

### Madrid vs Barcelona, Which is Better?





### **Outline**

- 1. Data Source and Initial Graphing
- 2. Centrality Measures
- 3. Community Detection
- 4. Insights & Analysis



### Data Source and Initial Graphing



### **Data Source**

In our analysis, we've used two data sets:

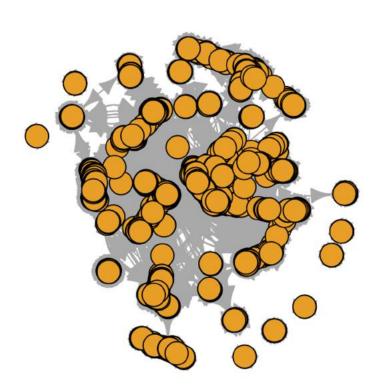
### Routes

 Last updated in 2014, contains information of source and destination airports, airlines...etc.

### Airports

 Last updated in 2017, contains information about latitude, longitude of the airport, the country and city where the airport locates, time zones... etc.

Both are from openflights.org



### **Initial Graphing**

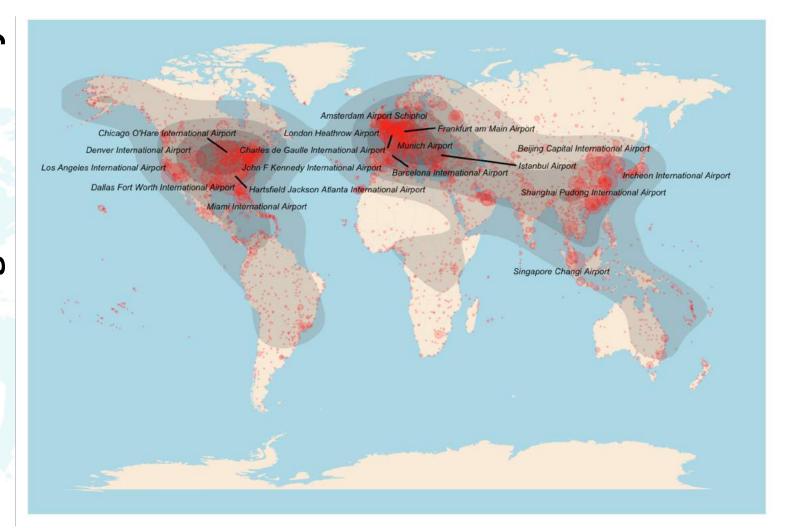
Characteristic of the graph:

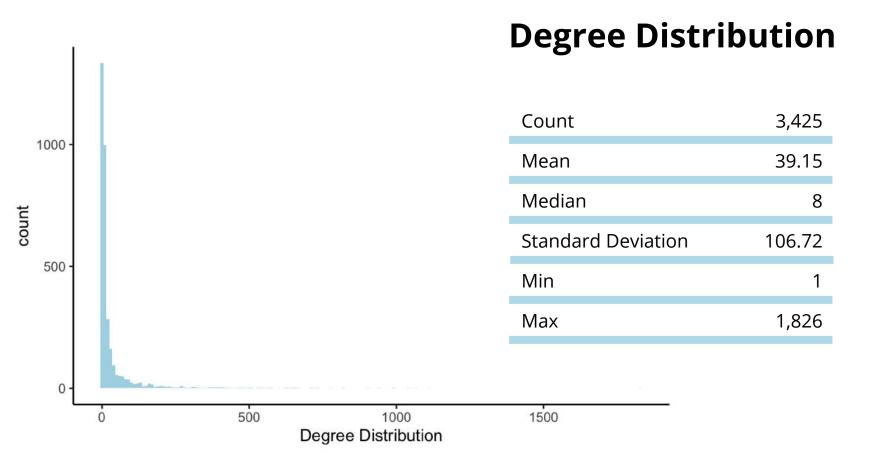
- 67,663 edges
- 3,425 vertexes
- Directed graph
- Weighted

### **Centrality Measures**



# Centralit

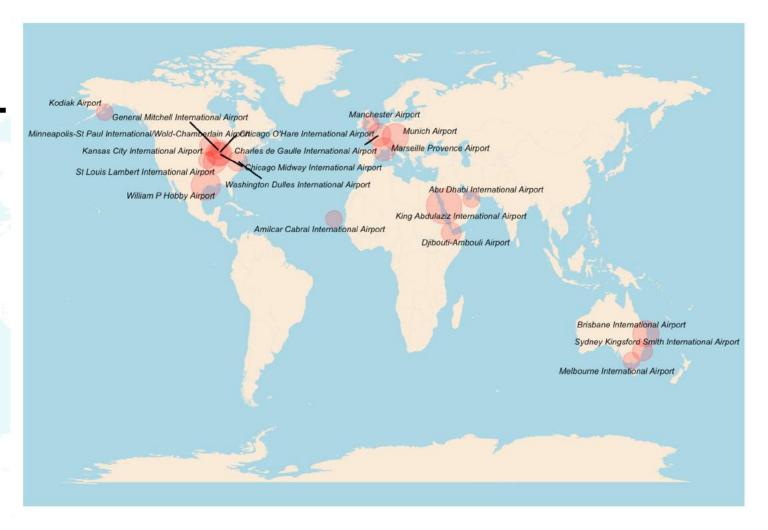




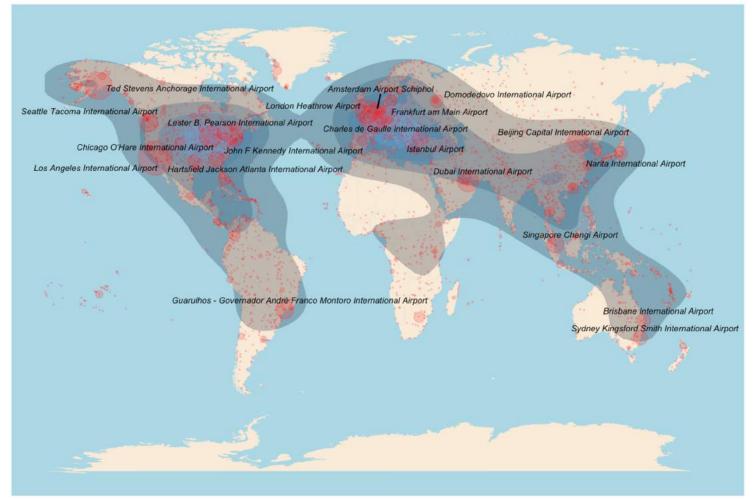
### London City Airport Halifax / Stanfield International Airport Denver International Airport Lyon Saint-Exupéry Airport Toulouse-Blagnac Airport Abraham Linsoln Capital Airport Portland International Jetport Airport Eleftherios Venizelos International Airport McCarran International Airport Palma De Mallorca Airport Yeager Airport Lamaca International Airport Los Angeles International Airport Humberto Delgado Airport (Lisbon Portela Airport) Phoenix Sky Harbor International Airport Prince Mohammad Bin Abdulaziz Airport Addis Ababa Bole International Airport Rabil Airport Robert Gabriel Mugabe International Airport Auckland International Airport

### Most Incoming ∆irports

### Most Outgoing Airports

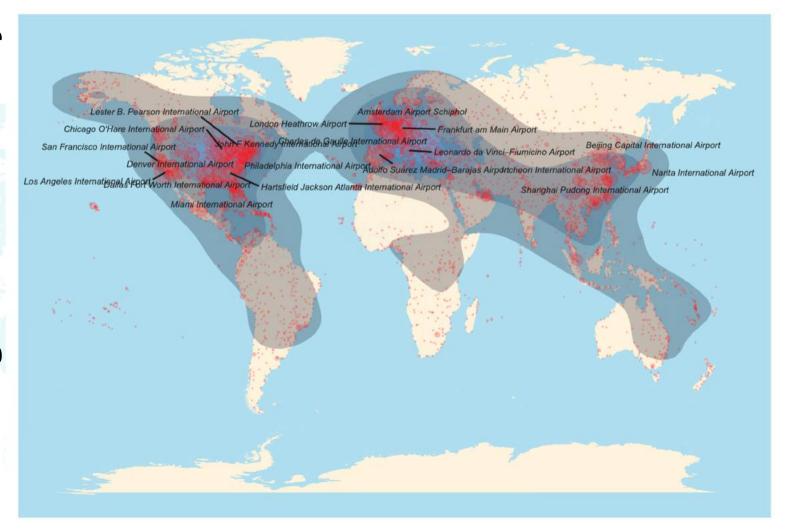


# **Setweenness**Centrality



### Amsterdam Airport Schiphol Vancouver Harbour Water Aerodrome London Heathrow Airport - Frankfurt am Main Airport Victoria Harbour Seaplane Base Lopez Island Airport Lester B. Pearson International Arport Munich Airport Beijing Capital International Airport Chicago O'Hare International Airport Charles de Gaulle International Airport Istanbul Airport Los Angeles International Airport John F Kenned International Airport John F Kenned International Airport Narita International Airport **Dubai International Airport** Newark Liberty International Airport Ovda International Airport Hamad International Airport

