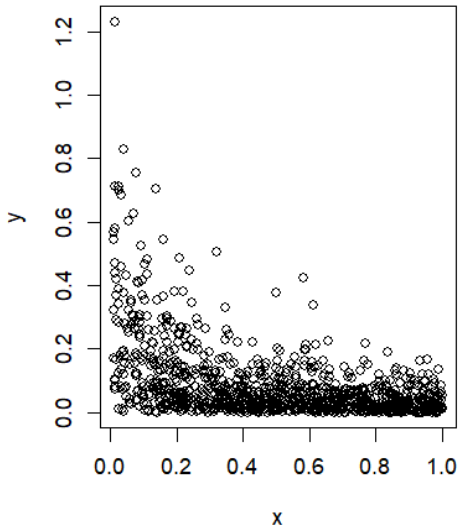
Week 10 Lab Problems

EEB 429
Bhaskar Kumawat
Submit all your answers in a single .Rmd file (along with the knitted html).

A. Link functions

1. Consider the following graph of some data. What do you think the underlying distribution of points around the mean is? Specifically, how would you figure this out? (1-2 line answer)



2. Let us assume the points are distributed with an exponential distribution. What is the link function for an exponential distribution (see table below)?

Distribution of y	$g(\mu)$	Link Function
Normal	μ	Identity
Binomial	$\ln\frac{\mu}{n-\mu}$	Logit
Gamma ($p=-1$)	μ^p	Negative inverse
Eksponensial ($p=-1$)	μ^p	Negative inverse
Geometrik	$\ln\frac{\mu-1}{\mu}$	Logit
Poisson	$\ln\mu$	Log
Binomial Negatif	$\ln\frac{k\mu}{1+k\mu}$	Logit
Inverse Gaussian ($p=-2$)	μ^p	Inverse squared

3. Now, in R, define an **inverse link function** for the **exponential distribution** that takes in a value “z” and calculates the *inverse* of the link function for this value–i.e., given an input z, it calculates (and returns) a value x such that z=link_function(x).
4. Define a linear deterministic function that takes in three inputs: x, a, and b, and returns y = a * x + b.
5. Create a vector called “x_sample” that contains a random sample of 100 values from a uniform distribution between 0 and 1 (see runif function).
6. Now, use the `rexp` function to sample 100 points from an exponential distribution with a rate parameter given by your deterministic function (with a=1, b=1) evaluated at different points in your x_sample vector.
7. Plot the values generated from the exponential distribution against x_sample on a graph.
8. On the same graph, plot the value of your deterministic function evaluated at different values in x_sample.
9. On the same graph, plot the value of the inverse link function evaluated at the value given by your deterministic function at different values in x_sample.
10. Which of the two: your deterministic function, or the link function **of** the deterministic function, resemble the expected value of your data better?

B. Using mle2 for Maximum Likelihood estimates

[Tutorial]