier(random_state=100, max_depth=3)
clf=clf.fit(trainfeat, trainchurn)

print(clf)
```

```
DecisionTreeClassifier(class_weight=None, criterion='gini', max_depth=3,
            max_features=None, max_leaf_nodes=None,
            min_impurity_decrease=0.0, min_impurity_split=None,
            min_samples_leaf=1, min_samples_split=2,
            min_weight_fraction_leaf=0.0, presort=False, random_state=100,
            splitter='best')
```

In [8]:
```
from IPython.display import Image
from sklearn.externals.six import StringIO
import pydotplus

dot_data = StringIO()
tree.export_graphviz(clf, out_file=dot_data,
                     feature_names=featlab)
graph = pydotplus.graph_from_dot_data(dot_data.getvalue())
Image(graph.create_png())
```

Out[8]:



Churn Analysis

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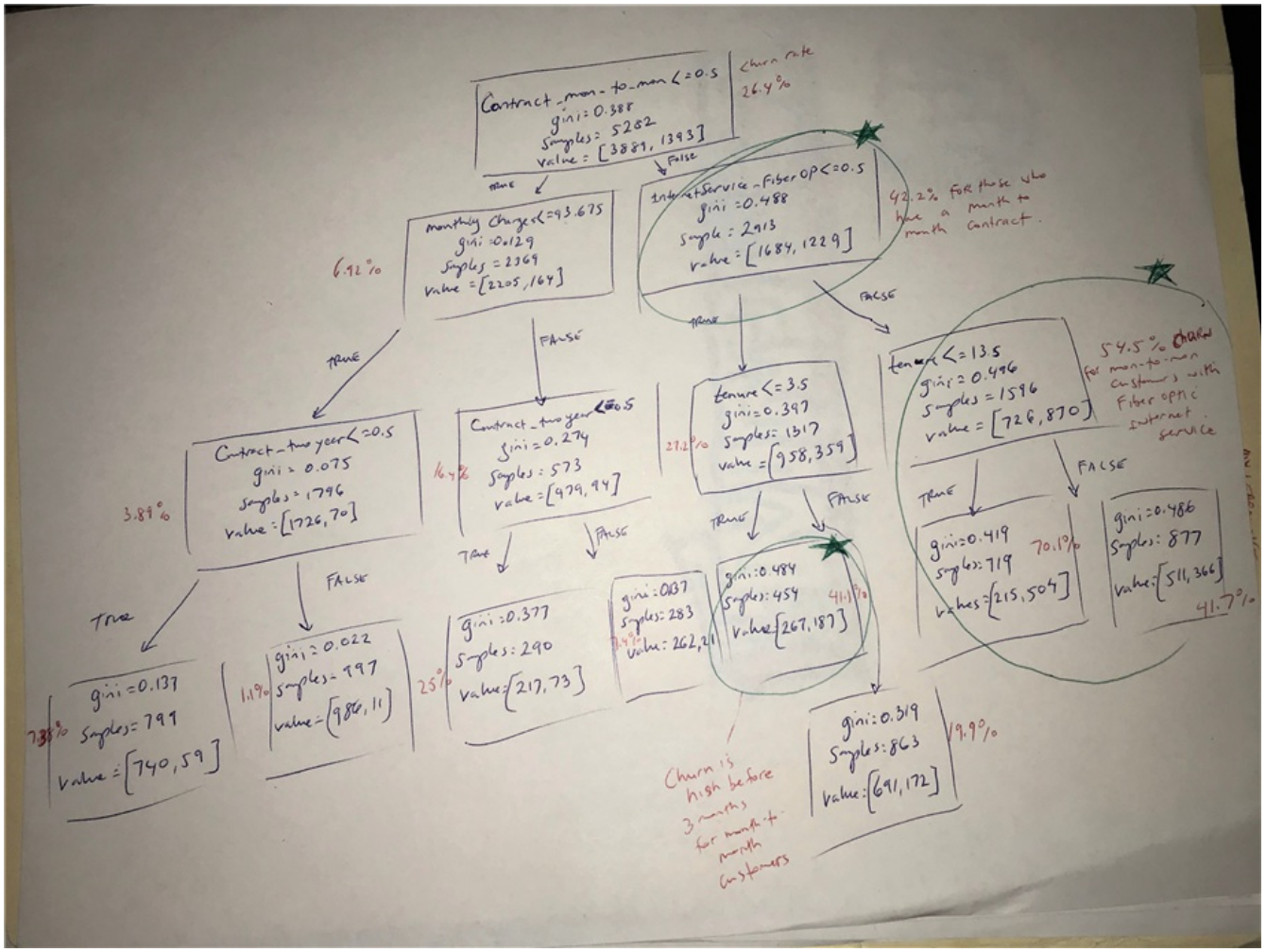

Churn Analysis

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(For the following slides, note the circle with black outline. This indicates the data in other charts have been filtered for that segment)

ENTIRE CUSTOMER POPULATION: Key Metrics: <3yr avg tenure, 26.5% churn rate, 55% M2M contracts, 34% use e-check pay, $65 avg mo charge, 78% internet subscriber, ..

