404 Homework 3

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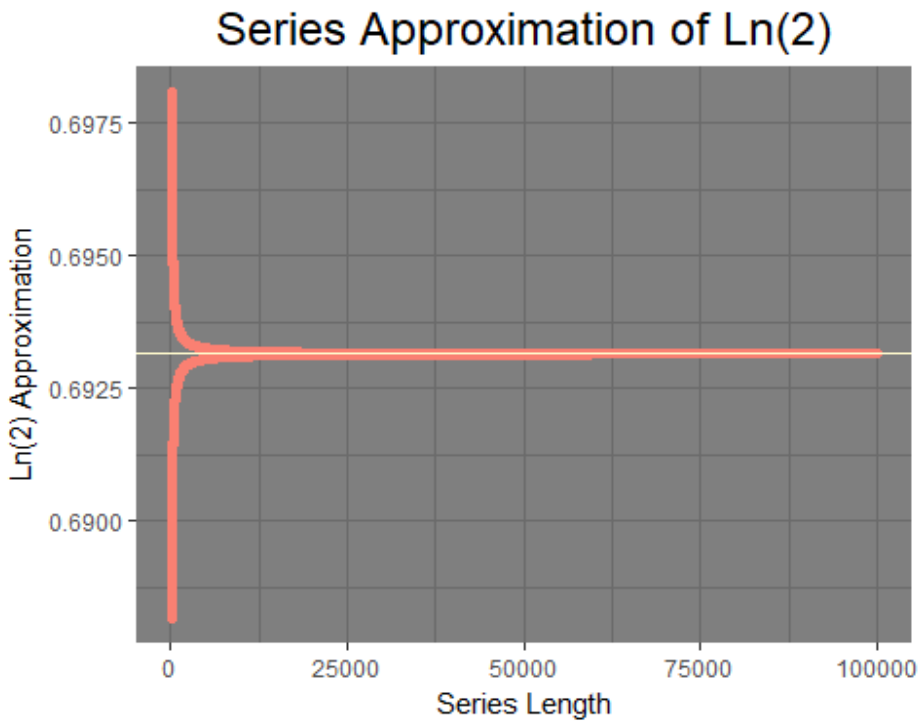
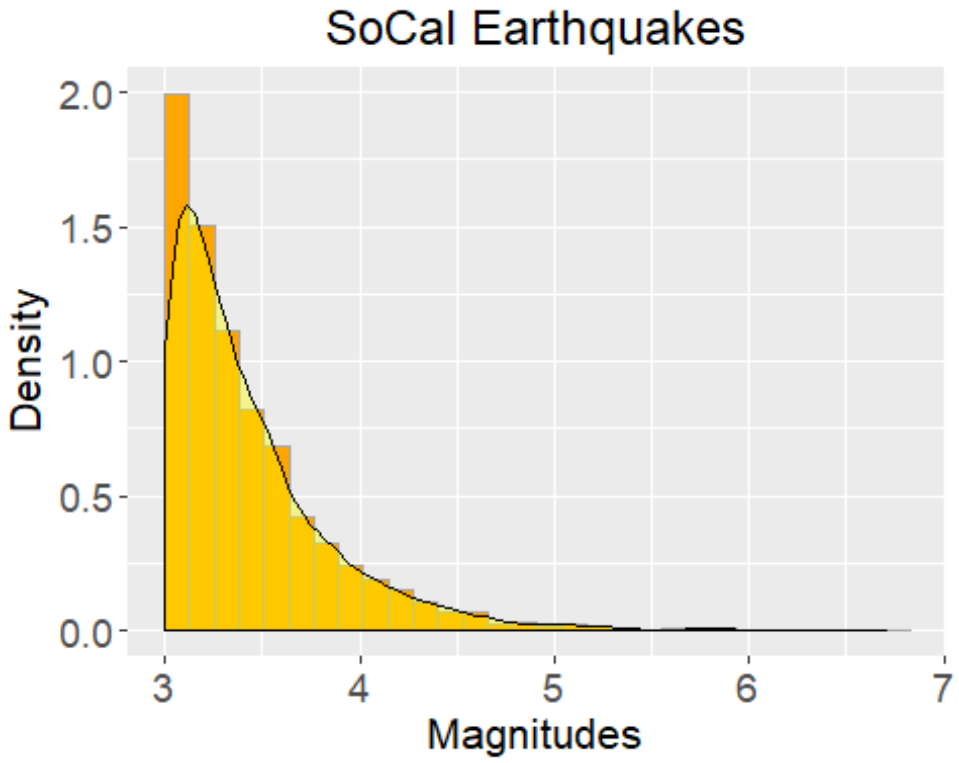
Plot 1



Plot 2



C Code Part 1

```
#include <R.h>

#include <Rmath.h>


void alt2(int *n, double *x){
        int i;
        x[0] = 1.0;
        for(i = 1; i < *n; i++) {
                x[i] = x[i-1] + (pow(-1.0,i)*(1.0/(i+1.0)));
        }
}
```

R Code Part 1

```
setwd("~/C")
library(ggplot2)
```

```
## Warning: package 'ggplot2' was built under R version 3.4.3

dyn.load("alt2.dll")
estimate_vector <- double(1000000)
ln_2_est <- .C("alt2", as.integer(1000000), double(1000000))

#I just picked an arbitrary number for the length.out argument for x and y so
they are equal
plot(x=seq(0,10000000,length.out = 10),y= seq(.691,.695,length.out = 10),
type="n", xlab= "Series Length", ylab = "Ln(2) Estimate")
points(ln_2_est[[2]], pch = ".")
abline(log(2), 0, col="red")
```

```
#ggplot alternative
ln2_data <- as.data.frame(ln_2_est[[2]])
ln2_data <- as.data.frame(cbind(c(100:100000),ln2_data[c(100:100000),]))
ln2_plot <- ggplot(data = ln2_data, aes(ln2_data[,1], ln2_data[,2]))
ln2_plot + geom_point(color= "salmon") +geom_abline(slope = 0, intercept =
log(2), color = "lemonchiffon") + xlab("Series Length") + ylab("Ln(2)
Approximation") + ggtitle("Series Approximation of Ln(2)") + theme_dark()+
theme(plot.title = element_text(hjust = 0.5, size = 18))
```

Part 2

C Code

```
#include <R.h>

#include <Rmath.h>

void norm_kern(int *m, int *n, double *b, double *g, double *x, double *y)

{

        int i,j;

        double a;

        for(i=0; i< *m; i++){

                a=0.0;

        for(j=0; j< *n; j++){

                a += dnorm((g[i] - x[j]) / *b, 0, 1, 0) / (*b * *n);

        }
```

```
        y[i] = a;
        }
}
```

R Code

```
Earthquakes_3 <- read.table("C:/Users/paulb/Downloads/SearchResults.txt",
skip = 2, nrows = 2471)
Earthquake_headers <- c("YYYY/MM/DD", "HH:mm:SS.ss", "ET", "GT", "MAG",
"M","LAT","LON","DEPTH", "Q",  "EVID", "NPH", "NGRM")
names(Earthquakes_3) <- Earthquake_headers
head(Earthquakes_3)

##   YYYY/MM/DD HH:mm:SS.ss ET GT  MAG M      LAT       LON DEPTH Q    EVID
## 1 1960/01/18 21:00:42.65 eq  l 3.37 l 34.92967 -118.8118   4.6 B 3351635
## 2 1960/02/21 17:02:50.16 eq  l 3.20 l 35.35067 -118.5637   6.0 C 3351194
## 3 1960/02/22 10:54:10.29 eq  l 3.02 l 35.36700 -118.5442   6.0 C 3351195
## 4 1960/02/25 01:39:48.26 eq  l 3.00 l 35.38050 -118.6817   6.0 C 3351200
## 5 1960/02/26 12:58:41.24 eq  l 3.32 l 35.33050 -118.6135   6.0 C 3351201
## 6 1960/02/28 02:55:33.78 eq  l 3.09 l 34.33700 -119.8323   8.0 B 3351203
##   NPH NGRM
## 1  19    0
## 2  20    0
## 3  19    0
## 4  22    0
## 5  23    0
## 6  17    0

#I am going to write these variables in the form
description_cFunctionLocation for my own future reference
magnitudes_x <- Earthquakes_3$MAG
grid_g <- seq(min(magnitudes_x), max(magnitudes_x), length.out = 100)
kernalStorage_y <- rep(0,100)
m <- 100
n <- length(magnitudes_x)
bandwidth_b <- bw.nrd(magnitudes_x)

setwd("~/C")
dyn.load("norm_kern.dll")
approx_mag <- .C("norm_kern", as.integer(m), as.integer(n),
as.double(bandwidth_b), as.double(grid_g), as.double(magnitudes_x),
as.double(kernalStorage_y))
hist(magnitudes_x,nclass = 50, probability = T)
lines(grid_g, approx_mag[[6]], col= "blue")


#ggplot alternative

library(ggplot2)
```

```
mag_data <- as.data.frame(magnitudes_x)
kern_data <- as.data.frame(cbind(grid_g,approx_mag[[6]]))
quake_plot <- ggplot()
quake_plot + geom_histogram(data= mag_data, aes(x = magnitudes_x,
y=..density..),bins = 30, col = "dark grey", fill = "orange") +
geom_area(data = kern_data, aes(x=grid_g, y=kern_data$V2), color="black",
fill= "yellow", alpha = .4)+
xlab("Magnitudes")+ylab("Density")+ggtitle("SoCal Earthquakes") +
theme(plot.title = element_text(hjust = 0.5, size = 18),
axis.title.x = element_text(size = 16),
axis.title.y = element_text(size = 16),
axis.text.y=element_text(size = 14),
axis.text.x=element_text(size = 14))
```