

CSE 6242 Activity 5

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Introduction

We will use the `igraph` package to visualize the graph data set.

The name of the Graph data is “Road networks” taken from the Stanford Large Network Dataset Collection. Specifically we will be analyzing the “California road network” (<http://snap.stanford.edu/data/roadNet-CA.html>). In this graph dataset, intersections and endpoints are represented by nodes and the roads connecting these intersections are represented by undirected edges.

Exploring The Graph Dataset

```
# Activity 3: http://cse6242.gatech.edu/fall-2017/ac5/
# To create zip file: zip ac5.zip ac5.Rmd ac5.pdf
require(igraph)

## Loading required package: igraph
## Warning: package 'igraph' was built under R version 3.4.3
##
## Attaching package: 'igraph'
## The following objects are masked from 'package:stats':
##
##      decompose, spectrum
## The following object is masked from 'package:base':
##
##      union
require(ggplot2)

## Loading required package: ggplot2
## Warning: package 'ggplot2' was built under R version 3.4.2
#setwd("~/git/GeorgiaTech/cse6242/activity_5")
setwd("C:/Users/vla/git/GeorgiaTech/cse6242/activity_5")

ca_road_net <- read.table("roadNet-CA.txt")
ca_road_net <- graph.data.frame(ca_road_net)

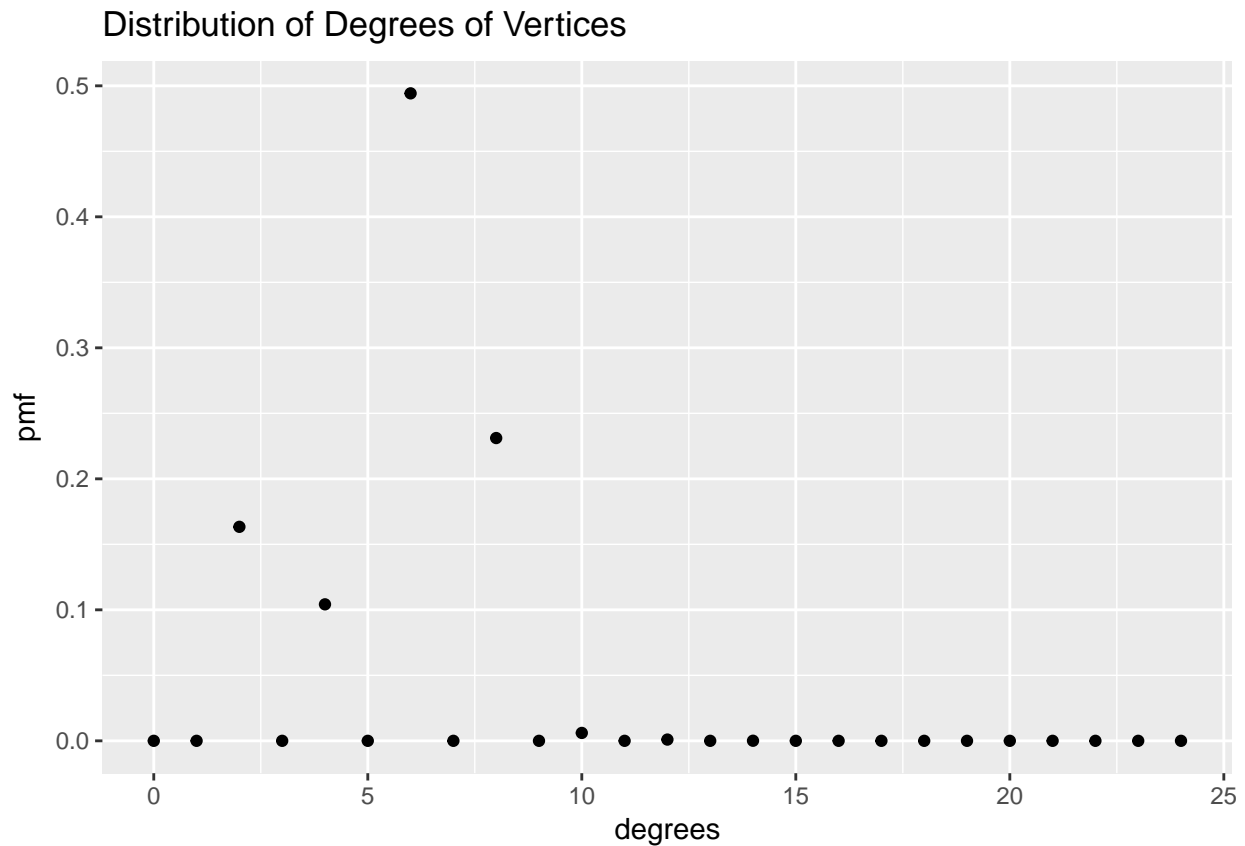
# Number of edges
num_edges = ecount(ca_road_net)
num_vertices = vcount(ca_road_net)

# Looking at distribution of Degrees of Vertices
# Degree Distribution starts at 0 degrees
```

```

max_degree = length(degree_distribution(ca_road_net)) - 1
degrees = 0:max_degree
distribution_df = data.frame(degrees=degrees, pmf=degree_distribution(ca_road_net))
ggplot(distribution_df, aes(x=degrees, y=pmf)) +
  geom_point() +
  ggtitle('Distribution of Degrees of Vertices')

```



```
print(degree_distribution)
```

```

## function (graph, cumulative = FALSE, ...)
## {
##   if (!is_igraph(graph)) {
##     stop("Not a graph object")
##   }
##   cs <- degree(graph, ...)
##   hi <- hist(cs, -1:max(cs), plot = FALSE)$density
##   if (!cumulative) {
##     res <- hi
##   }
##   else {
##     res <- rev(cumsum(rev(hi)))
##   }
##   res
## }
## <environment: namespace:igraph>

```

We plot the distribution of degrees of vertices above. Notice that the modal (and median in this case) degrees

is 6, which is interesting.

Visualizing a part of the Graph

In the next part, we visualize a section of the graph (too big to visualize the entire thing). More specifically, we visualize the first 15 vertices. We also weight the depiction of each node by its degrees. This visualization depicts the graph of California road network. A brief description is as follows. Nodes 4 and 3 have the highest degrees in this graph with degree 4. Nodes 7 and 8 are completely unconnected from the rest.

```
induced = induced_subgraph(ca_road_net, V(ca_road_net)[[1:15]])
nodesize = degree(induced) * 5
plot(induced, vertex.size=nodesize)
```