Churn Analysis

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MONTH-TO-MONTH CUSTOMERS: 42.7% churn, subsc to Fiber optic internet more, use e-check method more, subsc to tech-support less, are more "single/childless". Possi..

Churn Analysis

After identifying some variables correlated with churn and segments with higher churn percentages, we can start a deeper analysis using a Tableau..

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Customers having issues with various services? Offer free Tech Support and other svcs if customer stays beyond 3 months? Delinquent payments? Incentive customer to ..

Churn Analysis Dashboard

Avg Monthly Charge	Avg Total Charge	Avg Tenure (months)	Churn Count		Churn Rate
$64.76	$2,283	32.4	Yes	1,869	26.5%
			No	5,174	
			Grand Total	7,043	

Services

Phone Service

	No Phone Service	Phone Service	Grand Total
	10% 682	90% 6,361	100% 7,043

Internet Service

	DSL	Fiber optic	No Internet Service	Grand Total
	34% 2,421	44% 3,096	22% 1,526	100% 7,043

Streaming TV

	No Streaming TV	Streaming TV	No internet service	Grand Total
	40% 2,810	38% 2,707	22% 1,526	100% 7,043

Tech Support

	No internet service	No Tech Support	Tech Support	Grand Total
	22% 1,526	49% 3,473	29% 2,044	100% 7,043

Streaming Movies

	No Streaming Movies	Streaming Movies	No internet service	Grand Total
	40% 2,785	39% 2,732	22% 1,526	100% 7,043

Lines

	No	Yes	No phone service	Grand Total

Duration

Tenure Tier

	0-3mos	3-6mos	6-9mos	9-12mos	12-18m..	18-24m..	24-36m..	36-48m..	48-72m..	Grand T..
	15% 1,062	6% 419	5% 373	5% 332	8% 548	7% 476	12% 832	11% 762	32% 2,239	100% 7,043

Contract

	Month-to-month	One year	Two year	Grand Total
	55% 3,875	21% 1,473	24% 1,695	100% 7,043

Payment

Payment Method

	Auto Bank xfr	Auto Cred Cd	e-check	mail-check	Grand Total
	22% 1,544	22% 1,522	34% 2,365	23% 1,612	100% 7,043

Monthly Charge Tiers

	0-19.99	20-39.99	40-59.99	60-79.99	80-99.99	100-119.99	Grand Total
	9% 613	17% 1,224	15% 1,070	21% 1,459	25% 1,769	13% 908	100% 7,043

Paperless Billing

	0	1	Grand Total
	41% 2,872	59% 4,171	100% 7,043

phics

Dependents

	0	1	Grand Total
	70% 4,933	30% 2,110	100% 7,043

artner

	0	1	Grand Total
	52%	48%	100%

Churn Analysis

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ENTIRE CUSTOMER POPULATION: Key Metrics: <3yr avg tenure, 26.5% churn rate, 55% M2M contracts, 34% use e-check pay, $65 avg mo charge, 78% internet subscriber, mainly childless non-senior population.

