

## Summary

- Human trafficking is a form of modern-day slavery that affects millions of people. Escort websites are a primary vehicle for selling the services of trafficking victims.
- We use data scraped from two major escort websites to build a statistical model that discriminates between trafficking victims and independent providers. The proposed model exhibits better predictive accuracy than competing methods.
- We created a suite of interactive data visualization and exploration tools to identify potential victims and to inform intervention strategies.

## Motivation & Challenges

- Human trafficking ranks as the third most profitable crime and generates 150 billion dollars/year.
- 63% of sex trafficking victims report being advertised online, most commonly on Backpage.<sup>1</sup>
- Raw data are unstructured text and characterized by nonstandard spelling and grammar and a large number of non-English characters.

MASSAGES!!!!!! \$\$\$60/\$100/\$120/\$140!!!!!! - 29 hey guys look no further your sexy blonde masse  
 Special Special Special Special Special LET Hazel 42F YO.U.R  
 NEW\*\*\*\*\*5star Upscale Latina Available NOW BOOK NO Good Evening Dont miss out on my  
 your personal eyecandy - 21 Sexy eyecandy looking to be on your arm looking  
 MAGNETIC PLEASURE & SATISFACTION at \*\*\*PARAD Come in and relive an extraordinary experience  
 SWEET SAVANNAH LP incall - 29 <b>Hi! Hosting in a clean safe apartment in Linc  
 Finest asians HOT YOUNG Korean to OC

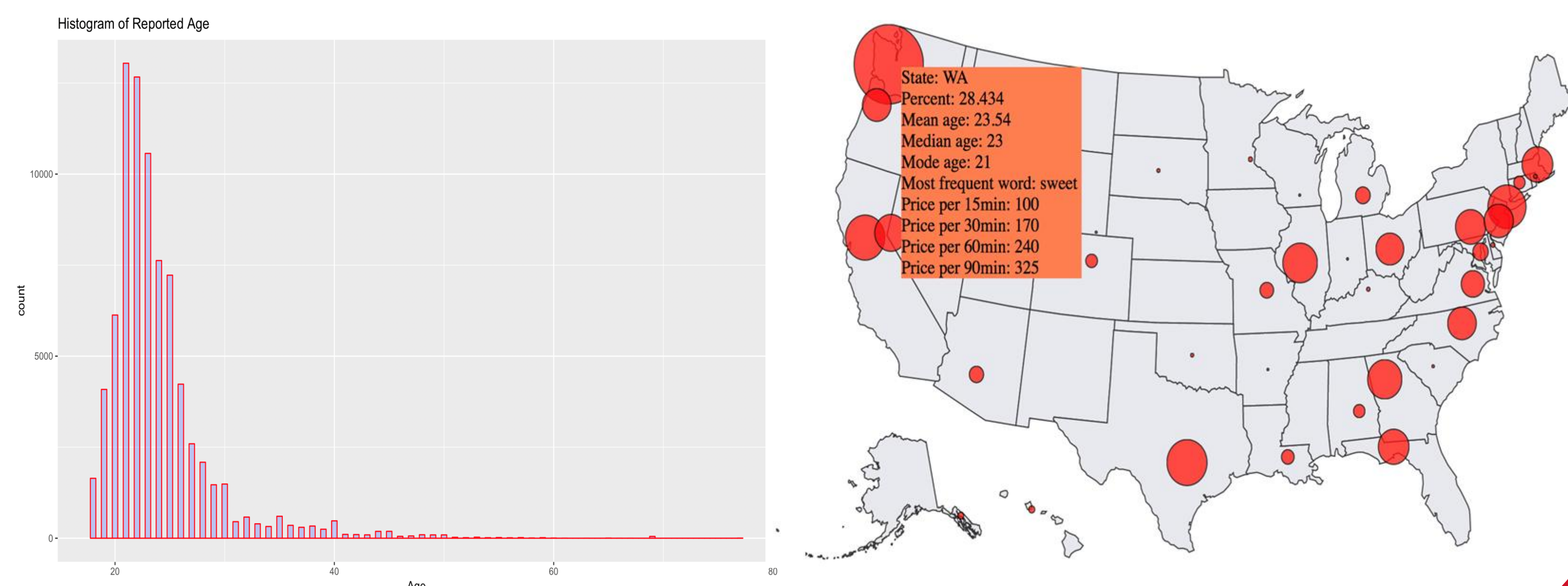
- Adversarial environment: Traffickers use slangs, intentional typos, obstructed images, multiple accounts...

