

NURSE'S COMMENTS  
NATURAL LANGUAGE PROCESSING  
**TEXT ANALYTICS**  
FREE TEXT  
INSIGHTS  
FRESENIUS  
HACKATHON  
NOV 2019  
NEURAL NETWORKS  
ARTIFICIAL INTELLIGENCE  
BUSINESS INTELLIGENCE  
DEEP LEARNING

Innovation Center Presentation  
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**GOALS**

**DATA**

**TOOLS**

**APPROACH**

**RESULTS**

**NEXT STEPS**

**Text  
Classification**

1. To separate Infection-related comments from the rest

**Text  
Extraction**

2. To identify the most frequently occurring Infection-related terms

**Text  
Analysis**

3. To trace Infection-related comments and match Infection records in KCNG

1



KCNG  
CL\_DIAL.AX\_OBV



INFECTION RELATED  
COMMENTS

OTHER COMMENTS

2

3



KCNG



**Examples of Nurse's Comments:**

- Rule out peritonitis.
- No fever, small amount of redness to legs. pt states she feels like she might have cellulitis.
- Suspected peritonitis.
- Pt will be treated for what might be peritonitis at the hospital. We will continue any treatment ordered when Pt is discharged home and follow his progress.
- Reviewed s/s of peritonitis to monitor, reviewed how to take antibiotics for touch contamination, reviewed use of on-call if further questions or any symptoms developed. Bill verbalized understanding and agrees to monitor as directed.
- Exit site tunnel infection continued surveillance
- Pt to in home dept for CCPD training. Pt states he is doing well and has no concerns. The pt connected to cyclor with verbal prompts using Dextrose 2.5%, fill 1200ml x2 and dwell 45mins. The effluent is clear and UF was 341ml. Reviewed s/s of infection ,
- Pt states heater bag was leaking slightly after he broke cone last night. Stated he still used bag. Discussed risk of contamination and to not use anything if leaking. discussed to monitor for s/s of infection and call RN right away if he has.
- Will continue to provide quality care to the pt and f/u monthly labs and re enforce compliance to HD tx, meds, fluid restrictions and infection control. Will continue access care and monitoring. Will continue to administer meds per MD order.
- Patient was prescribed oral abx - Keflex prophylaxis to prevent peritonitis while awaiting surgical follow up for catheter repair and/or replacement
- Pt seen in clinic with Dr, RN, and RD. Pt states that dialysis is going well. Pt stated that she has some sinus stuff going on, reports itchy eyes, drainage.
- Left AV Access w/o infection, with self cannulation. On self cannulation Pt c/o occasional cramps & dizziness during 2nd half of the tx relieved by turning off/down UFR . HD Adequacy within acceptable range.No A&H/missed tx this month.
- Per the peritonitis algorithm, pt is to soak the end with Povidone Iodine for 5 mins, which she did by placing a new cap right away on the transfer set. Pt was prescribed Keflex 250mg, 1 tablet, three times a day for 3 days, no refills, called to
- pt came by for mircera ,c/o pain and weakness of rt arm,noted swelling of rt upper arm,pt stated she is on her way to er, she had spoke with C Coleman RN ,Mircera held currently in case of possible infection