MONTH-TO-MONTH CUSTOMERS: 42.7% churn, subsc to Fiber optic internet more, use e-check method more, subsc to tech-support less, are more "single/childless". Possibly a more fickly younger base. 26% churn in less than 6 mos!

Customers having issues with various services? Offer free Tech Support and other svcs if customer stays beyond 3 months? Delinquent payments? Incentive customer to use Auto Bank Transfer method rather than e-check?

MONTH-TO-MONTH CUSTOMERS with Fiber optic Internet: 54.6% churn! Same recommendations as prior slide. 30% seniors in this segment?!? Discover more about s..

Churn Analysis Dashboard

Avg Monthly Charge	Avg Total Charge	Avg Tenure (months)
$66.40	$1,369	18.0

Churn Count	
Yes	1,655
No	2,220
Grand Total	3,875

Churn Rate: 42.7%

Services

Phone Service

No Phone Service	Phone Service	Grand Total
10% 376	90% 3,499	100% 3,875

Internet Service

DSL	Fiber optic	No Internet Service	Grand Total
32% 1,223	55% 2,128	14% 524	100% 3,875

Streaming TV

No Streaming TV	Streaming TV	No internet service	Grand Total
53% 2,053	33% 1,298	14% 524	100% 3,875

Tech Support

No internet service	No Tech Support	Tech Support	Grand Total
14% 524	69% 2,680	17% 671	100% 3,875

Streaming Movies

No Streaming Movies	Streaming Movies	No internet service	Grand Total
53% 2,047	34% 1,304	14% 524	100% 3,875

Lines

No	Yes	No phone service	Grand Total

Duration

Tenure Tier

0-3mos	3-6mos	6-9mos	9-12mos	12-18m..	18-24m..	24-36m..	36-48m..	48-72m..	Grand T..
26% 1,025	10% 388	8% 319	7% 262	11% 418	8% 319	13% 486	8% 316	9% 342	100% 3,875

Contract

Month-to-month	One year	Two year	Grand Total
55% 3,875	21% 1,473	24% 1,695	100% 7,043

Payment

Payment Method

Auto Bank xfr	Auto Cred Cd	e-check	mail-check	Grand Total
15% 589	14% 543	48% 1,850	23% 893	100% 3,875

Monthly Charge Tiers

0-19.99	20-39.99	40-59.99	60-79.99	80-99.99	100-119.99	Grand Total
6% 233	14% 528	19% 729	24% 911	30% 1,148	8% 326	100% 3,875

Paperless Billing

0	1	Grand Total
33% 1,289	67% 2,586	100% 3,875

Demographics

Dependents

0	1	Grand Total
80% 3,086	20% 789	100% 3,875

Partner

0	1	Grand Total
64%	36%	100%

Churn Analysis

ENTIRE CUSTOMER POPULATION: Key Metrics: <3yr avg tenure, 26.5% churn rate, 55% M2M contracts, 34% use e-check pay, $65 avg mo charge..

MONTH-TO-MONTH CUSTOMERS: 42.7% churn, subsc to Fiber optic internet more, use e-check method more, subsc to tech-support less, are more "single/childless". Possibly a more fickly younger base. 26% churn in less than 6 mos!

Customers having issues with various services? Offer free Tech Support and other svcs if customer stays beyond 3 months? Delinquent payments? Incentive customer to use Auto Bank Transfer method rather than e-check?

MONTH-TO-MONTH CUSTOMERS with Fiber optic Internet: 54.6% churn! Same recommendations as prior slide. 30% seniors in this segment?!? Discover more about seniors

SENIOR CUSTOMERS: 16% of customer base, 41.7% churn rate, 71% have M2M contract, tend to have multiple lines more as well as full package subscr (Ph+Internet+..

Churn Analysis

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SENIOR CUSTOMERS: 16% of customer base, 41.7% churn rate, 71% have M2M contract, tend to have multiple lines more as well as full package subscr (Ph+Internet+StreamTV+StreamMovie)

Predictive Model: Logistic Regression with 77.9% Accuracy. Used Jupyter/TabPy to facilitate model usage in Tableau.

