

## LISTA 05 – ANÁLISE DOS DADOS DIÁRIOS SOBRE A COVID19

PEAM - PROBABILIDADE E ESTATÍSTICA PARA APRENDIZADO DE MÁQUINA

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# Considerações Iniciais

## DATASETS:

020-PIAUI

021-ALAGOAS

## PROCEDIMENTOS:

1. LEITURA DO DATASET

2. ESTATÍSTICAS PRELIMINARES

3. DEFINIÇÃO DO WORKSET

- REMOÇÃO DOS OUTLIERS E DADOS INVÁLIDOS

4. DEFINIÇÃO DAS FAIXAS DE VALORES

5. PROCESSAMENTO ESTATÍSTICO

- HISTOGRAMA E BOX PLOT

- MLE

- PLOT PROBABILITY

- TESTE KOLMOGOROV-SMIRNOV

\* VERIFICA SE OS DADOS PODEM SER REPRESENTADOS PELAS DISTRIBUIÇÕES:  
EXPONÊNCIAL, NORMAL, LOG-NORMAL E WEIBULL

# Considerações Iniciais

## **BIBLIOTECA: LIBPEAM.py**

Com o objetivo de fixar os processos estatísticos apresentados em aula, foi desenvolvido a biblioteca LIBPEAM, implementada em Python, com as funções estatísticas necessárias para a resolução dos problemas da lista de exercícios.

## **RECURSOS:**

1. READDATA(): LEITURA DO DATASET PARA UMA LISTA (DESPREZANDO O CABEÇALHO)
2. QTD(), SOMA(), MIN(), MAX(), MEDIA(), VAR(), STD()
3. OUTLIERS(), WORKSET(), LISTA\_FREQ()
4. FUNÇÕES:
  - Geométrica e Exponencial (definição interna)
  - Normal (importada da biblioteca "statistics")
  - Beta, F e Chi-Square (importadas da biblioteca: "scipy")
5. CÁLCULO DO VALOR DE "X" EM FUNÇÃO DA ÁREA (p-value)
  - F e Chi-Square
6. CÁLCULO DOS PARÂMETROS - MLE
  - Geométrica, Beta, Exponencial e Normal
7. IMPLEMENTAÇÃO DOS TESTES
  - One-Way ANOVA
  - Chi-Square
  - Kolmogorov-Smirnov
8. FUNÇÕES PARA APRESENTAÇÃO GRÁFICA
  - \* implementadas com a biblioteca "matplotlib"

# **DADOS DO PIAUI**

## **Casos Novos - COVID-19**

# Estatísticas Preliminares

## Piauí - Casos Novos - COVID-19

### DADOS DE ENTRADA:

N: 193.0  
SOMA: 95227.0  
MEDIA: 493.4041  
STD: 459.4956  
VAR: 211136.1786  
MIN: 0.0  
MAX: 1907.0  
Z: 3.0 (confianca = 99.73%)  
LIMITES: [ -885.0826 , 1871.8909 ]  
OUTLIERS: [ ["2020-09-03 00:00:00", 1907.0] ]

### DADOS DE TRABALHO (S/OUTLIERS):

N: 192.0  
SOMA: 93320.0  
MEDIA: 486.0417  
STD: 449.1927  
VAR: 201774.0712  
MIN: 0.0  
MAX: 1637.0  
Z: 3.0 (confianca = 99.73%)  
LIMITES: [ 0.0 , 1833.6197 ]

### DISTRIBUIÇÃO DOS DADOS

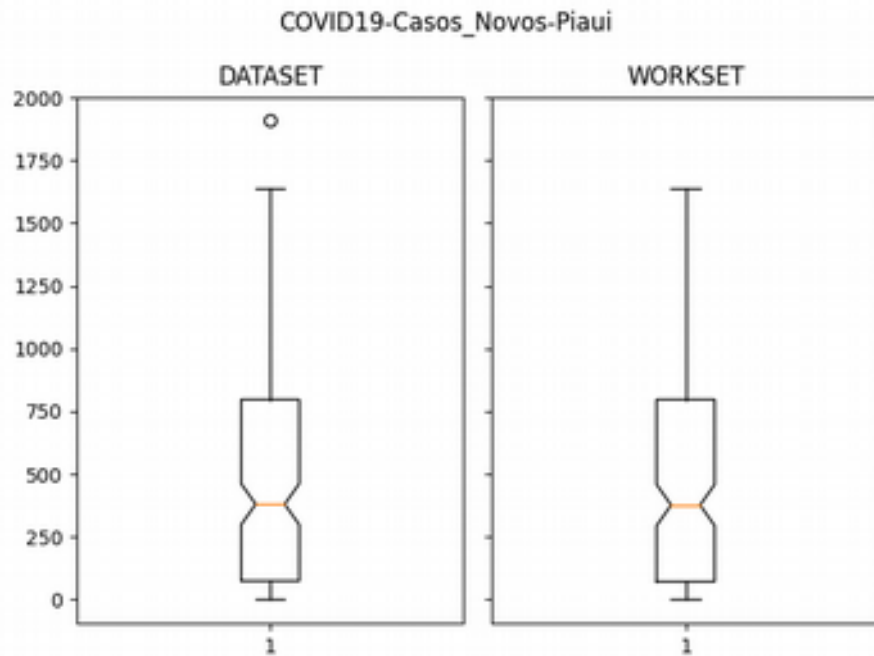
**N. FAIXAS-calculado: 8** (Equação Fornecida em Aula)