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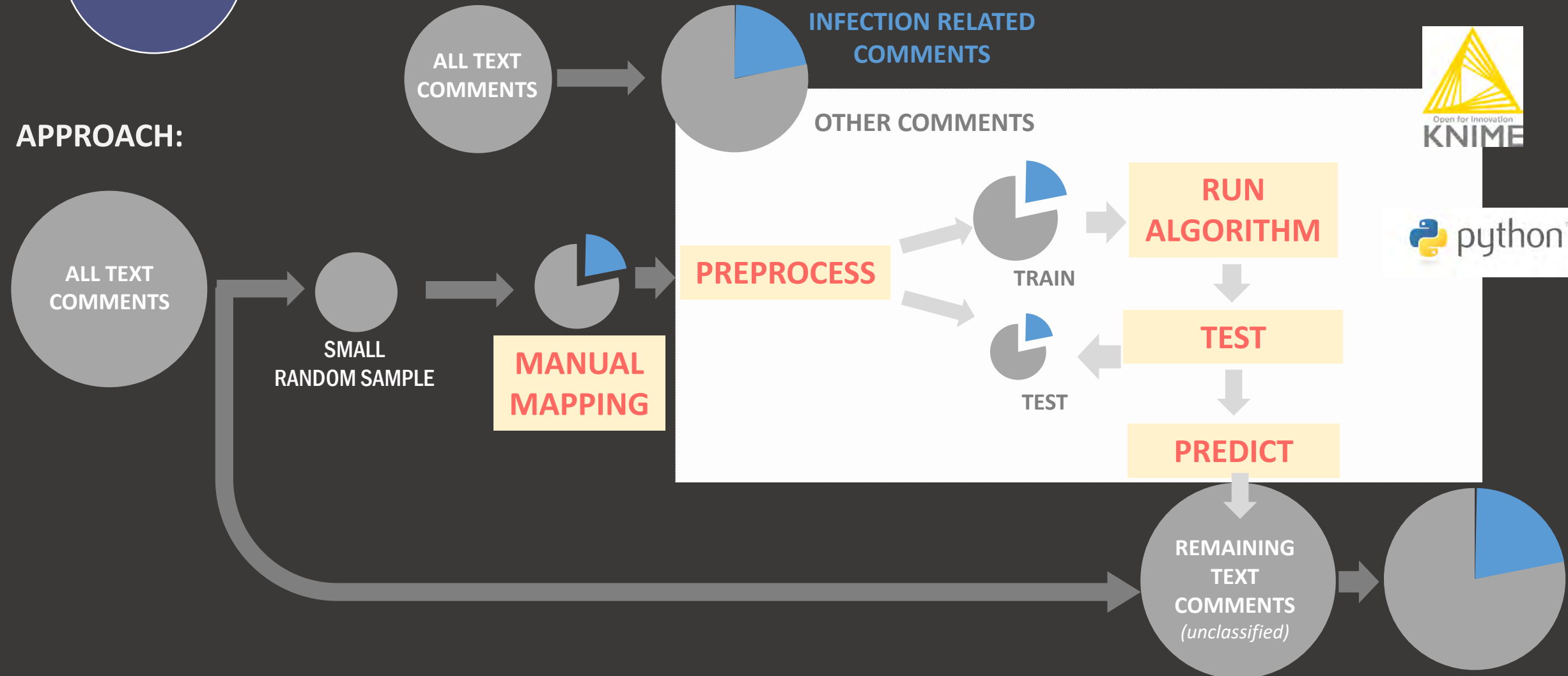
RESULTS

NEXT STEPS

Text Classification

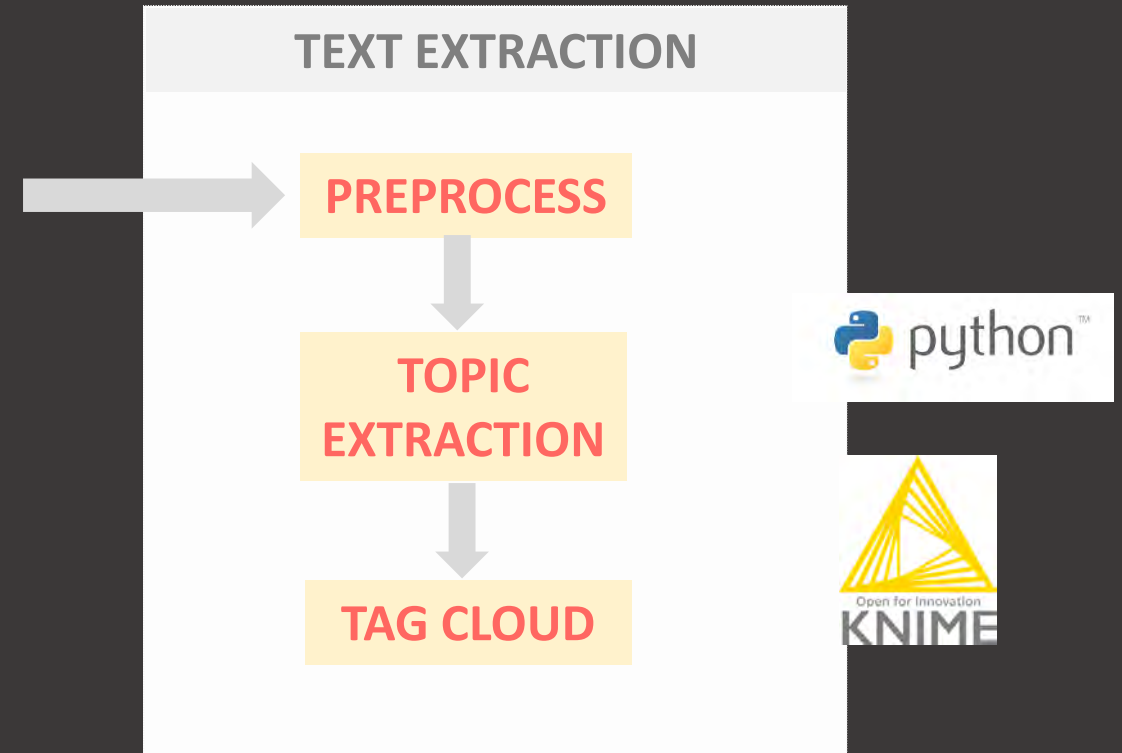
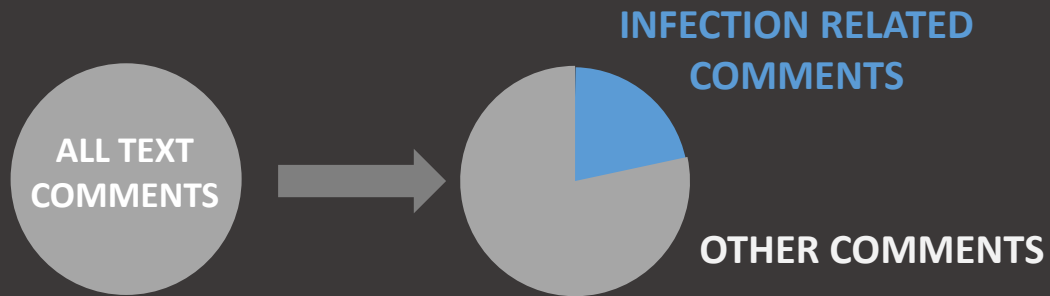
1. To separate Infection-related comments from the rest

APPROACH:



Text Extraction

2. To identify the most frequently occurring Infection-related terms





Text  
Classification

## 1. To separate Infection-related comments from the rest

Model	CV Score % (TF)	Test Score % (TF)	CV Score % (TF-IDF)	CV Score% (TF-IDF)
Naive Bayes	79.8	79.9	79.8	80.2
Logistic Regression	88.9	88.8	86.8	87.1
Linear SVM	87.4	87.7	87.4	88.4
Linear SVM (SGD)	85.3	86.8	86.7	87.8
Random Forest	86.9	84.7	85.2	85.9
Gradient Boosted Machines	88.2	88.1	88.1	88.1

CONFUSION MATRIX			
		Predicted	
		Infection	Non-Infection
Actual	Infection	682	121
	Non-Infection	231	1031

CV – Cross Validation

TF – Term Frequency

TF-IDF – Term Frequency, Inverse Document Frequency

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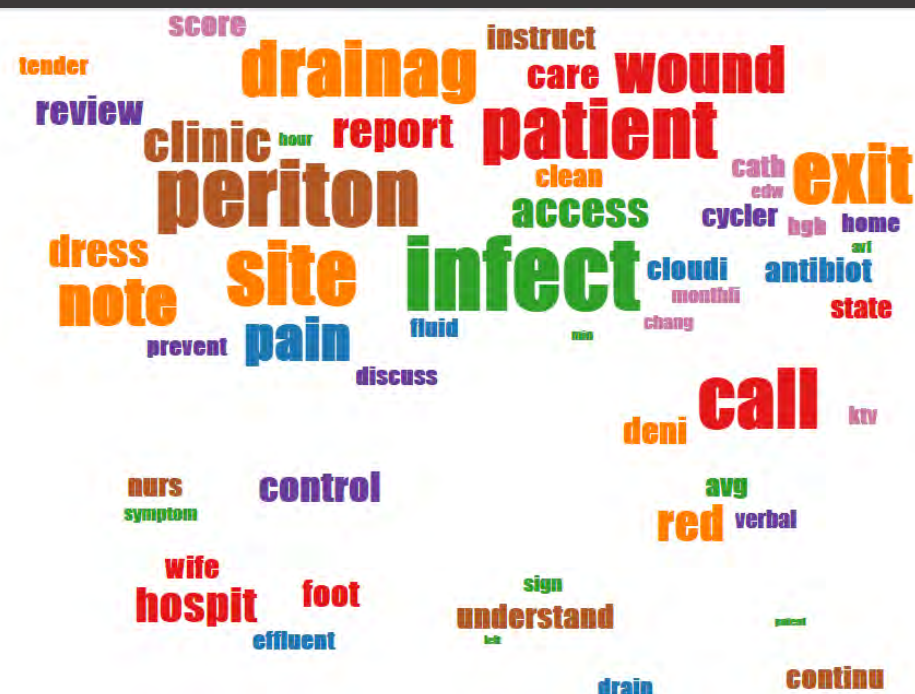
Text  
Classification



