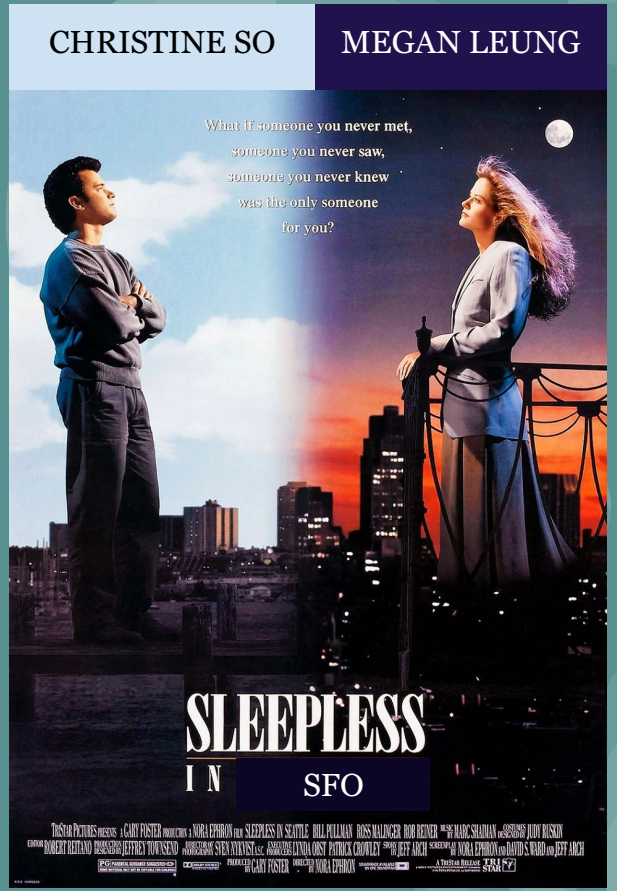
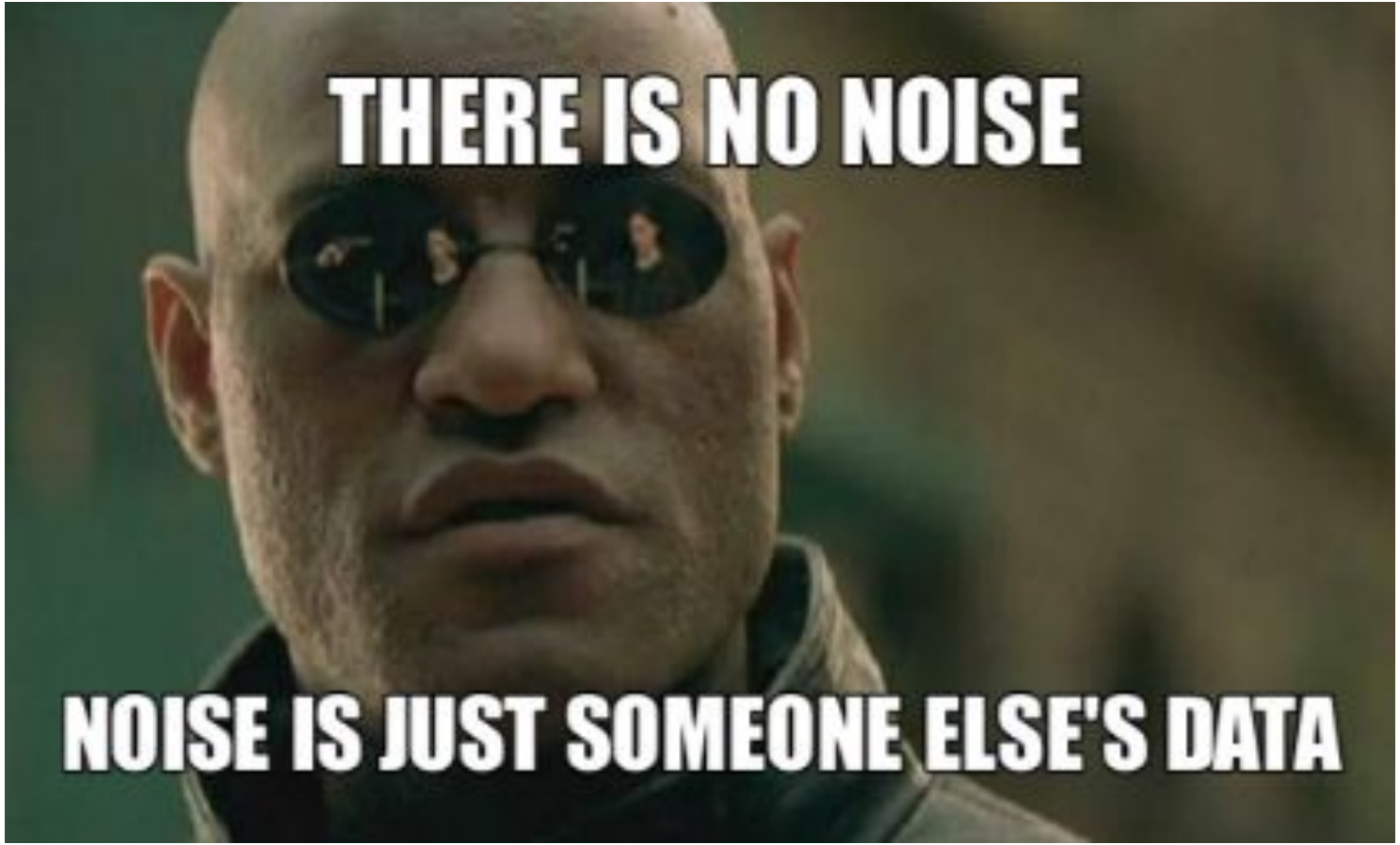
Sleepless SFO

