

VAST
CHALLENGE
2018
MC1



Contributions of each Team Member

Gohil Anuragsinh

Migration of Bent-Beak Riffraff over the preserve area, Migration pattern of Bent-Beak Riffraff over the years, Line Graph of Bent-Beak Riffraff over the years
(Slide - 16, 17-18, 19)

Mulinti Harshavardhan Reddy

Migration of Canadian Cootamum over the preserve area, Migration pattern of Canadian Cootamum over the years, Line Graph of Canadian Cootamum over the years
(Slides - 20, 21, 22)

Guha Kanupriya

Migration of Rose-Crested Blue Pipits over the preserve area, Migration pattern of Rose-Crested Blue Pipits over the years, Line Graph of Rose-Crested Blue Pipits over the years
(Slides - 12, 13-14, 15)

Madipeddi Rishika Dwipi

Bird Count, Line Graph of all the Birds over the years, Location of 3 Birds
(Slides - 5, 10, 11)

Marri Shashank Reddy

Map Visualization of All the Birds, Bar Graph of all Birds over the years
(Slides - 6, 7-9)



Challenge Overview

- ❖ 2017 VAST Challenge results suggest a connection between Kasios Furniture manufacturing company and decline in number of Rose-Crested Blue Pipit
 - Kasios supposedly used banned Methylosmolene substance in manufacturing
 - Dumped process waste in northeast region of Boonsong Lekagul Preserve
 - Methylosmolene detected in smokestack emissions
- ❖ Kasios claims analysis was flawed and biased
 - Launched their own investigation
 - Report there are plenty of Rose-Crested Blue Pipits in the Preserve
 - Provided a set of Pipit bird calls
- ❖ Pangera Ornithology Conservation Society is at their wit's end
 - Vetted recordings of bird calls from the Preserve
 - Recommend machine learning and visual analytics to investigate Kasios' claims



Progress 1



Task

- ❖ Using the bird call collection and the included map of the Wildlife Preserve, characterize the patterns of all of the bird species in the Preserve over the time of the collection.
- ❖ Please assume we have a reasonable distribution of sensors and human collectors providing the recordings, so that the patterns are reasonably representative of the bird locations across the area.
 - Do you detect any trends or anomalies in the patterns? Please limit your answer to 10 images and 1000 words.



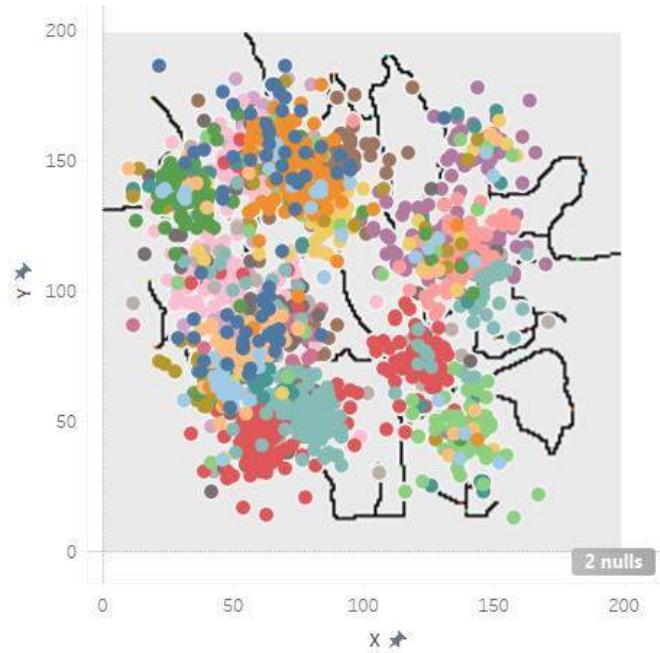
Birds Count

English name	
Bent-beak Riffraff	72
Blue-collared Zipper	67
Bombadil	140
Broad-winged Jojo	94
Canadian Cootamum	82
Carries Champagne Pipit	104
Darkwing Sparrow	86
Eastern Corn Skeet	88
Green-tipped Scarlet Pipit	88
Lesser Birchbeere	150
Orange Pine Plover	215
Ordinary Snape	94
Pinkfinch	73
Purple Tooting Tout	73
Qax	53
Queenscoat	241
Rose-crested Blue Pipit	186
Scrawny Jay	91
Vermillion Trillian	84



Above figure shows Birds Count

Map Visualization Of All Birds

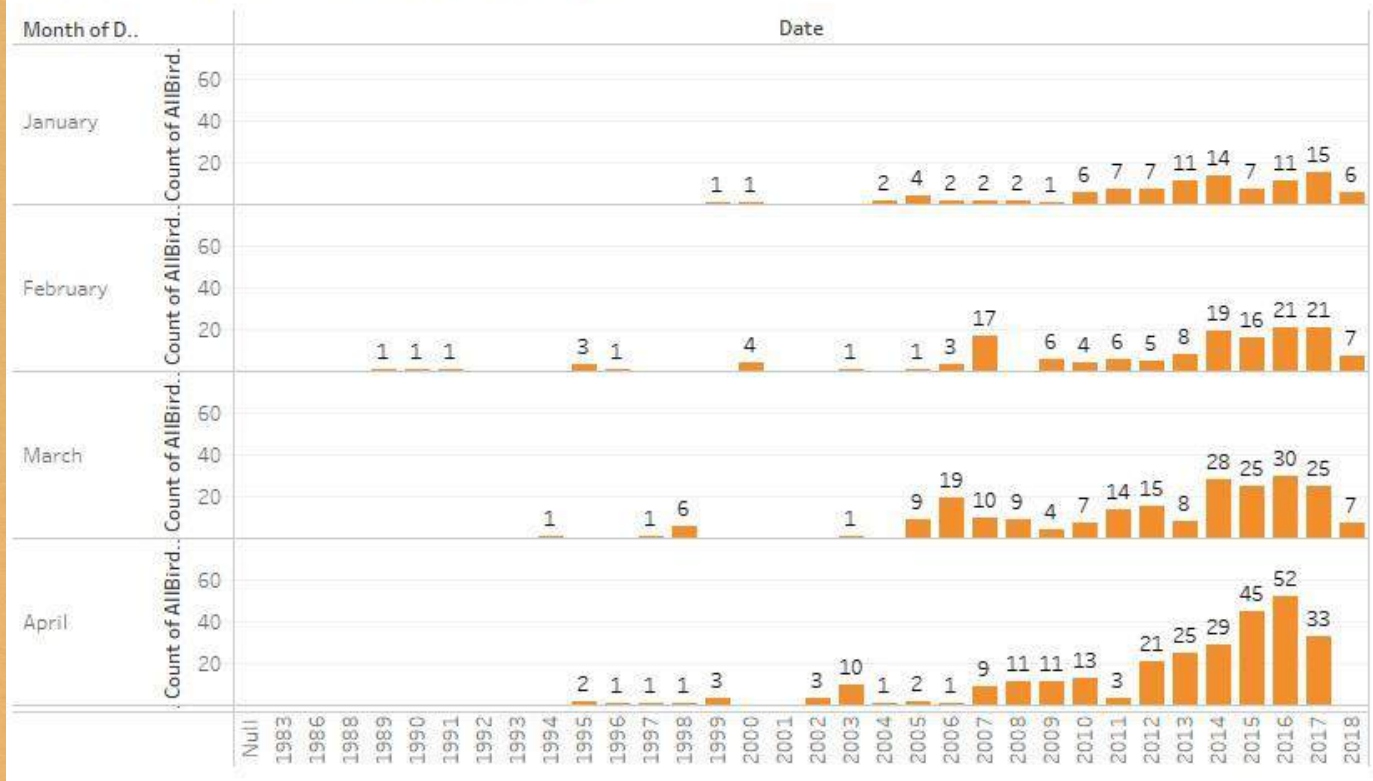


English name

- Bent-beak Riffraff
- Blue-collared Zipper
- Bombadil
- Broad-winged Jojo
- Canadian Cootamum
- Carries Champagne ..
- Darkwing Sparrow
- Eastern Corn Skeet
- Green-tipped Scarlet..
- Lesser Birchbeere
- Orange Pine Plover
- Ordinary Snape
- Pinkfinch
- Purple Tooting Tout
- Qax
- Queenscoat
- Rose-crowned Blue Pi..
- Scrawny Jay
- Vermillion Trillian

