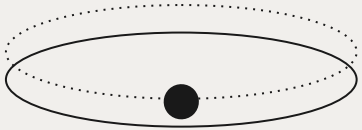
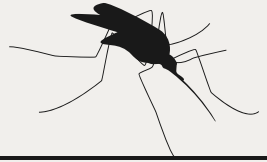




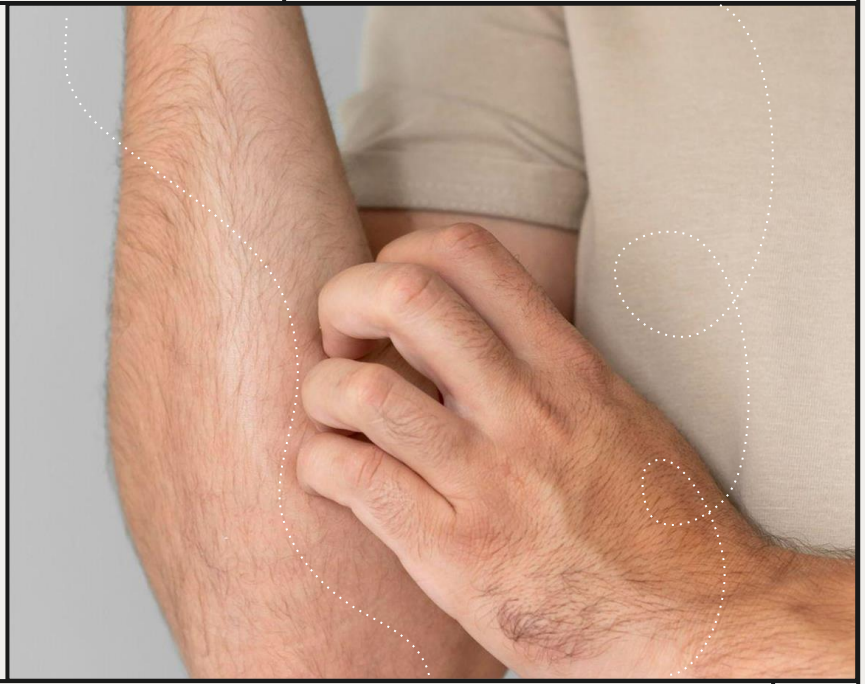
15th August 2022

Fighting West Nile Virus

Cheong Hao Han, Phua Jia Qing, Choo Wende

Content

15th August 2022

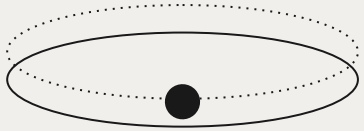


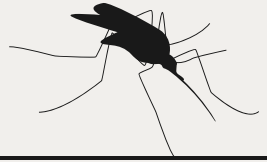
15th August 2022

Background and Outside Research

01

Jia Qing

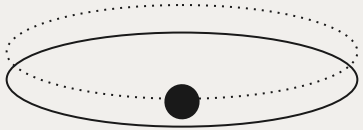




15th August 2022

Predicting the presence of West Nile Virus (WNV)