Megan Leung & Christine So




ACME
JET
PARK SLOPE
WELCOME
WAGON

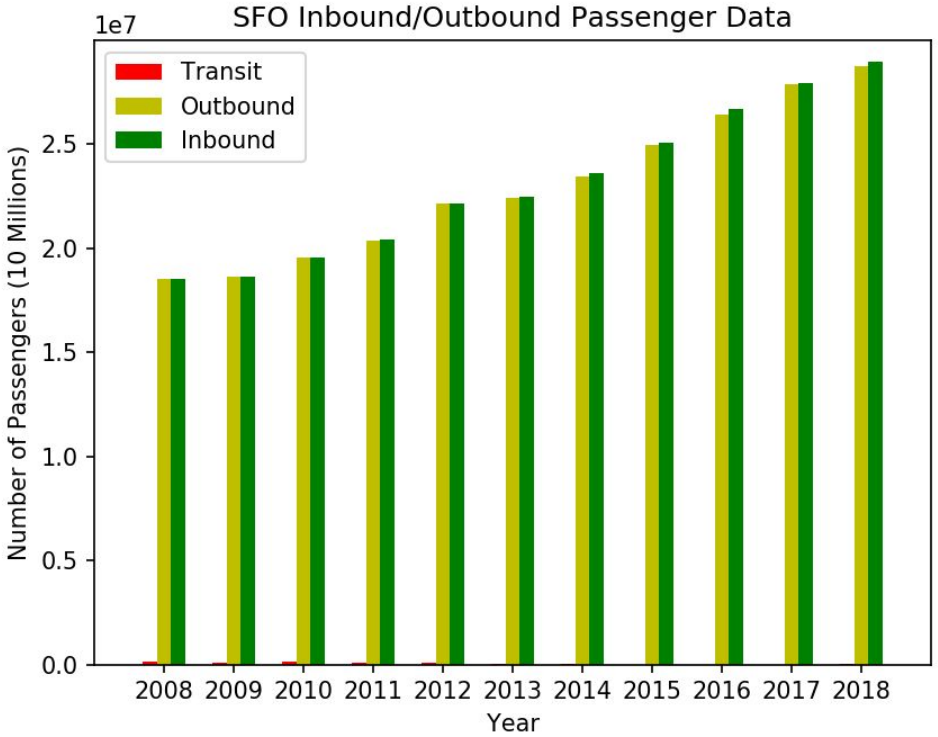

THERE IS NO NOISE
NOISE IS JUST SOMEONE ELSE'S DATA

Which communities have been most impacted by airplane noises from SFO?