**N. FAIXAS-usado: 25**

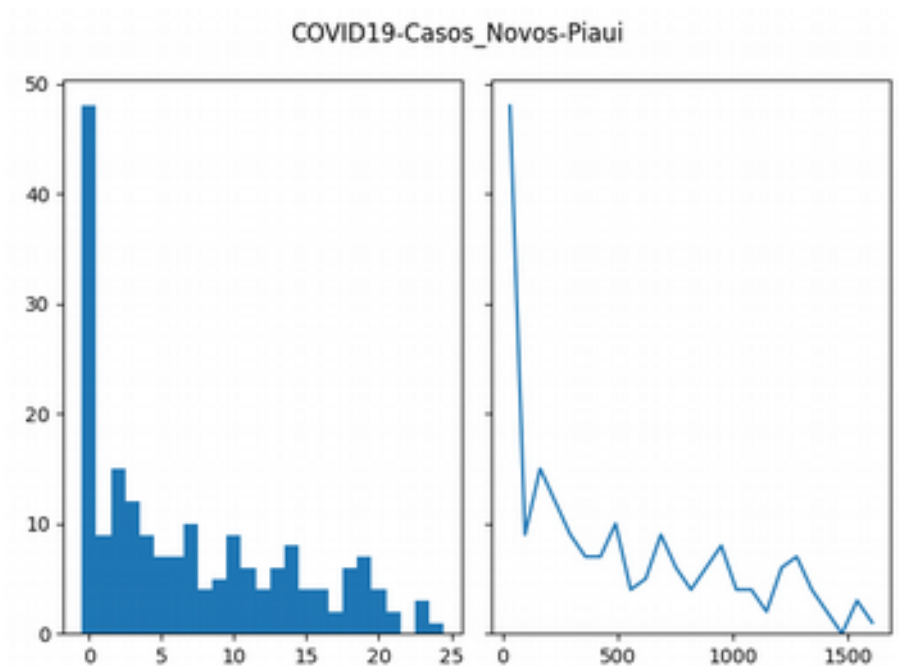
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Faixa: 2	Limites: [ 130.96 , 196.44 ]	Freq: 15.0	P[X]: 7.8125
Faixa: 3	Limites: [ 196.44 , 261.92 ]	Freq: 12.0	P[X]: 6.25
Faixa: 4	Limites: [ 261.92 , 327.4 ]	Freq: 9.0	P[X]: 4.6875
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Faixa: 6	Limites: [ 392.88 , 458.36 ]	Freq: 7.0	P[X]: 3.6458
Faixa: 7	Limites: [ 458.36 , 523.84 ]	Freq: 10.0	P[X]: 5.2083
Faixa: 8	Limites: [ 523.84 , 589.32 ]	Freq: 4.0	P[X]: 2.0833
Faixa: 9	Limites: [ 589.32 , 654.8 ]	Freq: 5.0	P[X]: 2.6042
Faixa: 10	Limites: [ 654.8 , 720.28 ]	Freq: 9.0	P[X]: 4.6875
Faixa: 11	Limites: [ 720.28 , 785.76 ]	Freq: 6.0	P[X]: 3.125
Faixa: 12	Limites: [ 785.76 , 851.24 ]	Freq: 4.0	P[X]: 2.0833
Faixa: 13	Limites: [ 851.24 , 916.72 ]	Freq: 6.0	P[X]: 3.125
Faixa: 14	Limites: [ 916.72 , 982.2 ]	Freq: 8.0	P[X]: 4.1667
Faixa: 15	Limites: [ 982.2 , 1047.68 ]	Freq: 4.0	P[X]: 2.0833
Faixa: 16	Limites: [ 1047.68 , 1113.16 ]	Freq: 4.0	P[X]: 2.0833
Faixa: 17	Limites: [ 1113.16 , 1178.64 ]	Freq: 2.0	P[X]: 1.0417
Faixa: 18	Limites: [ 1178.64 , 1244.12 ]	Freq: 6.0	P[X]: 3.125
Faixa: 19	Limites: [ 1244.12 , 1309.6 ]	Freq: 7.0	P[X]: 3.6458
Faixa: 20	Limites: [ 1309.6 , 1375.08 ]	Freq: 4.0	P[X]: 2.0833
Faixa: 21	Limites: [ 1375.08 , 1440.56 ]	Freq: 2.0	P[X]: 1.0417
Faixa: 22	Limites: [ 1440.56 , 1506.04 ]	Freq: 0.0	P[X]: 0.0
Faixa: 23	Limites: [ 1506.04 , 1571.52 ]	Freq: 3.0	P[X]: 1.5625
Faixa: 24	Limites: [ 1571.52 , 1637.0 ]	Freq: 1.0	P[X]: 0.5208

