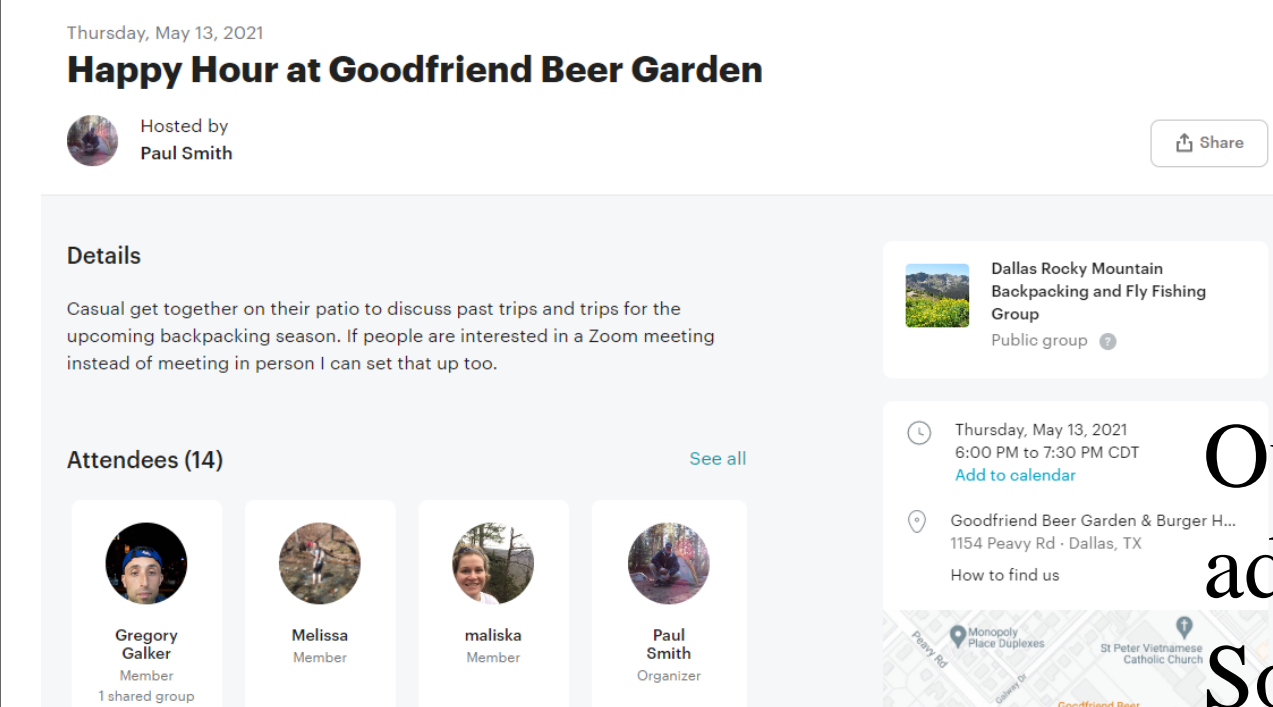
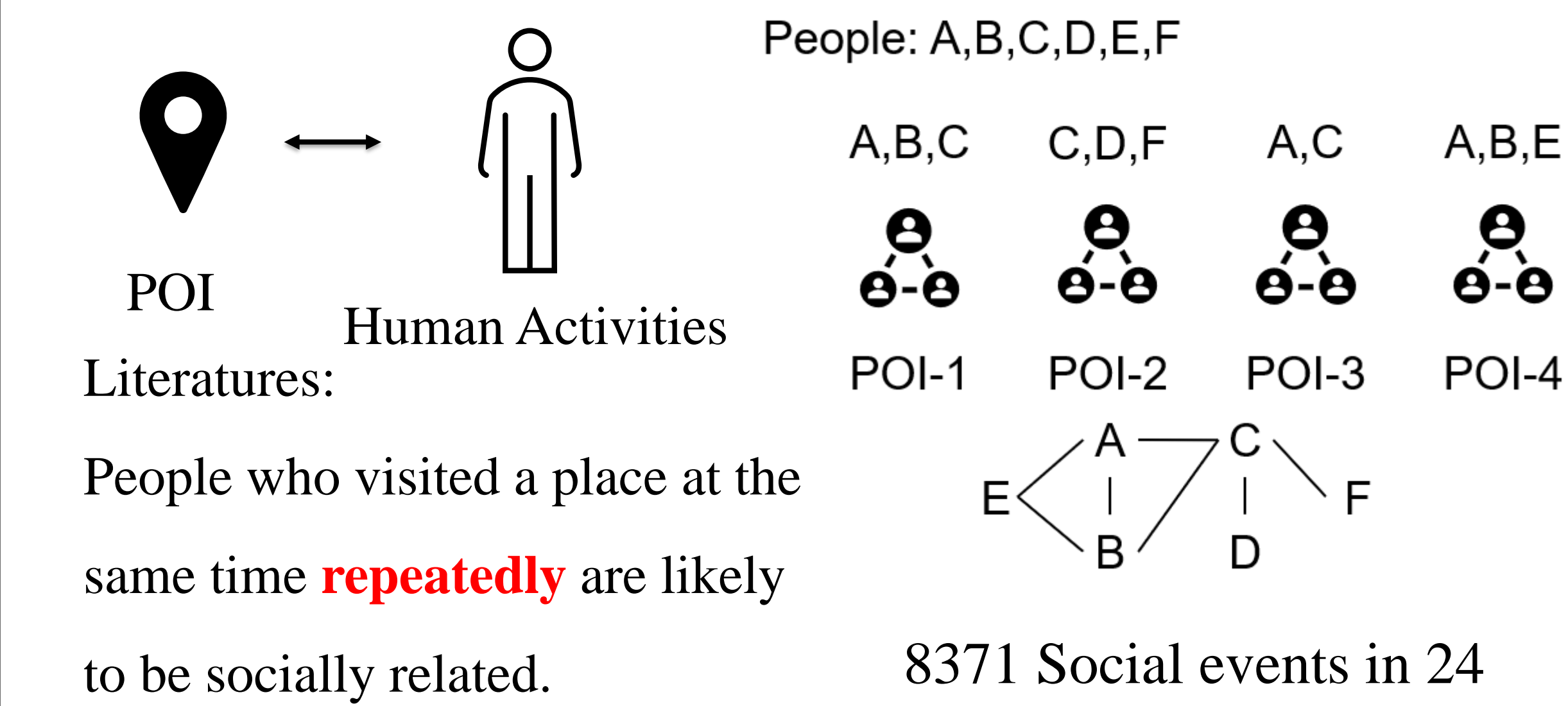


# Introduction

**Assumption:** Assumption: POI (points of interest) afford social  
actives. And social events raise new relations.

In this study, we ask the **following research question**: Does the built environment have spatial associations with social events? If so, how to quantitatively measure it. We employ POI data from Maptitude to describe the site characteristics and utilize the social events records from meetup to address the spatial associations between human activities and surrounding physical facilities.

# Data



8371 Social events in 24 categories from meetup.com from Feb 26, 2020, to Jan 30, 2021, at 1434 locations (unique Lat/Long pairs)

## Outdoors & adventure, Social:

## Park, natural preserve

# Book, Sci-Fi & Games, Writing School area

Hotel: 3,254  
 Medical: 4,307  
 Appearance: 16,833  
 Parking: 515  
 Party: 7,348  
 Public-Transportation: 205  
 Shopping: 20,633

## Methods

## Data Preparation

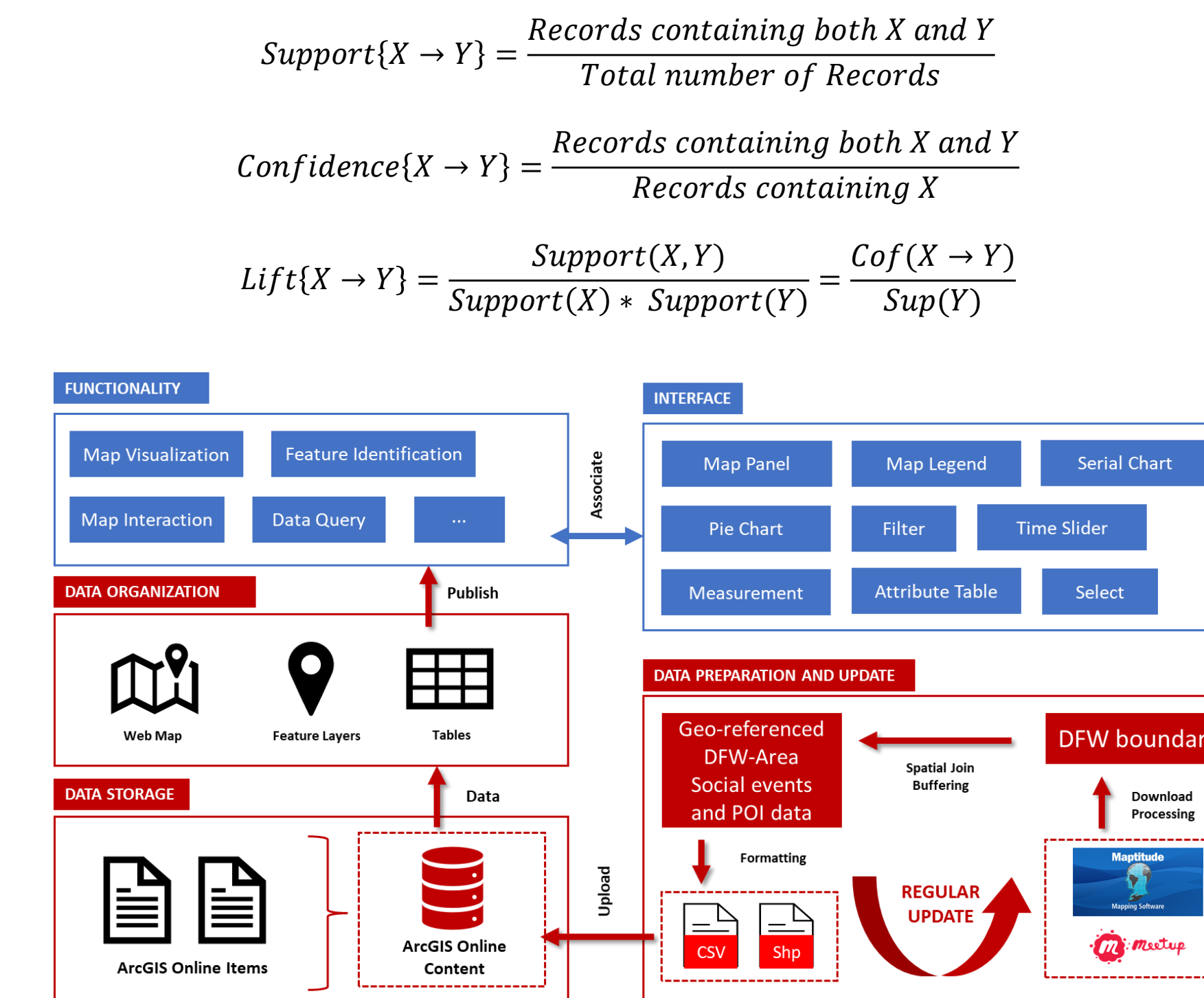
1. Data collecting by **web crawling**
2. Geo-coding and referencing

## Spatial Association

1. **Monte Carlo simulation** for background probability calculation
2. Spatial association mining between POI and social events using **Apriori algorithm**
3. Measure the interestness of discovered rules using the **lift** metric

Open to public developing

1. Build a **REST API** Cdata (up to date)
2. Build the Client interface using **ArcGIS Webapp builder** and **experience builder**



## Results

## Co-location Analysis

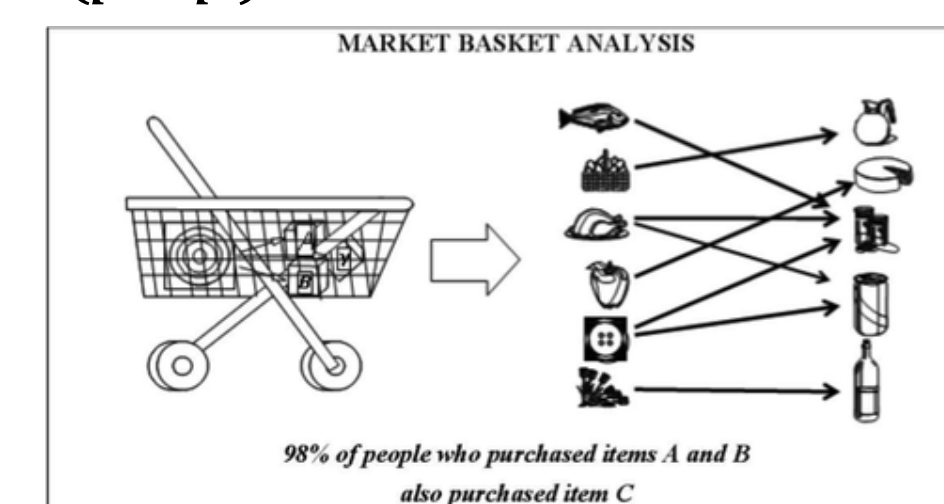
## Spatial statistics-based approaches

Spatial autoregressive model + spatial regression, Ripley's K function, Gravity etc.

## Data mining approaches

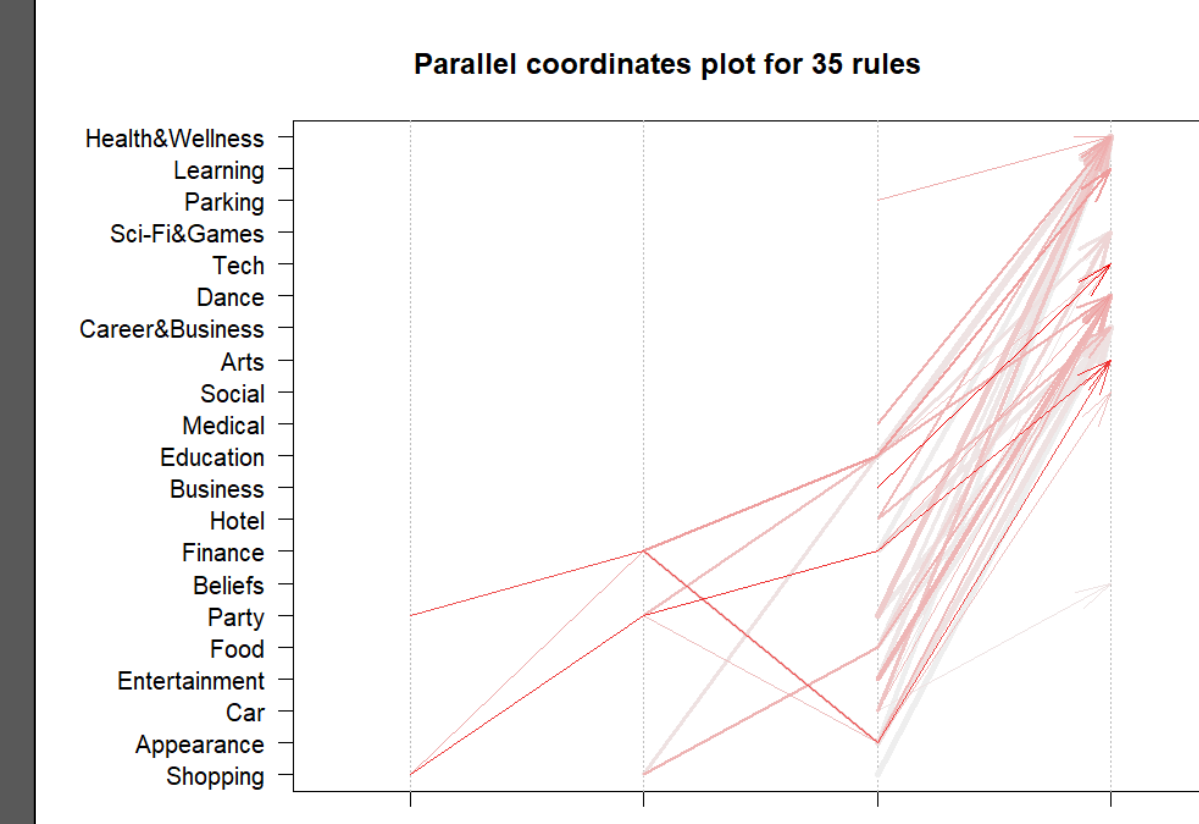
## Association rule mining

$X \rightarrow Y(p, cp)$ , Both X and Y can be set of items

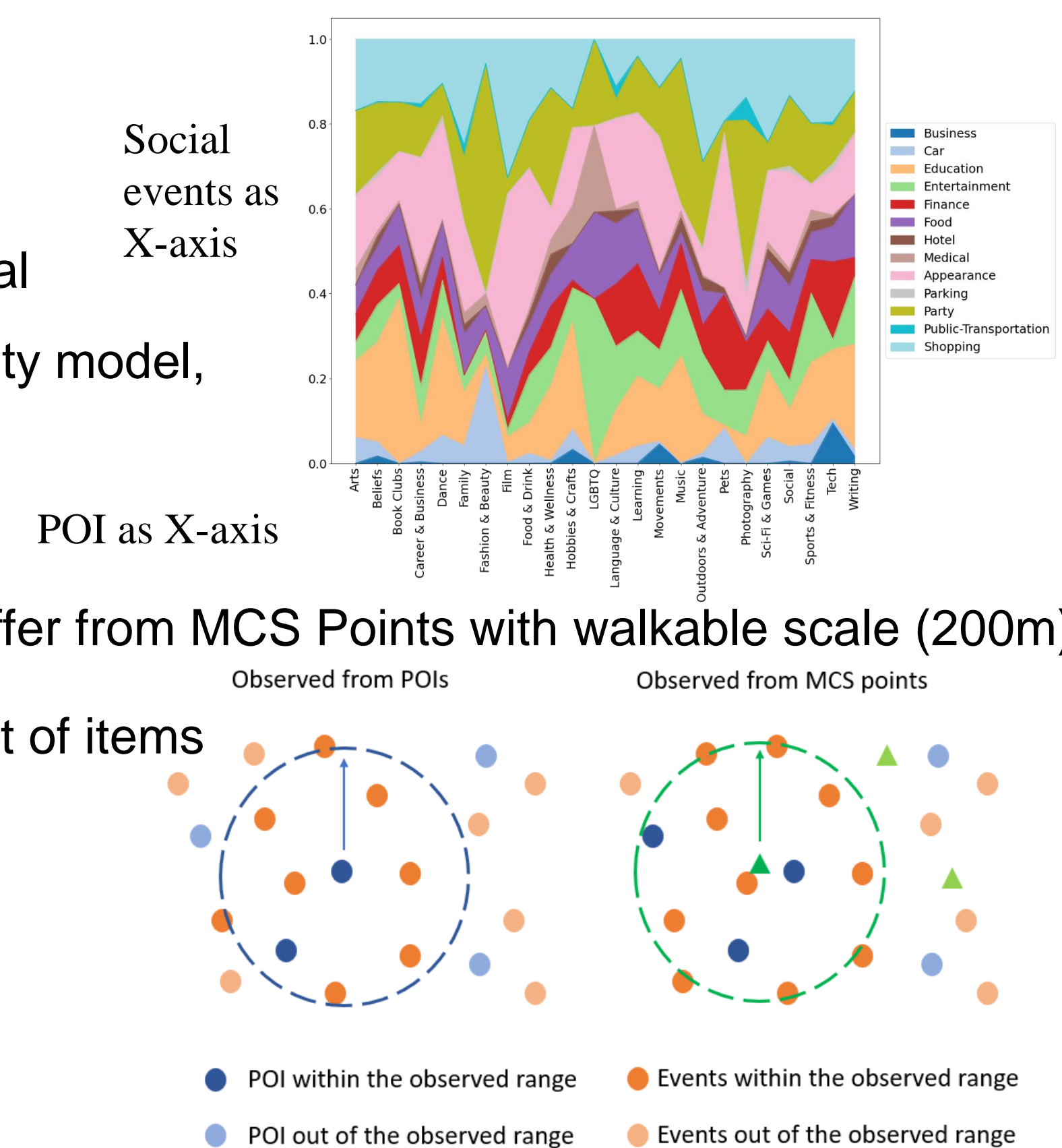


## Spatial Association Rules

- Detect **35 rules** with  
 $Support_{threshold} = 1\%$  and  
 $Confidence_{threshold} = 10\%$
- The popular Lift measure in literature suggests 29 significant among the POI and social events

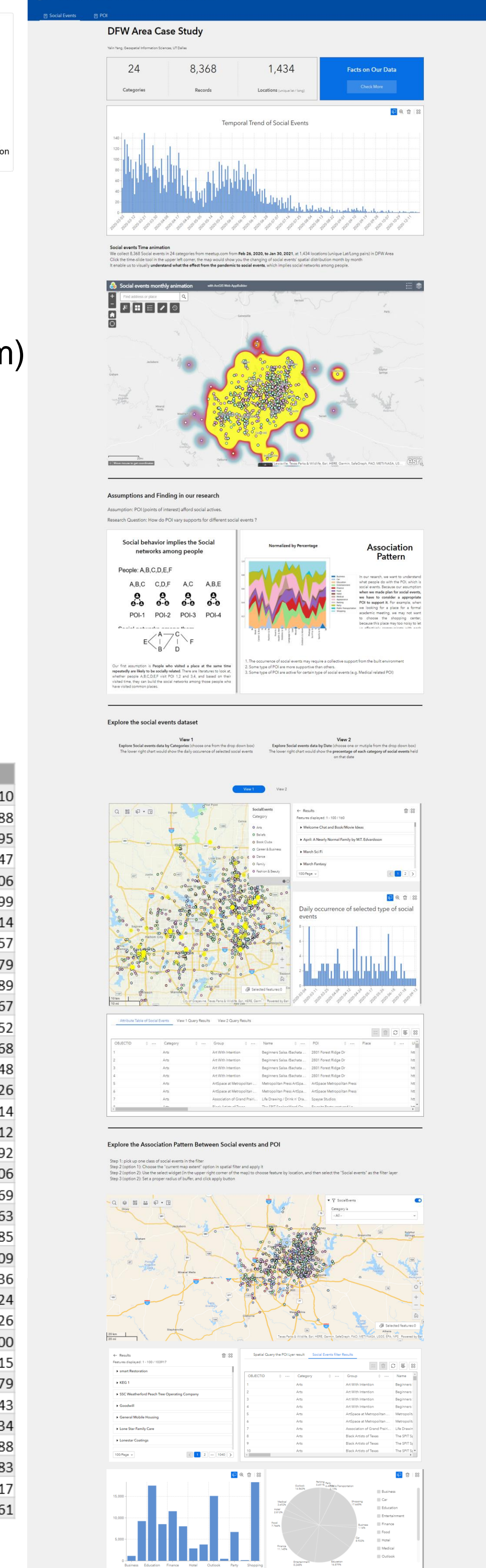


Width arrow: support (0.01-0.05)  
Color: confidence (0.1-0.22)  
lift: 1.07-3.8



lhs	Column2	rhs	support	confidence	lift	count
{Business}	=>	{Tech}	0.0131	0.2259	3.8030	80
{Finance, Party, Shopping}	=>	{Arts}	0.0105	0.1082	3.4545	118
{Appearance, Finance, Party}	=>	{Arts}	0.0114	0.1005	3.1495	95
{Education, Finance}	=>	{Learning}	0.0176	0.1061	2.932	147
{Finance, Party, Shopping}	=>	{Dance}	0.0127	0.1304	2.3718	106
{Education, Finance, Shopping}	=>	{Dance}	0.0118	0.1200	2.1830	99
{Parking}	=>	{Health&Wellness}	0.0136	0.2036	2.7007	114
{Medical}	=>	{Health&Wellness}	0.0188	0.1990	2.1212	157
{Food, Shopping}	=>	{Dance}	0.0214	0.1108	2.0162	179
{Entertainment}	=>	{Dance}	0.0345	0.1105	2.0104	289
{Hotel}	=>	{Health&Wellness}	0.0200	0.1813	1.9329	167
{Appearance, Finance}	=>	{Dance}	0.0182	0.1059	1.9269	152
{Hotel}	=>	{Career&Business}	0.0201	0.1824	1.8962	168
{Education, Party}	=>	{Dance}	0.0177	0.1027	1.8684	148
{Car}	=>	{Dance}	0.0151	0.1021	1.8575	126
{Appearance, Party, Shopping}	=>	{Social}	0.0136	0.1019	1.8216	114
{Appearance, Party, Shopping}	=>	{Dance}	0.0184	0.1001	1.8094	112
{Education, Finance, Party}	=>	{Tech}	0.0110	0.1059	1.8725	92
{Car}	=>	{Health&Wellness}	0.0246	0.1669	1.7975	206
{Party}	=>	{Health&Wellness}	0.0441	0.1538	1.6399	369
{Food}	=>	{Sci-Fi&Games}	0.0314	0.1227	1.4755	263
{Appearance}	=>	{Career&Business}	0.0460	0.1247	1.2960	385
{Education, Shopping}	=>	{Sci-Fi&Games}	0.0250	0.1065	1.2801	209
{Car}	=>	{Beliefs}	0.0163	0.102	1.2651	136
{Education}	=>	{Health&Wellness}	0.0507	0.1186	1.2646	424
{Car}	=>	{Sci-Fi&Games}	0.0151	0.1021	1.2276	126
{Entertainment}	=>	{Health&Wellness}	0.0359	0.1147	1.2220	300
{Finance}	=>	{Career&Business}	0.0376	0.1174	1.2209	315
{Party}	=>	{Career&Business}	0.0333	0.1163	1.2089	279
{Food}	=>	{Career&Business}	0.0290	0.1134	1.1972	243
{Food}	=>	{Health&Wellness}	0.0280	0.1092	1.1640	234
{Entertainment}	=>	{Career&Business}	0.0344	0.1101	1.1448	288
{Finance}	=>	{Health&Wellness}	0.0338	0.1054	1.1120	283
{Appearance}	=>	{Health&Wellness}	0.0379	0.1027	1.0934	317
{Shopping}	=>	{Career&Business}	0.0431	0.1035	1.0762	361

