IS 622 Week 14 Homework

Ben Arancibia

November 28, 2015

10.5.1

Suppose graphs are generated by picking a probability p and choosing each edge independently with probability p, as in Example 10.21. For the graph of Fig. 10.20, what value of p gives the maximum likelihood of seeing that graph? What is the probability this graph is generated?

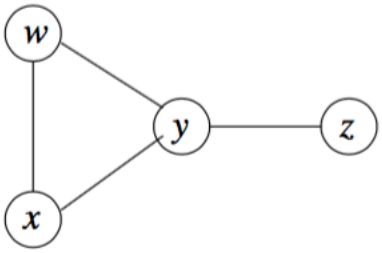

Figure 10.20: A social graph

There are 6 possible edges. The probability this graph is generated is:

$$p^4(1-p)^2$$

To find the the value of p that maximizes this you must do the derivate and solve for 0:

$$(d/dp) = p^4(1-p)^2$$

$$p^4(2(1-p)(-1)) + (1-p)^2(4p^3) = 0$$

$$2p^5 - 2p^4 + (1-2p+p^2)(4p^3) = 0$$

$$2p^5 - 2p^4 + 4p^3 - 8p^4 + 4p^5 = 0$$

$$2(3p^5 - 5p^4 + 2p^3) = 0$$

$$p^3(3p^2 - 5p + 2) = 0$$

$$p^3(3p-2)(p-1) = 0$$

$$p^3 = 0$$

,

$$(3p - 2) = 0$$

,

$$(p - 1) = 0$$

The value of p that maximizes the probability is 2/3.

$(2/3)^4(1 - 2/3)^2 = 0.02194787$

10.7.1

How many triangles are there in the graphs:

(a) Figure 10.1.

```
triangles(a)
```

```
##   Vertex 1 Vertex 2 Vertex 3
## 1        A        B        C
## 2        D        E        F
## 3        D        F        G
```

(b) Figure 10.9.

```
triangles(b)
```

```
##   Vertex 1 Vertex 2 Vertex 3
## 1        A        B        C
## 2        D        E        F
## 3        G        H        I
```

(c) Figure 10.2.

```
triangles(c)
```

```
##   Vertex 1 Vertex 2 Vertex 3
## 1       T1       U1       W1
## 2       T2       U1       W1
## 3       T2       U1       W2
## 4       T2       U2       W2
## 5       T2       U2       W3
## 6       T3       U1       W2
## 7       T3       U2       W2
## 8       T4       U2       W2
## 9       T4       U2       W3
```