Trust, Perceptions, and Effects of News Sources and Social Media: A Data Driven Study of the Recent Unrest in Kashmir

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Abstract

In recent times, the Kashmir Valley in India has seen a resurgence of mass protests and separatist violence. Some experts believe that the new wave of separatism may have its roots in social media which provides a fertile platform to catalyze mass protests. While the penetration of the Internet is fairly even throughout the Kashmir Valley, certain regions and subdivisions have been affected more adversely by the recent unrests. We seek to model dichotomies in both the demographic factors and regional effects, and external factors such as the influence of social and traditional media in the form of television broadcasting and print. We describe a data driven approach to model the propensity of Kashmiri youth to secessionism based on an extensive survey that includes basic demographic data and their use, belief in social and news media. The proposed approach helps us uncover interesting patterns of activity with in the Kashmir Valley.

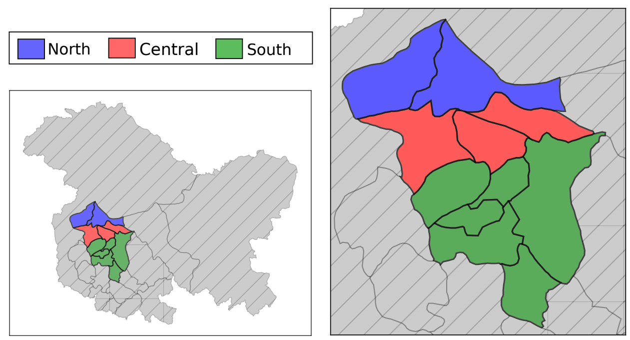

Figure 1: The Kashmir Valley (colored regions), within the larger state of J&K. This study primarily focused on the regions in the Valley, most affected by separatist violence.

Introduction

The Indian state of Jammu and Kashmir (J&K) has remained relatively peaceful since 2005. Inhabitants of the region have been participating in elections both at the local level as well as in the national elections. Recently however, this has changed, with renewed support of violent separatism especially from the youth in Kashmir. The recent unrests between the period of 2015-17 have resulted in 4,799 of 'stone pelting'[1] incidents and also in deaths of 273 individuals[2] which includes security forces and the civilian population involved in militant violence, which constitutes a substantial increase from previous years.

While there is no clear consensus as to what might have caused the situation to deteriorate, the experts generally attribute it to a combination of factors including the lost opportunity by successive Indian governments at the centre and the state level to provide a semblance of positive peace when there was a near rejection of external insurgency by the people of Kashmir, the inability of the state to provide meaningful governance at a very critical time between 2004 and 2010, and finally the elimination of a poster-boy of separatist militancy in 2016. While deadly incidents are not unusual to Kashmir owing to its long history of dealing with violence, social media is believed to have played a role in the organization of such protests and violent strikes in their recent surge . This hypothesis is further strengthened by the observation that the militant in question was a popular figure on many social media platforms with the individual's videos and pictures organizing and inciting the Kashmiri masses widely shared across platforms such as Facebook, Twitter and Whatsapp.

It is interesting to note that while the Valley is somewhat homogeneous with respect to factors such as culture, language and other demography, certain regions especially in the Southern and Central parts of Kashmir seem to be more adversely affected by the recent violence. This is in contrast to other social indicators, including levels of literacy, Internet penetration, etc. that seem fairly homogeneous across regions of Kashmir.

In the light of such unobvious dichotomies we conducted a large survey among the youth population of Kashmir enrolled in higher education programs from ten districts in the Kashmir Valley, a region of the state of J&K depicted in

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[1] https://en.wikipedia.org/wiki/Stone_pelting_in_Kashmir

[2] Indian Parliament, Rajya Sabha, Unstarred Question 556

color in Fig. 1. The respondents were asked certain basic questions representative of their predisposition to the Republic of India along with demographic information and certain questions reflective of their propensity to be influenced by social and traditional media. The contributions of this paper can be summarized as follows:

- We present results of a survey in Kashmir, and determine the relationship between the disposition of the Kashmiri population towards India and various instruments of the Indian State;
- We propose a latent variable model to incorporate regional dissimilarities and isolate effects of social media and traditional news sources including electronic and print media on the respondents predispositions.
- We determine relations between the latent effects and determine if such effects are correlated across individuals as well as basic demographic variables in the different regions of the Valley.