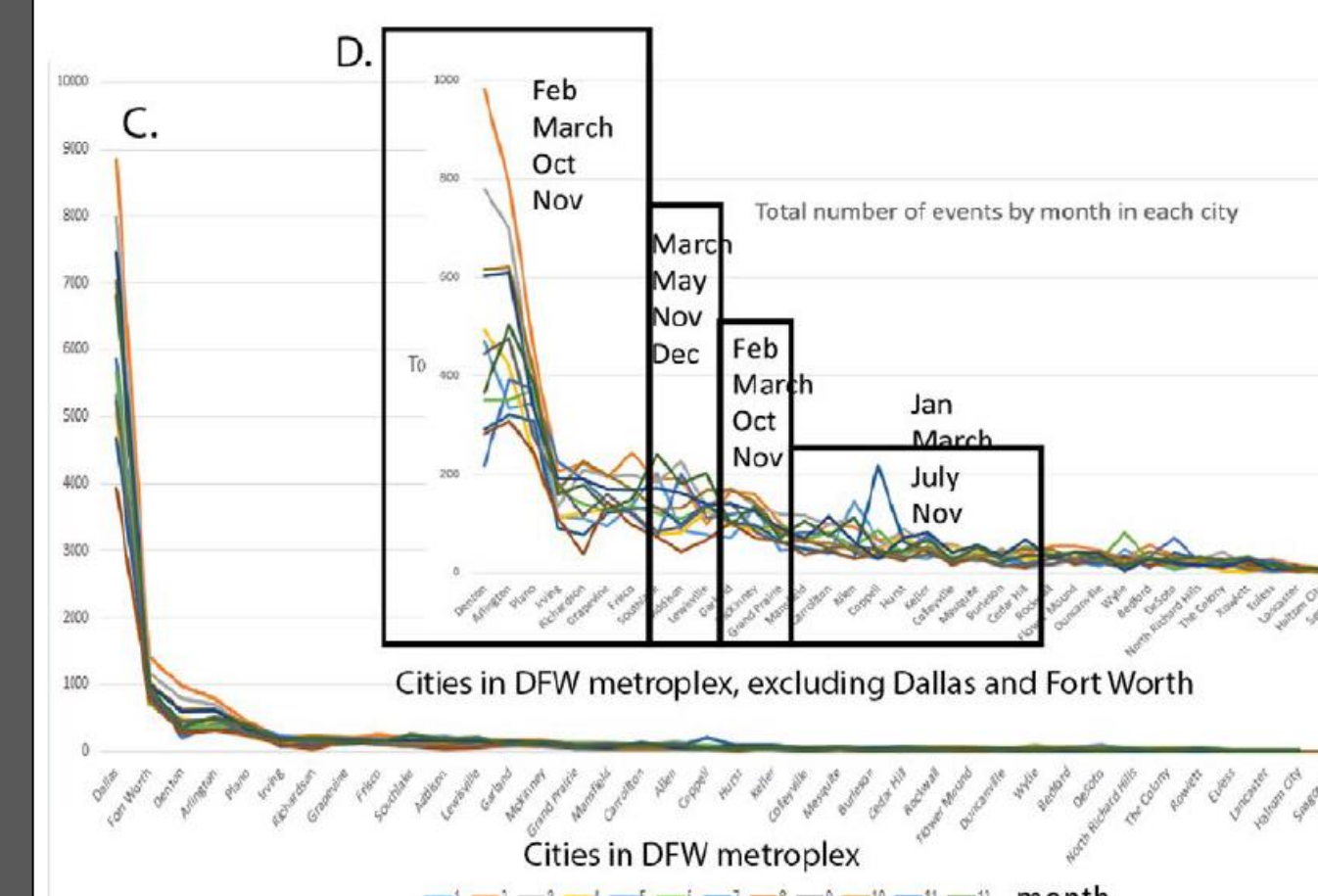
## Web app Interface



## Future Work



Safegraph Building footprints (June 2020). Aggregated POI footprints to buildings: 55,846 buildings had POIs. POIs in August 2020 appeared in 51,893 buildings. Meetup events were within 730 buildings.



- Temporal trends of social events
- 25,000 social events data for over 2 years (2020-now)
- Address the impact from pandemic to local social networks

## Conclusions

- Distinctive association patterns between different types of social events and POI
- Food, shopping and party related POI actively contribute to the occurrence of social events.
- Pandemic and related policy have dramatically altered the distribution of social events, which implies the local social networks among participants

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