SFO Data

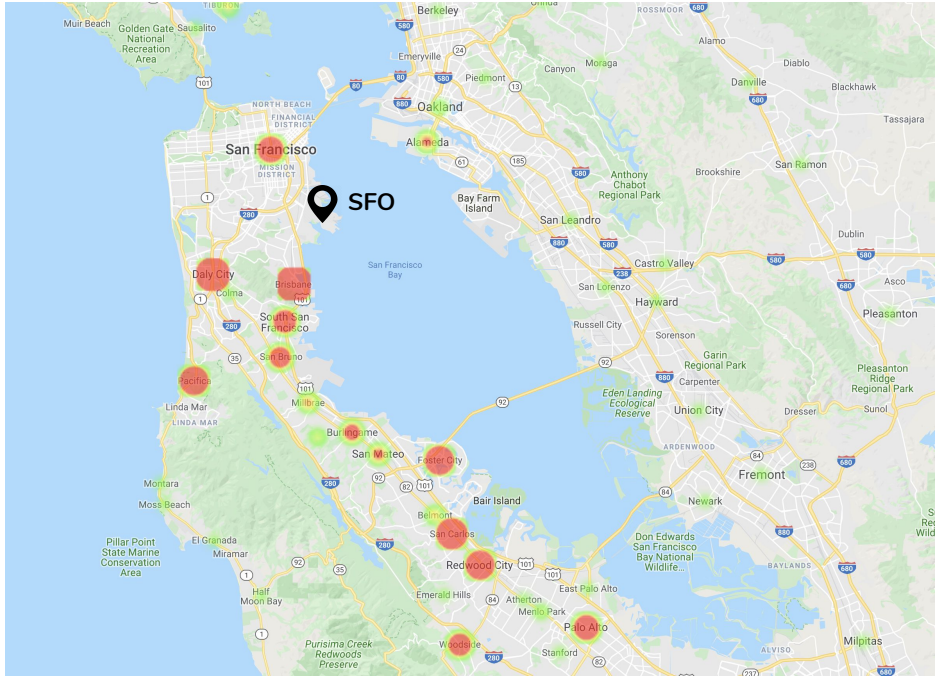
- Source: SFO
- Timeframe: 2008 to 2018
- Datasets:
  - Air Traffic Passenger Statistics
  - Aircraft Noise Complaints
  - SFO Runway Usage
  - Airline Noise Exceedance Rating

From 2008 to 2018, the Number of SFO Passengers Increased Year Over Year



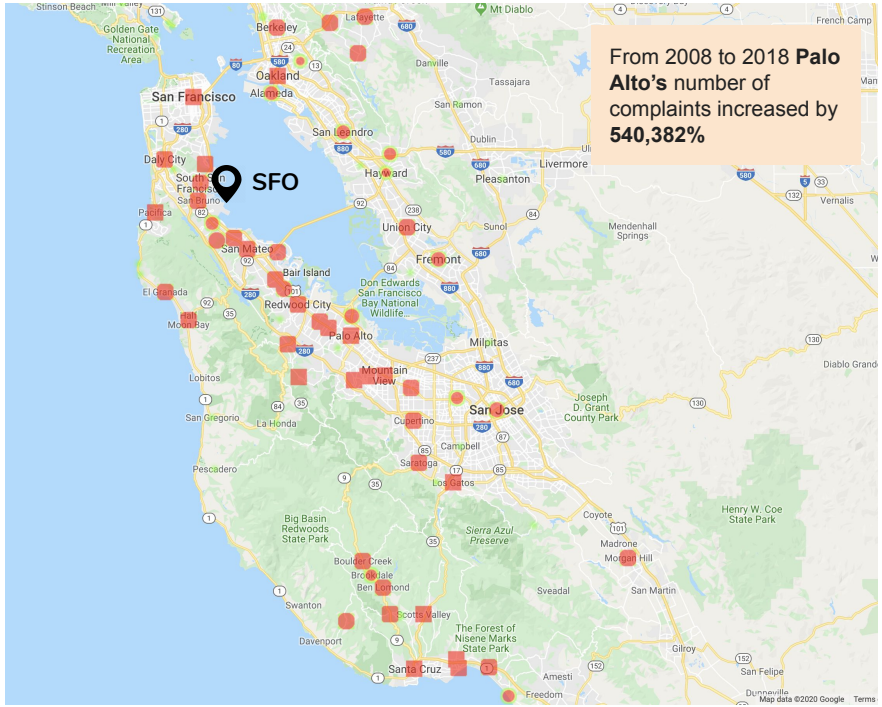
```
#Plot bar graphs with Deplaned and Enplaned passengers for a comparison

year = ["2008", "2009", "2010", "2011", "2012", "2013", "2014", "2015", "2016", "2017", "2018"]
deplaned = sfo_passenger_summary.loc["Deplaned"]
enplaned = sfo_passenger_summary.loc["Enplaned"]
transit = sfo_passenger_summary.loc["Thru / Transit"]

x_axis = np.arange(len(year))
tick_locations = []
for x in x_axis:
    tick_locations.append(x)

plt.title("SFO Inbound/Outbound Passenger Data")
plt.xlabel("Year")
plt.ylabel("Number of Passengers")
plt.xticks(x_axis, ("2008", "2009", "2010", "2011", "2012", "2013", "2014", "2015", "2016", "2017", "2018"))

plt.xlim(-1, len(year))
plt.ylim(0, max(deplaned) + 1000000)


ax = plt.subplot(111)
ax.bar(x_axis-0.2, transit, facecolor = "r", width=0.2, align="center", label="Transit")
ax.bar(x_axis, enplaned, facecolor="y", width=0.2, align="center", label="Outbound")
ax.bar(x_axis+0.2, deplaned, facecolor="g", width=0.2, align="center", label="Inbound")
plt.legend(loc="upper left")
plt.show()