## Data

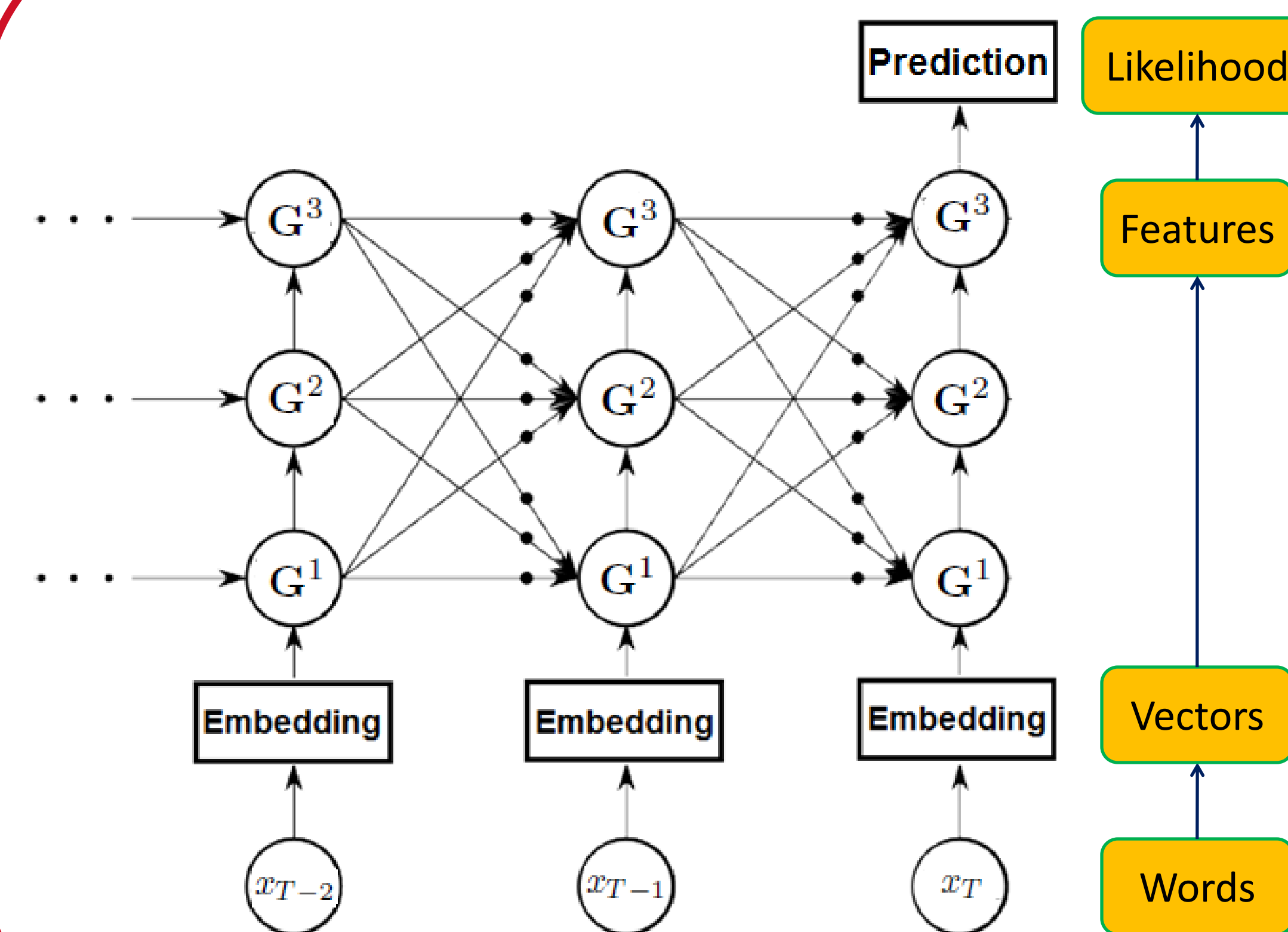
- 10K annotated Backpage posts provided by Marinus Analytics LLC.<sup>2</sup> Each post is assigned an ordinal score from 0-6 coding the likelihood that the provider in the post is a trafficking victim:

Label	0	1	2	3	4	5	6
Description	Strongly Unlikely	Unlikely	Slightly Unlikely	Unsure	Weakly Likely	Likely	Strongly Likely

- 170k and counting raw posts scraped from Backpage, Craigslist, and TNABoard.
- Key variables extracted from raw data: Account ID, Location, Phone Number, Price, Age, Age Flags, Trafficking Flags...



## Predictive Model



- Gated Feedback Recurrent Neural Network<sup>3</sup> that predicts the likelihood that a post is for a trafficking victim from the raw text.
- Achieved state-of-the-art performance compared to results from previous papers:
  - 81.1% binary classification accuracy
  - 76.3% weighted binary classification accuracy
  - 0.799 mean absolute error
- Example of how the model updates the predicted probability word by word in the binary classification case:

NEW Sexy ASIAN in Town INCALL  
 12% 17% 22% 28% 46% 57% 67%  
 Young & Petite - 24. Hi I'm kelly. I am 24 years old  
 81% 87% 94%  
 Japanese 5'2" 34c Natural 110 lbs...  
 99% ...

## Search Tool

- Uses a fast and flexible fuzzy matching algorithm.
- Returns the result based on matching score.
- Example of searching for "young student new in town":

id	label	text_all	score
170848780	4	nuru massage stay in keep warm ...	100.0
182350399	5	new asian student in town young pretty...	100.0
99284438	4	8o hh 100 real pic korean young st...	89.0
105265476	4	sweet charlotte 20 yrs old new in nyc 20 b 7 0...	89.0
174173730	4	richmond vancouver 4 hand...	89.0
181915692	4	peterborough 1st time hot kore...	89.0
25689244	5	richmondhill new to canada ...	86.0

- Filter by both text and location to track movement:

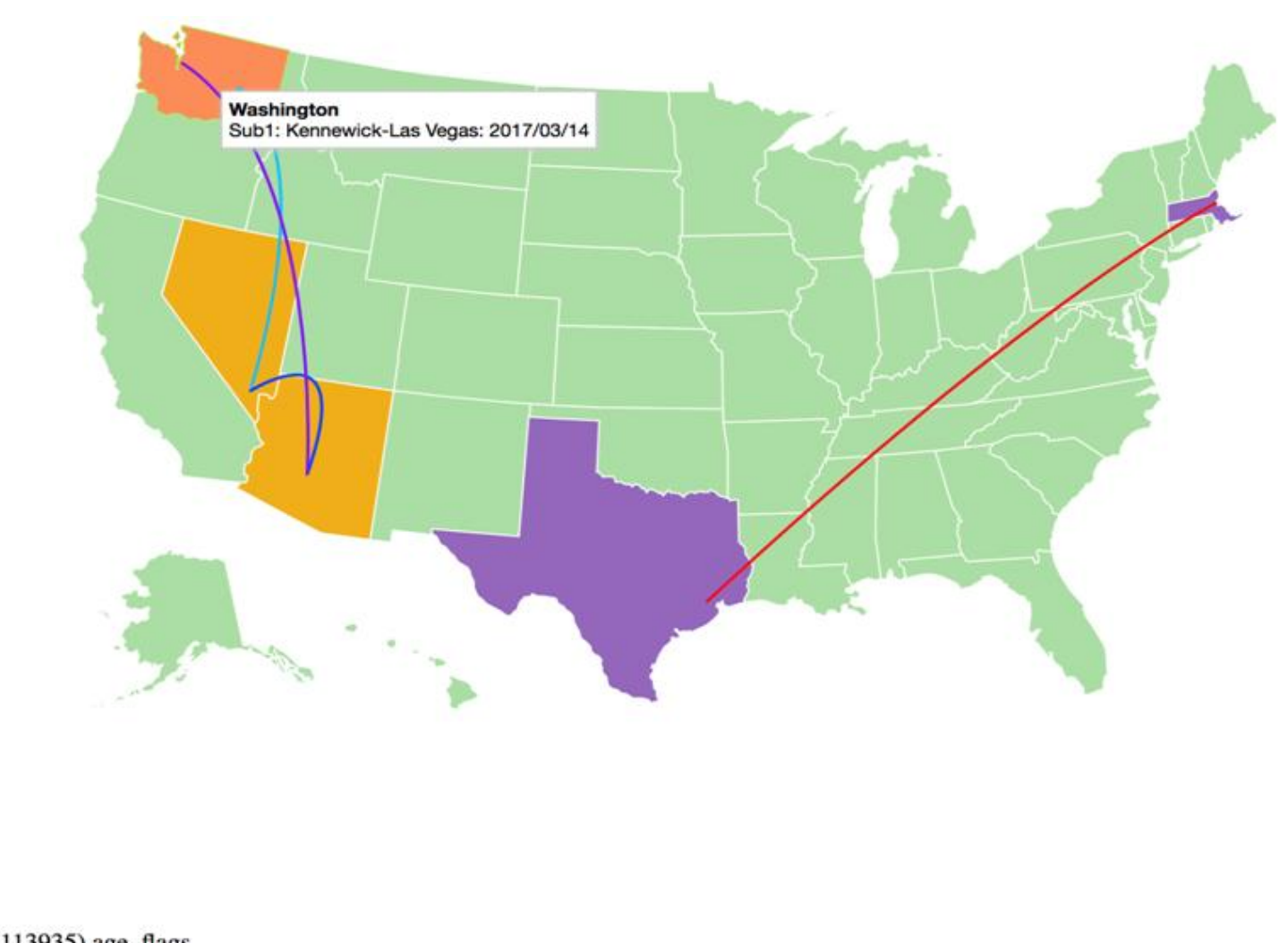
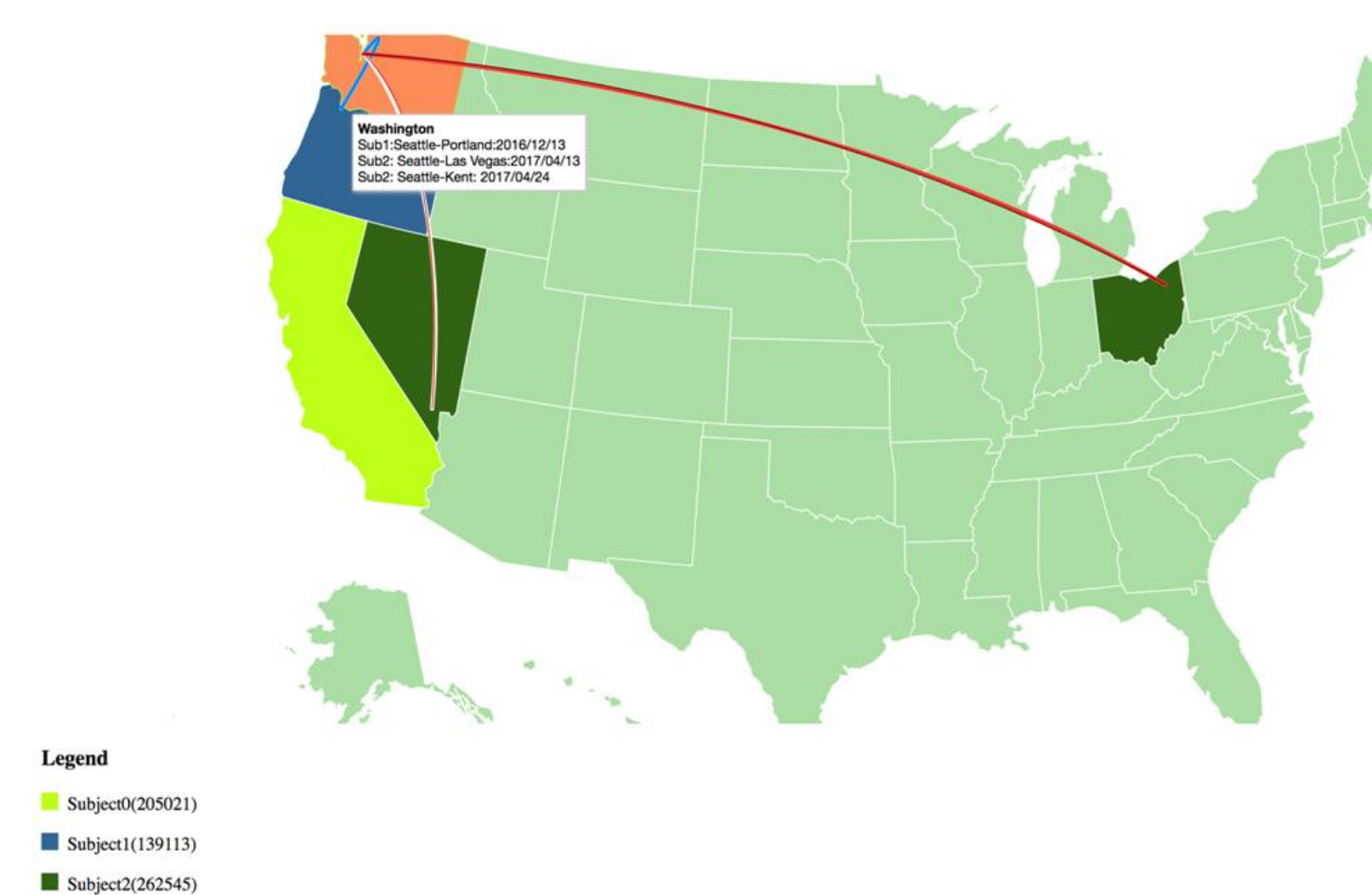
id	location	text	score
38284	seatac	new pics new friends special sexy young colleg...	89.0
1466	n. seattle	new pics new friends special sexy young colleg...	89.0
21897	dt seattle	new pics new friends special sexy young colleg...	89.0

- Search for similar ads under different accounts:

user_id	text_all
139113	service type escort hello gentlemen my name is bre i m just the girl you re looking for i have the sweetest personality with a hot petite body and tempting curves imagine getting lost in my captivating green eyes or running your fingers through my long blonde hair ... new number hope to meet you soon lovely bre
205021	service type escort hello gentlemen my name is alexis i m just the girl you re looking for i have the sweetest personality with a hot petite body and tempting curves imagine getting lost in my captivating baby blue eyes or running your fingers across my soft silky body ... for quicker response and let me know ... hope to meet you soon xoxo alexis

## Movement Map

- Visualize the movement of any subject identified by the predictive model or search tool.
- Example: Movement of different users with similar posts:
  - Example: Movement of users with the highest flag counts:



## Future Work

- Expand annotated dataset & improve predictive models
- Face detection and age prediction
- Image segmentation for body ratio estimation

## References

- A report on the use of technology to recruit, groom and sell domestic minor sex trafficking victims, 2015, THORN.
- Combating human trafficking with deep multimodal models, 2017, E. Tong et al.
- Gated feedback recurrent neural network, 2015, J. Chung et al.