KUNAL RELIA

Ph.D. Candidate - New York University

NYU Tandon School of Engineering
370 Jay St., 1122 F
Brooklyn, NY 11201, USA
+1 (347) 433 0825
krelia@nyu.edu
www.kunalrelia.com

EDUCATION

Sep 2017 - Present **Ph.D., Computer Science**,
NYU Tandon School of Engineering, *Brooklyn - USA*.
Advisor: Julia Stoyanovich, Ph.D.

Jan 2015 - Dec 2016 **M.S., Computer Science**,
NYU Tandon School of Engineering, *Brooklyn - USA*.

Jul 2010 - Jun 2014 **B.E., Computer Engineering**,
Gujarat Technological University, *Rajkot - India*.

RESEARCH INTERESTS

Computational Social Choice, Responsible Data Science, Preference Data Management, Computational Social Sciences, Spatiotemporal Analysis.

PROFESSIONAL EXPERIENCE

Research Experience

Jun 2016 - Present **Research Assistant**, *NYU Tandon School of Engineering, Brooklyn - USA*.
Research Projects: Diversity and Representation Constraints in Multiwinner Elections; Algorithmic Techniques for Necessary and Possible Winners; Discrimination in Social Media and Hate Crimes Across 100 U.S. Cities; Socio-Spatial Self-Organizing Map; Filling User Timeline Using Sparse Social Media Data; Predicting Demographics of Social Media Users

Non-research Experience

Sep 2015 - May 2016 **Team Lead/Analyst**, *NYU Office of Graduate Admissions, Brooklyn - USA*.
Led a team of 21 graduate assistants; cut application processing time by 15%, and augmented a transcript evaluation algorithm

Sep 2015 - Dec 2015 **Teaching Assistant**, *NYU Tandon School of Engineering, Brooklyn - USA*.
Assisted Prof. Viji Srinivasan (Computer Architecture 1) with coursework, assignments and exams, and tutored students excel in their concepts

Jun 2010 - Jan 2015 **Co-founder**, *ReLife Pharma, Rajkot - India*.
Co-founded a health care start-up manufacturing and marketing medicines in India

- Unique marketing strategy of only targeting doctors in tier 3 cities was done as the customer base was untapped by any internationally licensed company
- Manufactured medicines at World Health Organization - Good Manufacturing Practices (WHO-GMP) certified facilities to ensure best quality products; only 1 in 10 facility in India is awarded this certificate
- Turned profitable from the first year itself managing sales in excess of $150,000 (within top 7 percentile of Indian income)

Jul 2013 - Jun 2014 **Software Developer Intern**, *Johnson & Johnson Ltd., Rajkot - India*.
Conceptualized and developed a claim management software capable of managing annual claims worth $4.5M of company's 1000+ dealers

- Automated the claim generation and management process reducing the required human hours by 80%
- Provisional patent for the concept has been filed at the Indian Patent Office

AWARDS

Award **School of Engineering Fellowship - NYU Tandon**, *Sep 2017*.
Institutional fellowship awarded to select first year Ph.D. students

Award **Graduate Scholarship - NYU Tandon**, *Jan 2015*.
Scholarship awarded to Master's students subject to renewal at the end of each semester based on the GPA

Award **Academic Excellence Award - GTU**, *Jun 2014*.
An award for final-year students who show exemplary academic performance well in exams or practical implementation of computer science topics in the final year academic project

PUBLICATION

[C] : conference; [J] : journal; [P] : in-preparation; [S] : in-submission.
* : authors listed alphabetically.

[P1*] Markus Brill, Jonas Israel, **Kunal Relia**, and Julia Stoyanovich. "*On Representation of Multi-attribute Voters in Multiwinner Elections*".

[S2*] **Kunal Relia** and Julia Stoyanovich. "*DiRe Committee: Diversity and Representation Constraints in Multiwinner Elections*".