Text	Class	Predicted Class	Predicted Confidence %	Compare
pt. performed entire CAPD manual exchanges using self correctly. Proper infection control techniques used while demonstrating. Ca+ 10.4 advised pt. to d/c Vit D3 as per MD order. Pt verbalized understanding	Infection	Infection	97.8	TRUE
Generally compliant with fluid restriction, infrequent large gains BP elevated at times, average pr 164/87, post 141/81, asymptomatic No cardiac events Hospitalized 11/3-11/7 for catheter infection	No Infection	No Infection	98.3	TRUE
Pt is awake, alert and oriented x 3, no acute distress. Ambulating without assistance, No new concerns reported. Access remains with +bruit and + thrill, no signs of infection, no redness, swelling or discharge	No Infection	No Infection	100	TRUE
Reviewed S/Sx of infection & importance of early detection & treatment in the event of suspected sepsis. Pt verbalizes understanding.	Infection	Infection	91.1	TRUE
arrives to clinic via w/c, compliant, no hospitalization till present 3.0 hrs. tx, 160 NRe dialyzer used, 2.0 K- 2.5 Ca bath. BFR at 441, DFR 647, EDW 52.0, Rt. jugular catheter -tunneled used, no S/S of infection noted. Foot check and meds list	No Infection	No Infection	100	TRUE
Follow up with patient. Reports no issues able to have fluids with antibiotic dwell for 6 hours. Drained without issues. He denies any pain or fever.	No Infection	No Infection	94.4	TRUE
pt called and stated that she had a fever over the weekend of 101.2 being the highest and it running around 100 the rest of the weekend. Pt stated that she felt "drained". Pts temperature today was 98.9. The pt stated that she took Tylenol	Infection	Infection	90.9	TRUE
prescribed manual exchange and she will call me if any cloudy on drain bag, said yesterday was clear. Nurse instructed patient's daughter to call with results and also if they have the peritonitis kit abx, she does not know but will look for it or asked	No Infection	Infection	95.7	FALSE
Patient telephoned, reported itching, requested a medication for itching, I instructed patient to try benadryl for itching, patient reported that his phosphorus was high, vitals stable, no nausea, abdominal pain, cloudy bag or fever.	No Infection	Infection	61	FALSE
AAOx3, respirations even, nonlabored with lungs CTA bilaterally. Abdomen soft, nontender without any evidence of infection to exit site.	No Infection	No Infection	100	TRUE
Pt. called to report ride sided pain. He reports no fever, no cloudy fluid, no nausea or vomiting. He tried to get in to see primary MD but cant see him until Thursday so he is going to ER. i notified Dr. Whitlow,	No Infection	Infection	93.7	FALSE
Pt. arrived to clinic at 0945 a/o x3 with used PDF bags. Pt. verbalizes feeling well, no c/o. Denies abd. pain, n/v or fever. temp. on arrival 97.3, b/p 162/68, p74. Dr. Dhupar made aware. Orderes received to draw c/s, gm stain and cell ct. from PDF.	No Infection	No Infection	86.3	TRUE
Evaluacion de los procedimientos manual y maquina coneccion y desconoccion. Evaluacion del lavado de manos. Evaluacion del area de suplidos. Repaso del peritonitis Kit procedimiento.	No Infection	Infection	96	FALSE
Instructed Jerry he schedule appt. with Dr. Kendrick who she saw previously with rectal bleeding/hemorrhoids. Instructed Jerry to clean exit site with Exsept topical cleanser on gauze & assess for bleeding/drainage from site.	Infection	Infection	98.2	TRUE
Pt follows infection control practices	Infection	Infection	81.5	TRUE