Background



West Nile Virus

Mosquito-borne disease

Peak Season

Optimal conditions

Culen Pipiens

Species that carry WNV

Mosquito Activity

Optimal conditions

Life Cycle

4 life stages

Peak Season

		
Rain Water	**Precipitation**	**High Temperature**

Mosquito Activity

Humidity

High humidity

Wind

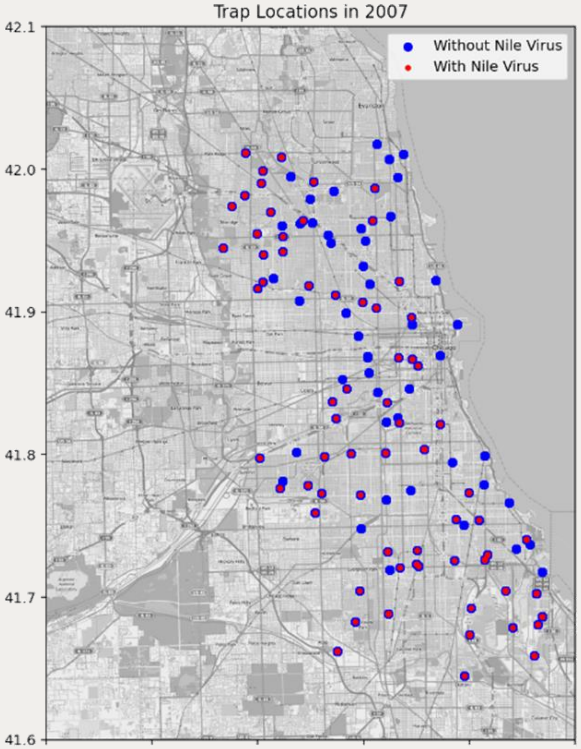
No wind

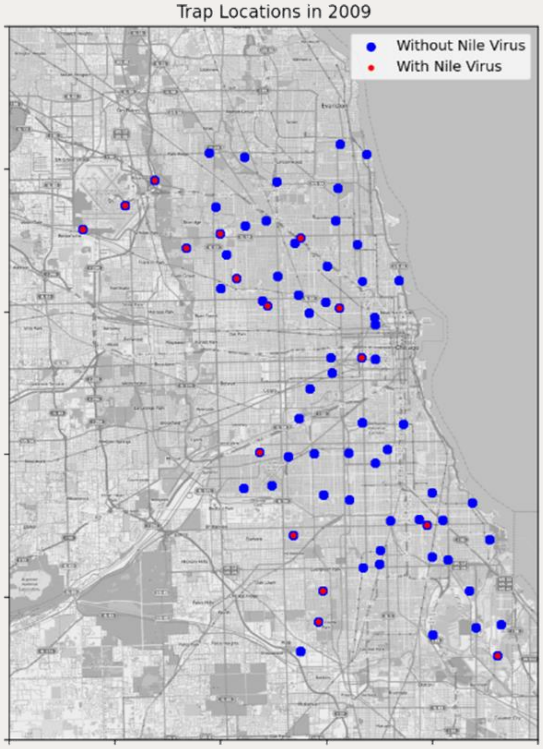
August 20th

02

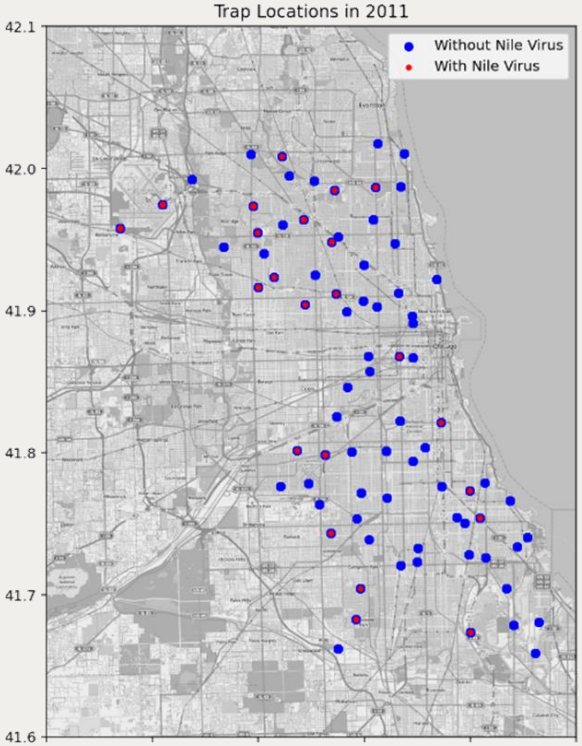
Exploratory Data Analysis

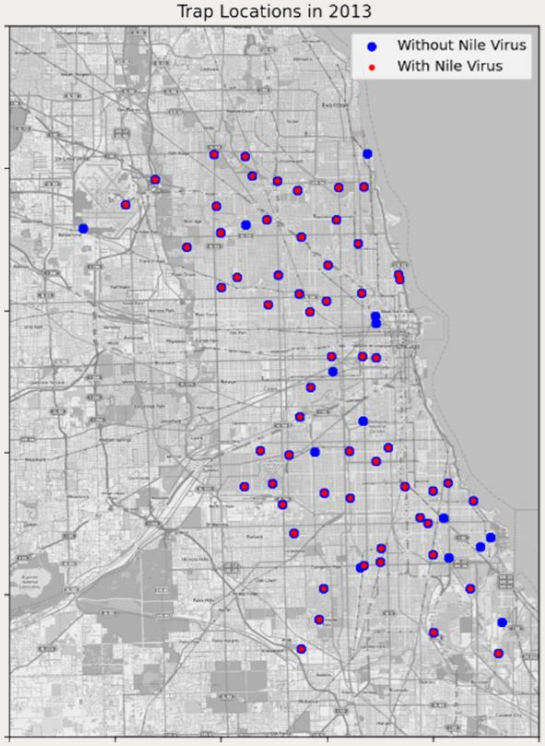
Wende





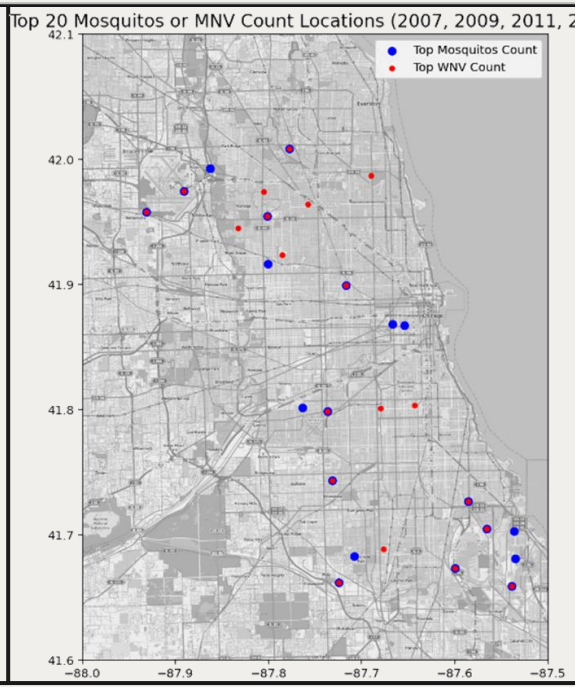
Reduced No of Traps with WNV (2007 & 2009)