Churn Analysis Dashboard

Avg Monthly Charge	Avg Total Charge	Avg Tenure (months)	Churn Count		Churn Rate
$87.02	$1,970	21.6	Yes	1,162	54.6%
			No	966	
			Grand Total	2,128	

Services

Phone Service

Phone Service	Grand Total
100% 2,128	100% 2,128

Internet Service

DSL	Fiber optic	No Internet Service	Grand Total
32% 1,223	55% 2,128	14% 524	100% 3,875

Streaming TV

No Streaming TV	Streaming TV	Grand Total
53% 1,128	47% 1,000	100% 2,128

Tech Support

No Tech Support	Tech Support	Grand Total
84% 1,796	16% 332	100% 2,128

Streaming Movies

No Streaming Movies	Streaming Movies	Grand Total
53% 1,131	47% 997	100% 2,128

Lines

No	Yes	Grand Total

Duration

Tenure Tier

0-3mos	3-6mos	6-9mos	9-12mos	12-18m..	18-24m..	24-36m..	36-48m..	48-72m..	Grand T..
20% 434	9% 185	8% 166	6% 131	11% 238	9% 187	15% 309	10% 212	13% 266	100% 2,128

Contract

Month-to-month	One year	Two year	Grand Total
69% 2,128	17% 539	14% 429	100% 3,096

Payment

Payment Method

Auto Bank xfr	Auto Cred Cd	e-check	mail-check	Grand Total
15% 327	14% 293	61% 1,307	9% 201	100% 2,128

Monthly Charge Tiers

60-79.99	80-99.99	100-119.99	Grand Total
31% 669	53% 1,133	15% 326	100% 2,128

Paperless Billing

0	1	Grand Total
21% 439	79% 1,689	100% 2,128

phics

Dependents

0	1	Grand Total
84% 1,781	16% 347	100% 2,128

artner

0	1	Grand Total
61%	39%	100%

Churn Analysis

Customers having issues with various services? Offer free Tech Support and other svcs if customer stays beyond 3 months? Delinquent payments..

MONTH-TO-MONTH CUSTOMERS with Fiber optic Internet: 54.6% churn! Same recommendations as prior slide. 30% seniors in this segment?!? Discover more about seniors

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Predictive Model: Logistic Regression with 77.9% Accuracy. Used Jupyter/TabPy to facilitate model usage in Tableau.

Despite the 77.9% Accuracy, the selected model should be tuned to be more accurate for predicting churners instead of non-churners.

Churn Analysis Dashboard

Avg Monthly Charge	Avg Total Charge	Avg Tenure (months)	Churn Count		Churn Rate
$79.82	$2,810	33.3	Yes	476	41.7%
			No	666	
			Grand Total	1,142	

Services

Phone Service

No Phone Service	Phone Service	Grand Total
9% 104	91% 1,038	100% 1,142

Internet Service

DSL	Fiber optic	No Internet Service	Grand Total
23% 259	73% 831	5% 52	100% 1,142

Streaming TV

No Streaming TV	Streaming TV	No internet service	Grand Total
45% 518	50% 572	5% 52	100% 1,142

Tech Support

No internet service	No Tech Support	Tech Support	Grand Total
5% 52	73% 830	23% 260	100% 1,142

Streaming Movies

No Streaming Movies	Streaming Movies	No internet service	Grand Total
43% 495	52% 595	5% 52	100% 1,142

Lines

No	Yes	No phone service	Grand Total

Duration

Tenure Tier

0-3mos	3-6mos	6-9mos	9-12mos	12-18m..	18-24m..	24-36m..	36-48m..	48-72m..	Grand T..
