Predicticting pandemic Outbreak

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An API to model effects of pandemic and aid in public health action with community inclusivity as a main objective

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Looking at some ancient things is sky

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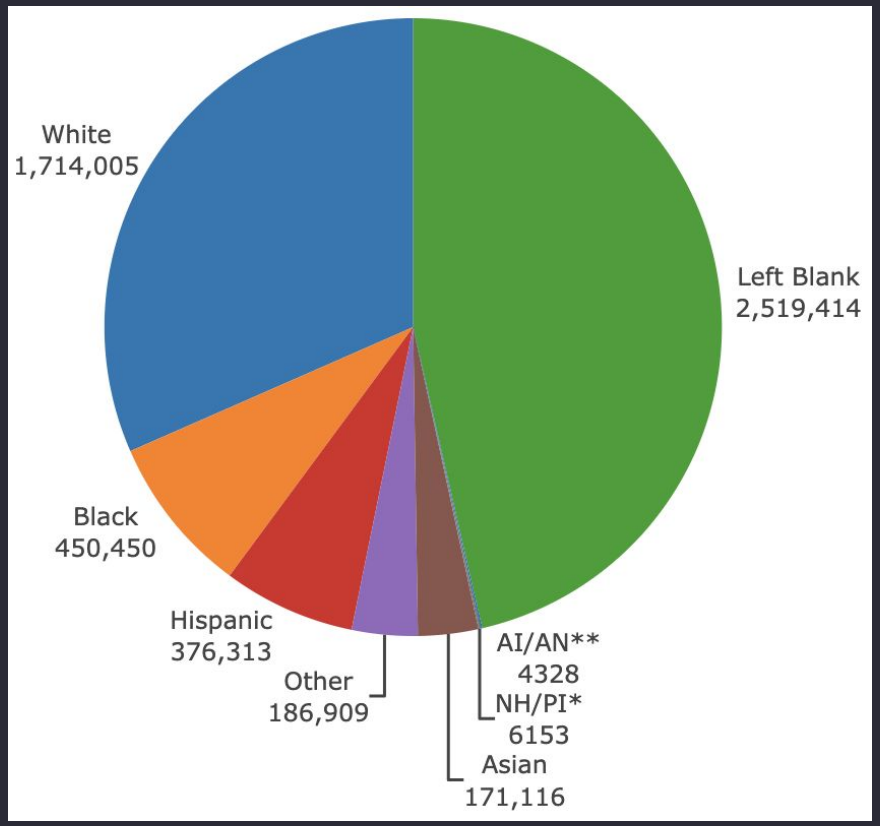
Covid-19: Disproportionate impact on minorities

If we look at the racial breakdown of COVID-19 tests performed in IL

We see this :