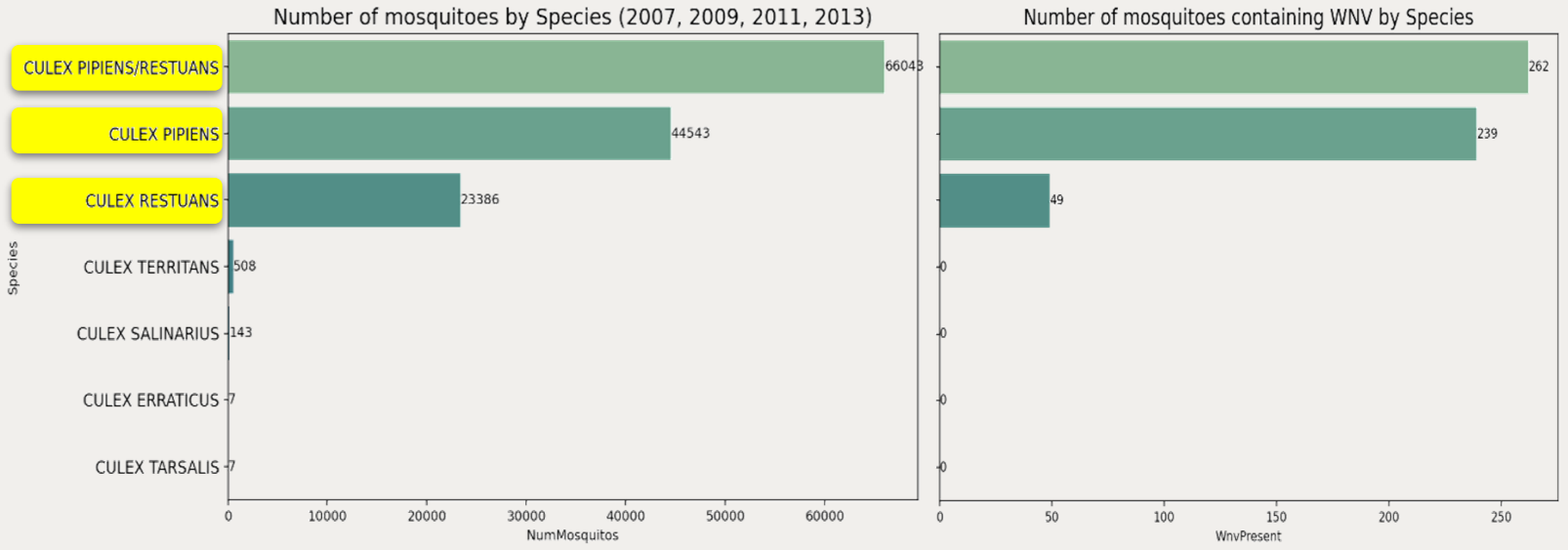
Proliferation of WNV in 2013 (2011 & 2013)