13% 154	6% 63	6% 63	4% 40	8% 91	7% 77	14% 158	11% 123	33% 373	100% 1,142

Contract

Month-to-month	One year	Two year	Grand Total
71% 807	17% 190	13% 145	100% 1,142

Payment

Payment Method

Auto Bank xfr	Auto Cred Cd	e-check	mail-check	Grand Total
20% 233	19% 221	52% 594	8% 94	100% 1,142

Monthly Charge Tiers

0-19.99	20-39.99	40-59.99	60-79.99	80-99.99	100-119.99	Grand Total
1% 16	7% 85	10% 115	24% 269	37% 421	21% 236	100% 1,142

Paperless Billing

0	1	Grand Total
23% 266	77% 876	100% 1,142

phics

Dependents

0	1	Grand Total
92% 1,051	8% 91	100% 1,142

artner

0	1	Grand Total
50%	50%	100%

Churn Analysis

MONTH-TO-MONTH CUSTOMERS with Fiber optic Internet: 54.6% churn! Same recommendations as prior slide. 30% seniors in this segment?!? Discover more ..

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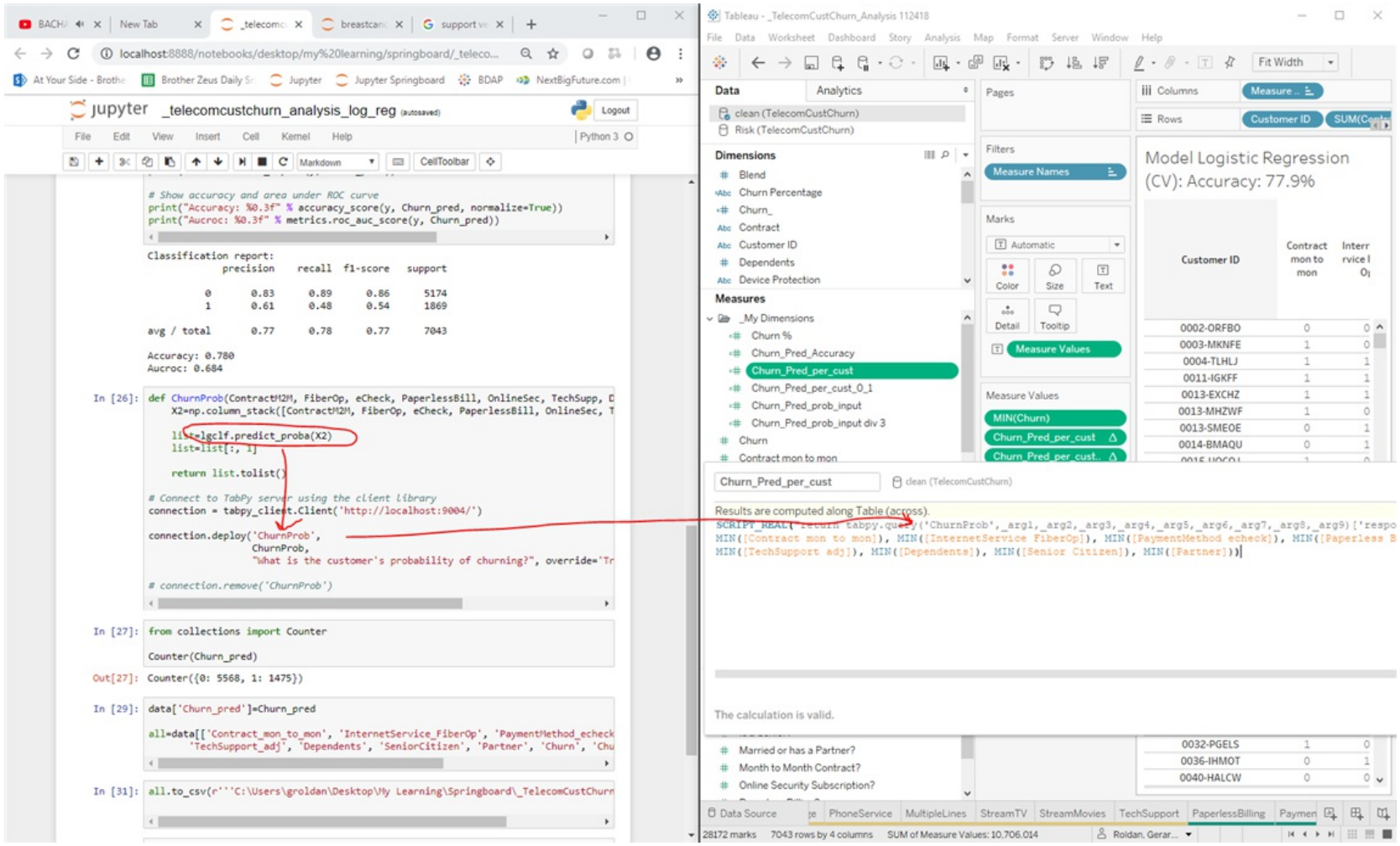
Can we create a dashboard that uses a predictive model to guage Churn Risk for a customer? Yes! See below as an example.