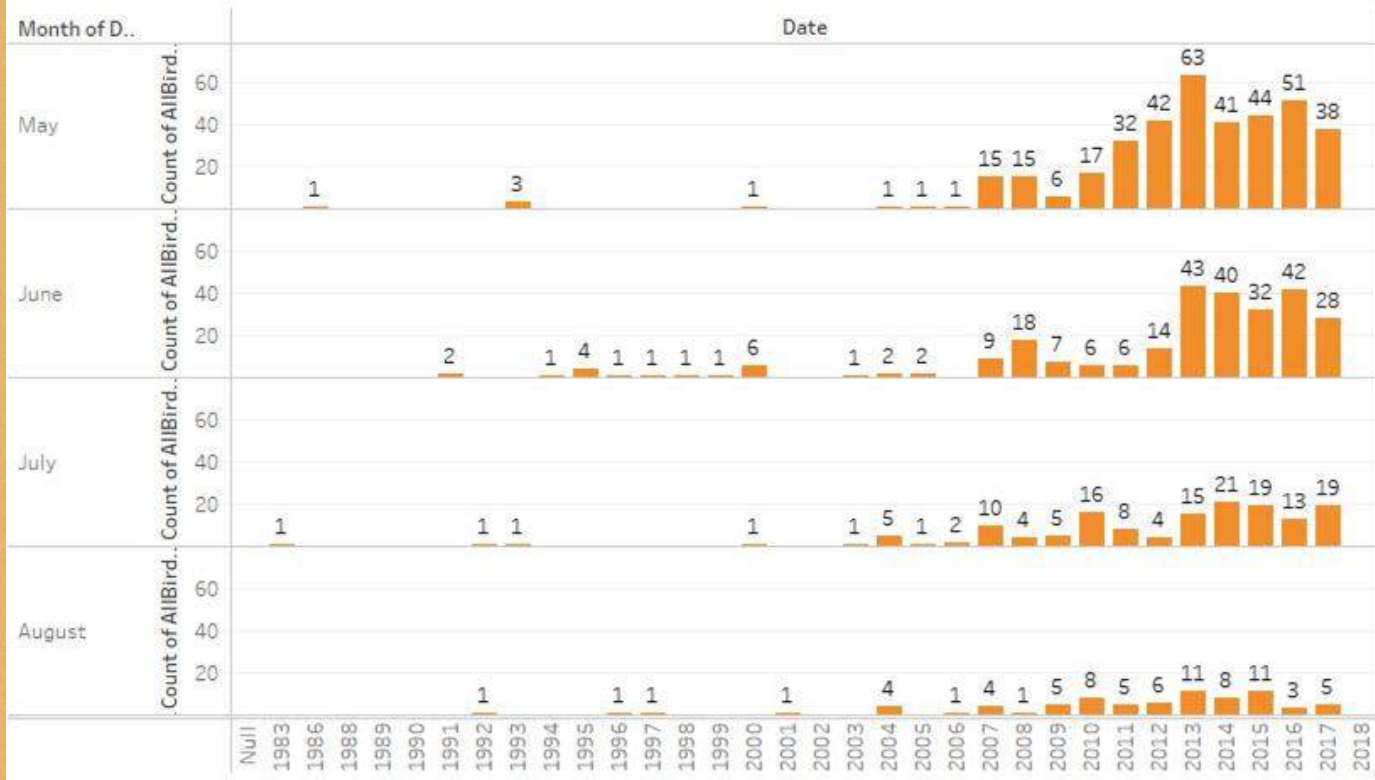
Above figure shows Map Visualization Of All Birds

Count Of All Birds Over Years Bar Chart



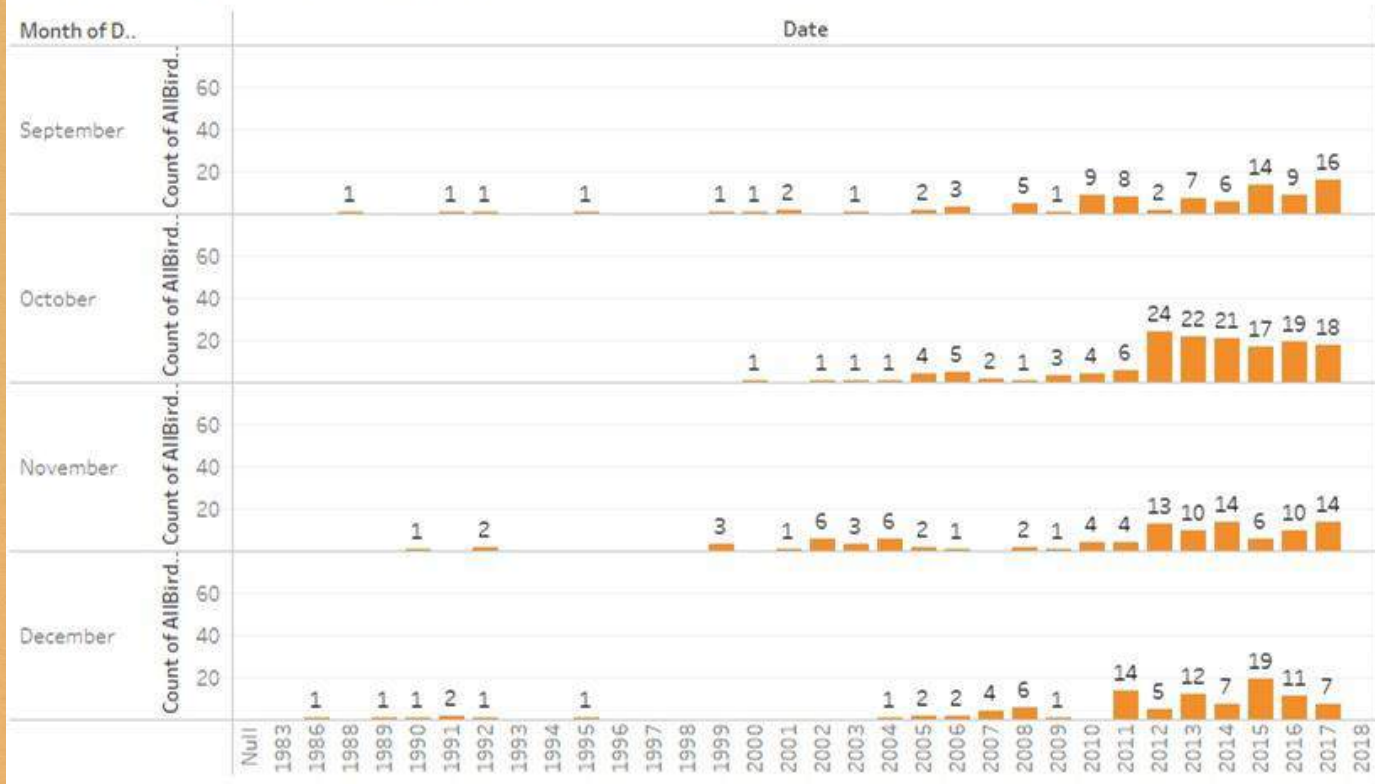
Above figure shows Count of all Birds over Years (January-April)

Count Of All Birds Over Years Bar Chart



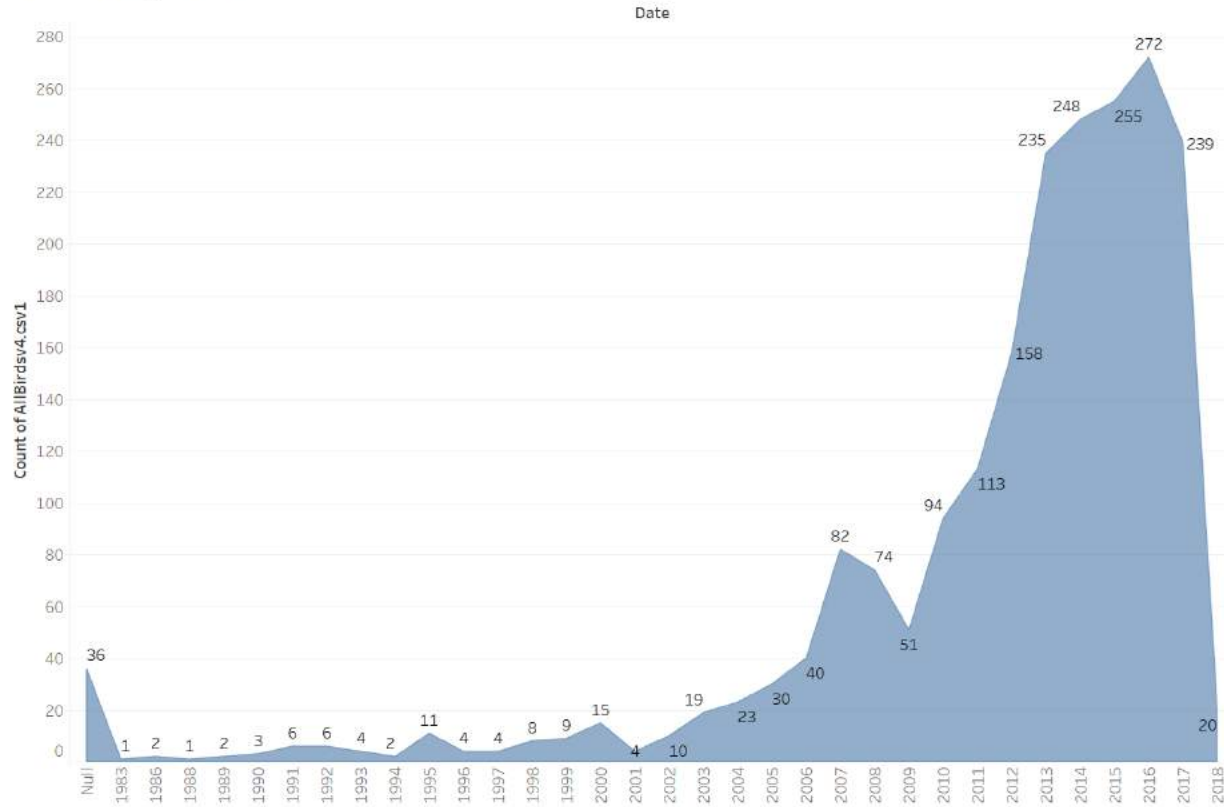
Above figure shows Count of all Birds over Years (May-August)