[S1*] Vishal Chakraborty, Theo Delemazure, Benny Kimelfeld, Phokion Kolaitis, **Kunal Relia**, and Julia Stoyanovich. "*Algorithmic Techniques for Necessary and Possible Winners.*".

[C5] **Kunal Relia**, Zhengyi Li, Stephanie H Cook, and Rumi Chunara. *"Race, Ethnicity and National Origin-based Discrimination in Social Media and Hate Crimes Across 100 U.S. Cities."* Proceedings of the Thirteenth AAAI International Conference on Web and Social Media (ICWSM-2019).
Media: Market Insider, Business Insider, The Register (UK), VICE, The Philadelphia Inquirer

[C4] Nabeel Abdur Rehman, **Kunal Relia**, and Rumi Chunara. "*Creating Full Individual-level Location Timelines from Sparse Social Media Data.*" ACM SIGSPATIAL GIS'18.

[C3] **Kunal Relia**, Mohammad Akbari, Dustin Duncan, and Rumi Chunara. "*Socio-spatial Self-organizing Maps: Using Social Media to Assess Relevant Geographies for Exposure to Social Processes.*" Proceedings of the ACM on human-computer interaction 2, no. CSCW (2018).

[C2] Mohammad Akbari, **Kunal Relia**, Anas Elghafari, and Rumi Chunara. "*From the User to the Medium: Neural Profiling Across Web Communities.*" Proceedings of the Twelfth AAAI International Conference on Web and Social Media (ICWSM-2018). *(poster paper)*

[C1] Tom Huang, Anas Elghafari, **Kunal Relia**, and Rumi Chunara. "*High-resolution temporal representations of alcohol and tobacco behaviors from social media data.*" Proceedings of the ACM on human-computer interaction 1, no. CSCW (2017).

MENTORING

2020 **Raisa Bhuiyan and Rachel Rose**, *High-school students from under-represented groups in STEM*.

2019 **Kennan Gumbs and Heeyun Kim**, *High-school students from under-represented groups in STEM*.
Kennan is now at MIT.

2018 **Zhengyi Li**, *Undergraduate student*.
Now Team-lead at Opine.

TALKS

2017 **Natural Language Processing (NLP) Community Reception**, *NYU Center for Data Science, New York - USA*.

COMMUNITY SERVICE

ACADEMIC.

Program Committee AAAI ICWSM (2020-21), AAAI (2021).

Reviewer AAAI (2021), AAAI ICWSM (2020-21), ACM CHI (2020-21), ACM CSCW (2019-20), ACM WebSci (2020).

Selection Committee NYU ARISE (2020).

NON-ACADEMIC.

Volunteer Part of UNICEF's "Leadership Circle" and "Guardian Circle".

RESEARCH PROJECTS

Apr 2020 - Present **Demographic, Social, and Physiological Vulnerabilities related to Development of COVID-19 Symptoms: A Prospective Digital Health Study**.

On July 17, 2020, the CDC updated their list of illnesses that are risk factors for COVID-19. Factors with "strongest and most consistent evidence" include hypertension, heart disease, cancer, and obesity, and demographic vulnerabilities are age, sex, minority race, and low SES. Social and psychological factors like stress, discrimination, and depression are less examined but may be critical factors in the disease contagion processes. In this project, we examine (i) psychophysiological vulnerability factors related to developing COVID-19 symptoms, (ii) mitigating factors associated with reduced symptomatic features, and (iii) the effect of randomly assigning people to stress reduction techniques aimed at reducing blood pressure or a control group.

Sep 2019 - Present **Diversity and Representation Constraints in Multiwinner Elections**.

