

# Operational Statistics for SAR Imagery Report

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## 1 sample Image

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```
> imagepath <- "../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[1500:1599,1500:1599]
> vexample <- data.frame(HH=as.vector(example))
> summary(vexample)
      HH
Min.   :      5
1st Qu.: 49397
Median : 139494
Mean    : 486161
3rd Qu.: 382280
Max.    :34400251
> plot(imagematrix(equalize(example))) (figure.a)
```

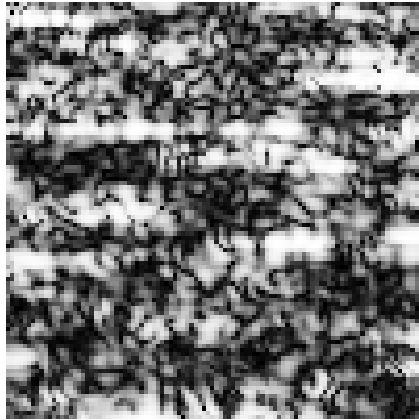
---

## 2 Histogram

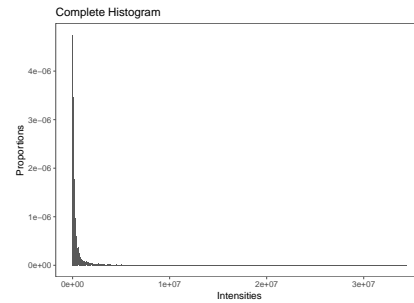
---

```
> ggplot(data=vexample, aes(x=HH)) +
+   geom_histogram(aes(y=..density..),
+   binwidth = binwidth_complete) +
+   xlab(" Intensities") +
+   ylab(" Proportions") +
+   ggtitle(" HistogramExample") +
+   theme_few()
```

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(a) example.



(b) HistogramExample.

## 3 Estimation

### 3.1 analogy

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```
> GI0.Estimator.mlm2 <- function(z, L) {
+   m1 <- mean(z)
+   m2 <- mean(z^2)
+   m212 <- m2/m1^2
+
+   a <- -2 - (L+1) / (L * m212)
+   g <- m1 * (2 + (L+1) / (L * m212))
+
+   return(list("alpha"=a, "gamma"=g))
+ }
```

---

```
> estim.example <- GI0.Estimator.mlm2(example, 1)
> estim.example
$alpha
[1] -2.223224

$gamma
[1] 1080845
```

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### 3.2 Likelihood

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```
> 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))
+   )
+ }

```

---

```

> estim.exampleML <- maxNR(LogLikelihoodKnown ,
+                           start=c(estim.example$alpha ,
+                                   estim.example$gamma,1) ,
+                           activePar=c(TRUE,TRUE,FALSE))$estimate[1:2]
> estim.exampleML
[1] -3.866783e+00  1.080319e+06

```

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