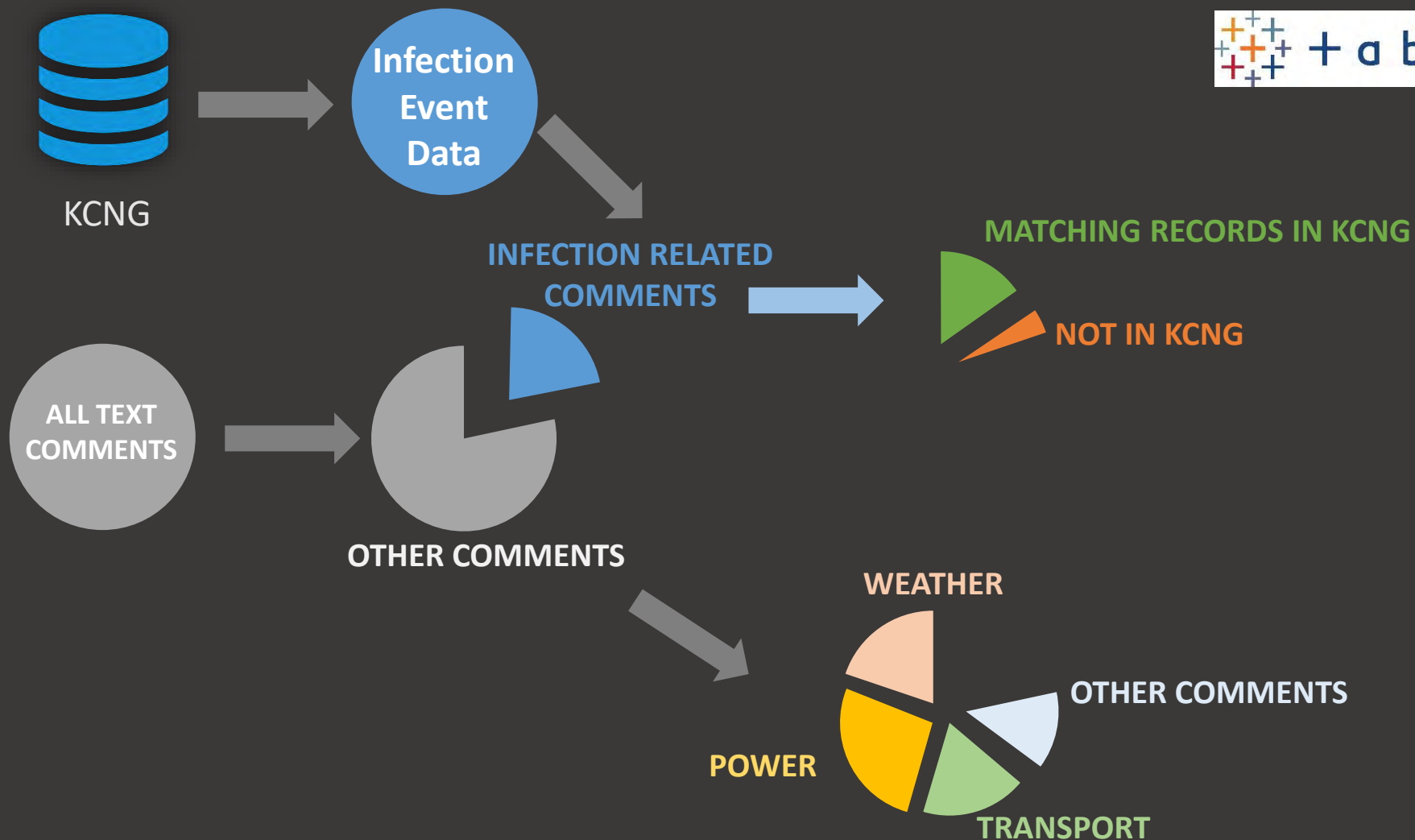
Text Extraction

2. To identify the most frequently occurring Infection-related terms



Text Analysis

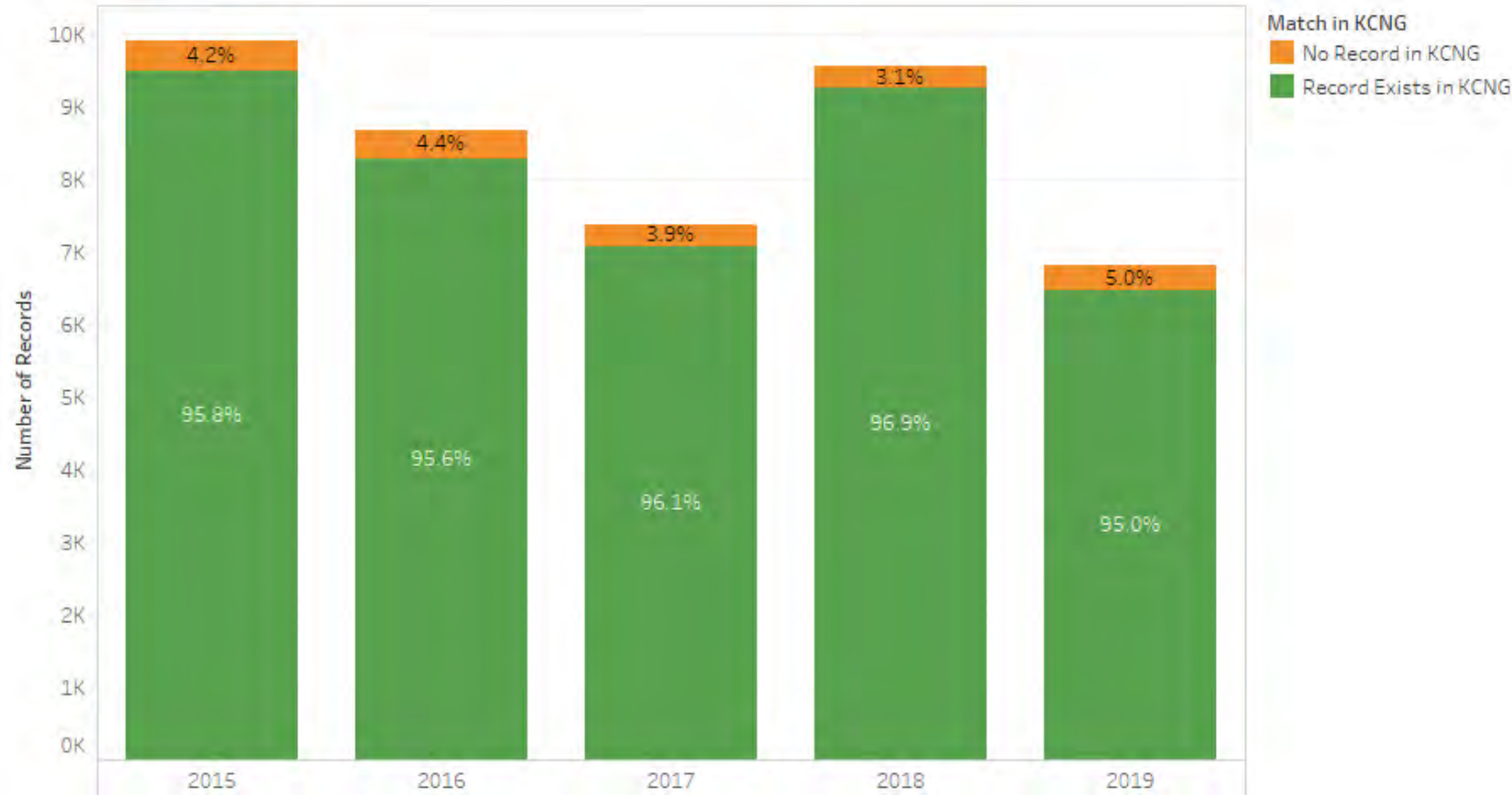
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Text Analysis

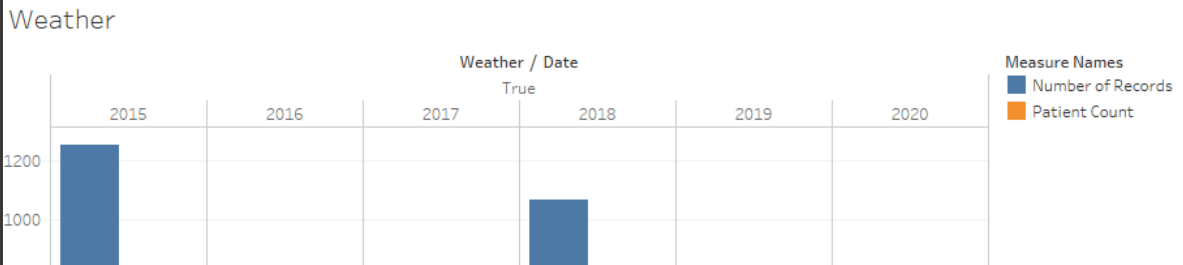
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Nurse Notes Counts



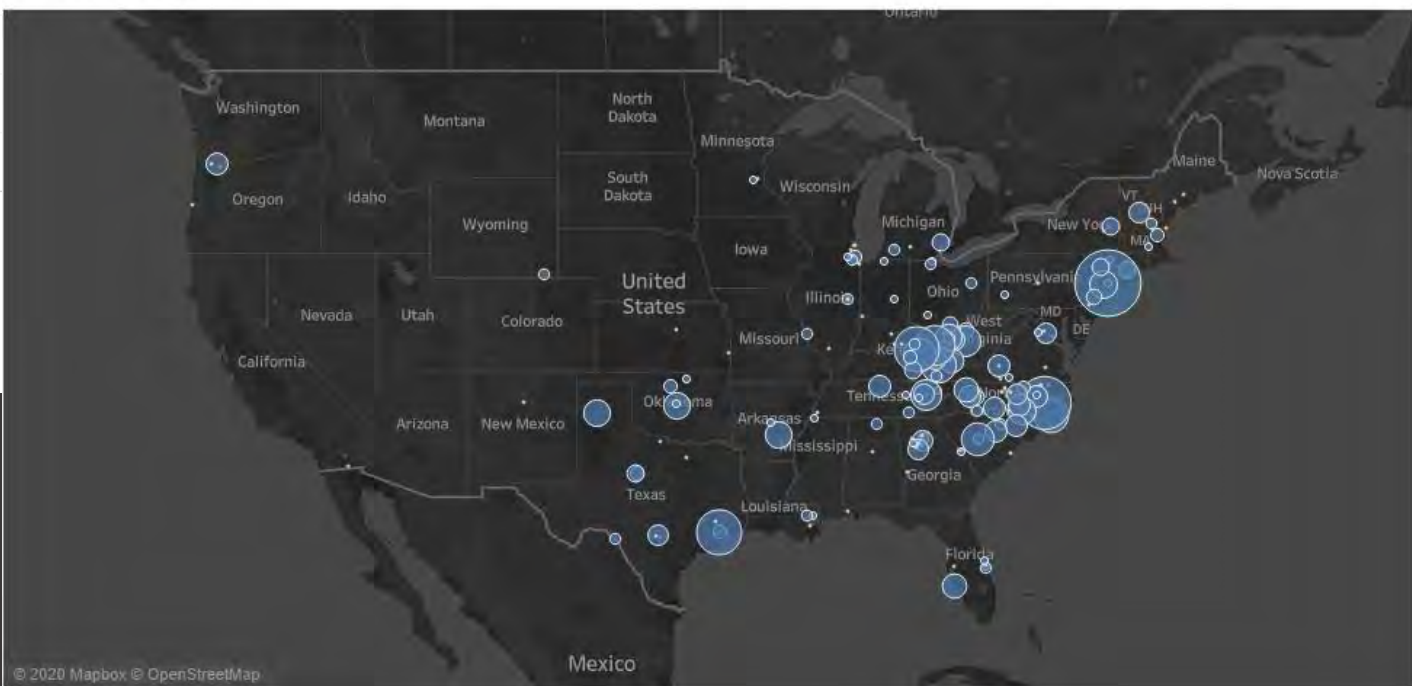
Sum of Number of Records for each Date Year broken down by InfectionsRelated. Color shows details about Match in KCNG. The marks are labeled by % of Total Number of Records. The data is filtered on Clinic, which has multiple members selected. The view is filtered on InfectionsRelated and Date Year. The InfectionsRelated filter keeps Infection Related. The Date Year filter excludes 2020.