Recent work in the study of fairness in multiwinner elections focuses on settings where candidates have attributes. However, voters may also be divided into predefined populations under one or more attributes (e.g., "California" and "Illinois" populations under the "state" attribute), which may be different from candidate attributes, and models that focus on candidate attributes alone may systematically under-represent smaller voter populations. Hence, we develop a model, DiRe Committee Winner Determination (DiReCWD), which delineates candidate and voter attributes and selects a committee (i) using diversity constraints to lower-bound the number of candidates selected from each candidate group, (ii) using representation constraints to lower-bound the number of candidates elected by each voter population, and (iii) maximizing the score of the committee subject to meeting the constraints. DiReCWD has the flexibility to specify diversity and representation constraints, and a voting rule, thus incorporating diverse committee winner determination and the apportionment problems as example special cases. We analyze the computational complexity of selecting a committee under DiReCWD, and study the inapproximability and parameterized complexity. We present an empirical analysis of feasibility and of the utility traded-off to satisfy the constraints.

Jan 2019 - Present **Algorithmic Techniques for Necessary and Possible Winners**.

We investigate the practical aspects of computing the necessary and possible winners in elections over incomplete voter preferences. In the case of the necessary winners, we show how to implement and accelerate the polynomial-time algorithm of Xia and Conitzer. In the case of the possible winners, where the problem is NP-hard, we give a natural reduction to Integer Linear Programming (ILP) for all positional scoring rules and implement it in a leading commercial optimization solver. Further, we devise optimization techniques to minimize the number of ILP executions and, oftentimes, avoid them altogether. We conduct a thorough experimental study that includes the construction of a rich benchmark of election data based on both real and synthetic data. Our experimental findings suggest that, the worst-case intractability of the possible winners notwithstanding, the algorithmic techniques presented here scale well and can be used to compute the possible winners in realistic scenarios.

May 2018 - Jan 2019 **Discrimination in Social Media and Hate Crimes Across 100 U.S. Cities**.

We study malicious online content via a specific type of hate speech: race, ethnicity and national-origin based discrimination in social media, alongside hate crimes motivated by those characteristics, in 100 cities across the United States. We develop a spatially-diverse training dataset and classification pipeline to delineate targeted and self-narration of discrimination on social media, accounting for language across geographies. Controlling for census parameters, we find that the proportion of discrimination that is targeted is associated with the number of hate crimes. Finally, we explore the linguistic features of discrimination Tweets in relation to hate crimes by city, features used by users who Tweet different amounts of discrimination, and features of discrimination compared to non-discrimination Tweets. Findings from this spatial study can inform future studies of how discrimination in physical and virtual worlds vary by place, or how physical and virtual world discrimination may synergize.

Sep 2016 - Nov 2018 **Socio-Spatial Self-Organizing Map**.

Historically, neighborhoods have been defined using administrative boundaries like Zip codes. But, it is a growing understanding in social sciences that what we experience around us is different from what is captured by such administrative boundaries. Hence, we develop a novel pipeline, Socio-Spatial Self-Organizing Map (SS-SOM), that uses freely-available, sparse, geo-tagged social media data to assess relevant geographies to measure exposure to social processes. The pipeline uses (i) shallow neural network to classify Tweets, (ii) followed by dividing the city into grid-cells, and (iii) then using an augmented version of the Self-organizing Maps to create contiguous, non-overlapping, homogeneous clusters. We use prevalence of racism and homophobia in New York City as example social processes to measure the change in exposure to these social processes between Zip codes and SS-SOM clusters.

Sep 2016 - Oct 2018 **Filling User Timeline Using Sparse Social Media Data**.

A stochastic framework for predicting individual level mobility timelines using sparse location data from social media. The framework utilizes individual and community mobility patterns and prioritizes the effect of location data closer in time, to make predictions.

Jun 2016 - Dec 2016 **Predicting Age and Gender of Social Media Users**.

Demographic attributes like age and gender are considered important covariates in public health study. Moreover, while data from social media platforms like Twitter is increasingly used in public health research, companies' policy of not sharing users' demographic attributes act as a bottleneck in such analysis. Hence, we use the text of the Tweets made by users to infer their age using modern NLP techniques, and use user-names to infer the gender of the users.