```

Cities w/ the Most SFO Noise Complaints in 2008



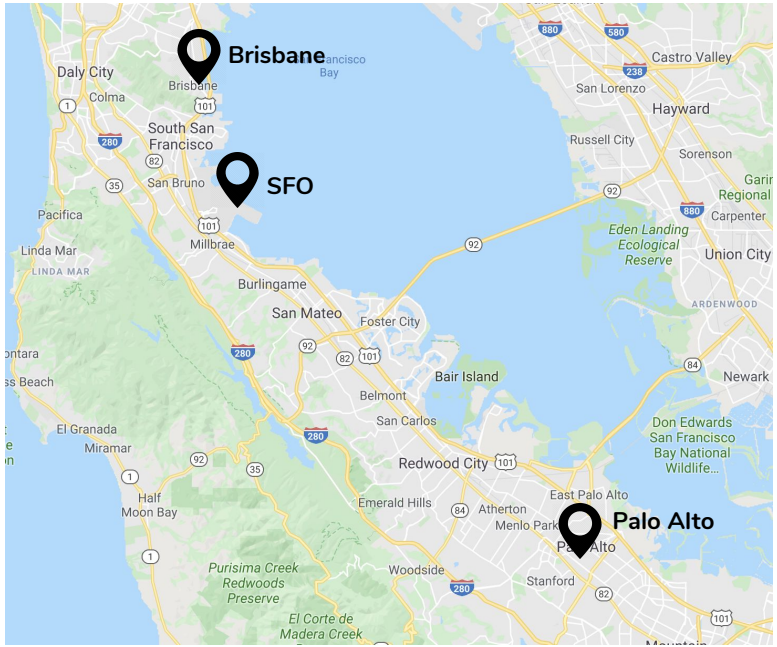
Rank	City	# of Complaints
1	Brisbane	3.849
2	Daly City	1,757
3	San Carlos	590
4	Redwood City	332
5	Foster City	319
6	Pacifica	306
7	San Francisco	146
8	Palo Alto	113
9	S. San Francisco	70
10	Woodside	67

Cities w/ the Most SFO Noise Complaints in 2018



Rank	City	# of Complaints
1	Palo Alto	610,745
2	Los Altos	275,434
3	Los Gatos	256,522
4	Santa Cruz	248,581
5	Scotts Valley	143796
6	Los Altos Hills	108,978
7	Soquel	96,981
8	Oakland	94,871
9	Portola Valley	80,912
10	Pacifica	67,112

In 2015, the Highest Number of Complaints Shifted from Brisbane to Los Galtos/Palo Alto



Year	Community	Number of Complaints
2008	Brisbane	3,849
2009	Brisbane	2,768
2010	Brisbane	5,150
2011	Brisbane	5,319
2012	Brisbane	3,630
2013	Brisbane	5,324
2014	Brisbane	9268
2015	Los Gatos	213,850
2016	Palo Alto	863,149
2017	Palo Alto	610,940
2018	Palo Alto	610,745