### Centr Eigenvect

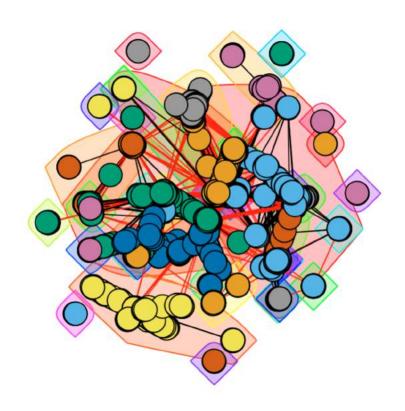


### **Community Detection**



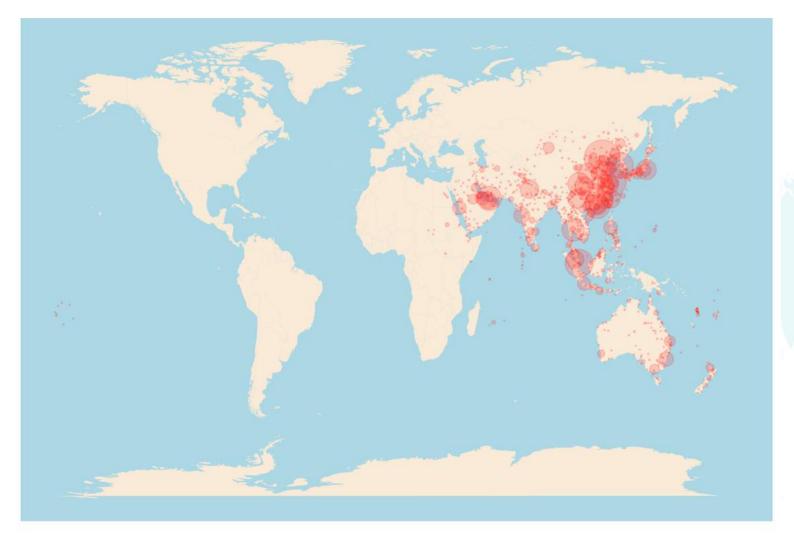
### **Community Detection**

- Method
  - Fastgreedy
    - Computationally economic
  - Simplify Graph
  - Remove Direction
- Result
  - o 49 communities
  - The biggest communities in terms of size are community 1, 2, 3 and 4