Top 12 NumMosquitos & WNV Present



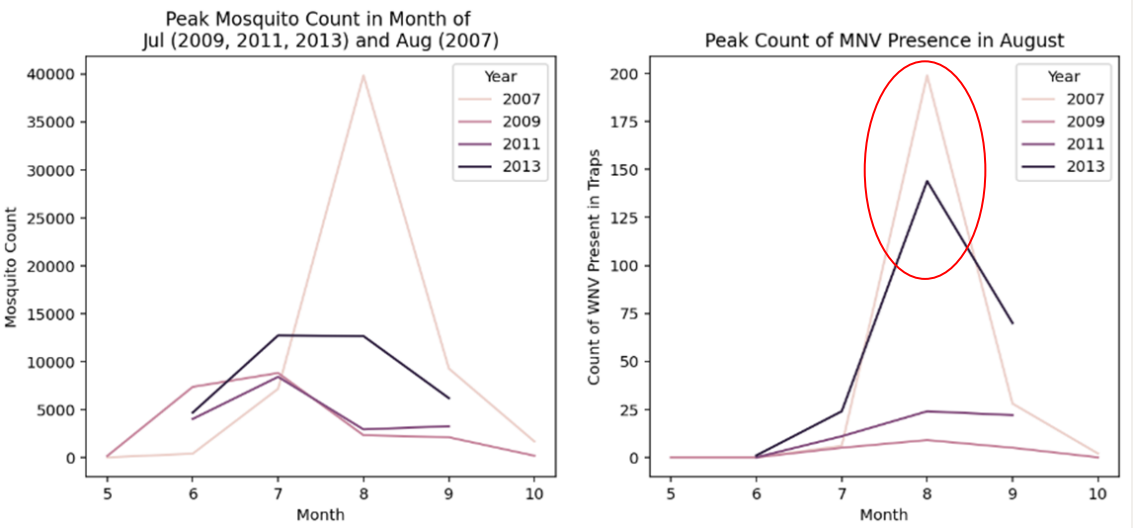
Longitude	Latitude	Trap	Address	NumMosquitos	WnvPresent
-87.890615	41.974689	T900	ORD Terminal 5, O'Hare International Airport, ...	15386	66
-87.599862	41.673408	T115	South Doty Avenue, Chicago, IL, USA	21668	41
-87.800991	41.954690	T002	4100 North Oak Park Avenue, Chicago, IL 60634,...	3710	18
-87.585413	41.726465	T138	South Stony Island Avenue, Chicago, IL, USA	9936	16
-87.731435	41.743402	T225	8200 South Kostner Avenue, Chicago, IL 60652, USA	2014	11
-87.565666	41.704572	T128	2400 East 105th Street, Chicago, IL 60617, USA	3315	11
-87.777921	42.008314	T008	7000 North Moselle Avenue, Chicago, IL 60646, USA	2668	10
-87.930995	41.957799	T903	Ohare Court, Bensenville, IL 60106, USA	2327	10
-87.538693	41.659112	T221	4000 East 130th Street, Chicago, IL 60633, USA	1699	9
-87.736812	41.798697	T114	5200 South Kolmar Avenue, Chicago, IL 60632, USA	2161	9
-87.724608	41.662014	T135	4200 West 127th Street, Alsip, IL 60803, USA	3122	8
-87.716788	41.899230	T030	1000 North Central Park Avenue, Chicago, IL 60...	1802	8

Pipiens & Restuans Carry WNV



Mosquitos Data by Month

1. WNV is more prevalent in 2007 and 2013
1. Higher proportion of WNV carrying mosquitos in 2013
1. Highest occurrence of the WNV presence in month of August



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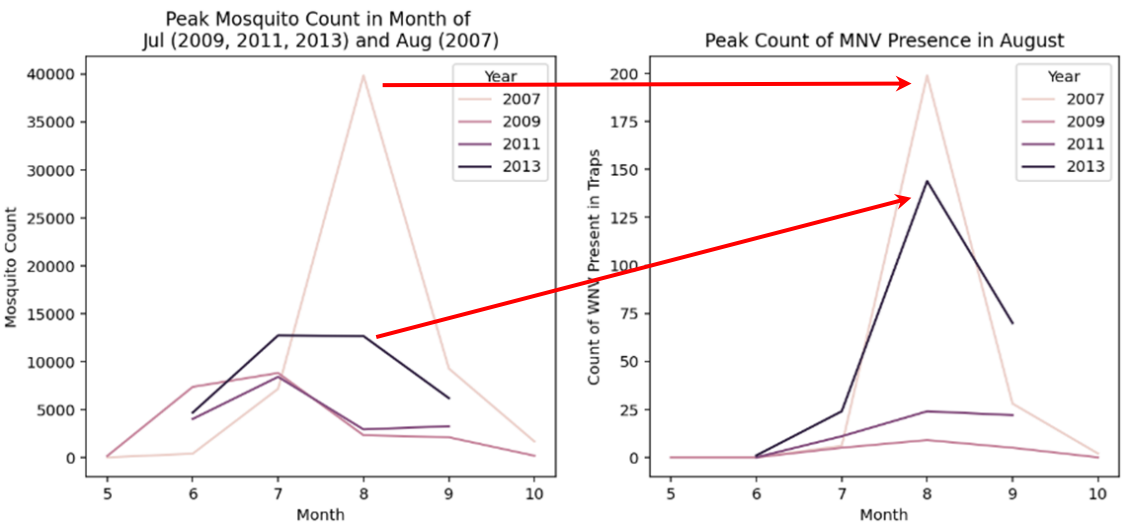