Through this study, we aim to model those propensities in order to understand the reasons for rising separatism and to better inform decisions made by policy makers.

Related Work

There has been considerable research effort in detection of rumor and events using social media. For instance, (Shao et al. 2017; Vosoughi 2015; Shu et al. 2017; Zubiaga et al. 2018) describe Machine Learning based approaches along with relevant feature extraction pipelines in order to identify microblogs suggestive of rumors and fake news. Most of these efforts used supervised learning to train models.

Quantifying the effect of the social media on mass political movements, uprisings and natural calamities, is another popular research area. The community has studied social media posts and their impact on events like the Boston Marathon bombing (Starbird et al. 2014), hurricane Sandy (Kogan, Palen, and Anderson 2015) and the Mexican Gulf BP oil spill (Starbird et al. 2015).

The use of latent variable models for computational social science is gaining popularity and widespread acceptability. (Abebe et al. 2018) describe topic-modelling of search queries for modeling healthcare needs in Africa, while (Jo et al. 2017) describe a graphical model to represent human dialogue and discourse. (De-Arteaga and Dubrawski 2017) describe an anomaly detection approach to extract patterns of sexual violence in El Salvador.

The research of religious extremism and its political ramifications in other parts of the subcontinent has also been studied in the social science literature. In a series of papers, (Blair et al. 2013; Shapiro and Fair 2010; Fair, Malhotra, and Shapiro 2012) explored the impact of religion and poverty on extremist tendencies in Pakistan. Their analysis was however limited to using linear models, and the effects of social and traditional media were not considered as a possible confounders.

Pandita describe various print media houses in Kashmir, while (Gul and others 2013) describe how traditional Kashmiri print and electronic media, have embraced social media. Towards the best of our knowledge, this is the first study that employs hierarchical Bayesian modeling in order to explicitly understand the impact of social media and traditional media, along with regional idiosyncrasies, specifically in the case of the Indian administered Kashmir Valley.

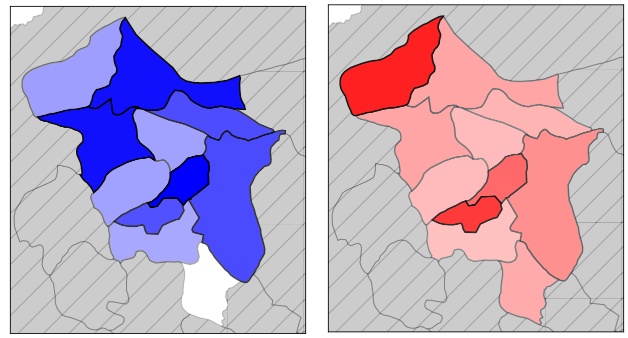


Figure 2: Heat maps depicting the number of responders and the extent of separatism, $\mathcal{Y}$ across districts of the Valley.

Survey Description

A large survey of the Kashmiri youth enrolled in higher educational institutes was conducted across ten districts of the Valley. The responders were asked questions about their level of education, age and some other questions indicative of there preferences of use of social media and traditional news sources. Table 1 and Table 2 presents some basic statistics about the responders and the questions that they were asked, respectively.

Determining Separatism, the variable $\mathcal{Y}$

It is true that alienation and separatism among the Kashmiri population lies on a spectrum rather than a strict binary. Separatist sympathies tend to increase around certain times and events. In times of peace, a large number of the people take part in democratic elections and seek employment in both the local and federal government, while this is not the case in the event of a recent public outrage. Under such circumstances, it is debatable as to what the correct definition of separatism is.

For the purposes of our experiment, we use a combination of responses to the following three questions in the survey, in order to determine a proxy label for separatism. We assigned all individuals who responded with **Yes** as **Positive (+ve)** for the variable $\mathcal{Y}$, and the ones who responded with a **No** as a **Negative (-ve)** for $\mathcal{Y}$. A large number of respondents responded with **Can't Say** for whom we resorted to the the next question in order to determine the label.

