Understanding COVID-19 Vaccine Campaign on Facebook using Minimal Supervision

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Introduction

• Covid-19 is a global infodemic that jeopardizes pandemic control by creating vaccine hesitancy.
• Facebook allows advertisers to adapt their messaging to target demographics and geographics.
  - Help alleviate or exacerbate the infodemic.
• Analyze the landscape of vaccination campaign on Facebook using a minimally supervised multi-task learning framework by identifying ad themes and moral foundations (MF).

Methodology & Results

• Identifying the theme is a **15-class** and the moral foundation is a **7-class** classification problem.
• Weak Label Generation:
- MF: lexicons from Moral Foundations Dictionary.
- Theme: pre-trained Sentence BERT to identify paraphrases in a large collection ads and assign theme based on cluster assignment.
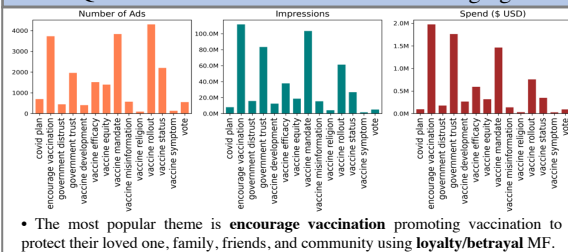• Overview of our proposed framework:
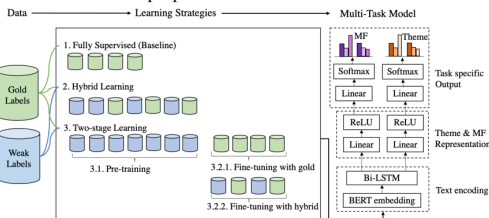
• Objective Function:
- Sum of cross-entropy losses for both tasks.
• **Hybrid learning strategy** achieves the best result.
- MF: Accuracy: **75.2%** , Macro-avg F1: **51.0%** .
- Theme: Accuracy: **69.0%** , Macro-avg F1 **57.9%** .

Contact

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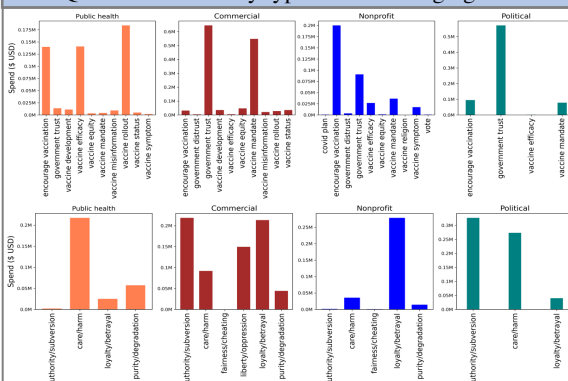🐦 @Tunaz_Islam
🌐 https://tunazislam.github.io/

RQ1: What are the narratives of the messaging?

• The most popular theme is **encourage vaccination** promoting vaccination to protect their loved one, family, friends, and community using **loyalty/betrayal** MF.

RQ2: How does entity type fulfill messaging roles?

• High spend on **government trust** narratives comes mostly from commercial and political entities focusing on **authority/subversion** MF.
• Public health entities spend more on **vaccine rollout** theme and **care/harm** MF.
• Nonprofit agency focus on **encourage vaccination** theme and **loyalty/betrayal** MF.
• Liberals mostly focus on **encourage vaccination** theme and **care/harm** moral foundation whereas conservatives mainly focus on **vaccine mandate** theme and **authority/subversion** moral foundation.

RQ3: Which demographics and geographic are reached by the advertisers and their messages?
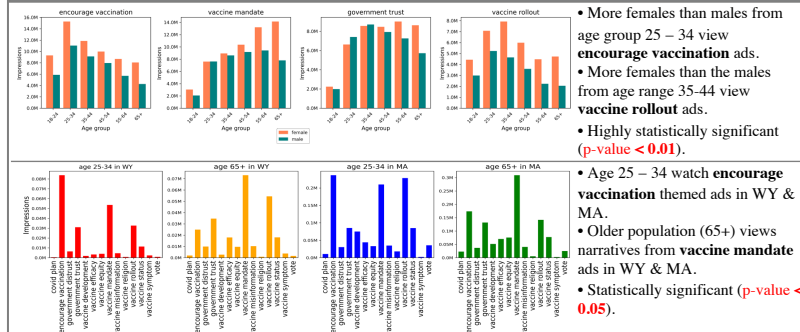
• More females than males from age group 25 – 34 view **encourage vaccination** ads.
• More females than the males from age range 35-44 view **vaccine rollout** ads.
• Highly statistically significant (p-value < 0.01).
• Age 25 – 34 watch **encourage vaccination** themed ads in WY & MA.
• Older population (65+) views narratives from **vaccine mandate** ads in WY & MA.
• Statistically significant (p-value < 0.05).

RQ4: Do ads follow current covid status?
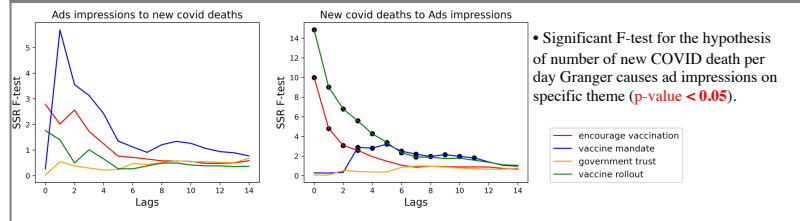
• Significant F-test for the hypothesis of number of new COVID death per day Granger causes ad impressions on specific theme (p-value < 0.05).

encourage vaccination
vaccine mandate
government trust
vaccine rollout

Conclusion

• We formulate a novel problem of using minimal supervision to analyze the landscape of vaccine campaigns on Facebook.
• We investigate the COVID vaccine ads on Facebook from four angles: **narratives** (thematic and moral foundation analysis), **entity types** (who is funding the ad), **reach** (who saw the ads), and **whether the ads reflect current COVID situations**.
• Our dataset is publicly available at https://github.com/tunazislam/Covid_FB_AD_MinimalSup
• As we make our dataset available to the community, we hope the advertising domain will become a crucial part of public discourse on public health.