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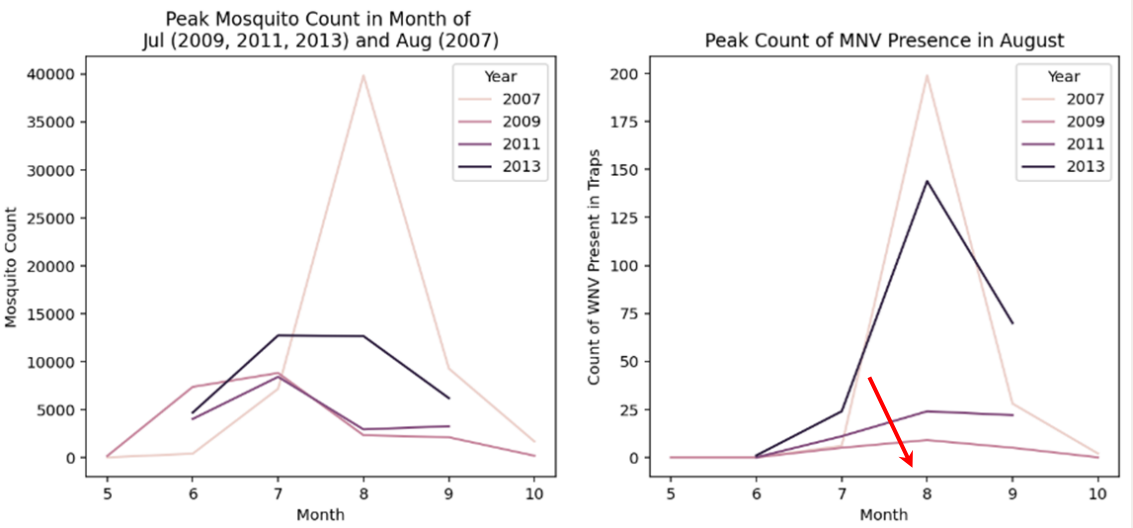
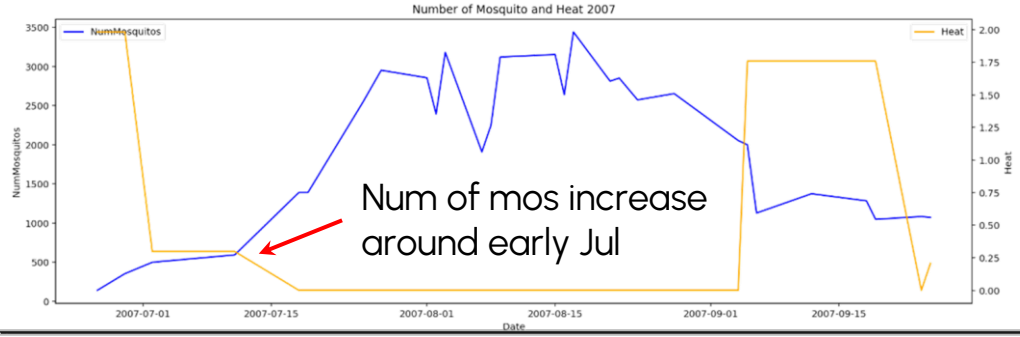
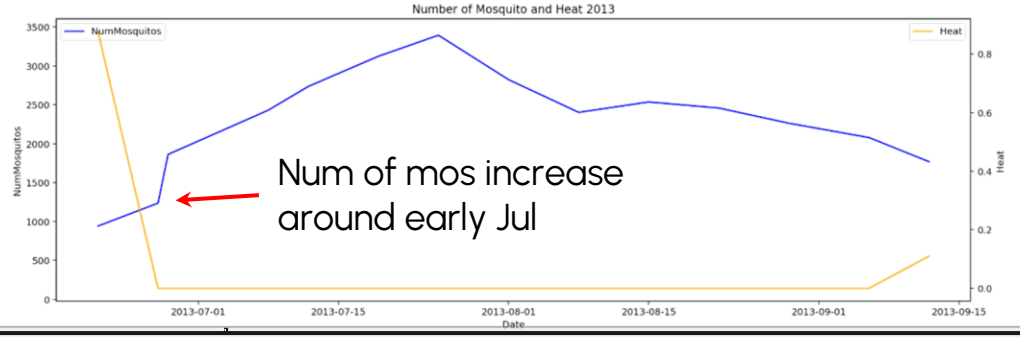


High Heat Level, Low Mos!

2007

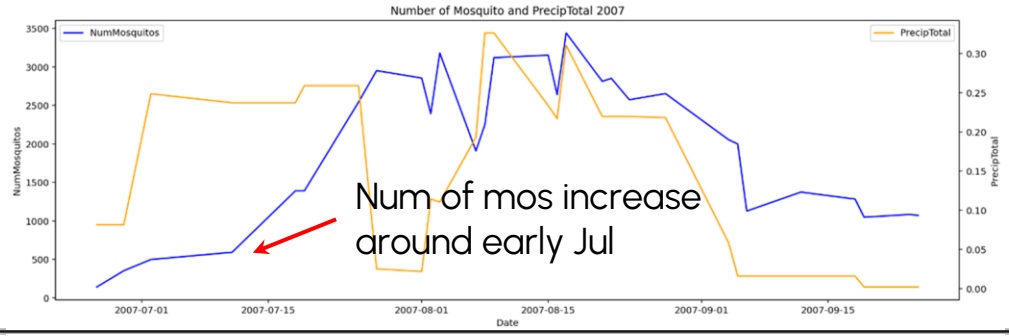


2013

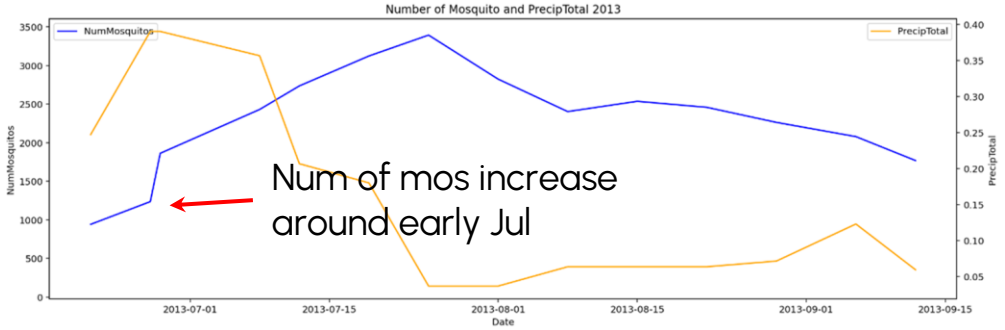


High Precipitate, High Mos!

2007

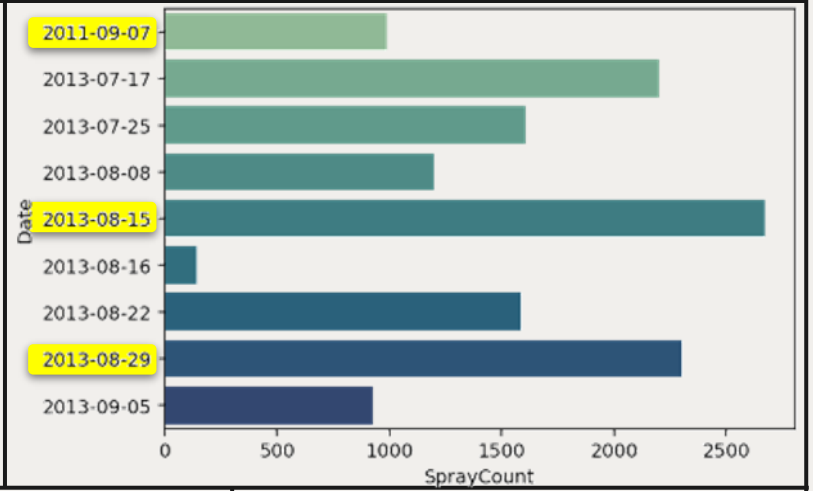


2013



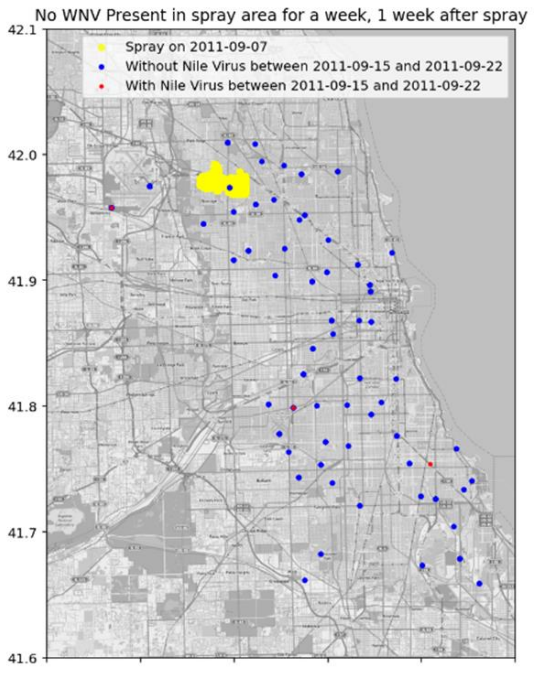
August 20th

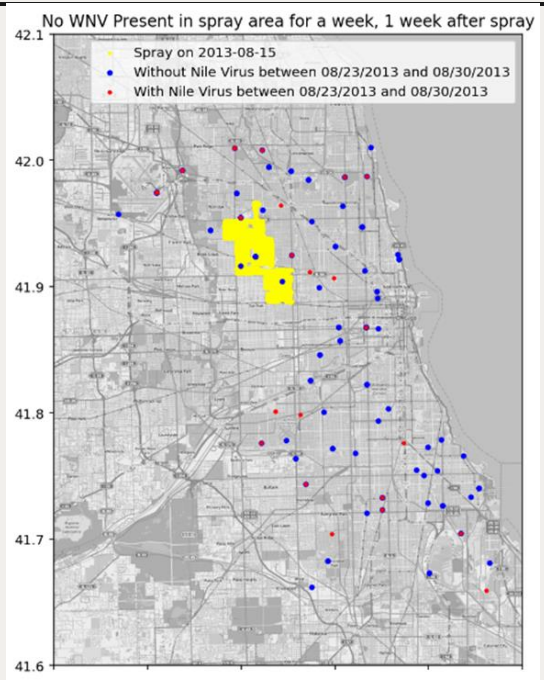
Spray conducted on 9 days in 2011 and 2013

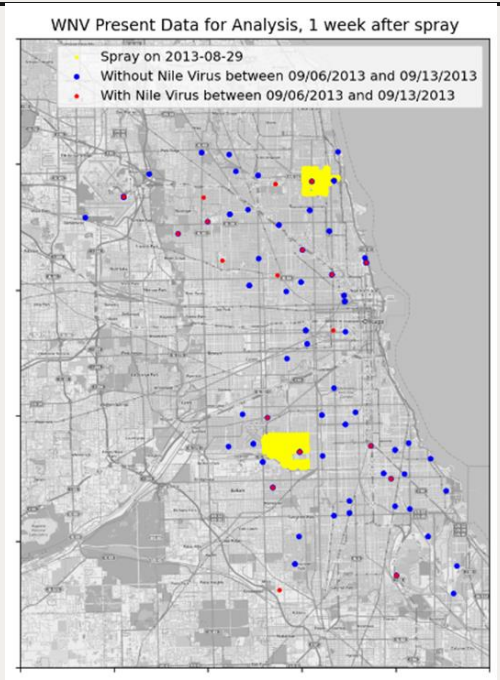


Spray dates mainly in month of Aug.

Limited Effects from Spraying

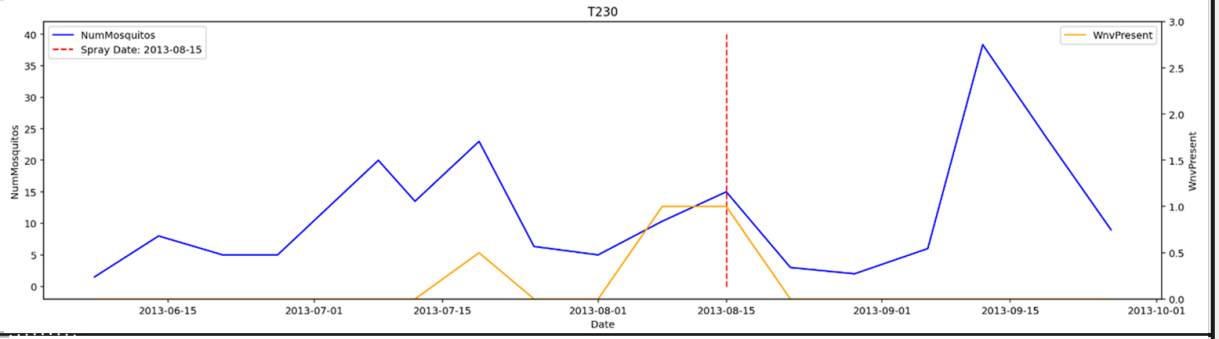




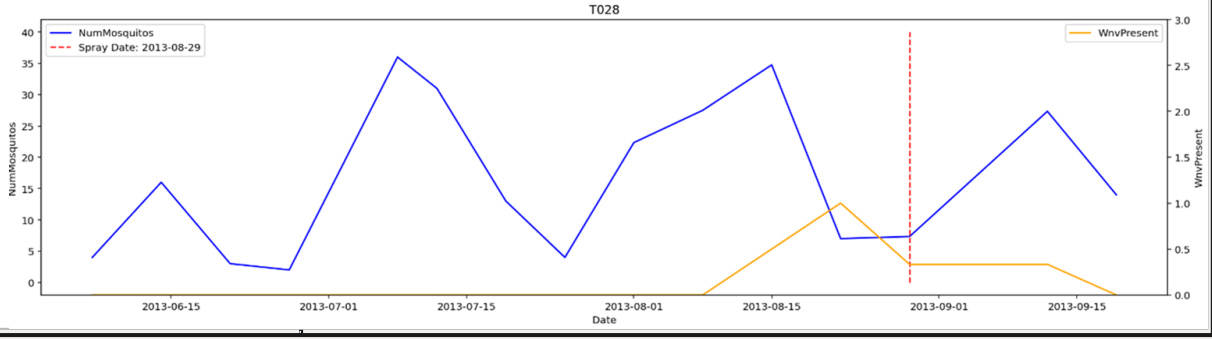


Limited Effects from Spraying

15/8/13



29/8/13



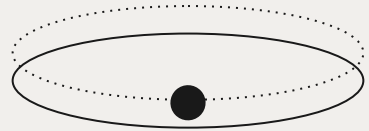
15th August 2022

Modelling & Evaluation

03

Hao Han

Models used



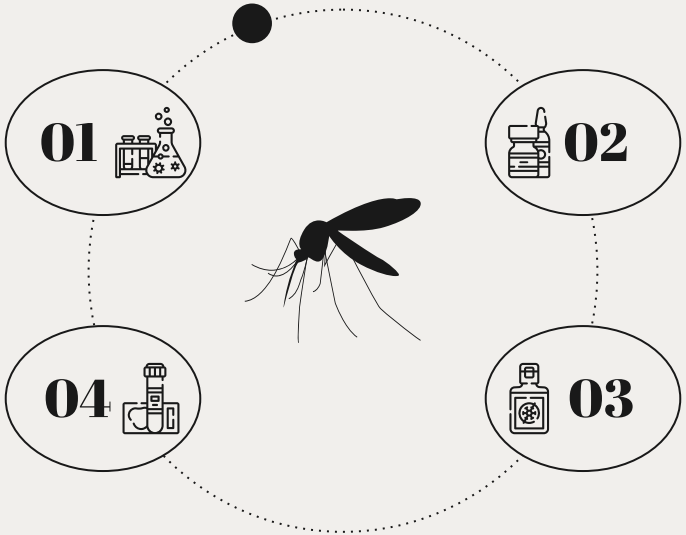
- Logistic Regression
- K Nearest Neighbours
- Random Forest
- AdaBoost
- Gradient Boosting
- Extra Trees

Modelling process

Function

Created a function for modelling which includes scaling and smote

01



02

Set Params

Set the hyper parameters for the respective models

Refine

Identify the useful and not useful features

04

03

Compare

Compare the model results

Model comparison

Model	Best score	Train score	Val score	Roc Auc
Logistic Regression	0.821	0.832	0.798	0.732
KNN	0.726	0.860	0.701	0.607
Random Forest	0.836	0.865	0.810	0.727
AdaBoost	0.833	0.850	0.814	0.726
Gradient Boosting	0.834	0.889	0.822	0.676
Extra Trees	0.830	0.847	0.809	0.726

Model comparison

Model	Best score	Train score	Val score	Roc Auc
Logistic Regression	0.821	**0.832**	**0.798**	**0.732**
Random Forest	0.836	0.865	0.810	0.727

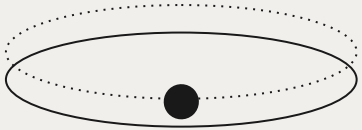
Logistic Regression

Predict WNV challenge

Kaggle

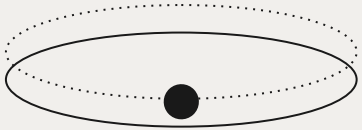
Use Logreg to predict
WNV on the test set