Table 3 presents the Spearman Rank Correlation the across each for each individual to **Q1** versus there response to **Q2**. Most responders who responded with a **No** to the **Q1**, also had low mean scores for this question, although the distribution for the **Can't Say** and **Yes** for fairly more even.

Trust on the Indian Armed Forces deployed in Kashmir seems to be most highly positively correlated with

# of Participants	503
# of Males	324
# of Females	179
Age Group (Min, Max)	18 - 36
Age Group (25th -75th) %ile	21 - 24
Home Districts	10

Table 1: Survey Statistics

	Sense of Separatism and belonging to India
Q1	**Do you consider yourself Indian?** a) **Yes**, b) **No**, c) **Can't Say**
Q2	**Trust on Various Instruments of the State** We asked the responders to report there level of trust on the following Instruments of the Indian Union a) **Local Government**, b) **Central Government**, c) **Local Law Enforcement**, d) **Local Administration**, e) **Armed Forces**, f) **Central Law Enforcement** and the g) **Judiciary** on a **4-Point Scale**, ranging from **No Trust (-2)**, **Can't Say (0)**, **Some Trust (+1)** and a **Great Deal of Trust (+2)**.
	Use of Social Media
Q S1	**Do you actively use Social Networks?** a) **Yes**, b) **No**
Q S2	**If Yes, what do you use it primarily for?** a) Connecting with Friends, b) Joining Groups, c) Following Celebrities, d) Expressing Political Opinion, e) Others, f) Never use it
Q S3	**Do you trust what you see on Social Media?** a) Yes, b) Sometimes, c) Can't Say & d) Not Very Truthful
	Use of Traditional Media
Q T1	**Do you read newspapers daily?** The responders were asked to choose between a) Daily, b) Sometimes or c) Never
Q T2	**If Yes, What Kind?** a) National Daily, b) Local Newspaper, c) No Preference or d) Don't Read
Q T3	**What kind of newspapers reports Kashmiri news most accurately?** a) Delhi and Other Indian Newspapers, b) Local Newspapers from Kashmir, c) Newspapers from Pakistan, d) Other
Q T4	**What News Channels do you watch on TV?** a) Private English News Channels, b) Private Hindi News Channels, c) Government Funded News Channels d) Local News Channels e) Pakistani News Channels f) Other International TV Channels

Table 2: Questions that the responders were asked, along with the answer options. The questions were selected in order to estimate the responders propensity to Separatism along with their preferences to social media and traditional sources of news in the forms of print and electronic.

the sense of being Indian across all the three major geographical regions of the Kashmir Valley. This is expected, since the Indian Army has played an active role in fighting armed militancy and also undertaken numerous civic action programs aimed at Human Development in the region through the 'Sadbhavana' (Goodwill) program. This campaign has included setting up of co-educational Junior and High Schools, Vocational training centers and Healthcare and Medical Camps. [3].

Interestingly, Trust on the Local Governments in these regions also seems to be Positively correlated with belonging to India for both North and South Kashmir, whereas that is not so in the Central Region. We also found that Trust on Local and Police agencies seems to not be correlated with this sense, suggesting an opportunity for the Local Law Enforcement to take up similar civic action programs to reach out and play a more active role in bringing about democratic consensus.

Based on these scores we proceeded to train a Logistic Regression with an $\ell 2$ penalty in order to predict there response to **Q1** based on responses to **Q2**. We tuned the strength of the regularization parameter by performing grid search and cross validation. For all the responders who responded with 'Can't Say' to **Q1**, we deferred to this classifier in order to obtain a label, by deploying it at a fixed threshold of False Positive and False Negative Rates. Thus, for all the following experiments this combination of the responses, $\mathcal{Y}$ was used as a label determining separatism for each responder.

