Pricing the Woman Card: Gender Politics between Hillary Clinton and Donald Trump

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Abstract—In this paper, we introduce computer vision to the study of gender politics and present a data-driven method to measure the impact of the ‘woman card’ exchange between Hillary Clinton and Donald Trump. Building from a unique dataset of the two candidates’ Twitter followers, we first examine the transition dynamics of the two candidates’ Twitter followers one week before the exchange and one week after. Then we train a convolutional neural network to classify the gender of the followers and unfollowers, and study how women in particular are reacting to the ‘woman card’ exchange. Our study suggests that the ‘woman card’ comment has made women more likely to follow Hillary Clinton, less likely to unfollow her and that it has apparently not affected the gender composition of Trump followers.

Keywords—Presidential Election; Donald Trump; Hillary Clinton; Gender; Woman Card;

I. INTRODUCTION

During his victory speech on April 26, 2016, Donald Trump accused Hillary Clinton of playing the ‘woman card,’ and said that she would be a failed candidate if she were a man. Clinton fired back during her victory speech in Philadelphia and said that “If fighting for women’s health care and paid family leave and equal pay is playing the ‘woman card,’ then deal me in.” The ‘woman card’ subsequently became the meme of the week and its effects are much debated. According to CNN, New York Times, Washington Post and The Financial Times, this exchange between the two presidential nominees signaled a heated general election clash over gender.1

In this paper, we apply computer vision techniques to the study of gender politics and present a data-driven method to measure the impact of the ‘woman card’ exchange between Hillary Clinton and Donald Trump. Building from a unique dataset of the two candidates’ Twitter followers, we first examine the transition dynamics of the two candidates’ Twitter followers one week before the woman’s card controversy and one week after. Then we train a convolutional neural network to classify the followers’ gender and study how women

1See, for example, http://www.nytimes.com/2016/04/29/us/politics/hillary-clinton-donald-trump-women.html.

II. RELATED LITERATURE

Our work builds on previous literature in electoral studies, data mining, and computer vision.

In electoral studies, researchers have argued that gender constitutes an important factor in voting behavior. One common observation is that women tend to vote for women, which is usually referred to as gender affinity effect [5], [2]. In the 2016 presidential election, Hillary Clinton also portrays herself as a champion “fighting for women’s healthcare and paid family leave and equal pay.” Our work will test the strength of this gender affinity effect.

In data mining, there is a burgeoning literature on using social media data to analyze and predict elections. In particular, several studies have explored ways to infer users’ preferences. According to [8], tweets with sentiment can potentially serve as votes and substitute traditional polling.
[12] exploits the variations in the number of ‘likes’ of the tweets to infer Trump followers’ topic preferences. [7] uses candidates’ “likes” in Facebook to quantify a campaign’s success in engaging the public. [11] uses follower growth on public debate dates to measure candidates’ debate performance. Our work also pays close attention to the number of followers, but we go further by examining both new followers and unfollowers.

Our main innovation, however, is to introduce computer vision techniques to the study of gender politics. In this dimension, our work is related to gender classification using facial features in the computer vision community. [6] uses a five-layer network to classify both age and gender. [3] introduces a dataset of frontal-facing American high school yearbook photos and uses the extracted facial features to study historical trends. [4] collects 4 million weakly labeled images to train an SVM classifier and has achieved an accuracy of 96.98% in gender classification. [9] uses user profile images to study and compare the social demographics of Trump followers and Clinton followers. [10] focuses specifically on the unfollowers of the Donald Trump and Hillary Clinton. Here our work goes one step further and looks at the new followers. In addition, our work focuses exclusively on the ‘woman card.’

III. DATA AND METHODOLOGY

In this section, we describe our dataset US2016, the pre-processing procedures and our CNN model. One key variable is number of followers. This variable is available for both candidates and covers the entire period from Sept. 18, 2015 to July 14, 2016. The two presidential nominees also have by far the most Twitter followers (Figure 1). This variable is updated every 10 minutes.

Besides the number of followers, our dataset US2016 also contains the detailed IDs of Trump’s and Clinton’s followers. Specifically for this paper, we are able to use these IDs to identify all the new followers and the unfollowers of Donald Trump first between April 19 and April 26 and then between April 26 and May 1. Similarly, we have information on Hillary Clinton’s new followers and unfollowers first between April 20 and April 27 and then between April 27 and May 2. This enables us to examine in a definitive manner the gender composition of new followers and unfollowers one week before the ‘woman card’ exchange (April 26) and one week after. We report the summary statistics in Table I.

Furthermore, as we have the follower information of other presidential candidates such as Bernie Sanders and Ted Cruz, we are able to identify the destinations of Trump and Clinton unfollowers. We report these statistics in Table II and Table III.

Based on follower (unfollower) IDs, we collect data on the profile images. Our goal is to infer an individual’s gender based on the profile image.

To process the profile images, we first use OpenCV to identify faces, as the majority of profile images only contain a face. [2] We discard images that do not contain a face and the ones in which OpenCV is not able to detect a face. When multiple faces are available, we choose the largest one. Out of all facial images thus obtained, we select only the large ones. Here we set the threshold to 18kb. This ensures high image quality and also helps remove empty faces. Lastly we resize those images to (28, 28, 3). In Table IV, we report the summary statistics of the images used in classification.

To classify profile images, we train a convolutional neural network using 42,554 weakly labeled images, with a gender ratio of 1:1. These images come from Trump’s and Clinton’s current followers. And we infer their labels using the followers’ names. For example, James, John, Luke and Michael are male names, and Caroline, Elizabeth, Emily, Isabella and Maria are female names. [3] For validation, we use a manually labeled data set of 1,965 profile images for gender classification. The validation images come from Twitter as well so we can avoid the cross-domain problem. Second, they do not intersect with the training samples as they come exclusively from individuals who unfollowed Hillary Clinton before March 2016.

| Table I | MOBILITY IN THE CANDIDATES’ FOLLOWERS |
|---------|---------------------------------------|
|          | Hillary Clinton | Donald Trump |          |          |
| ‘Woman Card’ | Before | After | Before | After |
| New Followers | 72266  | 54820 | 116456 | 115246 |
| Unfollowers   | 9572   | 8393  | 18376  | 18292  |

| Table II | MOBILITY OF HILLARY CLINTON’S UNFOLLOWERS |
|----------|------------------------------------------|
| Destination | Bernie Sanders | Donald Trump | Ted Cruz* |
| Before | 14.55% | 11.95% | 2.19% |
| After | 12.47% | 11.03% | 2.52% |
| *Ted Cruz has dropped out after the Indiana primary.

| Table III | MOBILITY OF DONALD TRUMP’S UNFOLLOWERS |
|----------|----------------------------------------|
| Destination | Hillary Clinton | Bernie Sanders | Ted Cruz |
| Before | 6.04% | 4.87% | 4.55% |
| After | 5.94% | 4.54% | 3.70% |

| Table IV | NUMBER OF PROFILE IMAGES IN US2016 |
|----------|----------------------------------|
| ‘Woman Card’ | Before | After | Before | After |
| New Followers | 14504 | 11147 | 20204 | 21187 |
| Unfollowers   | 2039  | 1587  | 3682  | 3036  |

http://opencv.org.

3The list of label names together with the validation data set and the trained model, is now available at the first author’s website.
The architecture of our convolutional neural network is illustrated in Figure 2, and we are able to achieve 90.2% accuracy, which is adequate for our task (Table V).

IV. MAIN RESULTS

In this section, we analyze the effects of the ‘woman card’ exchange on the gender composition of new followers and unfollowers for both Hillary Clinton and Donald Trump. Specifically, we will examine whether this exchange has made women more likely to follow Hillary Clinton and more likely to leave Trump. As reported in Section 3, we have set the time window of observation to one week.

A. New Followers

In Figure 3, we report on the gender composition of Clinton’s new followers one week before the ‘woman card’ exchange and one week after. We observe a 1.6% increase in percentage of women followers. Our sample size is 14504 in the first week and in the second 11147. Using score test (Table VI), we are able to show that for Clinton the surge of female presence among her new followers is statistically significant. The same does not hold for Donald Trump.

B. Unfollowers

In Figure 5, we report on the gender composition of Clinton’s unfollowers one week before the ‘woman card’ exchange and one week after. We observe a 3.7728% decrease in the percentage of women unfollowers. Our sample size is 2039 in the first week and 1587 in the second. With large $n_1$ and $n_2$, $z$ is approximately standard normal.

### Table V

| Architecture | Precision | Recall | F1 | Accuracy |
|--------------|-----------|--------|----|----------|
| 2CONV-1FC    | 91.36     | 90.05  | 90.70 | 90.18    |

### Table VI

| Null Hypothesis | Clinton | Trump |
|-----------------|---------|-------|
| $H_0: p_1 = p_2$ | $z = 2.597$, $p = 0.0093$ | $z = 1.411$, $p = 0.1582$ |

The formula for the score test statistic is: $z = \sqrt{n_1 n_2 / (n_1 + n_2)}$. With large $n_1$ and $n_2$, $z$ is approximately standard normal.
In Figure 6, we report on the gender composition of Trump’s unfollowers one week before the ‘woman card’ exchange and one week after. We observe a 0.2786% decrease in the percentage of women unfollowers. Our sample size is 3682 in the first week and 3036 in the second.

Using score test (Table VII), we show that for Clinton the decrease of female presence among her unfollowers is statistically significant at 95% confidence interval. While Donald Trump also observes a decrease in the percentage of female unfollowers, the decrease is not statistically significant.

| Null Hypothesis | Clinton | Trump |
|-----------------|---------|-------|
| \( p_{\text{before}} = p_{\text{after}} \) | \(-2.2581\) | \(-0.23178\) |
| \( p_{\text{value}} \) | \(0.0239\) | \(0.8167\) |

V. CONCLUSIONS AND FUTURE WORK

Gender is playing a crucial role in the 2016 U.S. presidential election campaign. In this paper, we presented an image-driven method to measure the effects of the first episode of the gender war between Hillary Clinton and Donald Trump: the ‘woman card’. Building from a unique dataset of the two candidates’ Twitter followers, we trained a convolutional neural network to classify the gender of followers and unfollowers, and study in particular how women are reacting to the ‘woman card’ exchange.

Our study suggests that the ‘woman card’ exchange has made women both more likely to follow Hillary Clinton and less likely to unfollow her. Equally important, this exchange has apparently not affected the gender composition of Trump followers. Our study has provided the first evidence of the possible impacts of the gender wars between Hillary Clinton and Donald Trump.

Our study has focused exclusively on images and we have demonstrated its effectiveness. In future work, we intend to incorporate text-based analysis (e.g. of user name and tweets) [1] to further improve our performance.

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