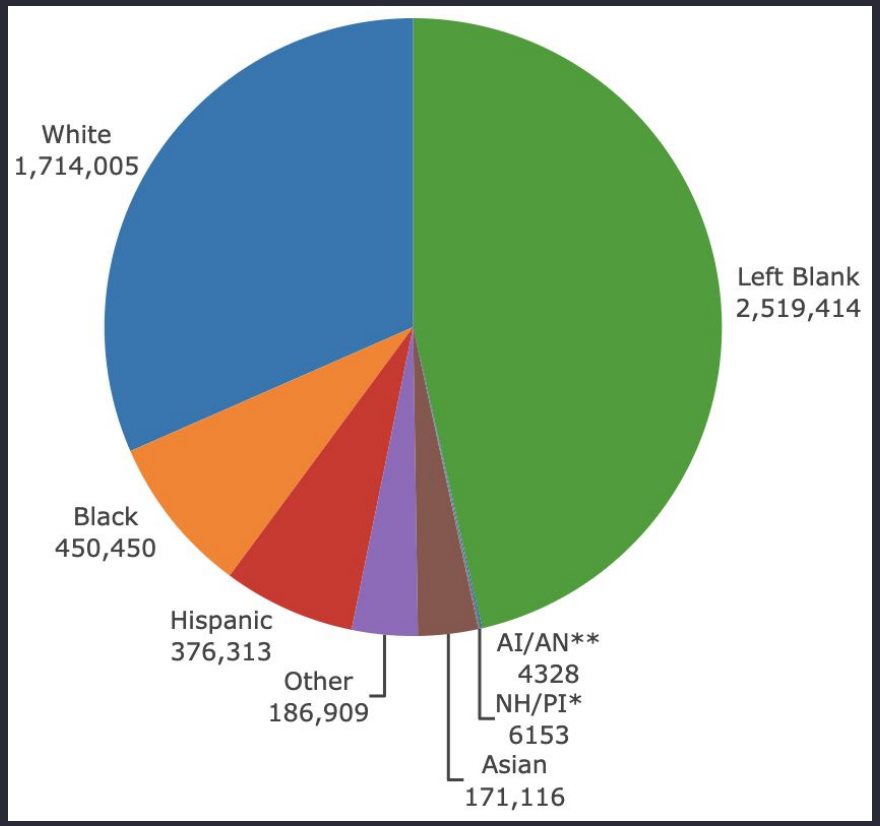


https://dph.illinois.gov/covid19/covid19-statistics

Covid-19: Disproportionate impact on minorities

I but if we see breakdown of COVID-19 deaths in IL

COVID-19 Tests in IL :



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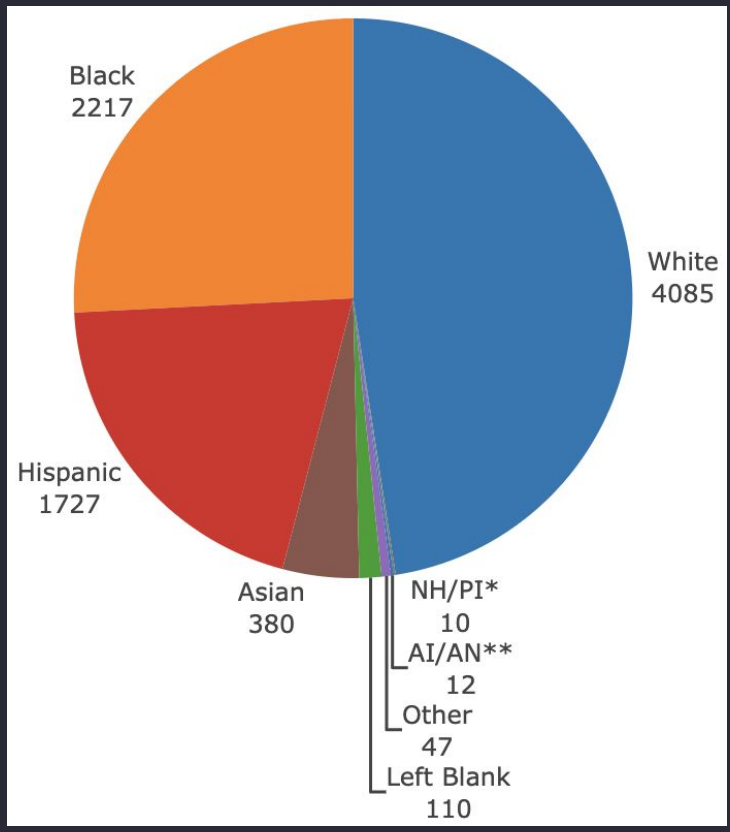


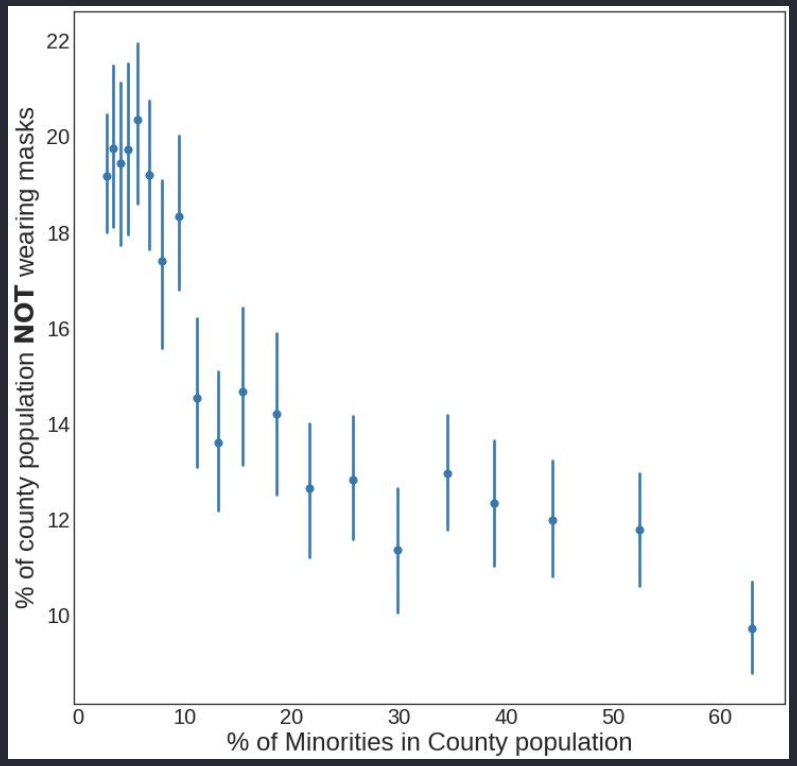
https://dph.illinois.gov/covid19/covid19-statistics

Covid-19: Disproportionate impact on minorities

- It is evident that some communities are disportionately affected by the COVID-19 pandemic.
    - These are minorities that are affected the most !
- There could be various socio-economic reasons leading to this effect
- We wanted to investigate this further
- Compiled data from following sources:
    - USDA, Economic Research Service: link
    - US Census data: link
    - COVID-19 county level statistics: link
    - County level mask-usage statistics: link
    - Champaign county Zip code level data: link

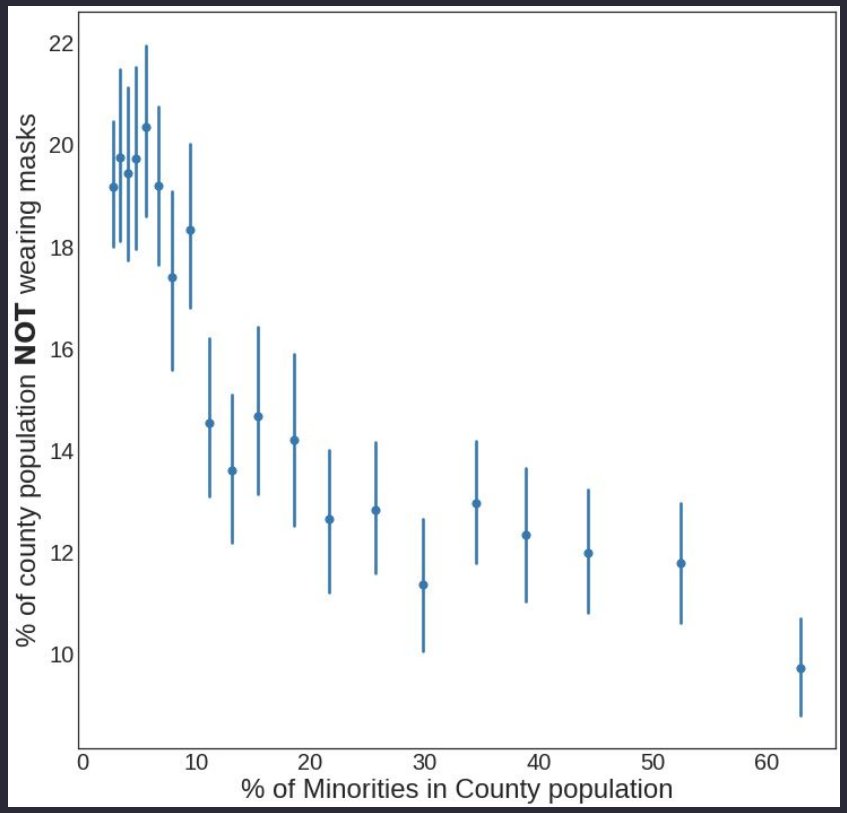
Covid-19: Disproportionate impact on minorities

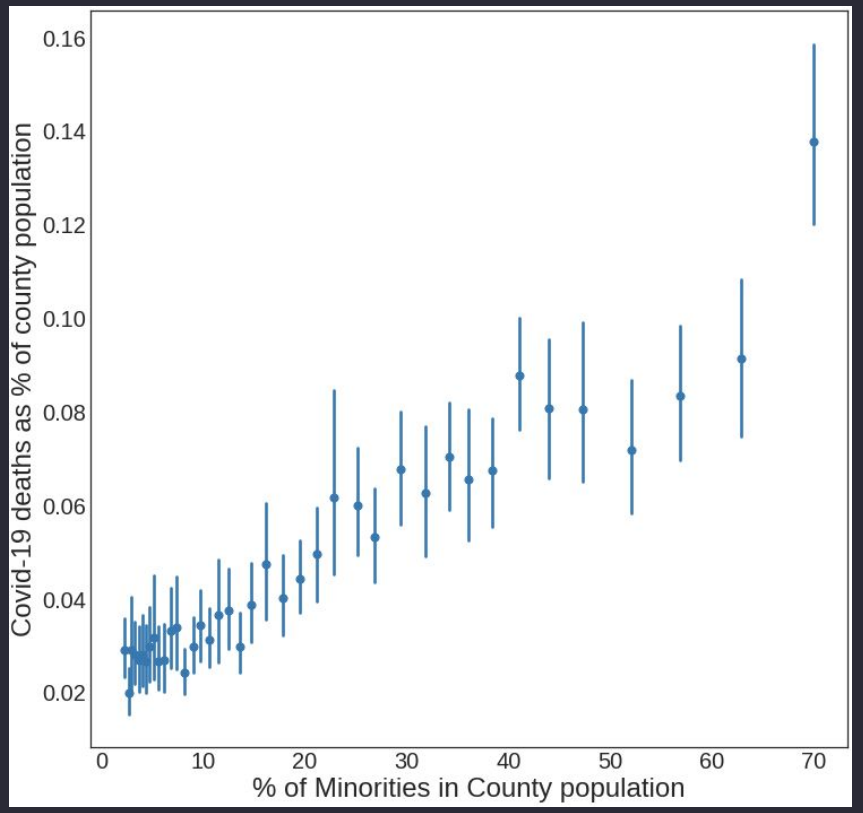
- Compiled results from 2600+ counties across united states
- We observed some very unfortunate trends !
- In communities with high minority population, most wear masks



Covid-19: Disproportionate impact on minorities

- Compiled results from 2600+ counties across united states
- We observed some very unfortunate trends !
- In communities with high minority population, most wear masks !
- But in there communities, death rate is also higher

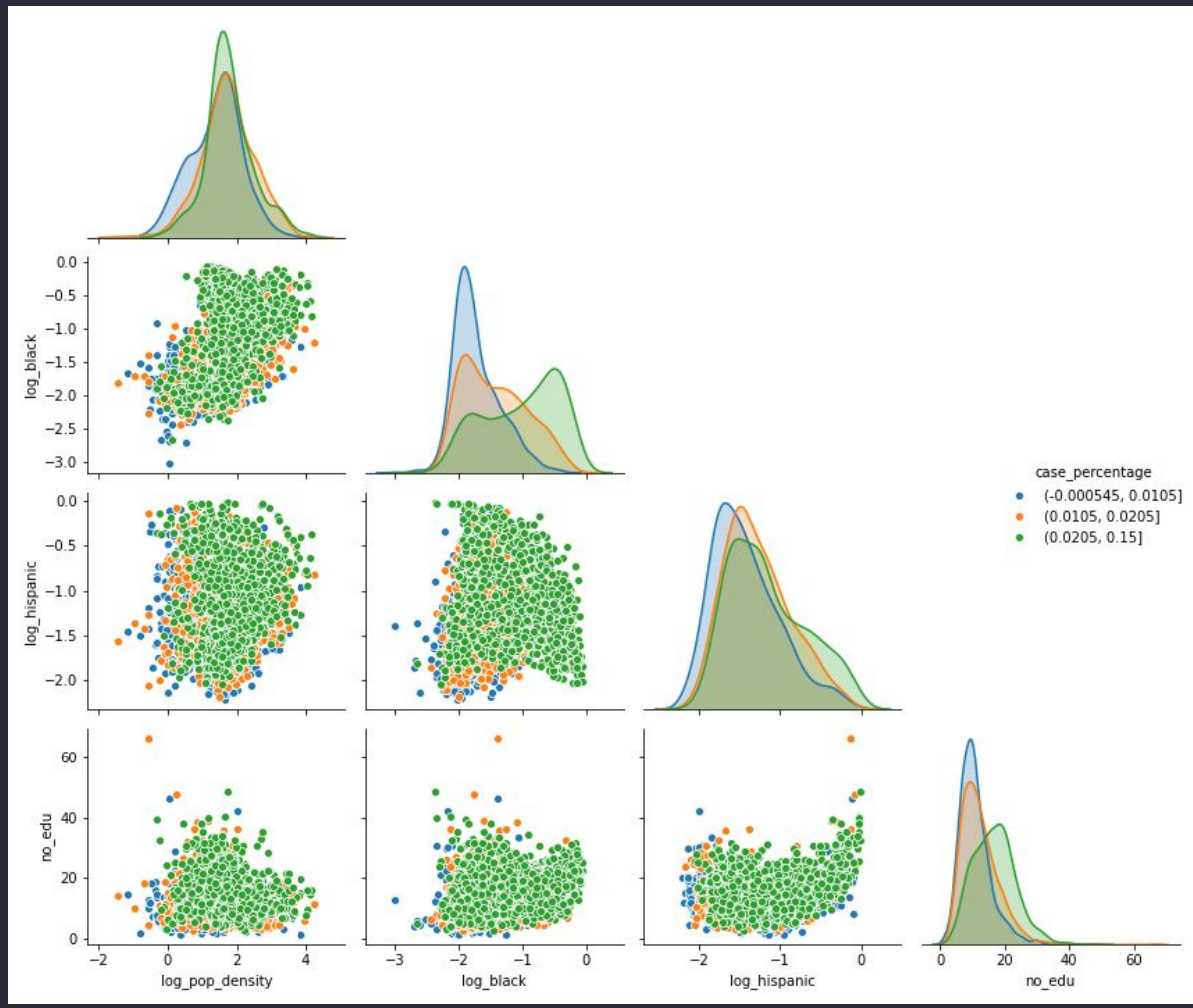




Demographics: Confirmed Cases

Skewed distribution to community with high density of

- African-American
- Low education level
- Hispanic



How do we tackle this/future pandemic ?

- While tackling a pandemic the medical facilities and public health resources can sometimes be spread too thin
- How can we take actions to make sure that no community or minority group gets left behind ?
- What if we have a tool (API) to predict :
  - Effect of pandemic in various regions/communities based on current demographics?
  - Estimate the (un)preparedness to handle the pandemic
- Having such a tool would help health agencies to efficiently manage the resources to tackle the pandemic

Our Model

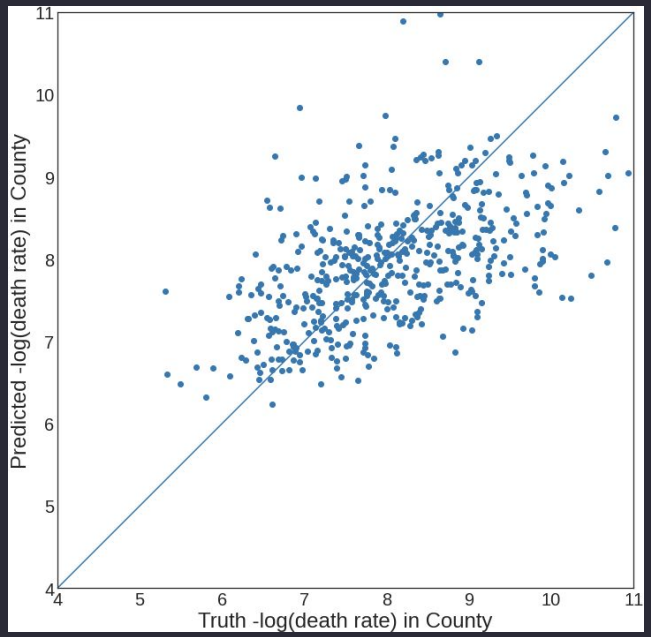
- We used Dense Neural Networks to develop a Pandemic preparedness prediction API
- We trained two models for our pandemic API to :
  a. Predict death rates
  b. Predict unpreparedness/mask usage
- Used county level data from various sources to train models
- We use the model to make predictions at a Zip-code level in Champaign County

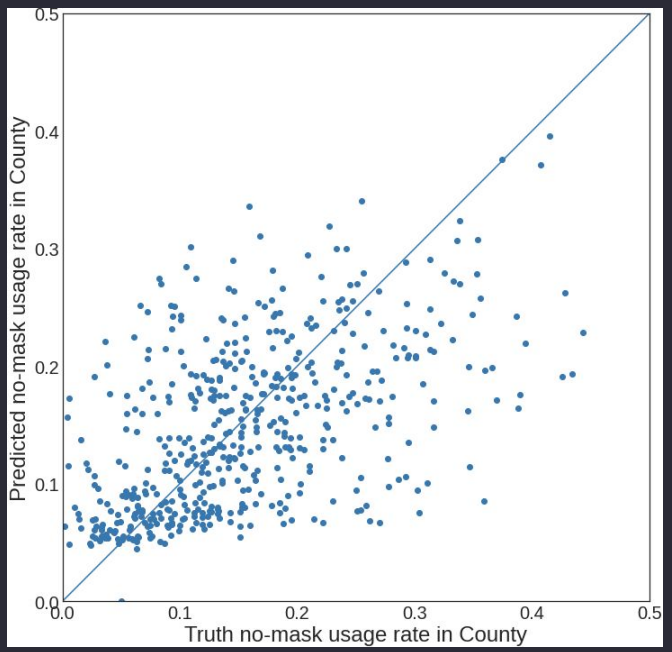
Model Architecture

- Perform a regression model using our DNN

- Features used in model : Population density, Unemployment rate, Median Household Income, Education level, Ethnicity breakdown of population
  - We are limited by time to gather more information
  - Age demographic information will help in better modeling
  - Zip-code level census data is released only every 10 years!

- We see that our model performs very well in testing

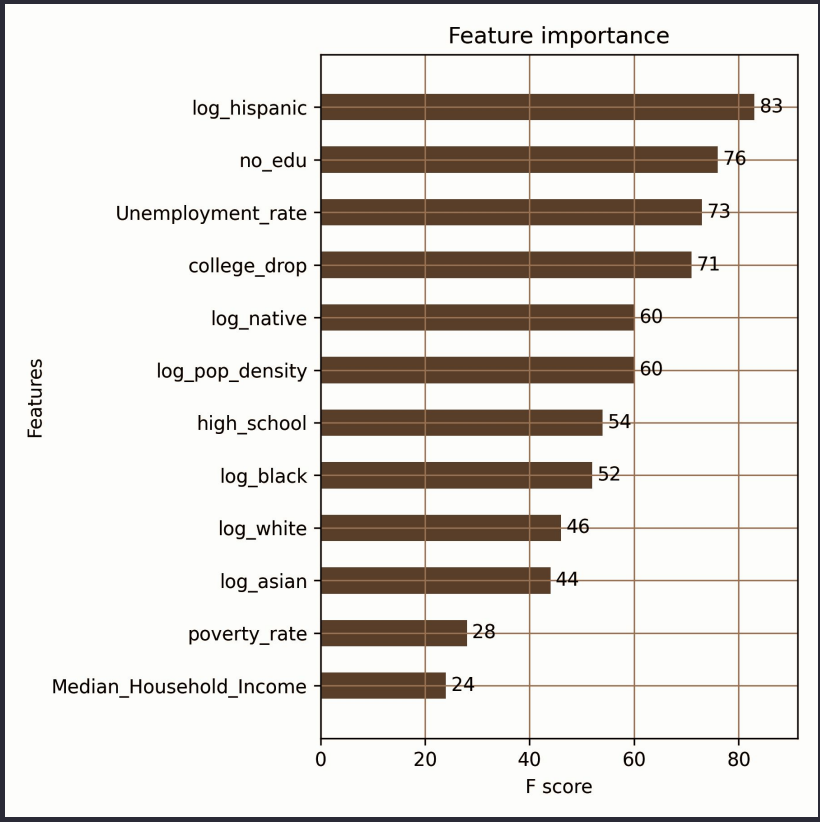




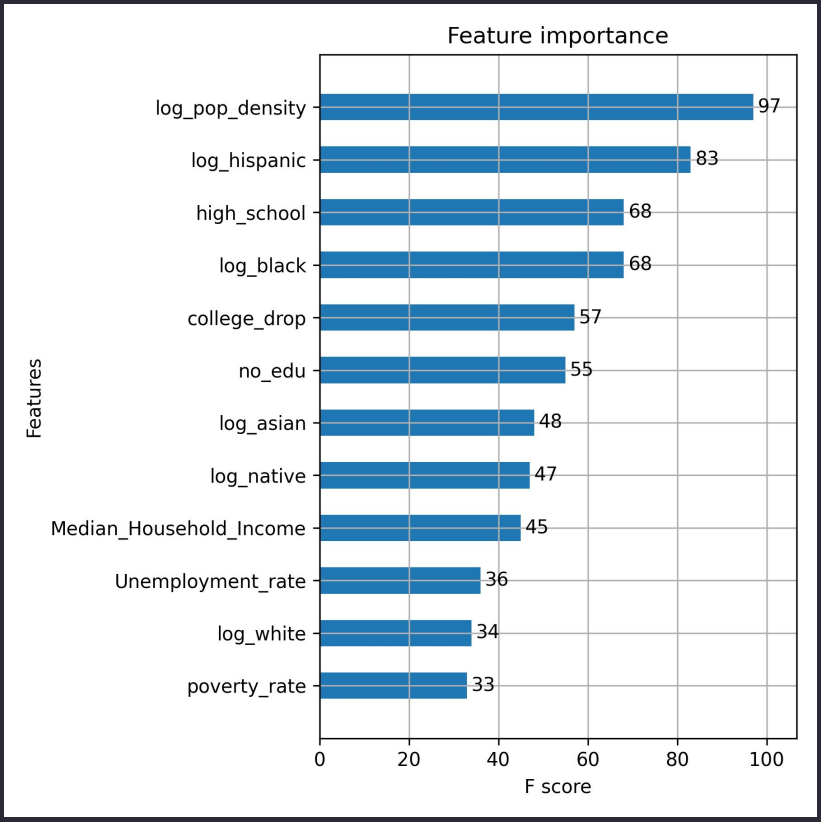
Dominating Features

- When predicting confirmed COVID cases, we observe that African American community demographics are not dominant
- However, it becomes important while predicting COVID deaths