]:
```
new_complaint_df['State'] = 'CA'
new_complaint_df['Lat'] = ''
new_complaint_df['Lng'] = ''
new_complaint_df = new_complaint_df[['Community', 'State', 'Lat','Lng', '2008', '2009', '2010', '2011', '2012', '20
                '2017', '2018']]
```

]:
```
# create a params dict that will be updated with new city each iteration
params = {"key": gkey}

# Loop through the cities_pd and run a lat/long search for each city
for index, row in new_complaint_df.iterrows():

    # update address key value
    base_url = "https://maps.googleapis.com/maps/api/geocode/json"
    # make request
    city = row["Community"]
    state = row["State"]

    params["address"] = (f"{city}, {state}")

    cities_lat_lng = requests.get(base_url, params = params)
#     print(cities_lat_lng.url)

    cities_lat_lng = cities_lat_lng.json()

    new_complaint_df.loc[index, "Lat"] = cities_lat_lng["results"][0]["geometry"]["location"]["lat"]
    new_complaint_df.loc[index, "Lng"] = cities_lat_lng["results"][0]["geometry"]["location"]["lng"]


    new_complaint_df
```

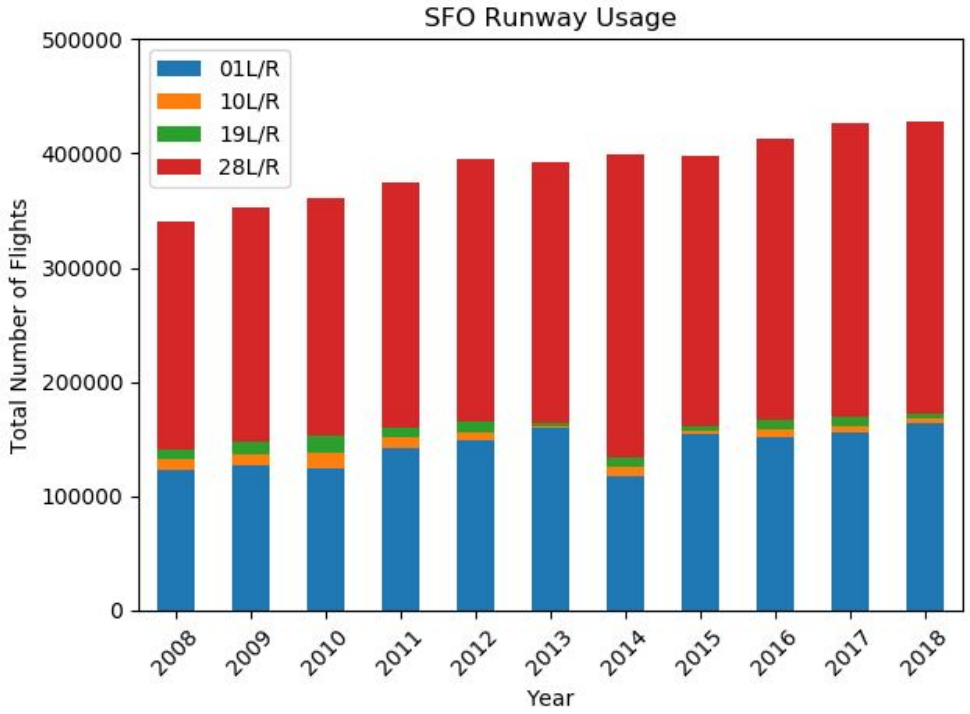
FAA Changes the Flight Paths in 2015

https://www.bizjournals.com/sanfrancisco/news/2018/09/07/sfo-airplane-noise-complaints-are-skyrocketing.html

