Dataset Information

Investors are considering making an investment in a new form of transportation - JetRail. JetRail uses Jet propulsion technology to run rails and move people at a high speed! While JetRail has mastered the technology and they hold the patent for their product, the investment would only make sense, if they can get more than 1 Million monthly users with in next 18 months.

You need to help Unicorn ventures with the decision. They usually invest in B2C start-ups less than 4 years old looking for pre-series A funding. In order to help Unicorn Ventures in their decision, you need to forecast the traffic on JetRail for the next 7 months.

Import modules

In [2]:
```python
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
%matplotlib inline
import warnings
warnings.filterwarnings('ignore')
from fbprophet import Prophet
```

In [ ]:
```python
# !pip install fbprophet
# install visual c++ - visual studio
# if you face errors - use conda install
```

Loading the dataset

In [3]:
```python
df = pd.read_csv('Traffic data.csv')
df.head()
```

Out[3]:

	ID	Datetime	Count
0	0	25-08-2012 00:00	8
1	1	25-08-2012 01:00	2
2	2	25-08-2012 02:00	6
3	3	25-08-2012 03:00	2
4	4	25-08-2012 04:00	2

In [4]:
```python
df
```

Out[4]:

	ID	Datetime	Count
0	0	25-08-2012 00:00	8
1	1	25-08-2012 01:00	2
2	2	25-08-2012 02:00	6
3	3	25-08-2012 03:00	2
4	4	25-08-2012 04:00	2
...	...	...	...
18283	18283	25-09-2014 19:00	868
18284	18284	25-09-2014 20:00	732
18285	18285	25-09-2014 21:00	702
18286	18286	25-09-2014 22:00	580
18287	18287	25-09-2014 23:00	534

18288 rows × 3 columns

Preprocessing the dataset

In [5]:
```python
# check null values
df.isnull().sum()
```

Out[5]:
```
ID          0
Datetime    0
Count       0
dtype: int64
```

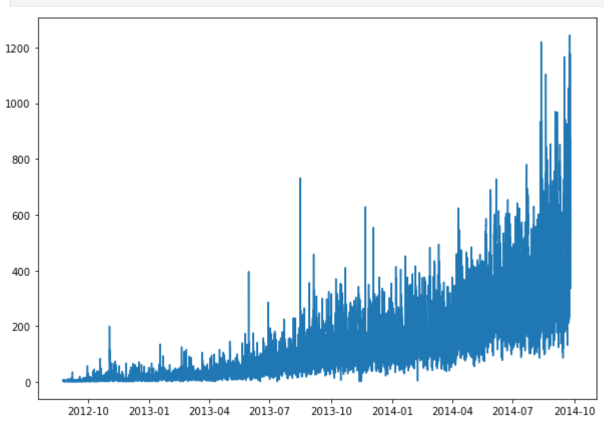
In [6]:
```python
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 18288 entries, 0 to 18287
Data columns (total 3 columns):
 #   Column    Non-Null Count  Dtype 
---  ------    --------------  ----- 
 0   ID        18288 non-null  int64 
 1   Datetime  18288 non-null  object
 2   Count     18288 non-null  int64 
dtypes: int64(2), object(1)
memory usage: 428.8+ KB
```

In [7]:
```python
# convert object to datetime datatype
df['Datetime'] = pd.to_datetime(df['Datetime'], format='%d-%m-%Y %H:%M')
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 18288 entries, 0 to 18287
Data columns (total 3 columns):
 #   Column    Non-Null Count  Dtype         
---  ------    --------------  -----         
 0   ID        18288 non-null  int64         
 1   Datetime  18288 non-null  datetime64[ns]
 2   Count     18288 non-null  int64         
dtypes: datetime64[ns](1), int64(2)
memory usage: 428.8 KB
```

In [9]:
```python
# EDA
plt.figure(figsize=(10,7))
plt.plot(df['Datetime'], df['Count'])
plt.show()
```



Format data for the model

In [10]:
```python
df.index = df['Datetime']
df['y'] = df['Count']
df.drop(columns=['ID', 'Datetime', 'Count'], axis=1, inplace=True)
df = df.resample('D').sum()
df.head()
```

Out[10]:

Datetime	y
2012-08-25	76
2012-08-26	88
2012-08-27	62
2012-08-28	58
2012-08-29	60

In [11]:
```python
df['ds'] = df.index
df.head()
```

Out[11]:

Datetime	y	ds
2012-08-25	76	2012-08-25
2012-08-26	88	2012-08-26
2012-08-27	62	2012-08-27
2012-08-28	58	2012-08-28
2012-08-29	60	2012-08-29

Input Split

In [12]:
```python
size = 60
from sklearn.model_selection import train_test_split
train, test = train_test_split(df, test_size=size/len(df), shuffle=False)
```

In [13]:
```python
train.tail()
```

Out[13]:

Datetime	y	ds
2014-07-23	10130	2014-07-23
2014-07-24	8156	2014-07-24
2014-07-25	7192	2014-07-25
2014-07-26	6562	2014-07-26
2014-07-27	6094	2014-07-27

In [14]:
```python
test.head()
```

Out[14]:

Datetime	y	ds
2014-07-28	8546	2014-07-28
2014-07-29	8218	2014-07-29
2014-07-30	8498	2014-07-30
2014-07-31	8740	2014-07-31
2014-08-01	9186	2014-08-01

In [17]:
```python
test.tail()
```

Out[17]:

Datetime	y	ds
2014-09-21	9102	2014-09-21
2014-09-22	14116	2014-09-22
2014-09-23	13304	2014-09-23
2014-09-24	16856	2014-09-24
2014-09-25	14152	2014-09-25

Model Training

In [15]:
```python
model = Prophet(yearly_seasonality=True, seasonality_prior_scale=0.9)
model.fit(train)
```

```
INFO:numexpr.utils:NumExpr defaulting to 4 threads.
INFO:fbprophet:Disabling daily seasonality. Run prophet with daily_seasonality=True to override this.
```

Out[15]:
```
<fbprophet.forecaster.Prophet at 0x1a0a1773a90>
```

In [16]:
```python
future = model.make_future_dataframe(periods=60)
future
```

Out[16]:

	ds
0	2012-08-25
1	2012-08-26
2	2012-08-27
3	2012-08-28
4	2012-08-29
...	...
757	2014-09-21
758	2014-09-22
759	2014-09-23
760	2014-09-24
761	2014-09-25

762 rows × 1 columns

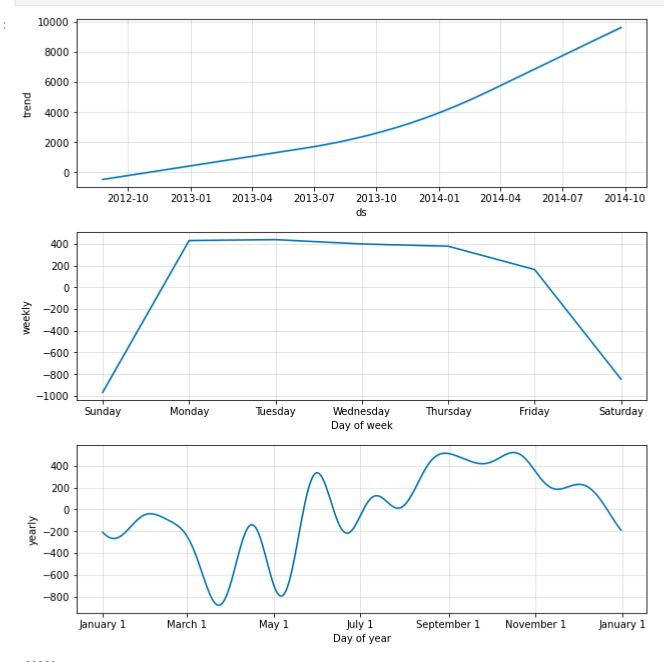
In [18]:
```python
forecast = model.predict(future)
forecast.head()
```

