GFLOP Testing with DGEMM Benchmark

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HPCC DGEMM Testing

HPC Challenge DGEMM measures the floating point rate of execution of double precision real matrix-matrix multiplication. We modified this benchmark suite to allow user based fixed-size matrices, as well as the ability to decide the amount of times the benchmark is tested. This repetition allows us to reduce the amount of noise that smaller matrix-matrix multiplication would create in terms of GFLOPS.

DGEMM GFLOPS vs Size of Matrices

```r
library(ggplot2)

GflopFile<- read.table("C://Users/Ohad/Documents/RFiles/Rinput.txt",
                    header=TRUE, sep=",", dec=".")
p1<-ggplot(GflopFile, aes(x=factor(N), y=GFLOPS))+
        geom_boxplot(alpha=.2)+
        geom_jitter()
p1+xlab("Matrix Size")+ylab("GFLOP/S")
```
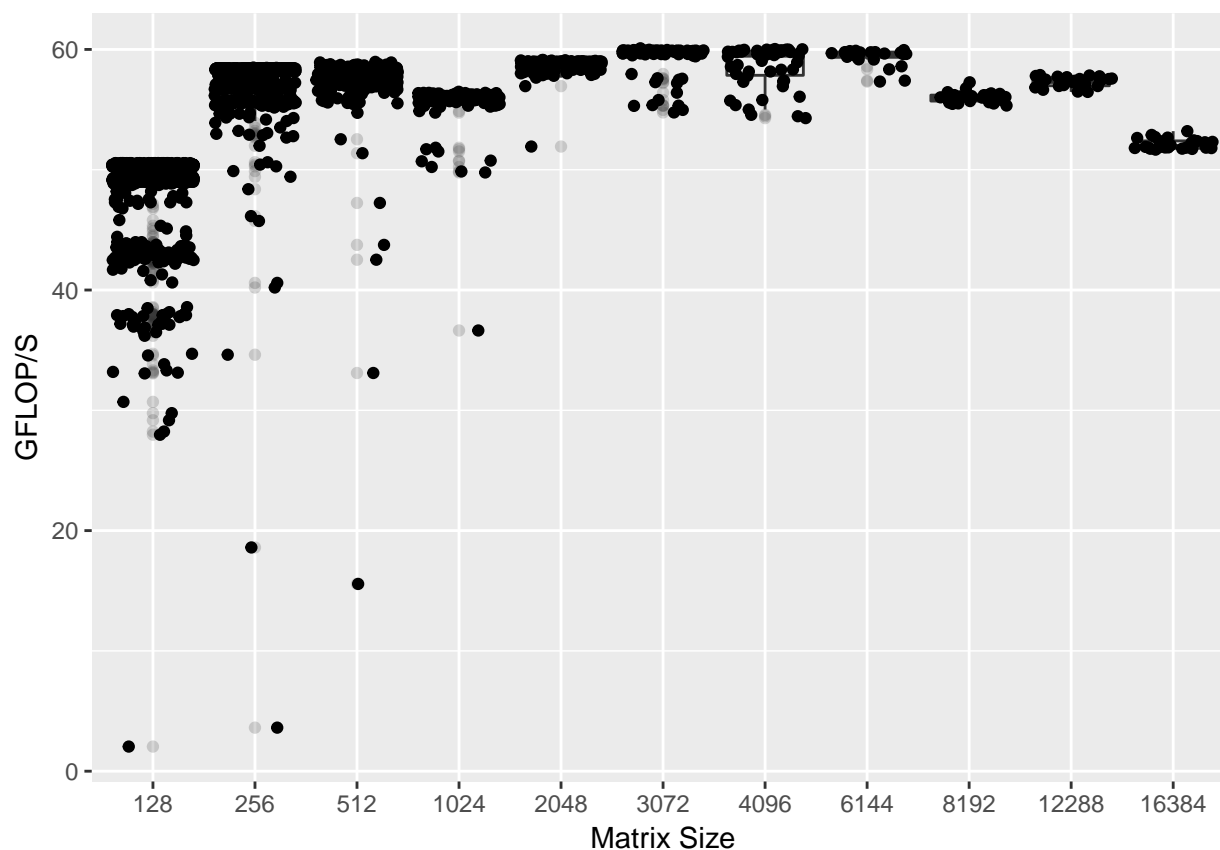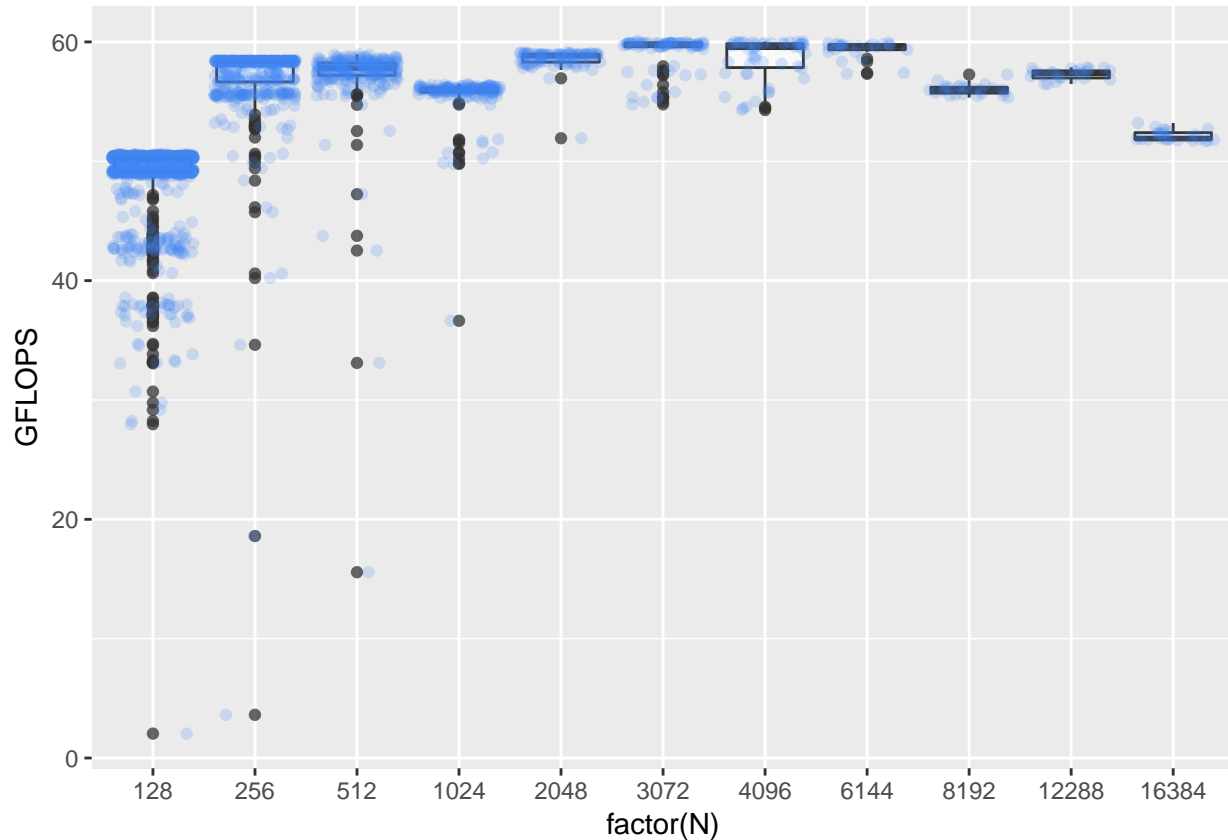
```
library(ggplot2)

NonOptimizedDGEMM<- read.table("C://Users/Ohad/Documents/RFiles/Rinput.txt",
                    header=TRUE, sep=",", dec=".")

Plot2<-ggplot(NonOptimizedDGEMM, aes(x=factor(N), y=GFLOPS))+
        geom_boxplot (position="identity", alpha = .75 )+
        geom_jitter(color="#4286f4", alpha=.2)+
        scale_fill_brewer(palette = "Dark2")
Plot2
```


What we noticed is that the amount of outliers is significantly lower with higher matrices. We can deduce that increasing the repetition of the smaller matrices will squeeze those outliers closer to the aformentioned median.

GFLOP VS MATRIX SIZE SERIAL

```
library(ggplot2)

GflopFile<- read.table("C://Users/Ohad/Documents/RFiles/RinputS.txt",
                    header=TRUE, sep=",", dec=".")
p1<-ggplot(GflopFile, aes(x=factor(N), y=GFLOPS))+
        geom_boxplot()+
        geom_jitter(alpha=.2)
p1+xlab("Matrix Size")+ylab("GFLOP/S")
```
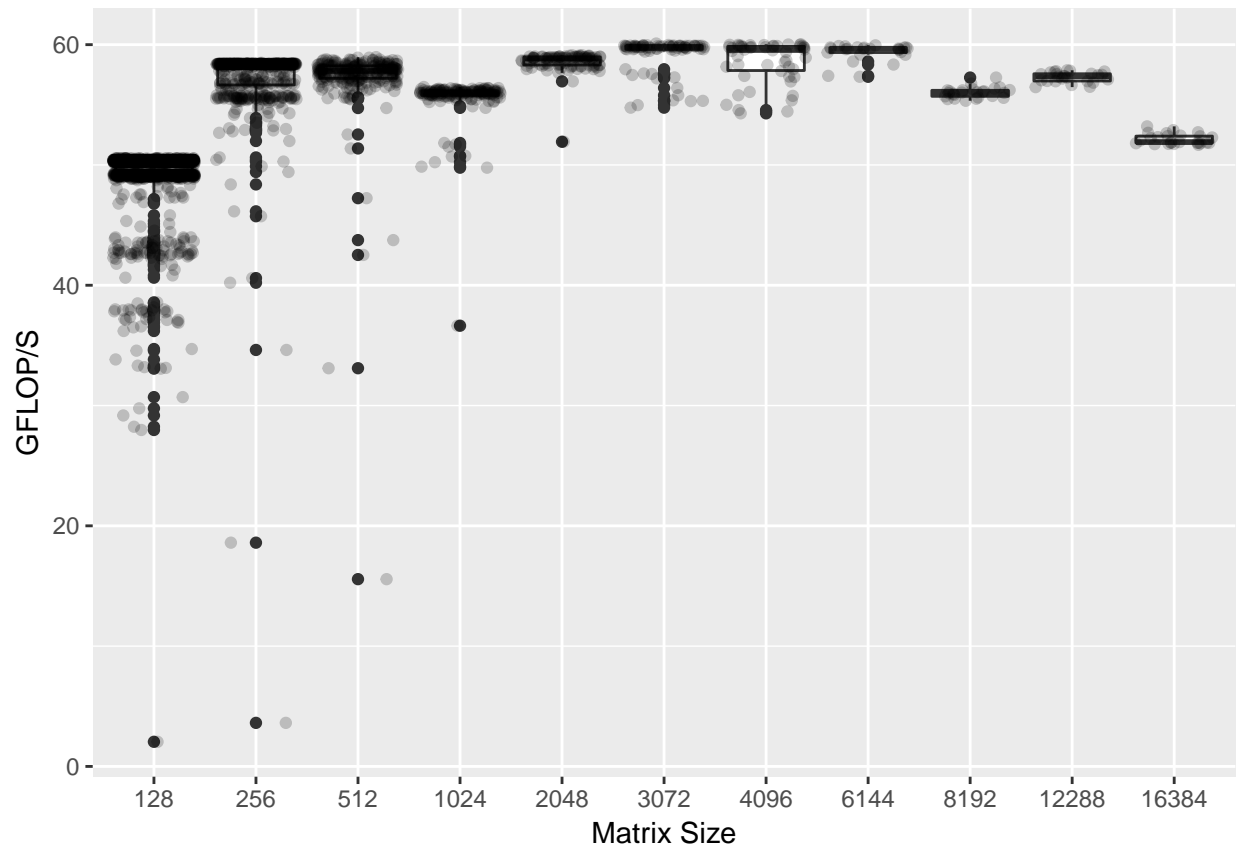
GFLOP VS MATRIX SIZE TOTALLY PARALLEL

```r
library(ggplot2)

GflopFile<- read.table("C://Users/Ohad/Documents/RFiles/RinputTP.txt",
                        header=TRUE, sep=",", dec=".")
p1<-ggplot(GflopFile, aes(x=factor(N), y=GFLOPS))+
        geom_boxplot(color="darkblue")+
        geom_jitter(alpha=.2, color="#41bef4")
p1+xlab("Matrix Size")+ylab("GFLOP/S")
```
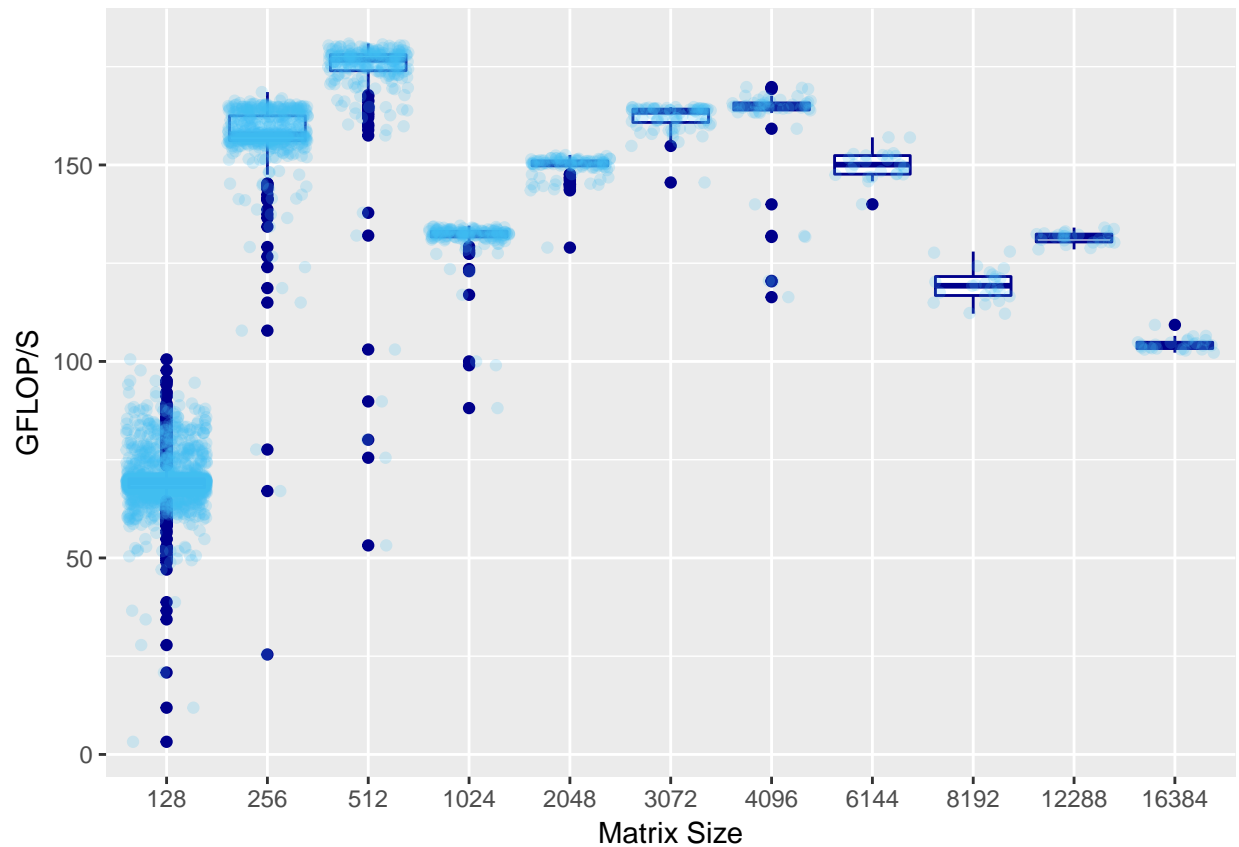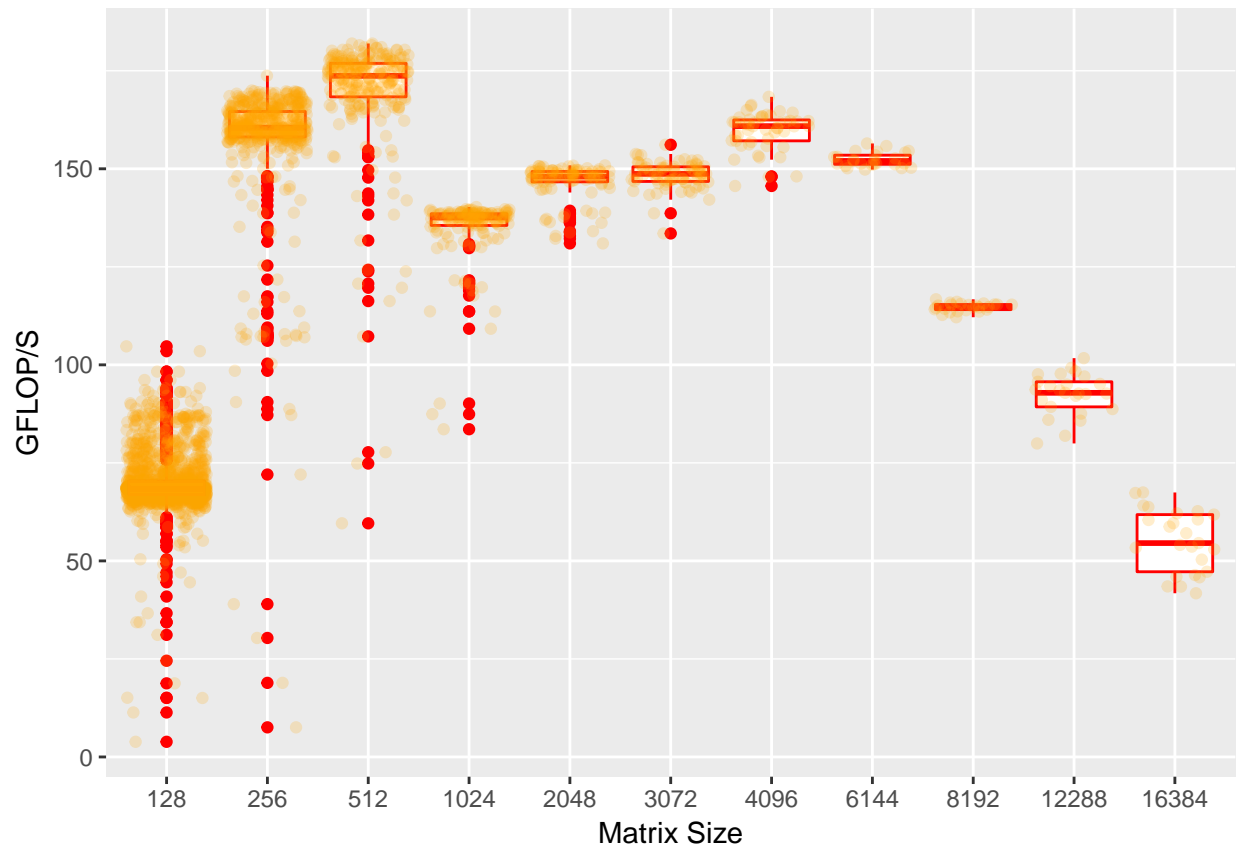
8 Threads Totally Parallel

```r
library(ggplot2)
TotallyParallel8<-read.table("C://Users/Ohad/Documents/RFiles/RinputTP8threads.txt",
                    header=TRUE, sep=",", dec=".")


p1<-ggplot(TotallyParallel8, aes(factor(N), GFLOPS))+
        geom_boxplot(color="red")+
        geom_jitter(color="orange", alpha=.2)

p1 + xlab("Matrix Size")+ylab("GFLOP/S")
```
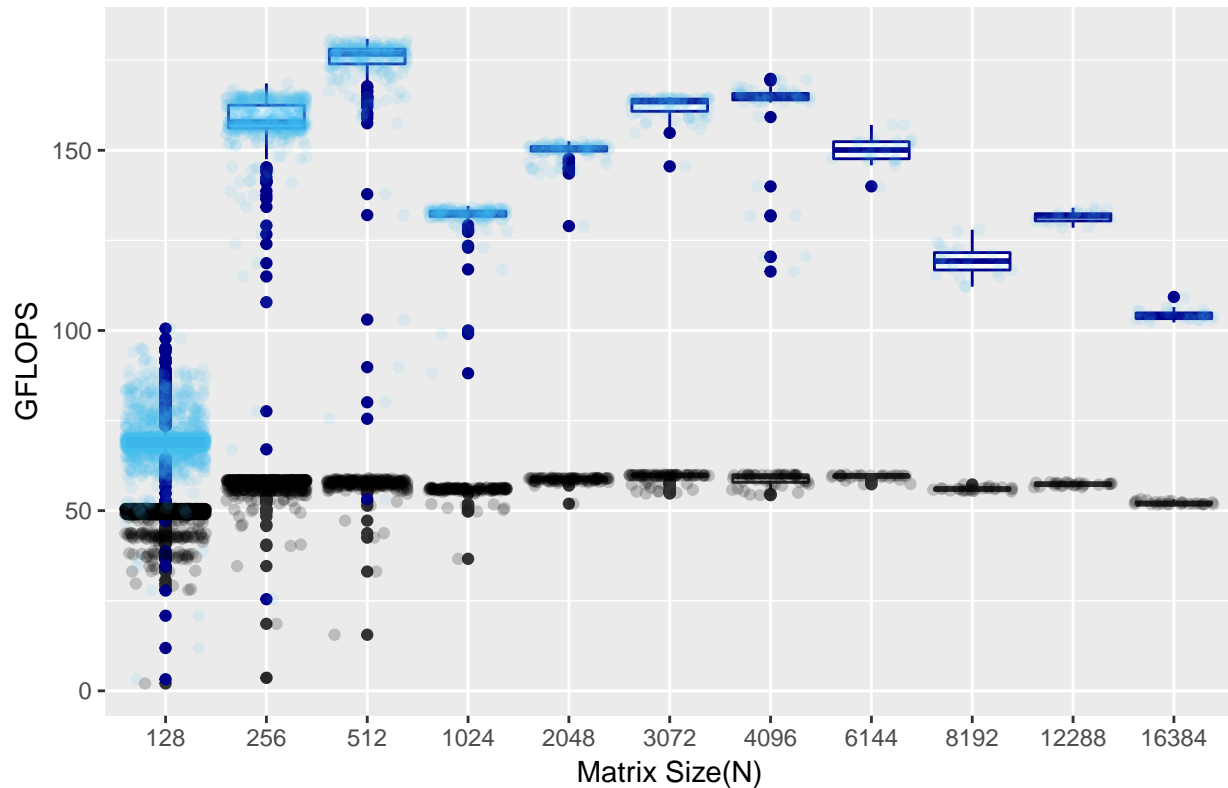
Overlap

```r
library(ggplot2)

Serial<- read.table("C://Users/Ohad/Documents/RFiles/RinputS.txt",
                     header=TRUE, sep=",", dec=".")

TotallyParallel<-read.table("C://Users/Ohad/Documents/RFiles/RinputTP.txt",
                     header=TRUE, sep=",", dec=".")


p1<-ggplot(Serial, aes(factor(N), GFLOPS))+
          geom_boxplot()+
          geom_boxplot(data=TotallyParallel, color="darkblue")+
          geom_jitter(alpha=.2)+
          geom_jitter(data=TotallyParallel, alpha=.1, color="#41bef4")+
          theme(plot.title=element_text(size=15,
                                        face="bold",
                                        color="dodgerblue",
                                        hjust=.5,
                                        lineheight=1.2))
p1+labs(title="GFLOP vs N Sized Matrix: Serial vs Totally Parallel",
        x="Matrix Size(N)",
        y="GFLOPS")
```

GFLOP vs N Sized Matrix: Serial vs Totally Parallel

Overlap with 8 Threads

```r
library(ggplot2)

Serial<- read.table("C://Users/Ohad/Documents/RFiles/RinputS.txt",
                    header=TRUE, sep=",", dec=".")

TotallyParallel<-read.table("C://Users/Ohad/Documents/RFiles/RinputTP.txt",
                    header=TRUE, sep=",", dec=".")

Parallel8threads<-read.table("C://Users/Ohad/Documents/RFiles/RinputTP8threads.txt",
                    header=TRUE, sep=",", dec=".")

p1<-ggplot(Serial, aes(factor(N), GFLOPS))+
        geom_boxplot(data=Serial,outlier.shape = NA)+
        geom_jitter(data=Serial, alpha=.2)+
        geom_boxplot(data=TotallyParallel, color="darkblue",outlier.shape=NA)+
        geom_jitter(data=TotallyParallel, alpha=.2, color="#41bef4")+
        geom_boxplot(data=Parallel8threads, color="red",outlier.shape=NA, alpha=.1)+
        geom_jitter(data=Parallel8threads, alpha=.2, color="orange")+
        theme(plot.title=element_text(size=12,
                                    face="bold",
                                    color="dodgerblue",
                                    hjust=.5,
```

```
                                        lineheight=1.2))+
            theme(legend.position = )
p1+scale_color_manual("", breaks=c("Serial", "Totally Parallel", "Parallel 8 Threads"),values= c("black"
    labs(title="GFLOP vs N Sized Matrix: Serial vs Totally Parallel (4 and 8 threads)",
        x="Matrix Size(N)",
        y="GFLOPS")
```

GFLOP vs N Sized Matrix: Serial vs Totally Parallel (4 and 8 threads)