Important features

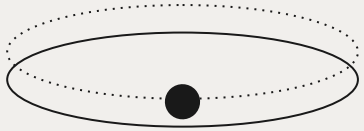


Day Duration	**Season**	**Species**	**Trap Cluster**
Mosquito are more active at night	Day, Week, Month, Year - trends affect activities	PIPIENS RESTUANS	Low cluster Identified by KMeans model

Important features



Tempera -ture Tavg, Heat Higher temperature promotes activities	**Moisture** R-Humid, PrecipTotal, Dewpoint High moisture promotes activities	**Wind Speed** Mosquito are poor flyers

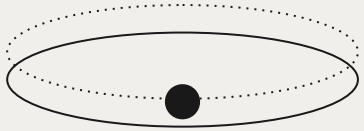


15th August 2022

04

Cost Benefit Analysis, Recommendations & Conclusion

Jia Qing



Cost Analysis

Zenivex: US$332

Pesticide used as approved by the U.S Environmental Protection Agency

Size of Chicago

150, 100 acres

USD259, 550

Cost of spraying over the whole of Chicago

Benefit Analysis

15th August 2022

Medical Leave

Median household income: USD65,886

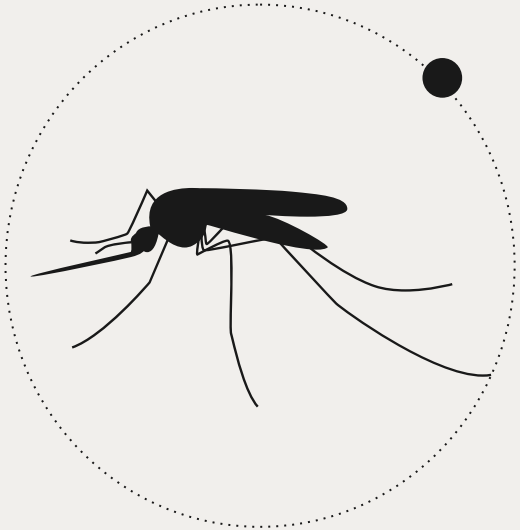
Weakened Workforce

USD335,729

Hospital Bills

Average hospital expense: USD25,000

Recommendations



Start spraying around Mid July

Spray at areas with high WNV presence

T900: ORD Terminal 5. O'Hare Int Airport

T115: South Doty Avenue

T002: 4100 North Oak Park Avenue

Conclusion

Spraying

Costly with temporal effect

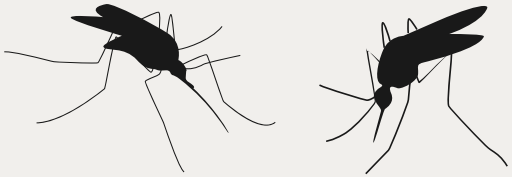
Peak season

Summer

Location

Spray areas with high WNV presence

Thanks!



Do you have any questions?