Instrument	All Regions	Central	South	North
Armed Forces	0.50**	0.40**	0.53**	0.58**
Central Govt	0.43**	0.34**	0.50**	0.41**
Central Police	0.42**	0.37**	0.42**	0.39**
Local Admin	0.40**	0.28**	0.53**	0.32**
Local Govt	0.35**	0.17	0.39**	0.39**
Judiciary	0.32**	0.24**	0.35**	0.24**
Local Police	0.23**	0.11	0.42**	0.08

Table 3: Spearman rank correlation (ρ) between the response to **Q1** and score assigned to each instrument in **Q2**. ** Indicates p-value<0.05

	Response	All	Central	South	North
S2	Connect w. friends	-0.21**	0.08	-0.40**	-0.13
S2	Express opinions	0.23**	-0.02	0.34**	0.24**
S3	Trust-Score	0.11**	0.03	0.25**	-0.12

Table 4: Spearman rank correlation (ρ) between the response to **Q2** and score assigned to each instrument in **Q2**. ** Indicates p-value<0.05

[3]https://economictimes.indiatimes.com/news/defence/operation-sadbhavana-7800-jammu-and-kashmir-youths-went-on-educational-trips-in-three-years/articleshow/50271238.cms

	Response	All	Central	South	North
T1	tm_use	-0.18**	0.23**	-0.38**	-0.05
T2	Don't Read	0.12**	-0.03	0.19**	0.1
T2	No Preference	-0.22**	-0.04	-0.2**	-0.27**
T3	Eng./Hindi (Delhi)	0.22**	0.18	0.26**	0.18**
T3	Local Urdu	0.14**	0.02	0.16**	0.1
T3	No newspaper	-0.26**	-0.11	-0.32**	-0.19**
T4	International	-0.16**	-0.0	-0.21**	-0.07
T4	Pakistani	-0.15**	-0.14	-0.09	-0.25**
T4	Private Hindi	0.22**	0.21**	0.15**	0.22**

Table 5: Spearman rank correlation (ρ) between the response to **Q2** and score assigned to each instrument in **Q2**. ** Indicates p-value$<$0.05

Effects of Social Media, the variable $\mathcal{S}$

Table 4 presents the statistically significant correlations between responses to **QS1-3** and our proxy definition of separatism, $\mathcal{Y}$. Interestingly we found that a large number of participants who responded that their primary use of social media was to express opinions in a political dialogue also had a positive disposition towards the Indian Union. This suggests that social media, although infamous for its deleterious effects in the Valley, does provide a platform for the youth to engage in political discourse, encouraging state instruments to play a more active role on social media platforms and attempt to positively engage the population through this channel.

Effects of Print and Electronic News, $\mathcal{T}$

We would further like to quantify the impact and relationship the international, national and local press has on the possible alienation. This includes both the print media in the form of the newspapers as well as electronic media like television news channels. Table 5 lists some significant correlations between responses to **QT1-4**. Notice that from the responses, it is clear that individuals actively engaging in reading newspapers have positive correlations with $\mathcal{Y}$. On the contrary individuals not actively reading or having strong preferences for newspapers, tend to be negatively correlated with $\mathcal{Y}$, suggesting a more negative disposition towards the Indian State. This suggests an interesting similarity of the use of print media with that of social media.

For electronic media, the results were somewhat less surprising. The consumption of India based Hindi news is positively correlated with $\mathcal{Y}$, while consumption of Pakistani and international news is negatively correlated with $\mathcal{Y}$. We thus hypothesize, that amongst the population with a general lack of trust towards the Indian State and its instruments, such mistrust extends to non-State instruments, including the private electronic media.

Demographic Covariates, $\mathcal{X}$

Apart from just the responses to the questions involving use of print, electronic, and social media, we also include additional covariates, suggestive of basic demographic information. We hypothesize that these additional covariates could help better adjust our models for confounding. The variables include the responder's gender, their home district, place of study, age and educational level, that is whether they are enrolled in undergraduate, masters or graduate programs in the science or humanities. In the case of the proposed model, these factors are represented as an observed variable x in Figure 3.

Modelling Effects with Latent Variables

We propose a Latent Variable Hierarchical Model (Figure 3) in order to model our dataset and better understand how the social media and regional differences impact the propensity for separatism.

Regional Differences

We hypothesize that in general owing to similar circumstances, Kashmiri youth have similar reasons for predisposition towards separatism. It is however clear from survey responses (Tables 4 & 5), as well as commonly believed by domain experts and policy makers, that there are important regional differences which cannot be ignored. In order to incorporate these regional differences into our model, we adopt a hierarchical graphical model. Not only does the use of the hierarchical model helps reflect the regional differences, it also helps alleviate the challenges of working with the relatively small dataset we are working with ($n < 500$).

Latent News and Social Media Effects, s and τ

We further hypothesize, that the influence of social media on an individual can be thought as a binary variable that indicates whether the user is negatively influenced or motivated by separatist ideologies. We further assume that this binary variable can be characterized by a log-linear parameterization of the individual's responses to **QS1 - S3** and **QT1 - T4**

The Generative Modeling Story

1. We first draw the set of parameters, w, φ, π
   (This corresponds to an $\ell 2$ penalty)
   $$w \sim \text{Norm}(w_0, \lambda_0),\ \varphi \sim \text{Norm}(\varphi_0, \lambda_0),\ \pi \sim \text{Norm}(\pi_0, \lambda_0)$$
   $$w_0 = \mathbf{0}, \quad \varphi_0 = \mathbf{0},$$
2. For each region $r \in R$, we draw the parameters, θ_r,
   $$\theta_r \mid (w, \lambda) \sim \text{Normal}(w, \lambda)$$
3. We draw the latent z_i, conditioned on φ and s_i as
   $$z_i \mid (\varphi, s_i) \sim \text{Bernoulli}(\sigma(\varphi^\top s_i))$$
   and the latent τ_i, conditioned on π and t_i as
   $$\tau_i \mid (\pi, t_i) \sim \text{Bernoulli}(\sigma(\pi^\top t_i))$$
4. The final output, y_i conditioned on r, θ and x_i , z_i is
   $$y \mid (x_i, \theta, r_i, z_i, \tau_i) \sim \text{Bernoulli}(\sigma(\theta_r^\top [x_i, z_i, \tau_i]))$$

Here, $\sigma(.)$ is the sigmoid function

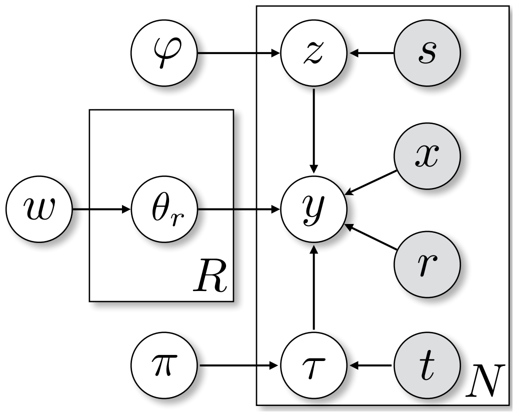


Figure 3: The Proposed Latent Variable Model. x are the observed demographic features, r represents the region the individual is drawn, s and t are the responses to questions about use of social and traditional media, while z and τ are the latent effects of the media. θ is the set of parameters that determine the outcome y.

Inference

Let the observed data $\{x_i, s_i, t_i, r_i, y_i\}_{i=1}^N$ be represented by $\mathcal{D}$. We denote the set of all parameters, $\{w, \varphi, \{\theta_r, \pi_r, \varphi_r\}_{r=1}^R,\}$ as $\mathbf{\Theta}$. We would like to maximize the joint probability of the dataset under our model.

Our first attempt at performing inference, was using a Markov Chain Monte Carlo sampling method. To this end, we experimented with both, a Metropolis Hastings based sampler with a Multivariate Gaussian Proposal Distribution, as well as Hamiltonian Monte Carlo NUTS based sampler (Hoffman and Gelman 2014; Salvatier, Wiecki, and Fonnesbeck 2016). Unfortunately, since most of the features we work with are categorical this results in a large parameter space. This limited the ability to have high acceptance rates for the samplers. We instead proceeded to model the point estimates of the parameters by using the Maximum A Posteriori estimator of the log-likelihood, given by

$$p(\mathcal{D}|\mathbf{\Theta}) = \prod_{i=1}^{N} p(x_i, s_i, t_i, y_i, r_i, \mathbf{\Theta})$$

$$= \Big(\prod_{i=1}^{N} \int_{z_i,\tau_i} p(y_i|x_i, \theta, \pi, r_i, z_i) p(z_i|s_i, \varphi) p(\tau_i|t_i, \pi) dz_i d\tau_i\Big) \prod_{i=1}^{R} p(\theta_r, \pi_r|w)$$

Note that we ignore the parameter priors to simplify thr notation. For inference, we perform stochastic gradient descent on the objective, with mini-batching for 10,000 training epochs.

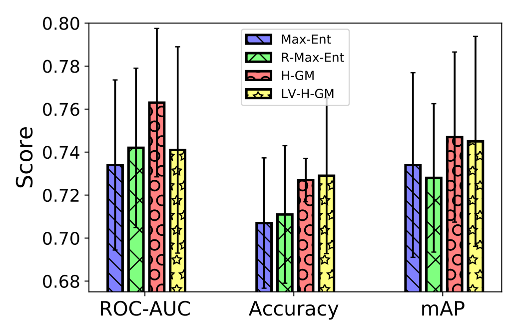
Experiments

We experiment with the following models

1. **Parametric Maximum Entropy Classifier (MAX-ENT)** amounts to learning a logistic regression model for the outcome variable y_i given x_i. This model assumes that the output y_i is a linear function of the inputs x_i on the log-odds scale.
2. **Region-Specific Maximum Entropy Classifier (R-MAX-ENT)** Similar to the previous baseline approach but involves separate models for each region. This allows learning globally non-linear (but locally linear) hypotheses by allowing linearly separable decision boundaries for each of the regions. However, the short supply of data raises a challenge and the model does not benefit from sharing knowledge about similarity across regions.
3. **Hierarchical Graphical Model (HGM)** The HGMis similar to the model proposed in Figure 3, but the observed covariates (s, t) corresponding to the responses to survey questions are grouped together with other demographic covariates, x instead of being reduced to latent variables.
4. **Hierarchical Latent Variable Model (H-LV-GM)** Finally we experiment with the proposed Latent Variable model. It reduces the potentially adverse effects of social and traditional media to single variables, helping interpretability and reliability of analysis.

Experimental Setup

For both our models and the baselines we perform 5-fold cross validation over the dataset. We compute the Area under the Receiver Operating Characteristic curve (AuROC), the mean Average Precision (mAP), and the classification Accuracy over the the held out fold, and report the mean of each metric over each of the 5 folds. Before training the models, we standardize each column of data by subtracting its mean and dividing by its sample variance, to ensure all the features are on the same magnitude scale.

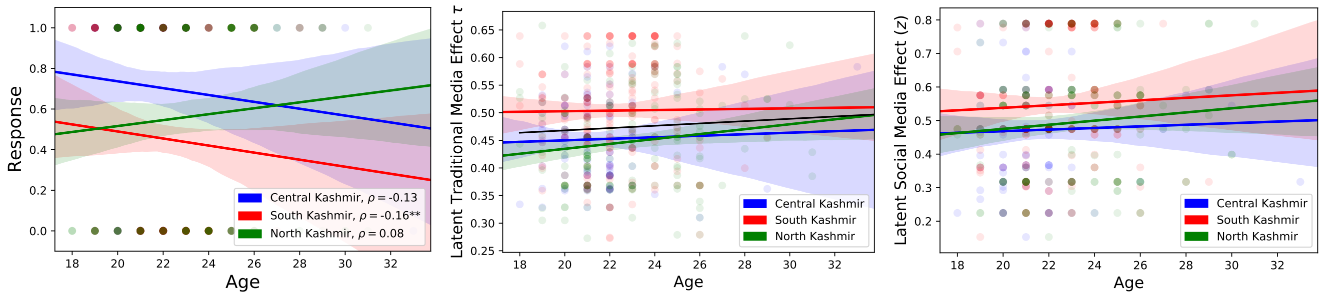


	AuROC	Accuracy	mAP
H-GM	$\mathbf{0.763 \pm 0.04}$	0.727 ± 0.01	$\mathbf{0.747 \pm 0.05}$
LV-H-GM	0.741 ± 0.05	$\mathbf{0.729 \pm 0.04}$	0.745 ± 0.06