WEATHER RELATED COMMENTS:



Number of Records and Patient Count for each Date Year broken down by Weather. Color shows details about Number of Records and Patient Count. The view is filtered on Weather, which keeps True.

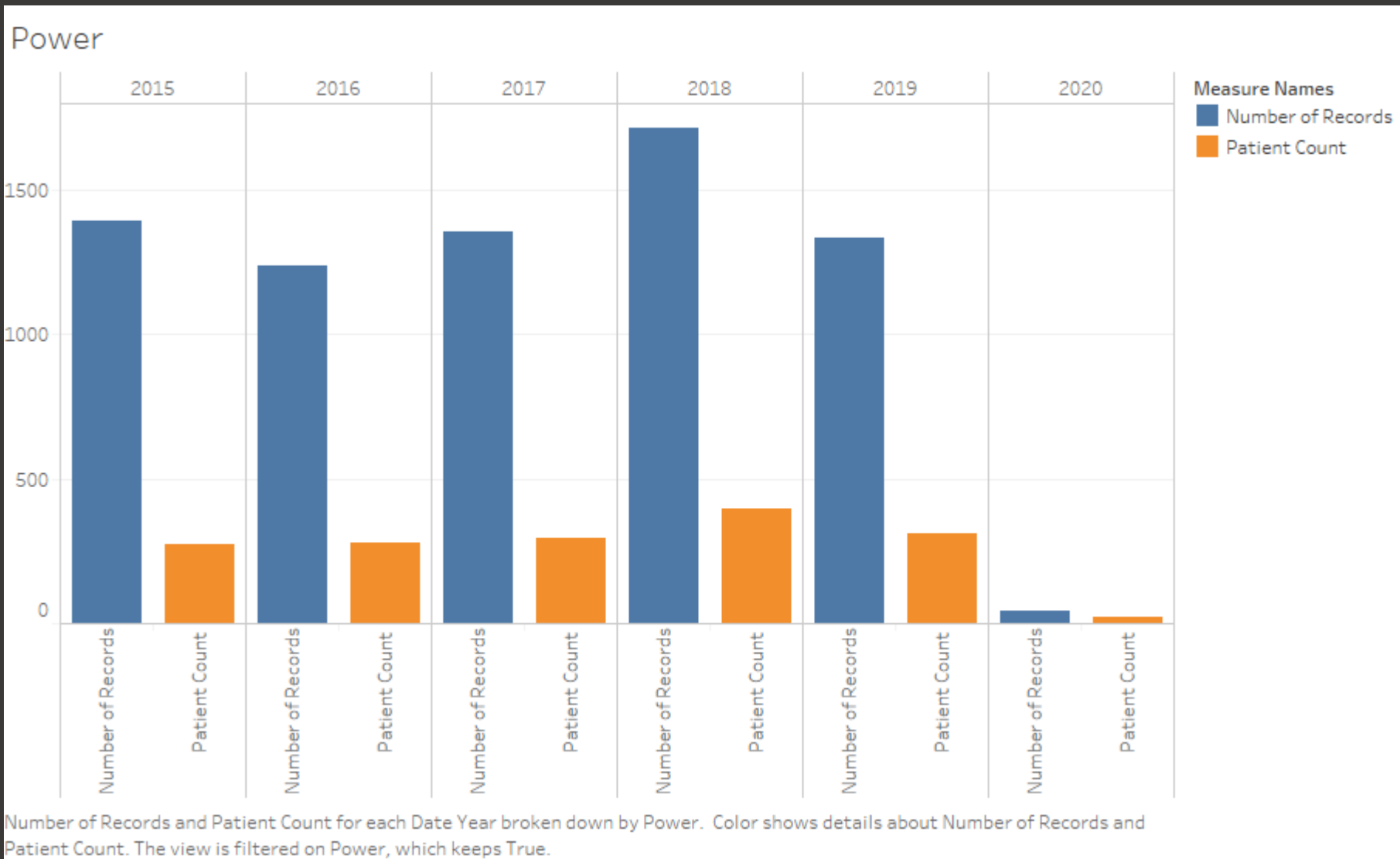
Weather Map



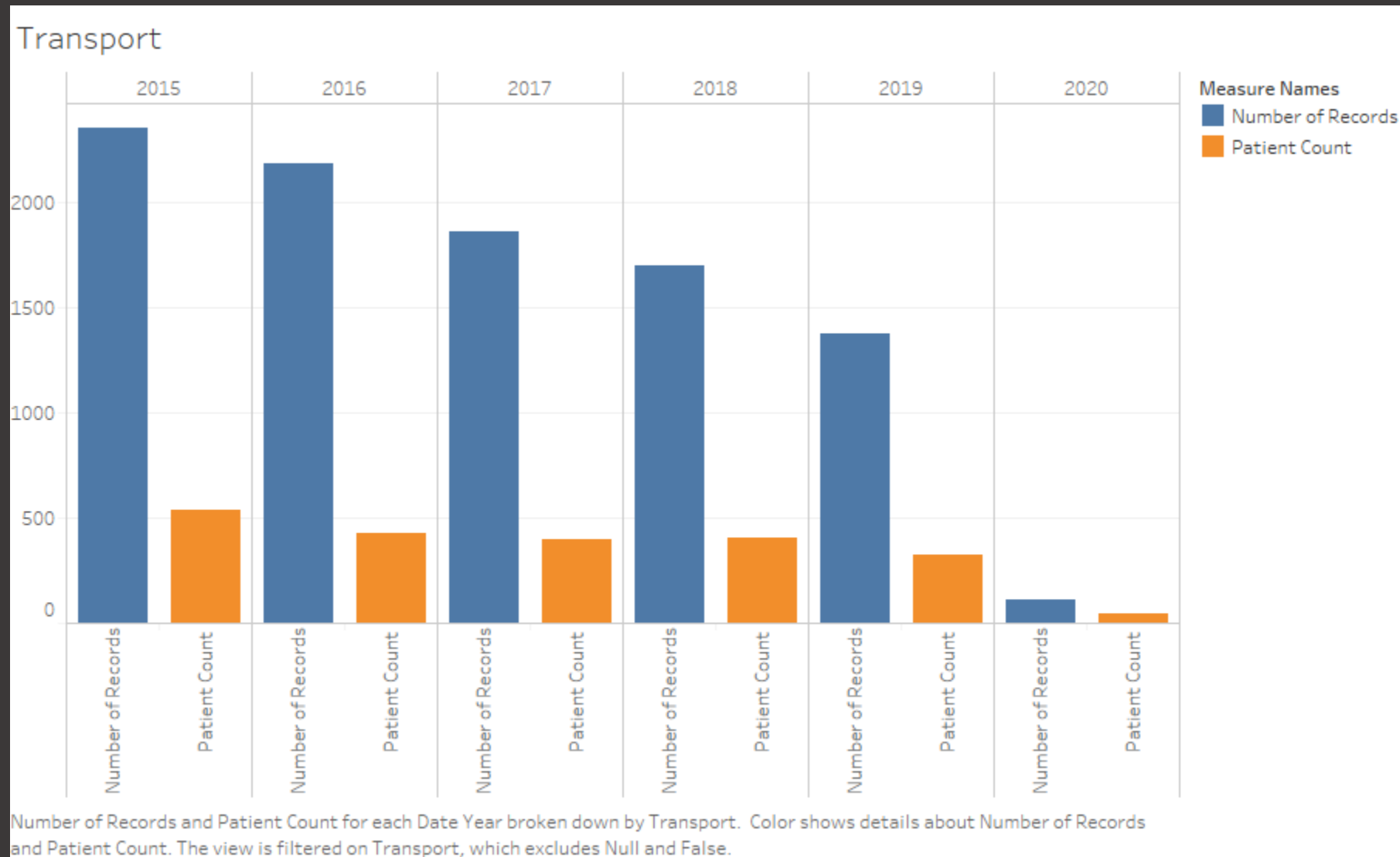
Map based on Loc Phys Longitude and Loc Phys Latitude broken down by Weather. Size shows Patient Count. The data is filtered on Date Year, which keeps multiple members. The view is filtered on Weather, which keeps True.



## POWER RELATED COMMENTS:



## TRANSPORT RELATED COMMENTS:





## HACKATHON GOALS

## HACKATHON RESULTS

## POTENTIAL NEXT STEPS

Text  
Classification

1. To separate Infection-related comments from the rest

Text classified into Infection-related and others

- Classify by Infection, Hospitalization, Geography, Transport, etc.
- Automatic categorization

Text  
Extraction

2. To identify the most frequently occurring Infection-related terms

Most frequently occurring terms identified

- Autofill text fields
- Preloaded Order forms based on keywords

Text  
Analysis

3. To trace Infection-related comments and match Infection records in KCNG

Patients with Infection-related comments without KCNG records identified

- Process gaps could be analyzed by clinics and addressed

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