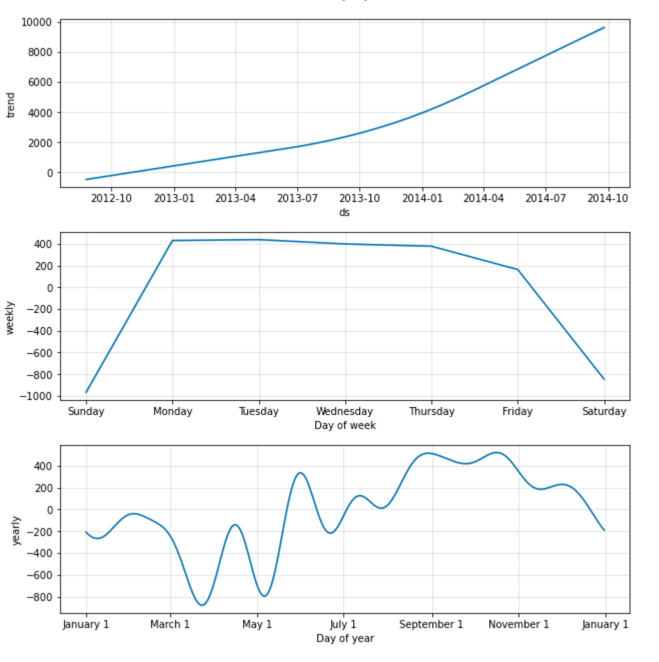
Out[18]:

	ds	trend	yhat_lower	yhat_upper	trend_lower	trend_upper	additive_terms	additive_terms_lower	additive_terms_upper	weekly	weekly_lower	weekly_upper	yearly	yearly_lower	yearly_upper	multiplicative_terms	multiplicative_terms_lower	multiplicative_terms_u
0	2012-08-25	-473.732066	-1734.877065	163.221651	-473.732066	-473.732066	-341.012799	-341.012799	-341.012799	-846.187838	-846.187838	-846.187838	505.175040	505.175040	505.175040	0.0	0.0	
1	2012-08-26	-466.733663	-1855.111354	-6.945309	-466.733663	-466.733663	-457.255955	-457.255955	-457.255955	-967.168356	-967.168356	-967.168356	509.912400	509.912400	509.912400	0.0	0.0	
2	2012-08-27	-459.735259	-411.374536	1478.193805	-459.735259	-459.735259	944.458519	944.458519	944.458519	431.253528	431.253528	431.253528	513.204990	513.204990	513.204990	0.0	0.0	
3	2012-08-28	-452.736856	-493.053438	1453.702595	-452.736856	-452.736856	954.762245	954.762245	954.762245	439.591890	439.591890	439.591890	515.170355	515.170355	515.170355	0.0	0.0	
4	2012-08-29	-445.738452	-474.329272	1523.918170	-445.738452	-445.738452	915.693928	915.693928	915.693928	399.762294	399.762294	399.762294	515.931634	515.931634	515.931634	0.0	0.0	

In [20]:
```python
model.plot_components(forecast)
```

Out[20]:

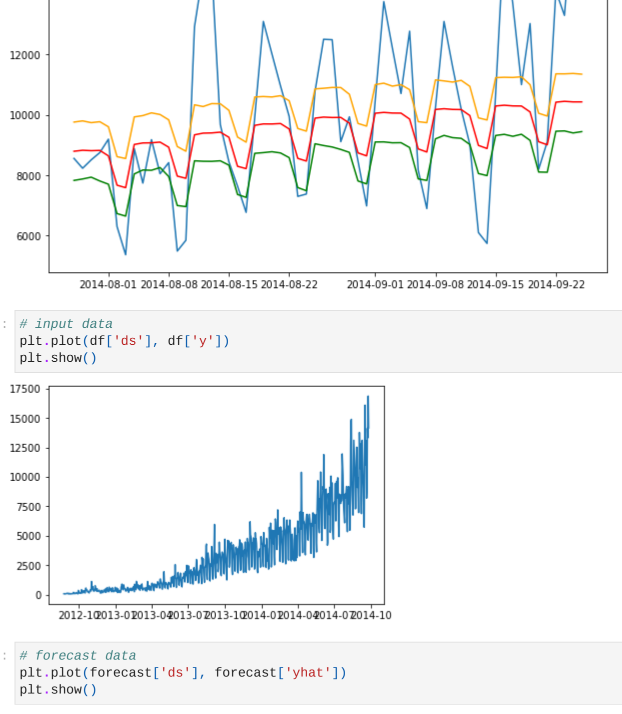




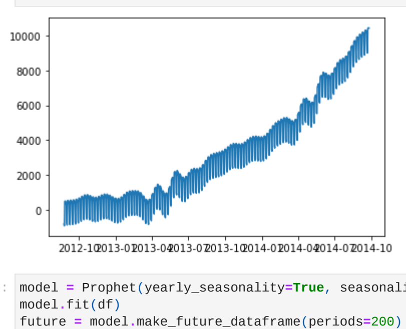
In [21]:
```python
pred = forecast.iloc[-60:, :]
len(pred)
```