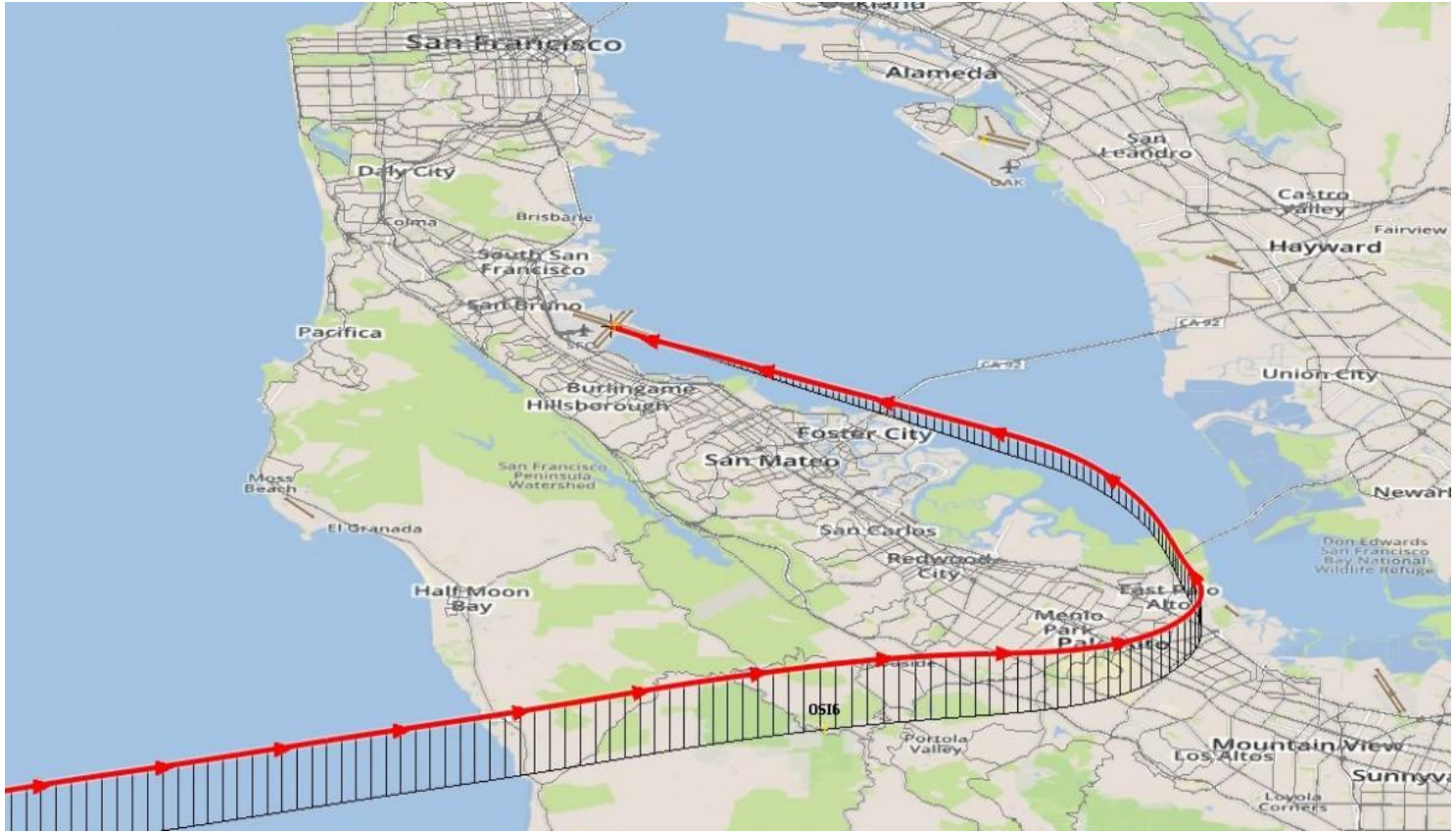
> **San Francisco Business Times**
>
> **Bay Area residents push back against SFO airport noise**
>
> Airport noise has been a longstanding gripe from residents living near San Francisco International Airport, but complaints from San Francisco, San Mateo, Santa Clara and Santa Cruz counties have skyrocketed in recent years. (113 kB)


10L 10R
19R 19L
Rental Car Center
San Francisco...
101
San Francisco
International
Airport
ITA PARK
82
28L 28R
101
1L 1R
Manor Park
Safeway

The Runway with the Highest Number of Flight Usage from 2008 to 2018 was <u>28L/R</u>