Count Of All Birds Over Years Bar Chart



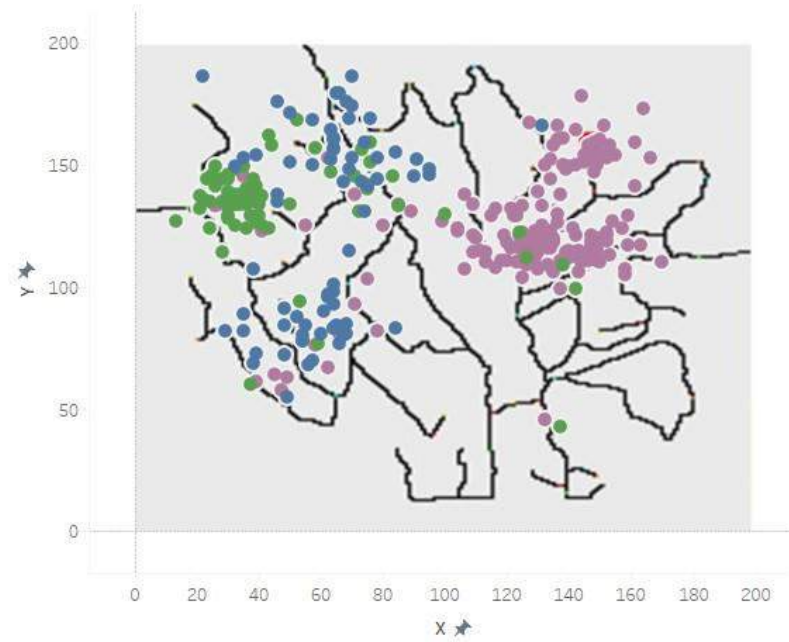
Above figure shows Count of all Birds over Years (September-December)

Birds count yearwise



Above figure shows Birds count yearwise

Location Of 3 Birds



English name

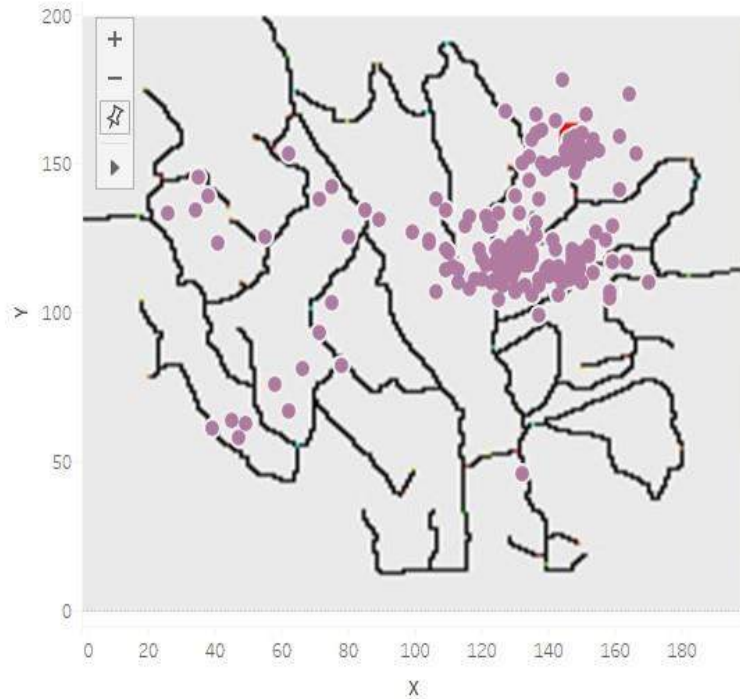
Bent-beak Riffraff

Canadian Cootamum

Rose-crested Blue Pi...

Above figure shows Location of 3 birds

Migration Of Blue Pipit Over The Area

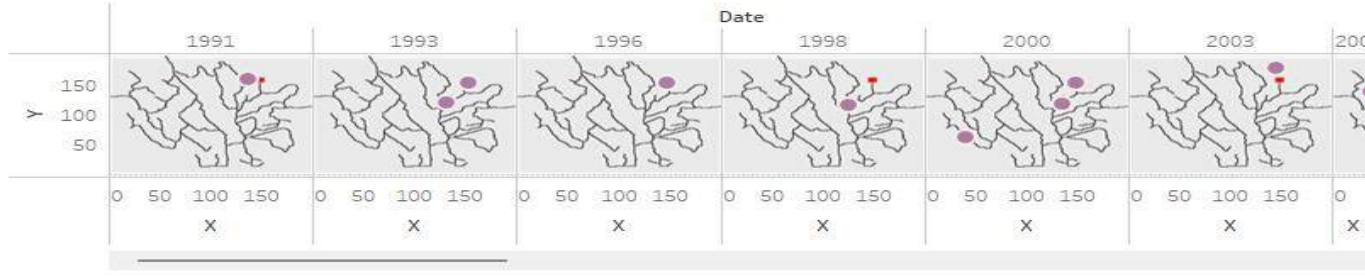


English name

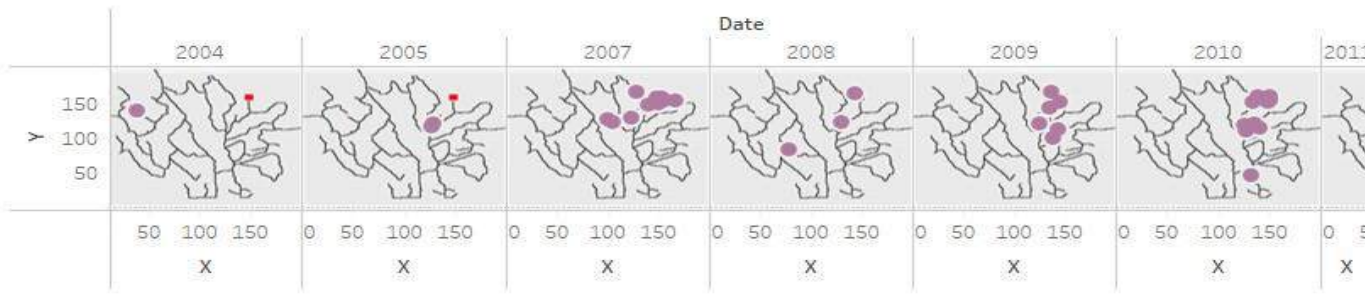
Rose-crested Blue Pi..