Out[21]:
```
60
```

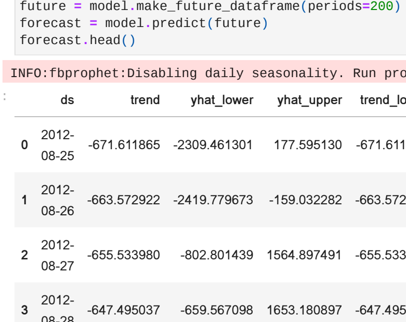
In [24]:
```python
# test results
plt.figure(figsize=(10,7))
plt.plot(test['ds'], test['y'])
plt.plot(pred['ds'], pred['yhat'], color='red')
plt.plot(pred['ds'], pred['yhat_lower'], color='green')
plt.plot(pred['ds'], pred['yhat_upper'], color='orange')
plt.show()
```



In [26]:
```python
# input data
plt.plot(df['ds'], df['y'])
plt.show()
```



In [25]:
```python
# forecast data
plt.plot(forecast['ds'], forecast['yhat'])
plt.show()
```



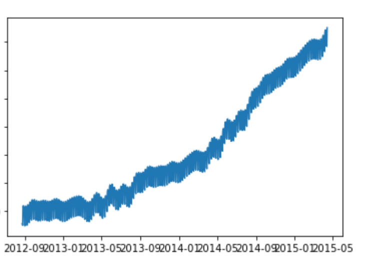
In [27]:
```python
model = Prophet(yearly_seasonality=True, seasonality_prior_scale=0.9)
model.fit(df)
future = model.make_future_dataframe(periods=200)
forecast = model.predict(future)
forecast.head()
```

```
INFO:fbprophet:Disabling daily seasonality. Run prophet with daily_seasonality=True to override this.
```

Out[27]:

	ds	trend	yhat_lower	yhat_upper	trend_lower	trend_upper	additive_terms	additive_terms_lower	additive_terms_upper	weekly	weekly_lower	weekly_upper	yearly	yearly_lower	yearly_upper	multiplicative_terms	multiplicative_terms_lower	multiplicative_terms_
0	2012-08-25	-671.611865	-2309.461301	177.595130	-671.611865	-671.611865	-424.000456	-424.000456	-424.000456	-995.245768	-995.245768	-995.245768	571.245311	571.245311	571.245311	0.0	0.0	
1	2012-08-26	-663.572922	-2419.779673	-159.032282	-663.572922	-663.572922	-582.367949	-582.367949	-582.367949	-1144.299997	-1144.299997	-1144.299997	561.932049	561.932049	561.932049	0.0	0.0	
2	2012-08-27	-655.533980	-802.801439	1564.897491	-655.533980	-655.533980	1007.348555	1007.348555	1007.348555	457.582428	457.582428	457.582428	549.766127	549.766127	549.766127	0.0	0.0	
3	2012-08-28	-647.495037	-659.567098	1653.180897	-647.495037	-647.495037	1143.949398	1143.949398	1143.949398	608.387591	608.387591	608.387591	535.561807	535.561807	535.561807	0.0	0.0	
4	2012-08-29	-639.456095	-792.463859	1661.049202	-639.456095	-639.456095	1077.093891	1077.093891	1077.093891	556.941854	556.941854	556.941854	520.152037	520.152037	520.152037	0.0	0.0	

In [28]:
```python
# forecast data
plt.plot(forecast['ds'], forecast['yhat'])
plt.show()
```


15000
12500
10000
7500
5000
2500
0
2012-09
2013-01
2013-05
2013-09
2014-01
2014-05
2014-09
2015-01
2015-05

In [ ]: