Operational Statistics for SAR Image Report

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1 load required files and packages

```
source("myread.ENVI.R")
source("imagematrix.R")
require(ggplot2)
require(reshape2)
require(ggthemes)
require(maxLik)
```

2 sample forest region from image

```
imagepath <- "../Statistics-SAR-Intensity-master/Data/Images/ESAR/"
HH_Complex <- myread.ENVI(paste(imagepath, "ESAR97HH.DAT", sep = ""),
paste(imagepath, "ESAR97HH.hdr", sep = ""))
HH_Intensity <- (Mod(HH_Complex))^2
example <- HH_Intensity[1300:1400,2280:2480]
vec_example <- data.frame(HH=as.vector(example))
plot(imagematrix(equalize(example)))
imagematrixPNG(name = "./forest.png", imagematrix(equalize(example)))
vec_example <- data.frame(HH=as.vector(example))
summary(vec_example)

        HH
Min.    :      0.91
1st Qu.:   2743.85
Median :   6678.06
Mean    :  10278.44
3rd Qu.:  13632.24
Max.    :276306.28
```
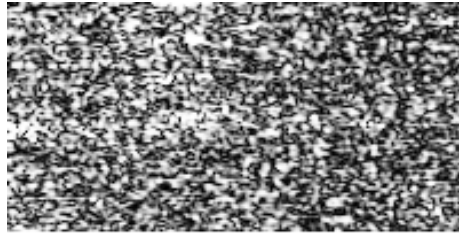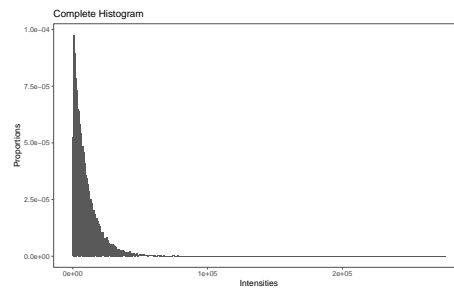
Figure 1: Forest Region

Figure 2: HistogramExample

3 Histogram

```
binwidth_complete <- 2*IQR(vec_example$HH)*length(vec_example$HH)^(-1/3)
ggplot(data=vec_example, aes(x=HH)) +
geom_histogram(aes(y=..density..),
binwidth = binwidth_complete) +
xlab("Intensities") +
ylab("Proportions") +
ggtitle("Complete Histogram") +
theme_few()
ggsave(filename = "./HistogramExample.pdf")
```

4 LogLikelihood

```
LogLikelihoodLknown <- function(params) {

p_alpha <- -abs(params[1])
p_gamma <- abs(params[2])
p_L <- abs(params[3])

n <- length(z)
```

```
return (
n*(lgamma(p_L-p_alpha) - p_alpha*log(p_gamma) - lgamma(-p_alpha)) +
(p_alpha-p_L)*sum(log(p_gamma + z*p_L))
)
}
```

5 Estimation

```
z <- vec_example$HH

estim.exampleML <- maxNR(LogLikelihoodLknown,
start=c(estim.example$alpha, estim.example$gamma,1),
activePar=c(TRUE,TRUE,FALSE))$estimate[1:2]
> estim.exampleML
[1]     -3.141452 23517.332553
```

results all above