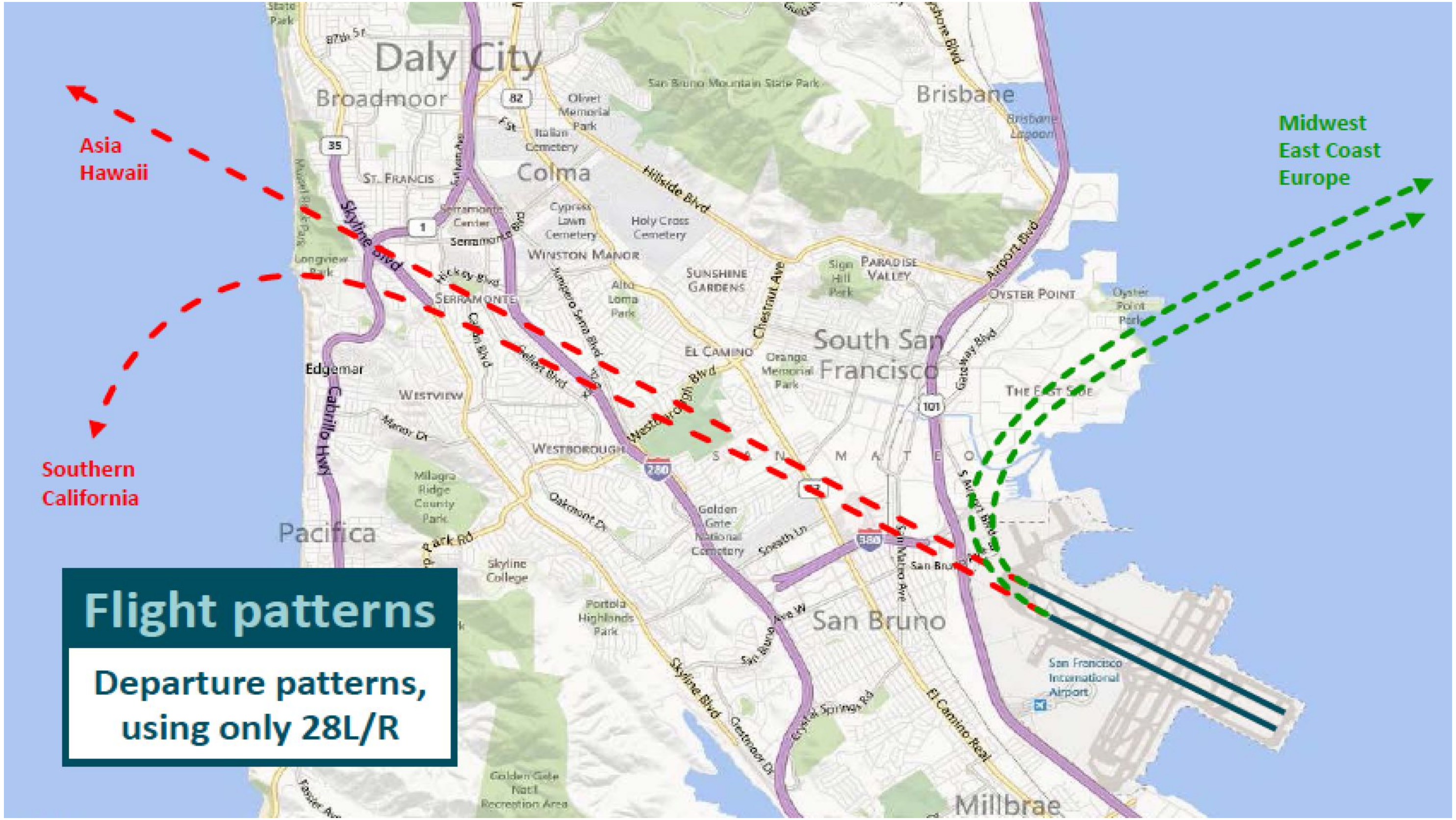


```
#Plot bar graphs with Deplaned and Enplaned passengers for a comparison

year = ["2008", "2009", "2010", "2011", "2012", "2013", "2014", "2015", "2016", "2017", "2018"]
zero_one = sfo_runway_final.loc["01L/R_Total"]
ten = sfo_runway_final.loc["10L/R_Total"]
nineteen = sfo_runway_final.loc["19L/R_Total"]
twenty_eight = sfo_runway_final.loc["28L/R_Total"]

x_axis = np.arange(len(year))
tick_locations = []
for x in x_axis:
    tick_locations.append(x)

plt.title("SFO Runway Usage")
plt.xlabel("Year")
plt.ylabel("Total Usage Count")
plt.xticks(x_axis, ("2008", "2009", "2010", "2011", "2012", "2013", "2014", "2015", "2016", "2017", "2018"))


plt.bar(x_axis, zero_one, facecolor = "b", width=0.35, label="01L/R")
plt.bar(x_axis, ten, facecolor="r", width=0.35, bottom=zero_one, label="10L/R")
plt.bar(x_axis, nineteen, facecolor="y", width=0.35, bottom=np.array(ten)+np.array(zero_one), label="19L/R")
plt.bar(x_axis, twenty_eight, facecolor="g", width=0.35, bottom=np.array(nineteen)+np.array(ten)+np.array(zero_one),
        label="28L/R")

plt.legend(loc="best")
plt.show()