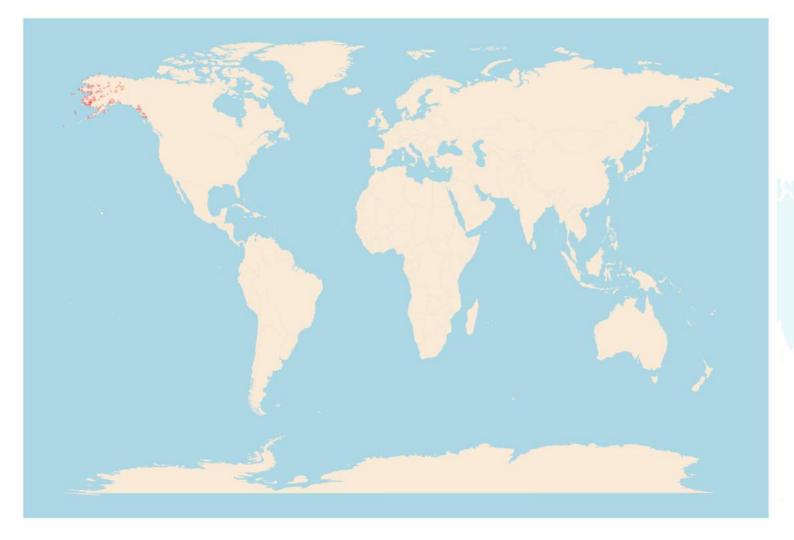
# Community

## **Community 2**



# M Community

## **Community 4**



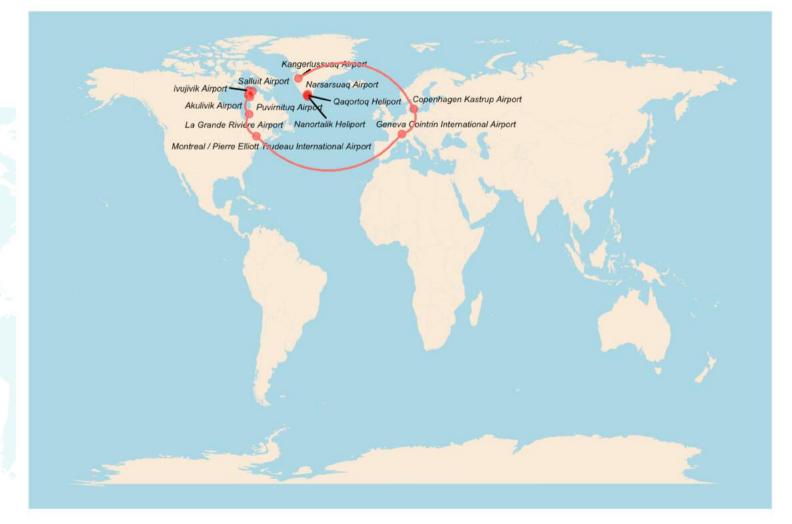
### Insights and Analysis



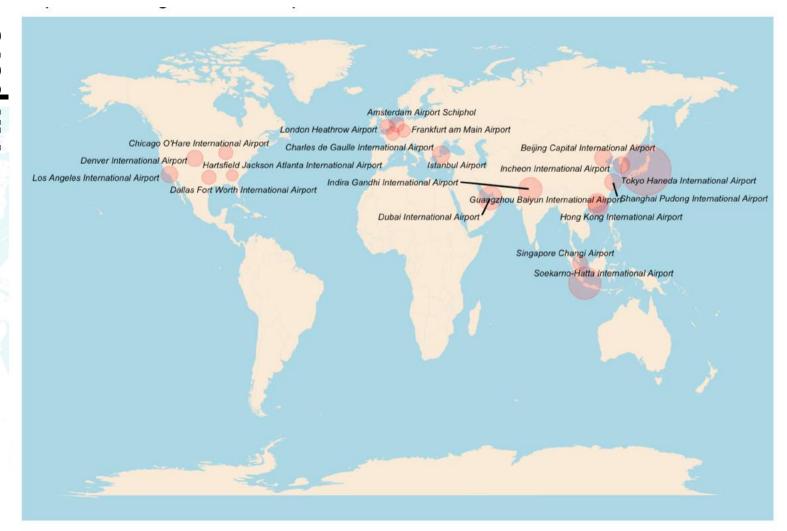
### Where are they flying from and to?

Rank	From	То	No. of Routes	R	a
1	US	US	10,518		9
2	China	China	6,877		10
3	Brazil	Brazil	1,195		11
4	Canada	Canada	1,167		12
5	India	India	1,057		13
6	Russia	Russia	964		14
7	Australia	Australia	776		15
8	Japan	Japan	623		16

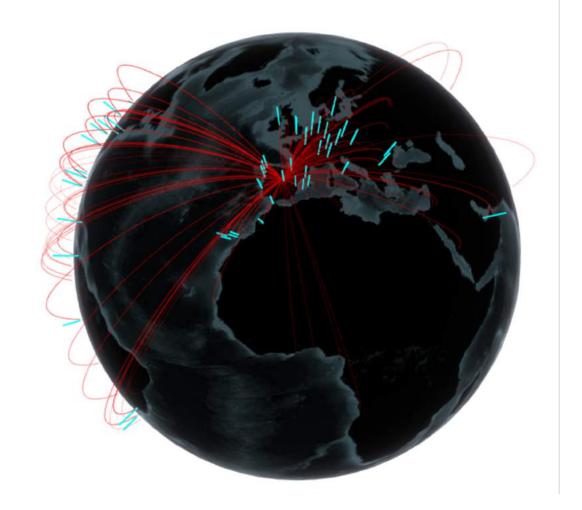
Rank	From	То	No. of Routes
9	Indonesia	Indonesia	611
10	Spain	Spain	579
11	Mexico	Mexico	577
12	UK	Spain	518
13	Spain	UK	512
14	France	France	483
15	Italy	Italy	425
16	Mexico	US	373



# Passel



### **Zoom in to Madrid**





### **Thank You**

And Hope We Could All Travel Soon Again!