# Estatísticas Preliminares

## Piauí – Casos Novos - COVID-19



**BOX PLOT**



**HISTOGRAMA**

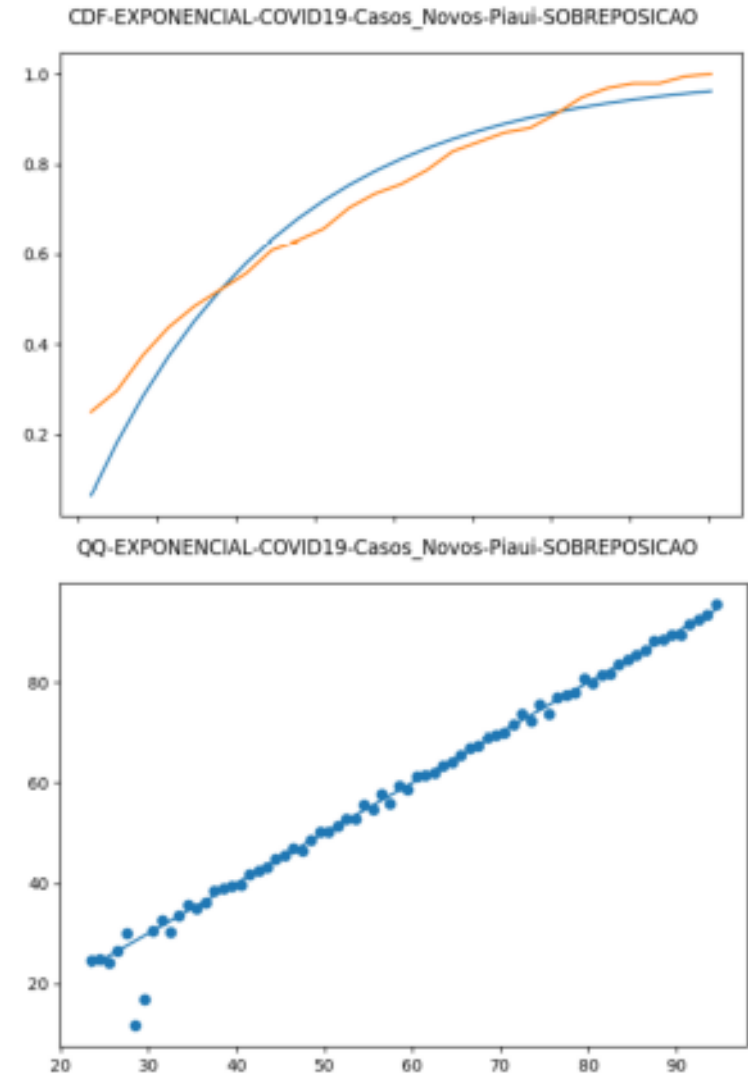
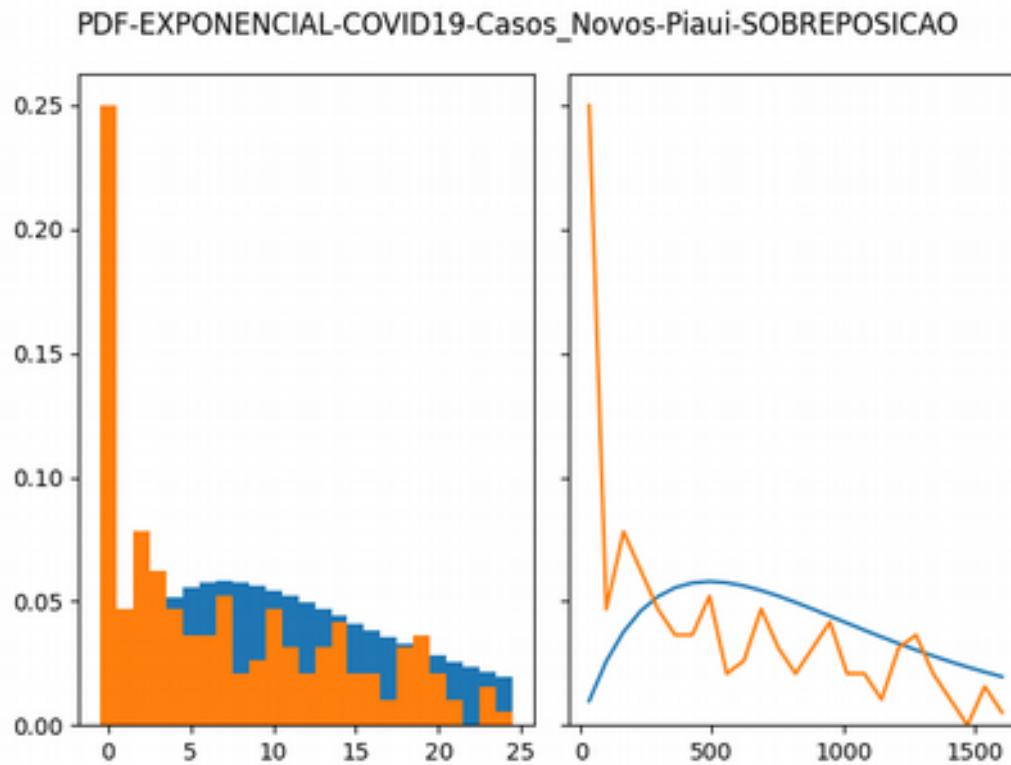
# EXPONENCIAL - MLE + PDF + CDF + QQ-PLOT

## Piauí - Casos Novos - COVID-19

### MLE - DISTRIBUICAO EXPONENCIAL:

C1: 0.15762260479835266

LAMBDA: 0.002037660205727268



# NORMAL - MLE + PDF + CDF + QQ-PLOT

## Piauí – Casos Novos - COVID-19

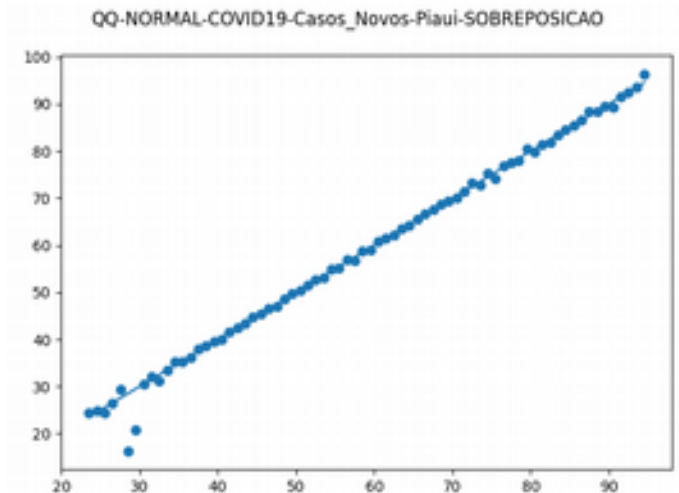
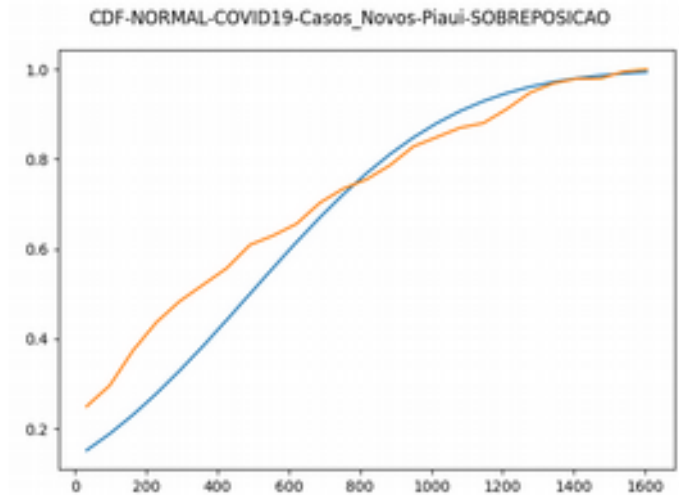
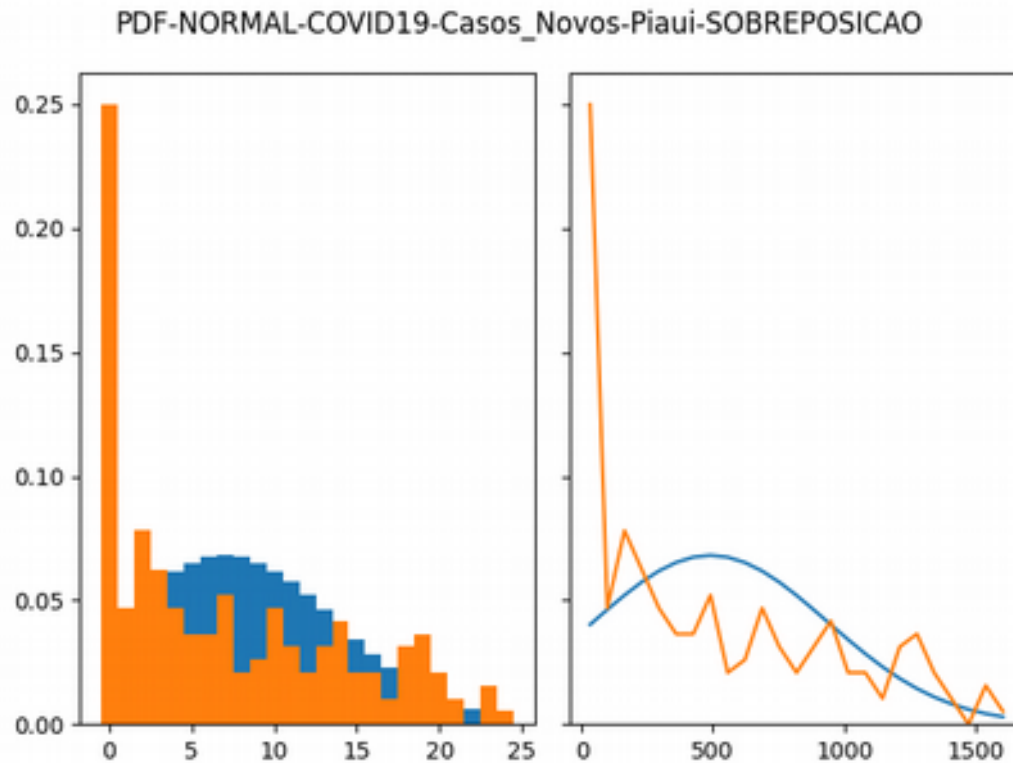
### MLE - DISTRIBUICAO NORMAL:

C1: 76.17778146583017

MEDIA: 490.75895833333345

STD: 446.01344212506643

VAR: 198927.99055625





# LOG-NORMAL - MLE + PDF + CDF + QQ-PLOT

## Piauí – Casos Novos - COVID-19

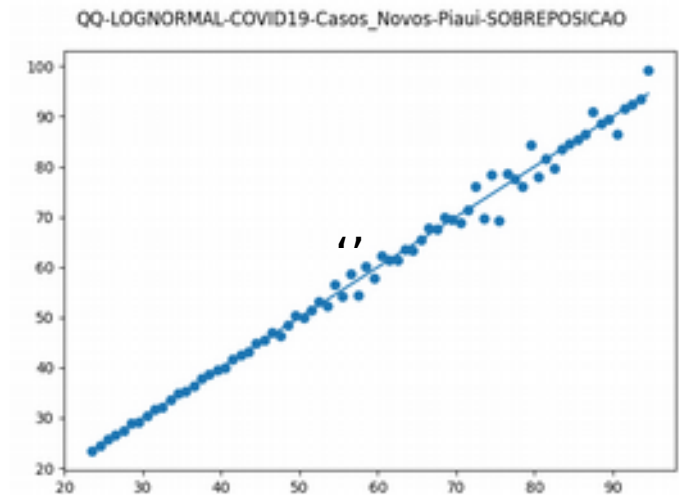
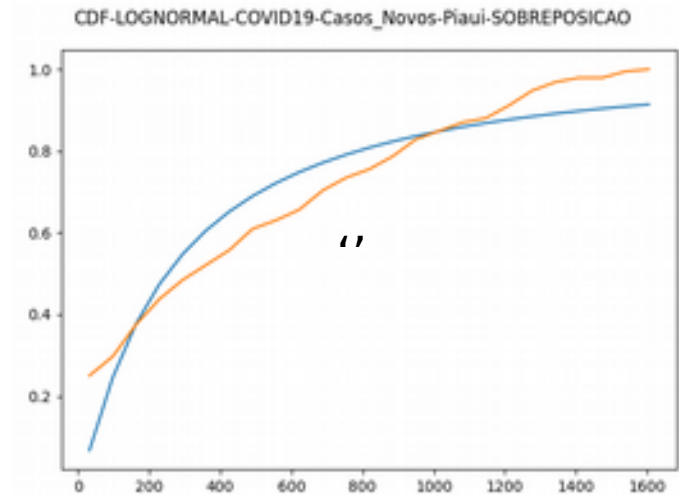
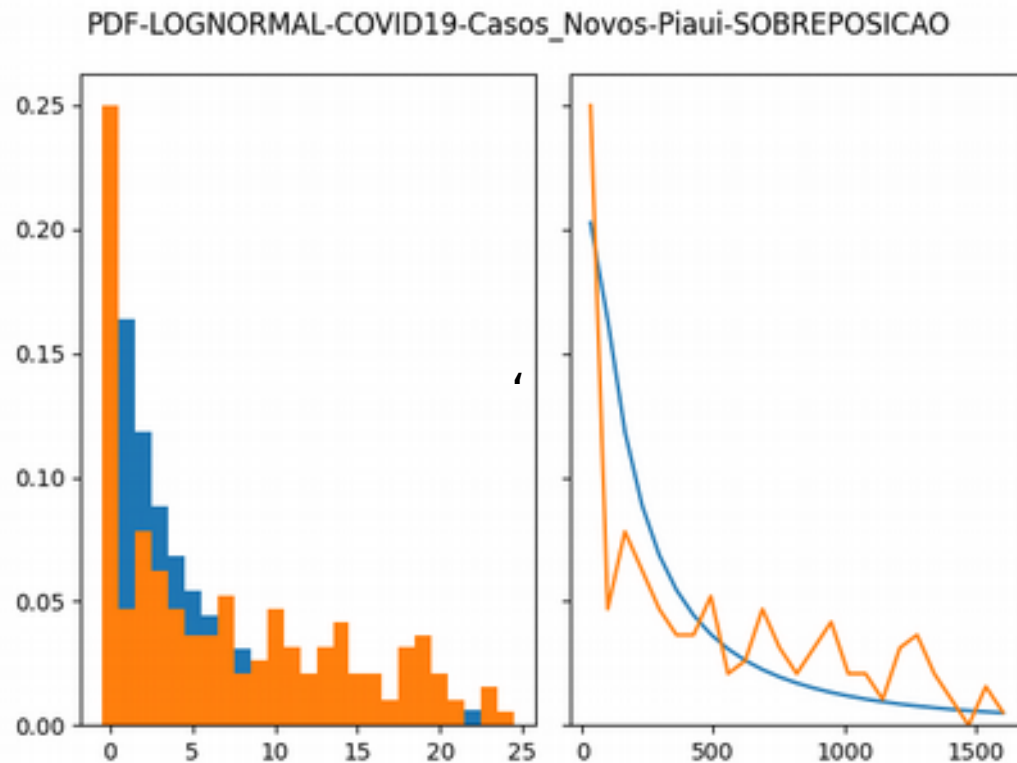
### MLE - DISTRIBUICAO LOG-NORMAL:

C1: 69.3857160947294

MEDIA: 5.523988765284616

STD: 1.3590515939258656

VAR: 1.847021234952436



# WEIBULL - MLE + PDF + CDF + QQ-PLOT

## Piauí – Casos Novos - COVID-19

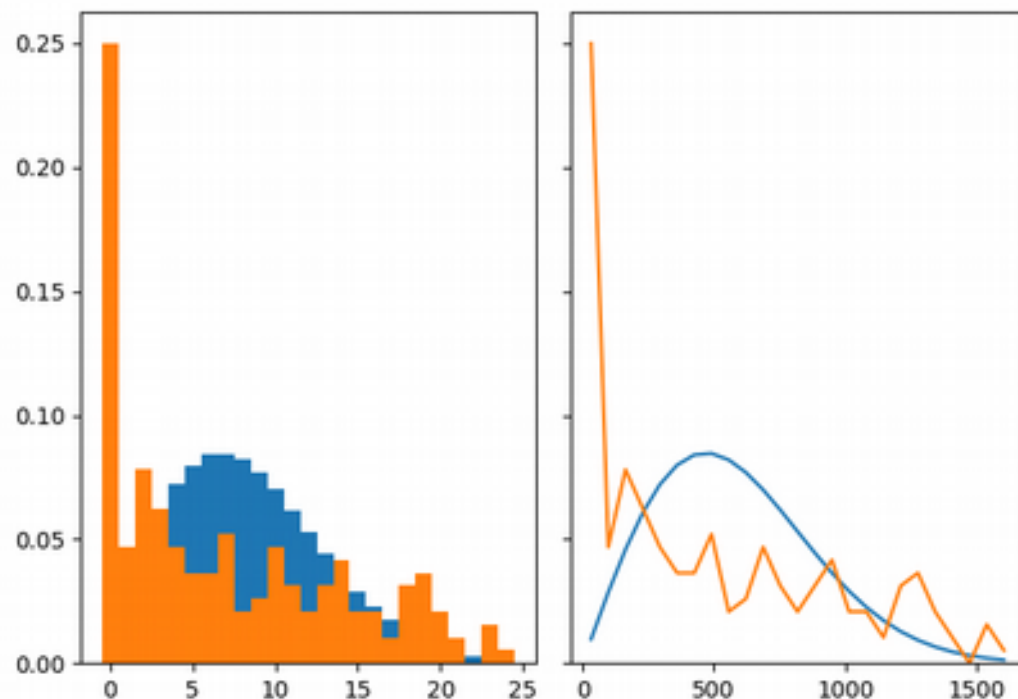
### MLE - DISTRIBUICAO WEIBULL:

C1: 65.57327009948452

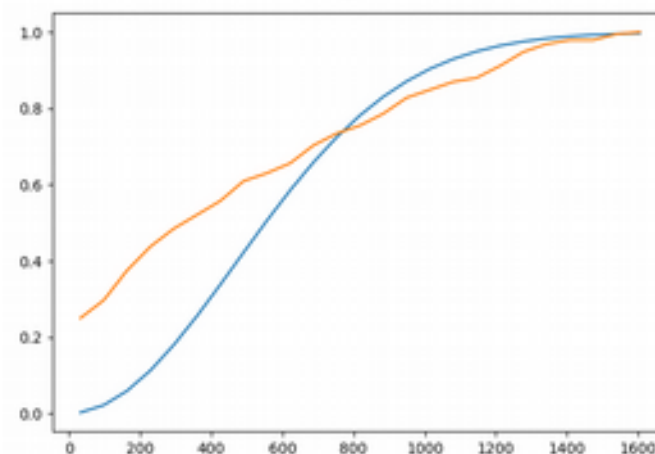
LAMBDA: 663.1365567513226

K: 2.0 (valor fixo - considerado)

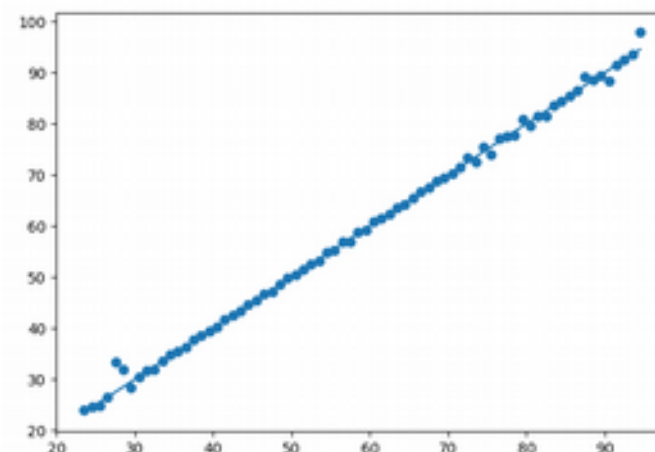
PDF-WEIBULL-COVID19-Casos\_Novos-Piaui-SOBREPOSICAO