Figure 4: Performance comparison of the proposed graphical model (H-LV-GM) against relevant baselines (MAX-ENT, R-MAX-ENT, HGM). (Error bars represent 90% CI)

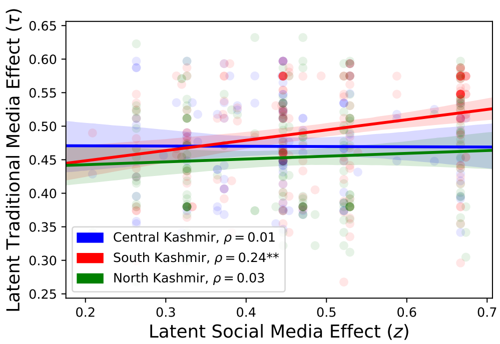
Results

Figure 4 Compares the performance of the proposed approaches (HGM, H-LV-GM) against baseline linear models. Note that the HGM has a larger number of parameters than H-LV-GM, which justifies better performance on classification metrics. H-LV-GM however while having lower performance, allows collapsing effects of media into a single



y vs. age τ vs. age z vs. age

Figure 5: The response variable (y), and the latent effects of media with age of the responders. Interestingly, we observe that as opposed to common belief, our proxy definition of separatism tends to be weakly positively correlated with age, suggesting that younger responders seem to have a more positive disposition towards the Indian Union. The effects of both traditional and social media seem to be positively correlated with the responders age as well, which is contrary to public opinion about social media being more popular and, by implication, more influential on the younger population.



Overall $\rho = 0.147$, p-value≈ 0.00

Figure 6: Correlation between the latent social media effect, z and the traditional media, τ. Notice that the effects seem to be mostly uncorrelated across the regions, except for South Kashmir where the effects have a weak correlation.

variable allowing for a simpler to interpret analysis, while still outperforming the other two baselines.

Figure 6 compares the distribution of the latent variables τ and z, representing the effects of traditional news sources and social media respectively. Notice that for both North and Central Kashmir, the effects seem to be mostly uncorrelated, while for South Kashmir, there seems to be some weak positive correlation. This suggests that, for the most part, cohorts of individuals who are likely to be adversely influenced into separatism through social media and traditional news sources, respectively, are disparate.

We also establish that as opposed to popular belief there seems to be an overall increasing trend in separatism with age, as shown in Figure 5. Notice also, that the effects of social media and traditional news sources, as captured by the latent variables, z and τ, seems to increase with age across all regions of the Valley. While one would expect this to be the case for electronic and print media, the observation that social media influence on separatism appears to increase with age is an interesting new discovery.

Limitations and Future Work

While we discovered some interesting trends and patterns in the Kashmiri youth populations support for separatism, we would like to caution that this study is limited by its relatively small data sample size and sample selection representative of mostly students enrolled in higher education programs. These factors may limit the applicability of our results in the context of other demographic groups in the Kashmir Valley. We further caution the readers of the temporal nature of Kashmiri separatism, which tends to have a cyclical pattern of periods with extensive unrest, followed by relative peace with high participation in electoral politics. Given these realities, in the future we aim to extend this study to larger sample sizes, representative of all heterogeneities of the Kashmiri demographic, sampled over fixed time intervals. In the future, we also aim to incorporate other demographic factors in order to better model all potentially confounding evidence to enable making stronger causal claims.

Conclusion

In this paper, we aimed to study the recent rise of separatist unrest in the Kashmir Valley of India, especially in the youth population. We conducted a survey of the youth population in the Valley to help understand the nature of separatism with regard to trust towards various instruments of the Indian State.

Further, we made an attempt to model the impact of social media and traditional sources of news on the rising of separatist movement based on its specifically constructed proxy definition, and exploited a Hierarchical Latent Variable modeling technique in order to probabilistically assess how these effects vary with the demography and determine separatism.

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