Descriptive Paper

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November 7, 2020

### Introduction (100 words)

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### Problem Description (100 words)

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### Broad Approach (200 words)

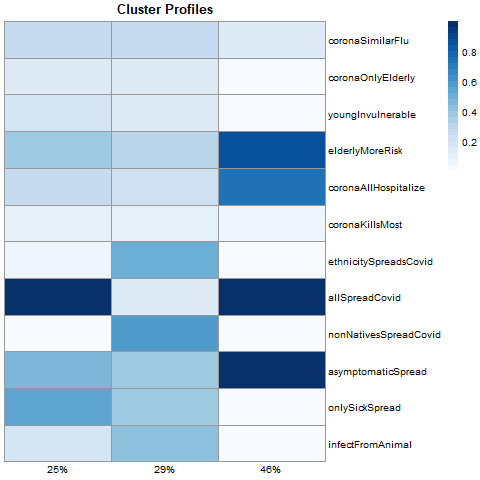
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### Technical Details of Approach (400 words)

To summarize beliefs about the virus, we took the 12 TRUE/FALSE questions from the survey and looked for subgroups of common answers by using cluster analysis. Since the data consists of binary responses, popular algorithms such as k-means which rely on Euclidean distance were not appropriate. Instead we implemented a Bernoulli mixture model in C++ and R which models the answers as realizations of a set of Bernoulli distributions and converges on the parameters via expectation-maximization.

The resulting cluster profiles are illustrated below. Each column represents a cluster and each row a survey response. Darker cells indicate a higher probability of a TRUE response for that question. After some experimentation we found three clusters best explained the data:



Cluster Summaries

1. **Skeptical** -- We see their profile on the left. This is roughly 25% of respondents. They believe all can spread COVID but don't acknowledge asymptomatic spread or the risk to elderly.
2. **Suspicious** -- This group, representing about 29% of respondents, largely believes animals, non-natives, and ethnicity are primary factors in the spead of the virus.
3. **Scientific** -- This third cluster seen on the right (46% of respondents) represents scientific beliefs about the virus and its properties. Asymptomatic spread is acknowledged as is the risk of all for being hospitalized.

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To create the Virus Belief profiles, we used a clustering algorithm. Since the data consisted of TRUE/FALSE survey responses, algorithms such as k-means were not appropriate, so we fit the model as a mixture of bernoulli vectors and used expectation-maximization to estimate the parameters.

### Results (100 words)

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### Impact (100 words)

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