CDF-WEIBULL-COVID19-Casos\_Novos-Piaui-SOBREPOSICAO



QQ-WEIBULL-COVID19-Casos\_Novos-Piaui-SOBREPOSICAO



# TESTE LMOGOROV-SMIRNOV

## Piauí – Casos Novos - COVID-19

### ANALISE DO TESTE KOLMOGOROV-SMIRNOV:

KS-confidence: 0.95

KS-alfa: 0.05

$D_{25;0,05}$ : 0,264 (vide anexo I)

### 1. DISTRIBUIÇÃO EXPONENCIAL

Exp-Dn: 0.1854636454293448 <  $D_{25;0,05}$  (H0: ACCEPTED)

**Dn < D-25;0.05**

H0: The exponential distribution fit the data is ACCEPTED

Ha: The exponential distribution don't fit the data is UNKNOW

### 2. DISTRIBUIÇÃO NORMAL

Norm-Dn: 0.8639252638161266 >  $D_{25;0,05}$  (H0: REJECTED)

**Dn > D-25;0.05**

H0: The normal distribution fit the data is REJECTED

Ha: The normal distribution don't fit the data is ACCEPTED

### 3. DISTRIBUIÇÃO LOG-NORMAL

Lognorm-Dn: 0.9999761482272529 >  $D_{25;0,05}$  (H0: REJECTED)

**Dn > D-25;0.05**

H0: The log-normal distribution fit the data is REJECTED

Ha: The log-normal distribution don't fit the data is ACCEPTED

### 4. DISTRIBUIÇÃO WEIBULL

Weibull-Dn: 64.38490266801628 >  $D_{25;0,05}$  (H0: REJECTED)

**Dn > D-25;0.05**

H0: The weibull distribution fit the data is REJECTED

Ha: The weibull distribution don't fit the data is ACCEPTED

# **DADOS DO PIAUI**

## **Obitos Novos - COVID-19**

# Estatísticas Preliminares

## Piauí – Óbitos Novos - COVID-19

### DADOS DE ENTRADA:

N: 193.0  
SOMA: 2107.0  
MEDIA: 10.9171  
STD: 8.9589  
VAR: 80.2626  
MIN: 0.0  
MAX: 36.0  
Z: 3.0 (confiança = 99.73%)  
LIMITES: [ -15.9597 , 37.7939 ]  
OUTLIERS: [ ]

### DADOS DE TRABALHO (S/OUTLIERS):

N: 193.0  
SOMA: 2107.0  
MEDIA: 10.9171  
STD: 8.9589  
VAR: 80.2626  
MIN: 0.0  
MAX: 36.0  
Z: 3.0 (confiança = 99.73%)  
LIMITES: [ 0.0 , 37.7939 ]

### DISTRIBUIÇÃO DOS DADOS

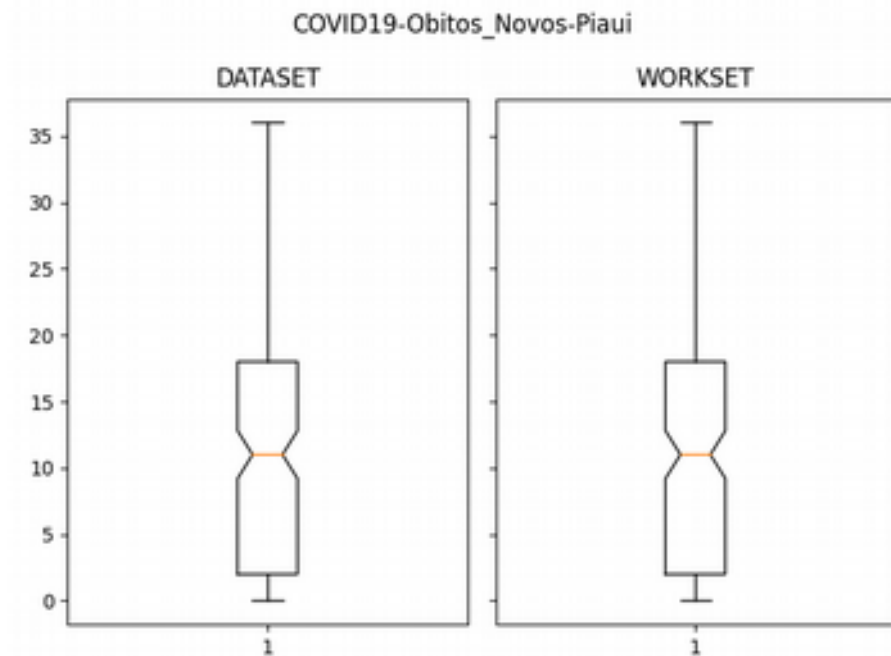
**N. FAIXAS-calculado: 8** (Equação Fornecida em Aula)