Above figure shows Migration Pattern of Rose-crested Blue Pipits

Migration Of Blue Pipits Over All The Years

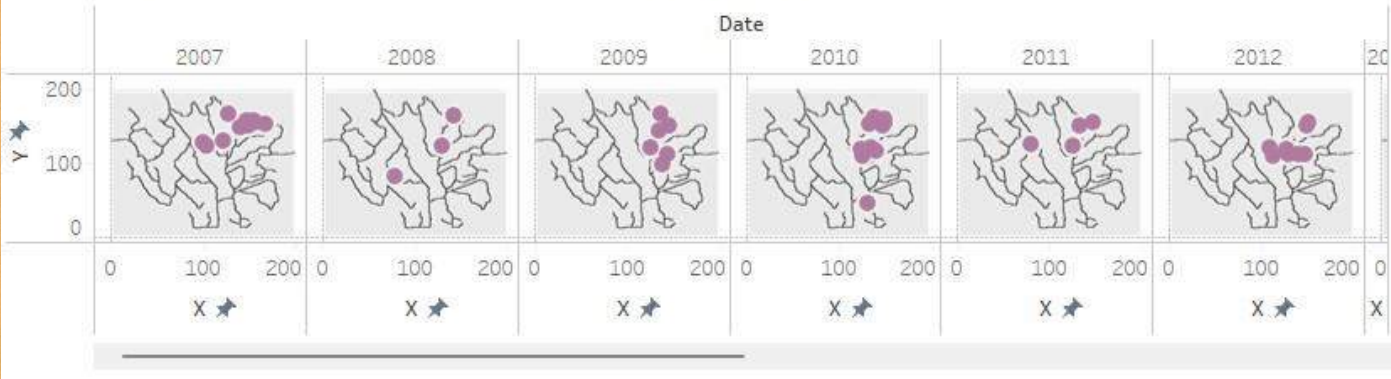


Migration Of Blue Pipits Over All The Years

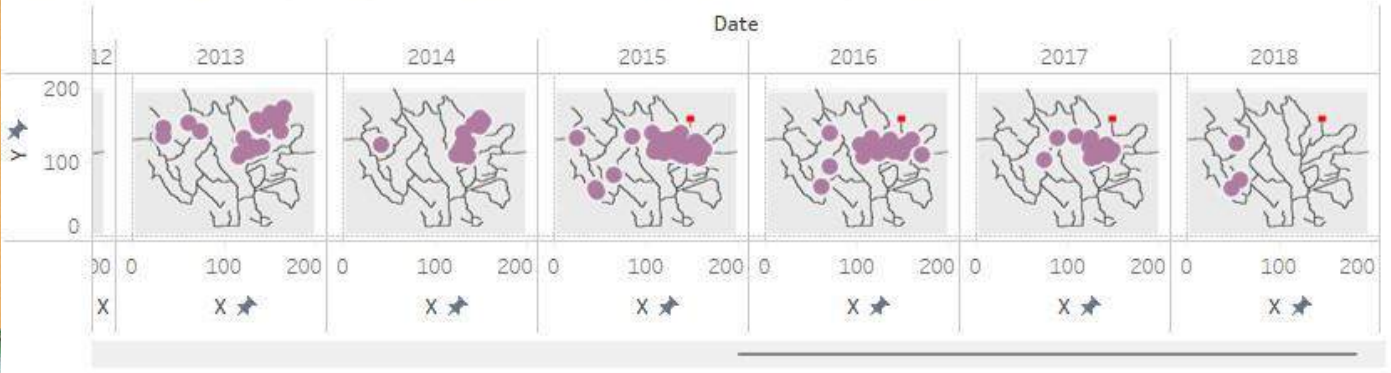


Above figure shows Migration Patterns Of Rose-crested Blue Pipits from 1991 to 2018

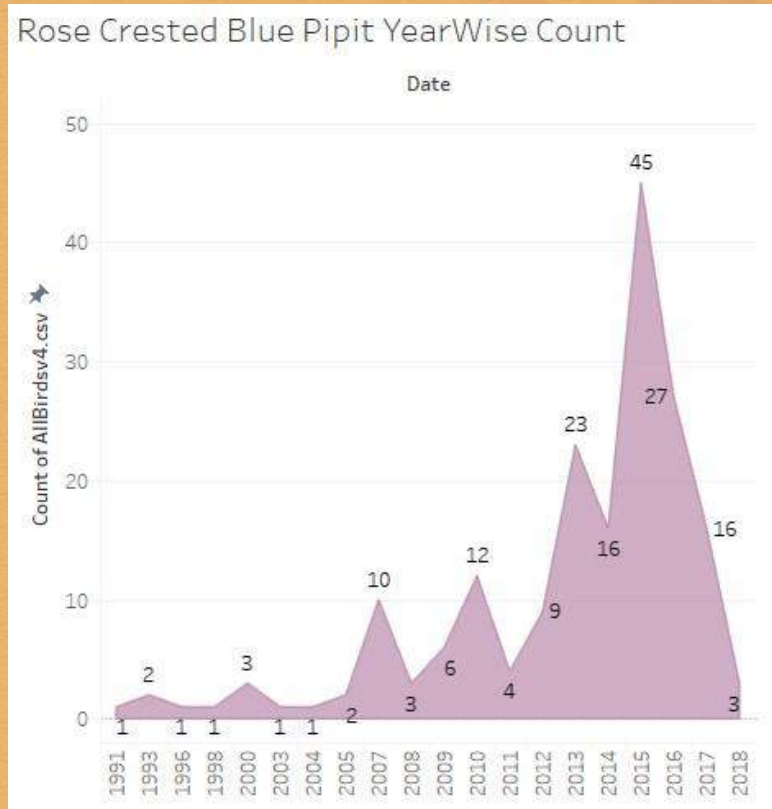
Migration Patterns Of Blue Pipits Over The Years 2007-2018



Migration Patterns Of Blue Pipits Over The Years 2007-2018



Above figure shows Migration Pattern of Blue Pipits from 2007-2018



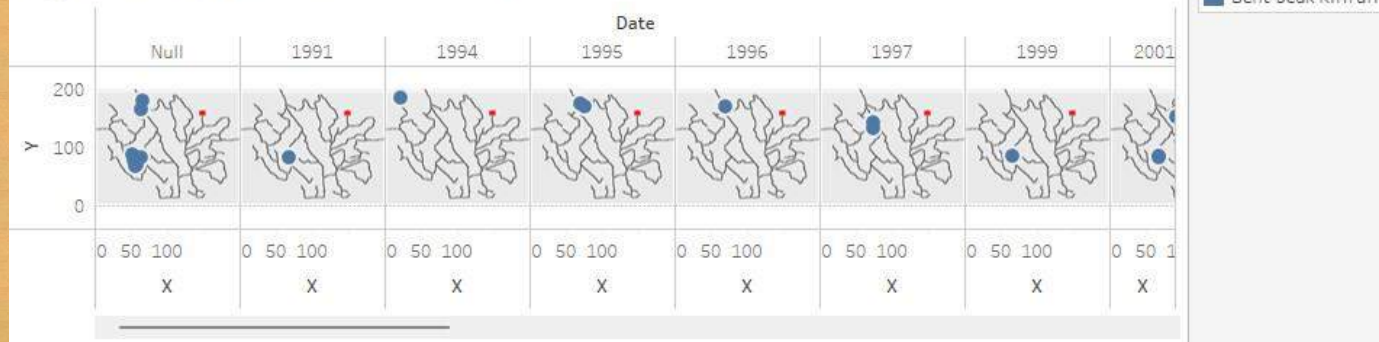
Above figure shows Bird count yearwise of Rose Crested Blue Pipit

Migration Of Bent Beak Riffraff Over Area

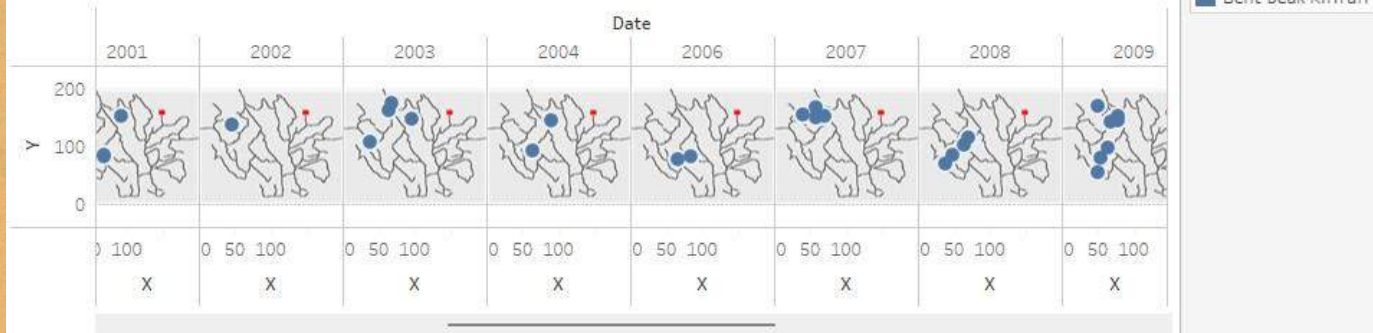


Above figure shows Migration Pattern of Bent-beak Riffraff

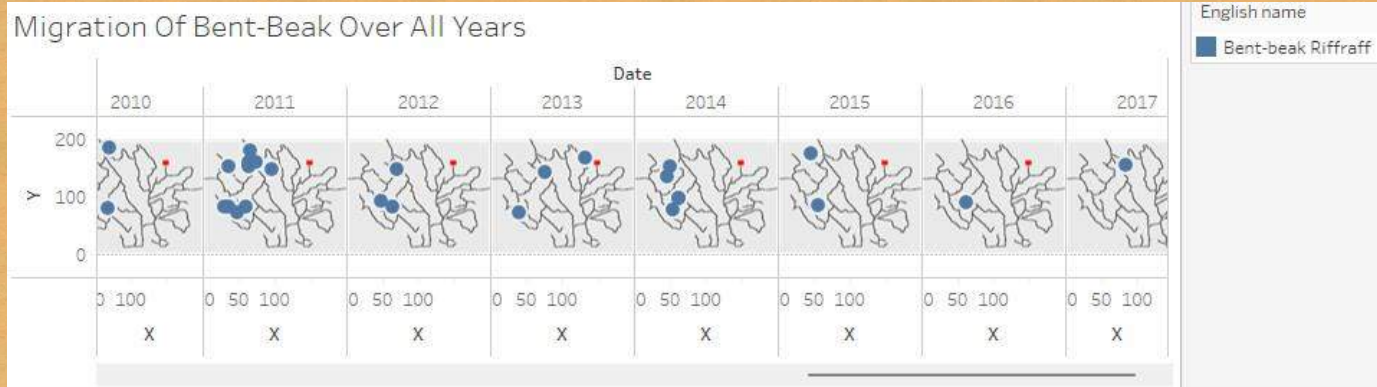
Migration Of Bent-Beak Over All Years



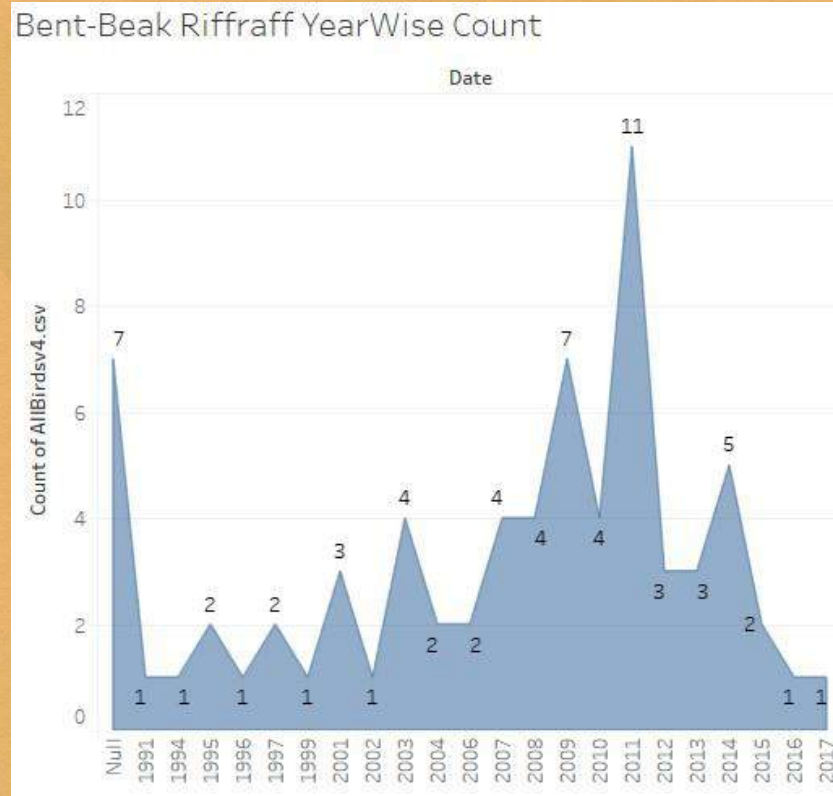
Migration Of Bent-Beak Over All Years



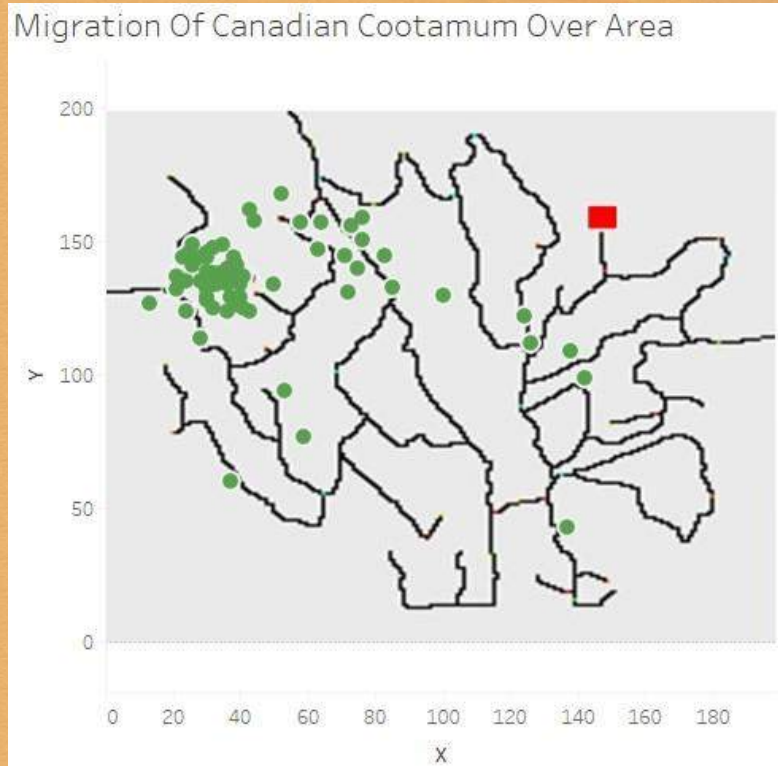
Above figure shows Migration Patterns Of Bent-Beak Riffraff from 1991 to 2017



Above figure shows Migration Patterns Of Bent-Beak Riffraff from 1991 to 2017

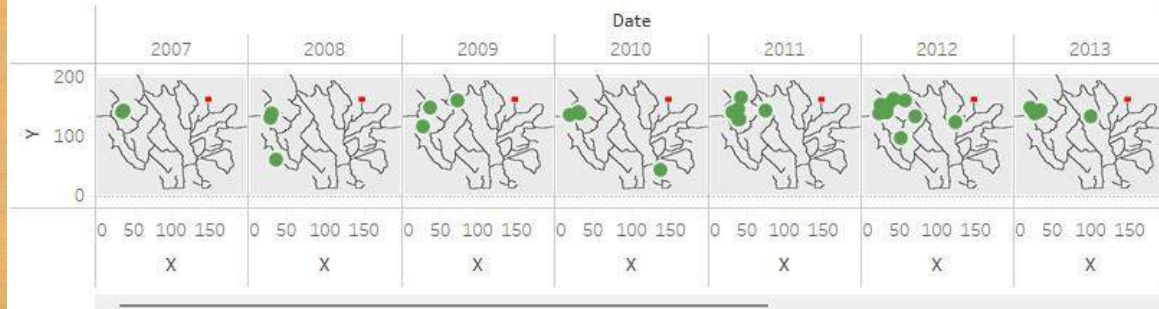


Above figure shows Bird count yearwise of Bent-beak Riffraff

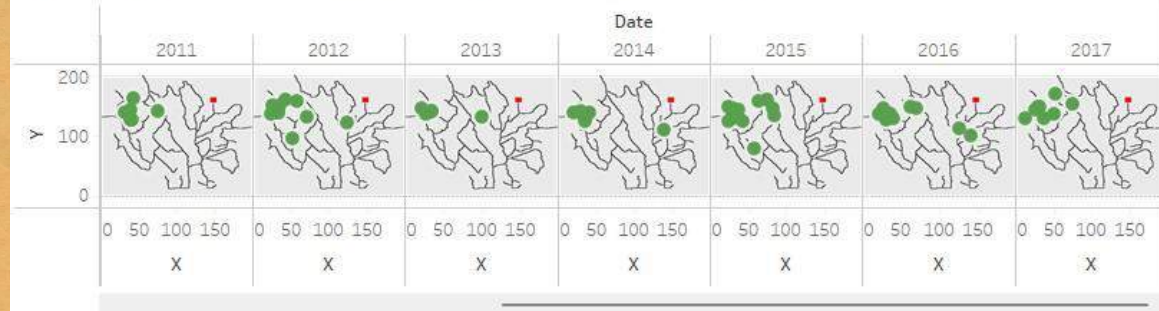


Above figure shows Migration Pattern of Canadian Cootamum

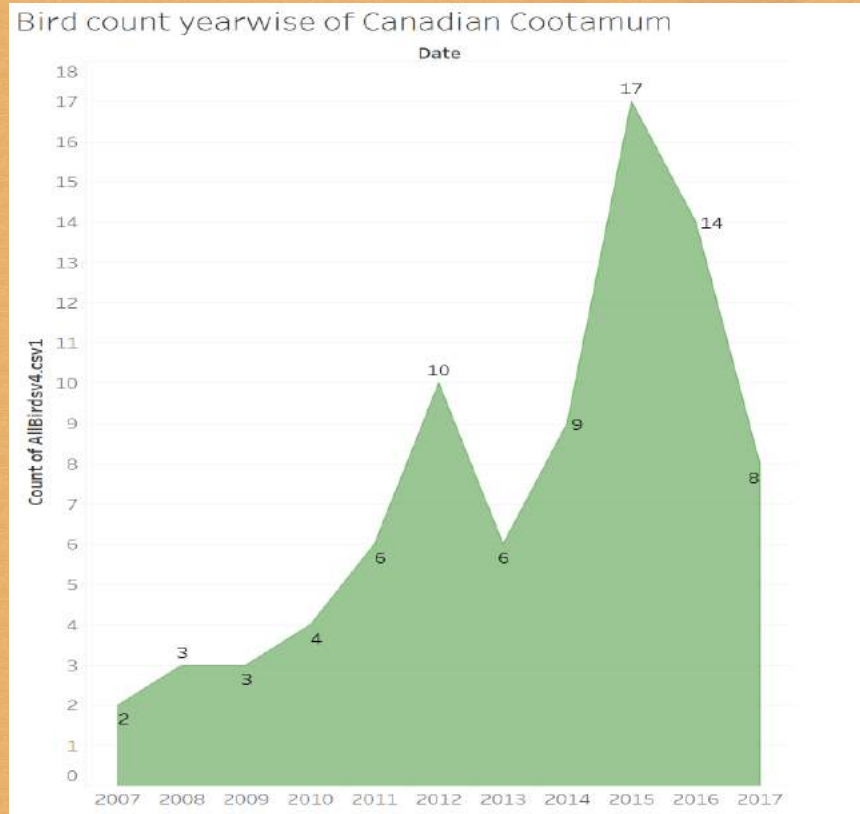
Migration Pattern Of Canadian Cootamum Over All Years



Migration Pattern Of Canadian Cootamum Over All Years



Above figure shows Migration Patterns Of Canadian Cootamum from 2007 to 2017



Above figure shows Bird count yearwise of Canadian Cootamum



Progress 2



Task

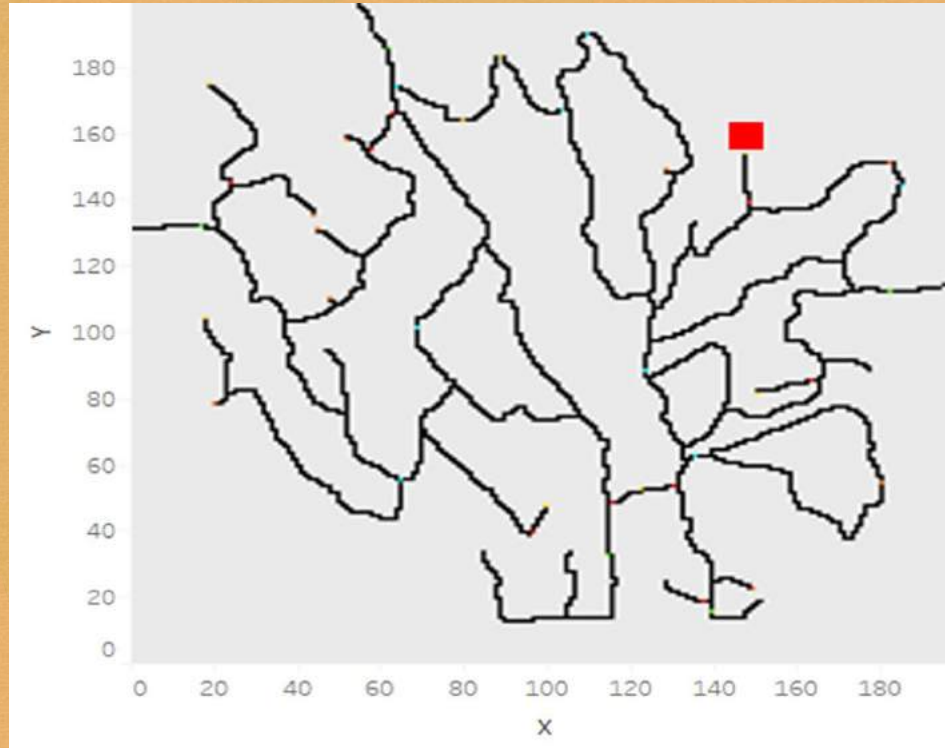
- ❖ Turn your attention to the set of birds calls supplied by Kasios. Does this set support the claim of Pipits being found across the Preserve? A machine learning approach using the bird call library may help your investigation. What is the role of visualization in your analysis of the Kasios bird calls?
 - Do you detect any trends or anomalies in the patterns? Please limit your answer to 10 images and 1000 words.

Objectives

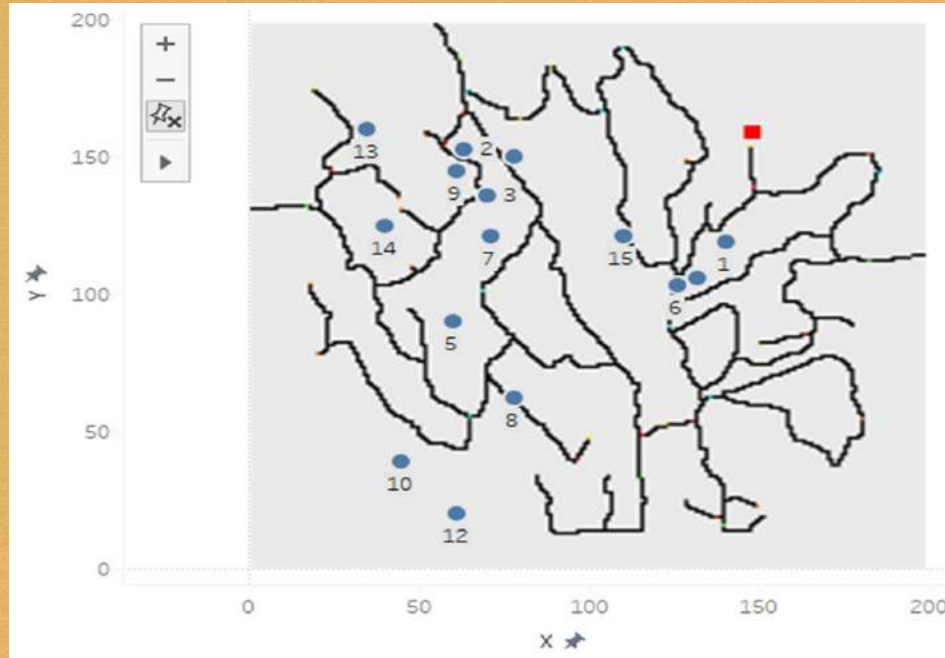
- Kasios claims that Rose-Crested Blue Pipits are spotted around the dumping region.
- Audio recordings are provided as evidence by the company
- Are the calls really heard? Is the claim valid?
- Machine Learning model to analyse calls



Boonsong Lekagul Nature Preserve Map with Dumpsite



Kasios claimed data for Blue Pipits across the preserve



Data Cleaning

```
In [2]: df = pd.read_csv(r"C:\Users\uppal\Desktop\Visual Analytics\MC1 2018\progress 2\AllBirdsv4.csv")
df
```

Out[2]:

	ID	English_name	Vocalization_type	Quality	Time	Date	X	Y
0	406171	Rose-crested Blue Pipit	call	A	07:48	07-06-2017 00:00	125	133
1	405901	Rose-crested Blue Pipit	call	A	12:00	08-02-2018 00:00	58	76
2	405548	Rose-crested Blue Pipit	song	A	11:00	10-03-2018 00:00	55	125
3	401782	Rose-crested Blue Pipit	song	A	06:00	29-06-2008 00:00	129	123
4	401720	Rose-crested Blue Pipit	call	A	13:00	28-12-2016 00:00	132	121
...
1748	305167	Vermillion Trillian	call	D	16:30	28-02-2016 00:00	56	87
1749	305166	Vermillion Trillian	call	D	16:00	28-02-2016 00:00	86	144
1750	236287	Vermillion Trillian	song	D	17:10	12-04-2015 00:00	72	58
1751	236286	Vermillion Trillian	song	D	17:05	12-04-2015 00:00	40	103
1752	153963	Vermillion Trillian	call	D	14:35	05-11-2013 00:00	148	158

1753 rows x 8 columns

Data Labelling

```
In [3]: df['label']=0
```

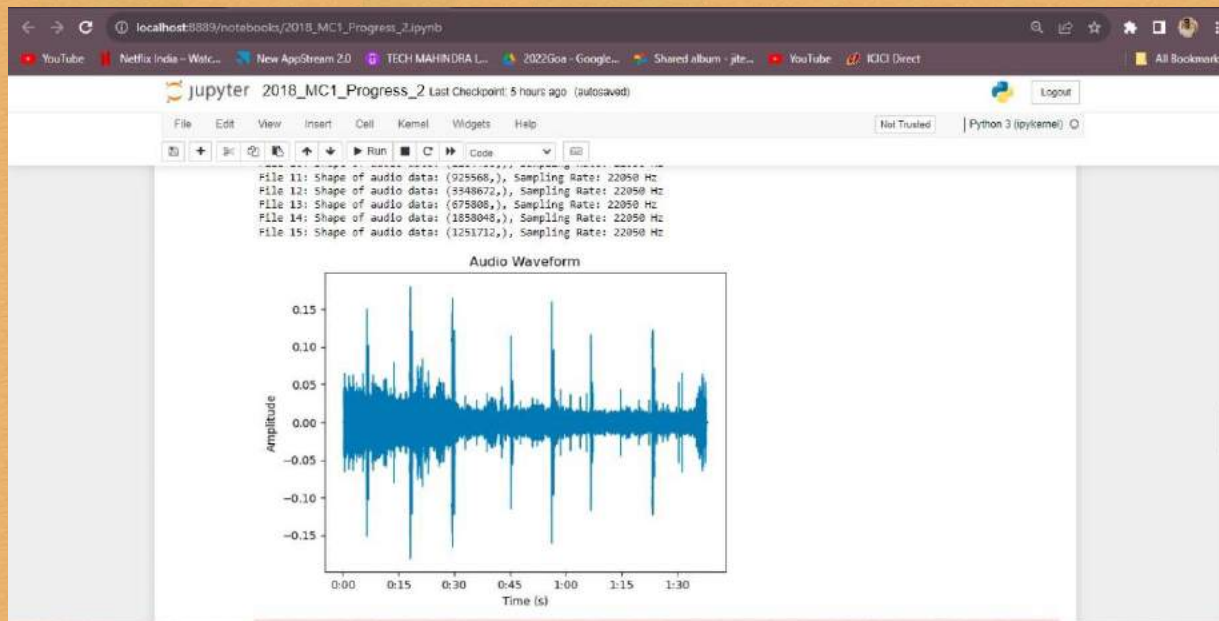
```
In [4]: df.loc[df['English_name'] == "Rose-crested Blue Pipit" , 'label'] = 1  
df
```

```
Out[4]:
```

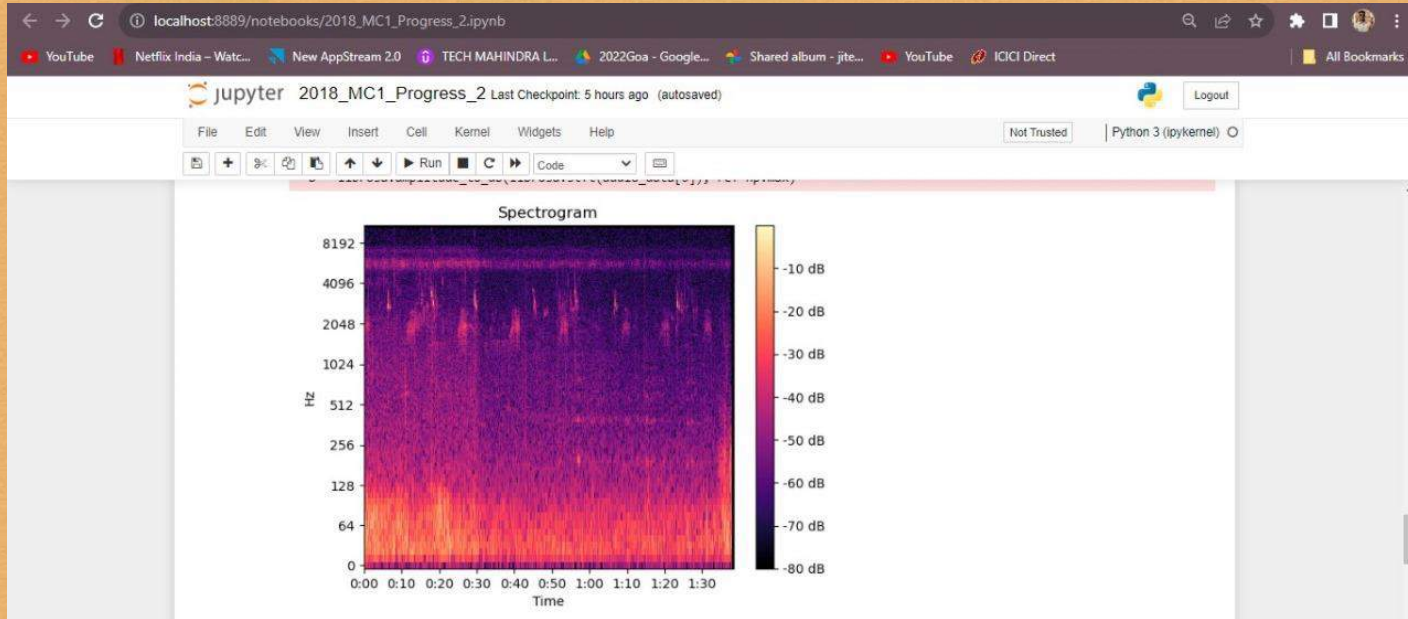
	ID	English_name	Vocalization_type	Quality	Time	Date	X	Y	label
0	406171	Rose-crested Blue Pipit	call	A	07:48	07-06-2017 00:00	125	133	1
1	405901	Rose-crested Blue Pipit	call	A	12:00	08-02-2018 00:00	58	76	1
2	405548	Rose-crested Blue Pipit	song	A	11:00	10-03-2018 00:00	55	125	1
3	401782	Rose-crested Blue Pipit	song	A	06:00	29-06-2008 00:00	129	123	1
4	401720	Rose-crested Blue Pipit	call	A	13:00	28-12-2016 00:00	132	121	1
...
1748	305167	Vermillion Trillian	call	D	16:30	28-02-2016 00:00	56	87	0
1749	305166	Vermillion Trillian	call	D	16:00	28-02-2016 00:00	86	144	0
1750	236287	Vermillion Trillian	song	D	17:10	12-04-2015 00:00	72	58	0
1751	236286	Vermillion Trillian	song	D	17:05	12-04-2015 00:00	40	103	0
1752	153963	Vermillion Trillian	call	D	14:35	05-11-2013 00:00	148	158	0

1753 rows x 9 columns

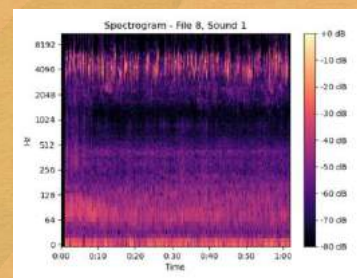
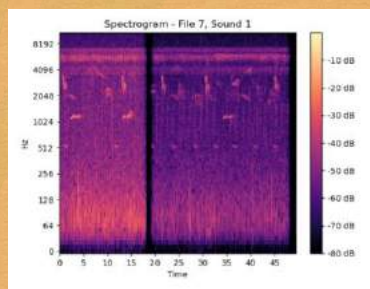
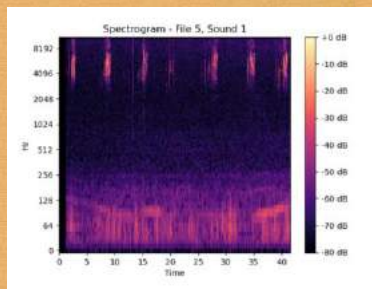
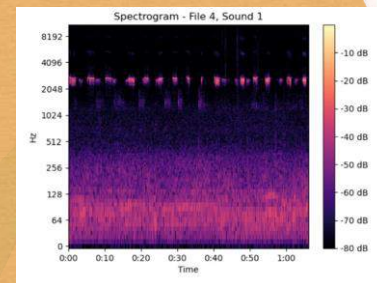
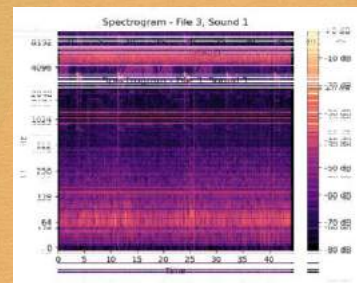
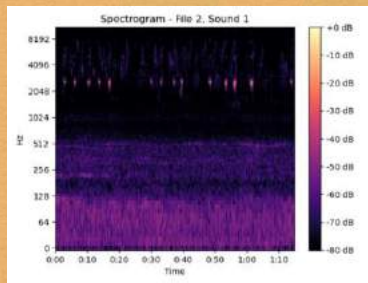
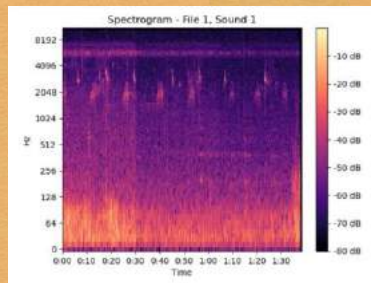
Root Mean Square value of all Blue Pipit audio Files



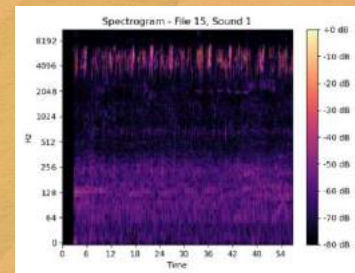
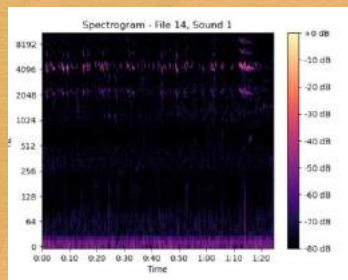
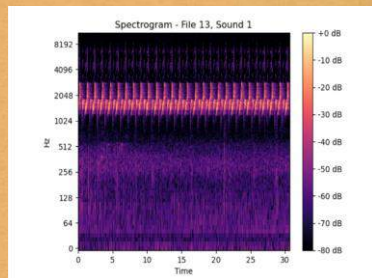
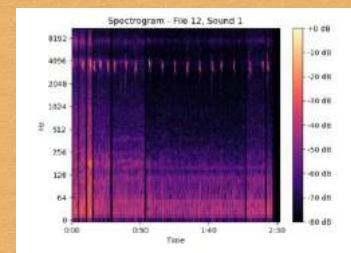
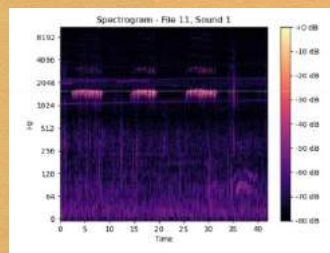
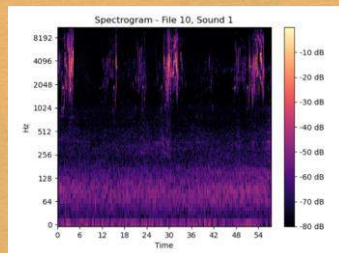
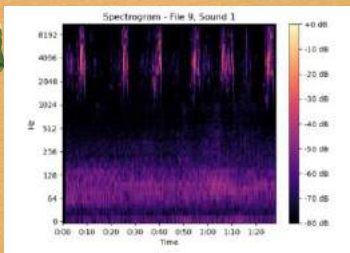
Spectrogram plot of Blue Pipit audio files



Audio sets given by Kasios are used as test

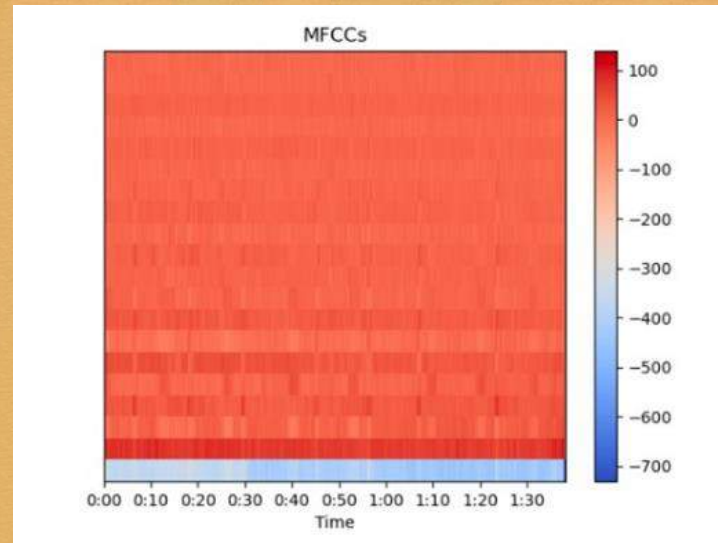


Audio sets given by Kasios are used as test



MFCC

Mel frequency cepstrum is a representation of the short-term power spectrum of a sound, based on a linear cosine transform of a log power spectrum on a nonlinear mel scale of frequency



Implementation of Machine Learning

Decision Tree

```
Confusion Matrix:
[[435  45]
 [ 29  12]]
Classification Report:
              precision    recall  f1-score   support

     0       0.94        0.91        0.92        480
     1       0.21        0.29        0.24         41

 accuracy          0.86        521
 macro avg         0.57        0.60        0.58        521
 weighted avg      0.88        0.86        0.87        521

Accuracy: 0.8579654510556622
```

K Nearest Neighbour kNN

```
Confusion Matrix:
[[479   1]
 [ 41   0]]
Classification Report:
              precision    recall  f1-score   support

     0       0.92        1.00        0.96        480
     1       0.00        0.00        0.00         41

 accuracy          0.92        521
 macro avg         0.46        0.50        0.48        521
 weighted avg      0.85        0.92        0.88        521

Accuracy: 0.9193857965451055
```


Implementation of Machine Learning

SVM

Confusion Matrix:

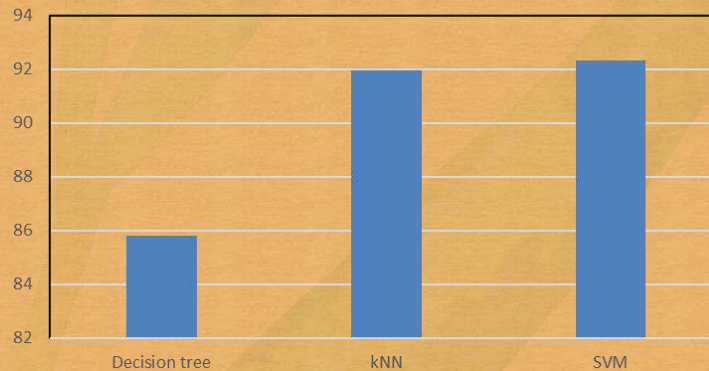
```
[[480  0]
 [ 40  1]]
```

Classification Report:

	precision	recall	f1-score	support
0	0.92	1.00	0.96	480
1	1.00	0.02	0.05	41
accuracy			0.92	521
macro avg	0.96	0.51	0.50	521
weighted avg	0.93	0.92	0.89	521

Accuracy: 0.9232245681381958

%Fit



Results

- All the models performed well on training dataset
- Only 2 class labels were found in the data which matched the Rose Crested Blue Pipits Calls.
- None of the other test audio really did contain Blue Pipits Calls.
- Kasios claim is hence proved to be false from the gathered evidence.

	id	Label
0	1	0
1	2	1
2	3	0
3	4	0
4	5	0
5	6	0
6	7	0
7	8	0
8	9	0
9	10	0
10	11	0
11	12	0
12	13	1
13	14	0
14	15	0

Conclusion/Hypothesis

- The hypothesis formulated is that the Rose Crested Blue Pipits bird species will continue to get affected by Kasios Manufacturing Company due to the dumping of smokestack emissions.
- Along with that, we the required evidence to support our hypothesis and can oppose the claim of Kasios Company which says that the Rose Crested Blue Pipits are not endangered/ are thriving is not reliable, as indicated by our analysis.

Thank You!

Do you have any
questions?