COVID Cases

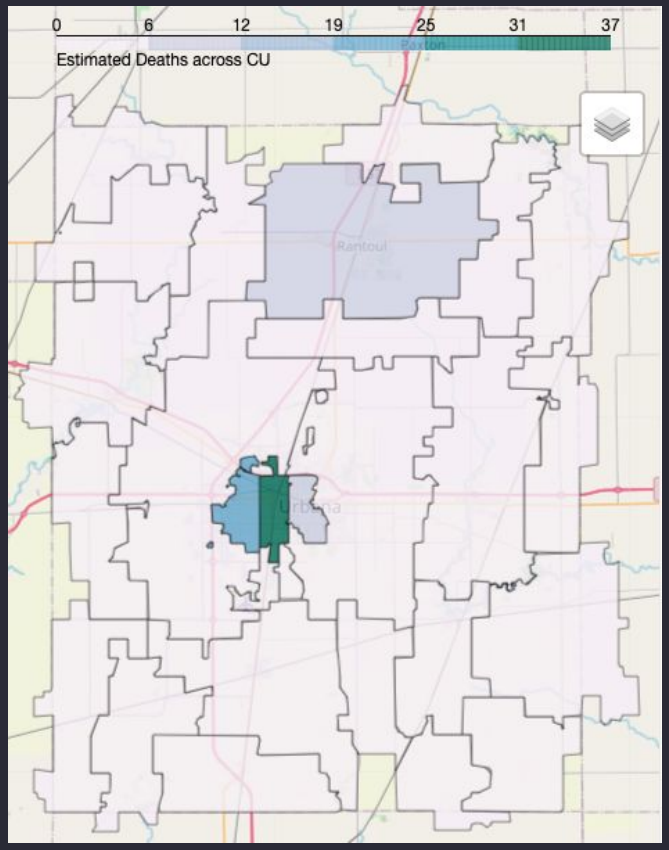


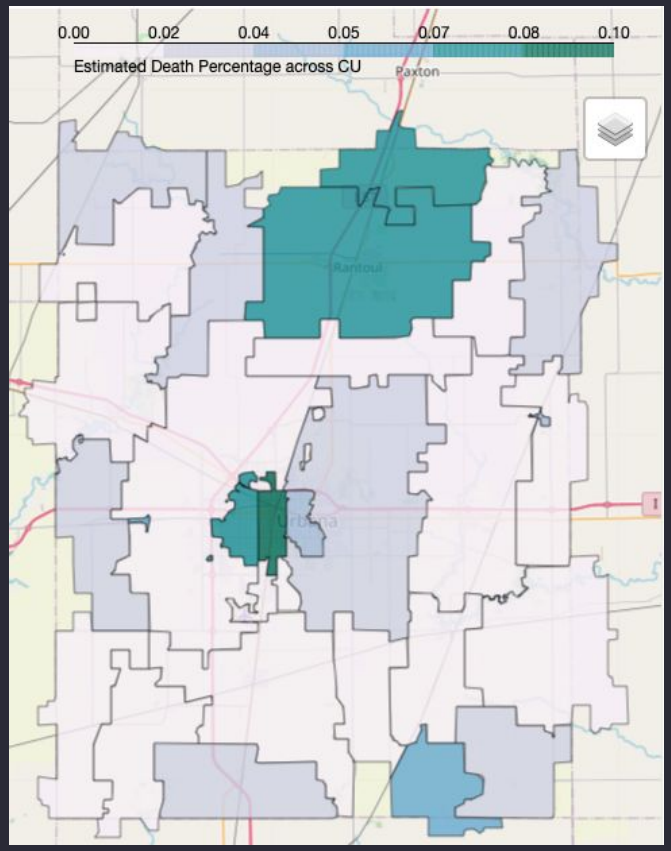
COVID Deaths



Predicting COVID 19 deaths in Champaign County

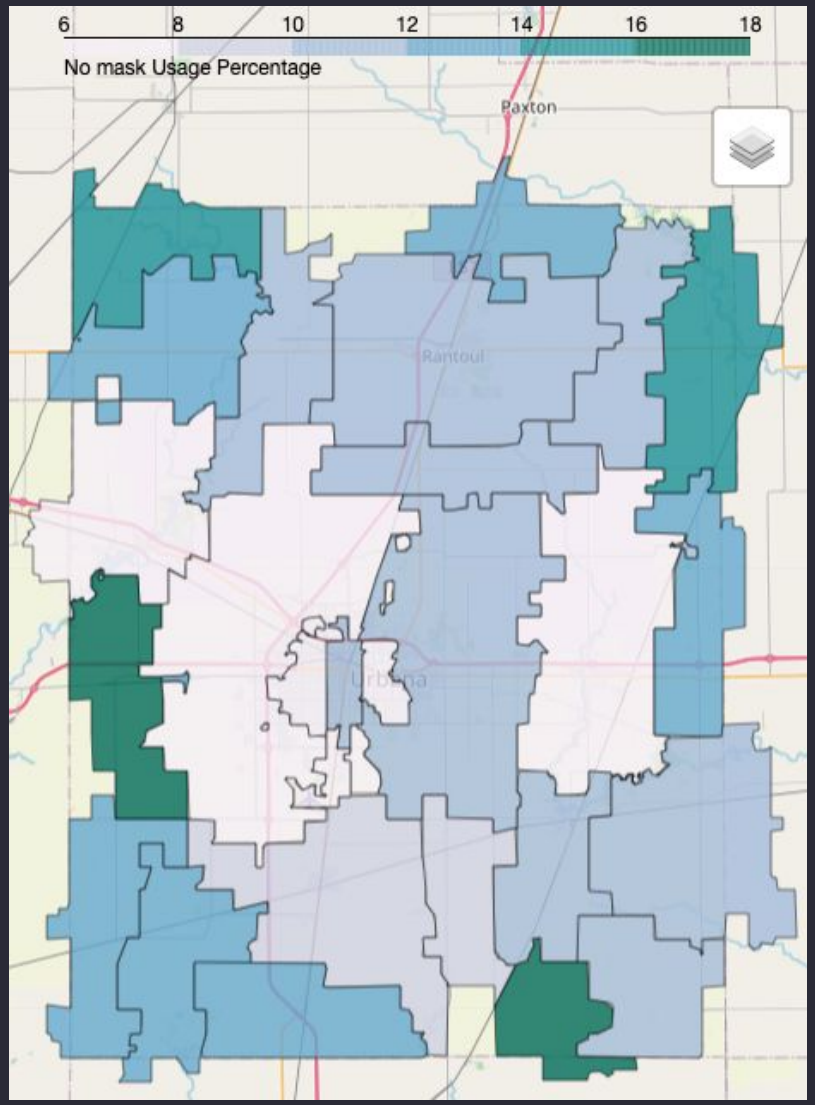
- We predict the death and death rate in each zip code using our models
- The predicted deaths are high in Champaign city
- The predicted death rate is high in Champaign, Bondville, Rantoul, Ludlow and Longview





Predicting NO mask usage in Champaign County

- From our models, we predict the zip codes where people are likely to be unprepared for a pandemic / NOT wear mask
- This will help the relevant health departments where to focus efforts for community preparedness and raise awareness
- In times of a pandemic, this will be a great resource



To further check our code/API:

Visit : https://github.com/jsv1206/pyghack_covid19

URL for API: coming soon