```


San Francisco
Alameda
Daly City
Brisbane
Colma
South San Francisco
San Bruno
Pacifica
Burlingame
Hillsborough
Foster City
San Mateo
San Francisco Peninsula Watershed
Moss Beach
El Granada
San Carlos
Redwood City
Half Moon Bay
Menlo Park
Portola Valley
Mountain View
Los Altos
Loyola Corners
Castro Valley
Fairview
Hayward
Union City
Don Edwards San Francisco Bay National Wildlife Refuge
0516

Flight patterns

Departure patterns, using only 28L/R



Recommendations for Bay Area Residents

- File more complaints to SFO (sfocop@flysfo.com) and city government officials to take action
- Avoid living in cities like Palo Alto, Los Altos, and Los Gatos
- Buy noise cancelling headphones
- Use ear plugs
- Take melatonin

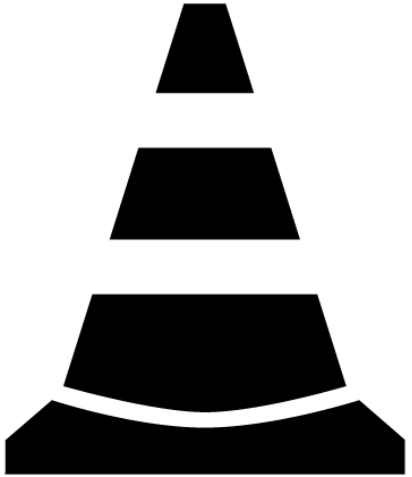
Current Airlines to Consider/Avoid

Airlines to Consider	Airlines to Avoid
Virgin Atlantic Airways	Qantas Airways
All Nippon Airways	Philippine Airlines
China Eastern Airlines	Asiana Airlines
KLM Royal Dutch Airlines	Fiji Airways
Air France	China Airlines
Japan Airlines	Eva Airways
Westjet	Korean Airlines
Turkish Airlines	Air India
Emirates	Singapore Airlines
Swiss International Airlines	Air New Zealand

```
#top 10 airlines in 2014
df_2014 = noise_quality_newdf.nlargest(10, ['2014'])
df_2014 = df_2014[['Airline Code']]
df_2014

#top 10 airlines in 2015
df_2015 = noise_quality_newdf.nlargest(10, ['2015'])
df_2015 = df_2015[['Airline Code']]
df_2015

#top 10 airlines in 2016
df_2016 = noise_quality_newdf.nlargest(10, ['2016'])
df_2016 = df_2016[['Airline Code']]
df_2016

#top 10 airlines in 2017
df_2017 = noise_quality_newdf.nlargest(10, ['2017'])
df_2017 = df_2017[['Airline Code']]
df_2017

#top 10 airlines in 2018
df_2018 = noise_quality_newdf.nlargest(10, ['2018'])
df_2018 = df_2018[['Airline Code']]
df_2018

top_10 = pd.concat([df_2008, df_2009, df_2010, df_2010, df_2011, df_2012, df_2013, df_2014, df_2015, df_2016,
                    df_2017, df_2018], keys = ['2008', '2009', '2010', '2011', '2012', '2013', '2014', '2015',
                                               '2016', '2017', '2018'],
                    axis=1, sort=False)

top_10 = top_10.apply(lambda x: pd.Series(x.dropna().values))
top_10.columns = top_10.columns.droplevel(-1)

top_10
```

Project Roadblocks

- Identifying consistency in data sets:
  - Crime data
  - Business data
  - Eviction data
  - Housing data
  - Aircraft type data
- Selecting the best visualizations
- No airport domain knowledge



Q&A?