Churn Analysis

MONTH-TO-MONTH CUSTOMERS with Fiber optic Internet: 54.6% c..

SENIOR CUSTOMERS: 16% of customer base, 41.7% churn rate, 71% have M2M contract, tend to have multiple lines more as well as full package subscr (Ph+Internet+StreamTV+StreamMovie)

Predictive Model: Logistic Regression with 77.9% Accuracy. Used Jupyter/TabPy to facilitate model usage in Tableau.

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Customer ID	Contract mon to mon	InternetService Fiber Op	Payment Method ec heck	Paperless Billing	OnlineSecurity adj	TechSupport adj	Dependents	Senior Citizen	Partner	Churn (Actual)	Churn (Prediction Probability)	Churn (Prediction)	Churn (Pred) matches Churn (Actual)
0002-ORFBO	0	0	0	1	0	1	1	0	1	0	3.9%	0	1
0003-MKNFE	1	0	0	0	0	0	0	0	0	0	23.9%	0	1
0004-TLHLJ	1	1	1	1	0	0	0	0	0	1	67.6%	1	1
0011-IGKFF	1	1	1	1	0	0	0	1	1	1	65.5%	1	1
0013-EXCHZ	1	1	0	1	0	1	0	1	1	1	44.1%	0	0
0013-MHZWF	1	0	0	1	0	1	1	0	0	0	22.6%	0	1
0013-SMEOE	0	1	0	1	1	1	0	1	1	0	8.3%	0	1
0014-BMAQU	0	1	0	1	1	1	0	0	1	0	7.1%	0	1
0015-UOCOJ	1	0	1	1	1	0	0	1	0	0	38.5%	0	1
0016-QLJIS	0	0	0	1	1	1	1	0	1	0	2.5%	0	1
0017-DINOC	0	0	0	0	1	1	0	0	0	0	2.6%	0	1
0017-IUDMW	0	1	0	1	1	1	1	0	1	0	6.1%	0	1
0018-NYROU	1	1	1	1	0	0	0	0	1	0	61.6%	1	0
0019-EFAEP	0	1	0	1	1	0	0	0	0	0	11.9%	0	1
0019-GFNTW	0	0	0	0	1	1	0	0	0	0	2.6%	0	1
0020-INWCK	0	1	0	1	0	0	1	0	1	0	12.1%	0	1
0020-JDNXP	0	0	0	0	1	1	1	0	1	0	1.7%	0	1
0021-IKXGC	1	1	1	1	0	0	0	1	0	0	71.1%	1	0
0022-TCJCI	0	0	0	0	1	0	0	1	0	1	4.1%	0	0
0023-HGHWL	1	0	1	1	0	0	0	1	0	1	49.6%	0	0
0023-UYUPN	0	0	1	0	0	0	0	1	1	0	8.4%	0	1
0023-XUOPT	1	1	1	0	0	0	0	0	1	1	51.8%	1	1
0027-KWYKW	1	1	1	1	0	0	1	0	1	0	57.5%	1	0
0030-FNXPP	1	0	0	0	0	0	0	0	0	0	23.9%	0	1
0031-PVLZI	1	0	0	0	0	0	1	0	1	1	16.9%	0	0
0032-PGELS	1	0	0	0	1	0	1	0	1	1	11.5%	0	0
0036-IHMOT	0	1	0	1	0	1	1	0	1	0	9.2%	0	1
0040-HALCW	0	0	0	0	0	0	1	0	1	0	3.5%	0	1

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