**N. FAIXAS-usado: 25**

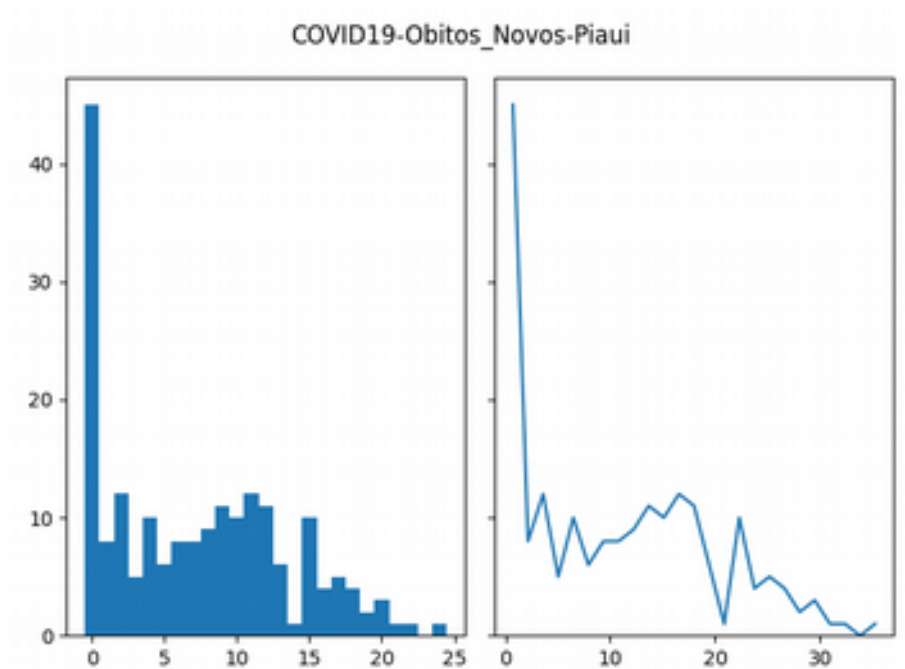
Faixa: 0	Limites: [ 0.0 , 1.44 ]	Freq: 45.0	P[X]: 23.3161
Faixa: 1	Limites: [ 1.44 , 2.88 ]	Freq: 8.0	P[X]: 4.1451
Faixa: 2	Limites: [ 2.88 , 4.32 ]	Freq: 12.0	P[X]: 6.2176
Faixa: 3	Limites: [ 4.32 , 5.76 ]	Freq: 5.0	P[X]: 2.5907
Faixa: 4	Limites: [ 5.76 , 7.2 ]	Freq: 10.0	P[X]: 5.1813
Faixa: 5	Limites: [ 7.2 , 8.64 ]	Freq: 6.0	P[X]: 3.1088
Faixa: 6	Limites: [ 8.64 , 10.08 ]	Freq: 8.0	P[X]: 4.1451
Faixa: 7	Limites: [ 10.08 , 11.52 ]	Freq: 8.0	P[X]: 4.1451
Faixa: 8	Limites: [ 11.52 , 12.96 ]	Freq: 9.0	P[X]: 4.6632
Faixa: 9	Limites: [ 12.96 , 14.4 ]	Freq: 11.0	P[X]: 5.6995
Faixa: 10	Limites: [ 14.4 , 15.84 ]	Freq: 10.0	P[X]: 5.1813
Faixa: 11	Limites: [ 15.84 , 17.28 ]	Freq: 12.0	P[X]: 6.2176
Faixa: 12	Limites: [ 17.28 , 18.72 ]	Freq: 11.0	P[X]: 5.6995
Faixa: 13	Limites: [ 18.72 , 20.16 ]	Freq: 6.0	P[X]: 3.1088
Faixa: 14	Limites: [ 20.16 , 21.6 ]	Freq: 1.0	P[X]: 0.5181
Faixa: 15	Limites: [ 21.6 , 23.04 ]	Freq: 10.0	P[X]: 5.1813
Faixa: 16	Limites: [ 23.04 , 24.48 ]	Freq: 4.0	P[X]: 2.0725
Faixa: 17	Limites: [ 24.48 , 25.92 ]	Freq: 5.0	P[X]: 2.5907
Faixa: 18	Limites: [ 25.92 , 27.36 ]	Freq: 4.0	P[X]: 2.0725
Faixa: 19	Limites: [ 27.36 , 28.8 ]	Freq: 2.0	P[X]: 1.0363
Faixa: 20	Limites: [ 28.8 , 30.24 ]	Freq: 3.0	P[X]: 1.5544
Faixa: 21	Limites: [ 30.24 , 31.68 ]	Freq: 1.0	P[X]: 0.5181
Faixa: 22	Limites: [ 31.68 , 33.12 ]	Freq: 1.0	P[X]: 0.5181
Faixa: 23	Limites: [ 33.12 , 34.56 ]	Freq: 0.0	P[X]: 0.0
Faixa: 24	Limites: [ 34.56 , 36.0 ]	Freq: 1.0	P[X]: 0.5181

# Estatísticas Preliminares

## Piauí – Obitos Novos - COVID-19



**BOX PLOT**



**HISTOGRAMA**

# EXPONENCIAL - MLE + PDF + CDF + QQ-PLOT

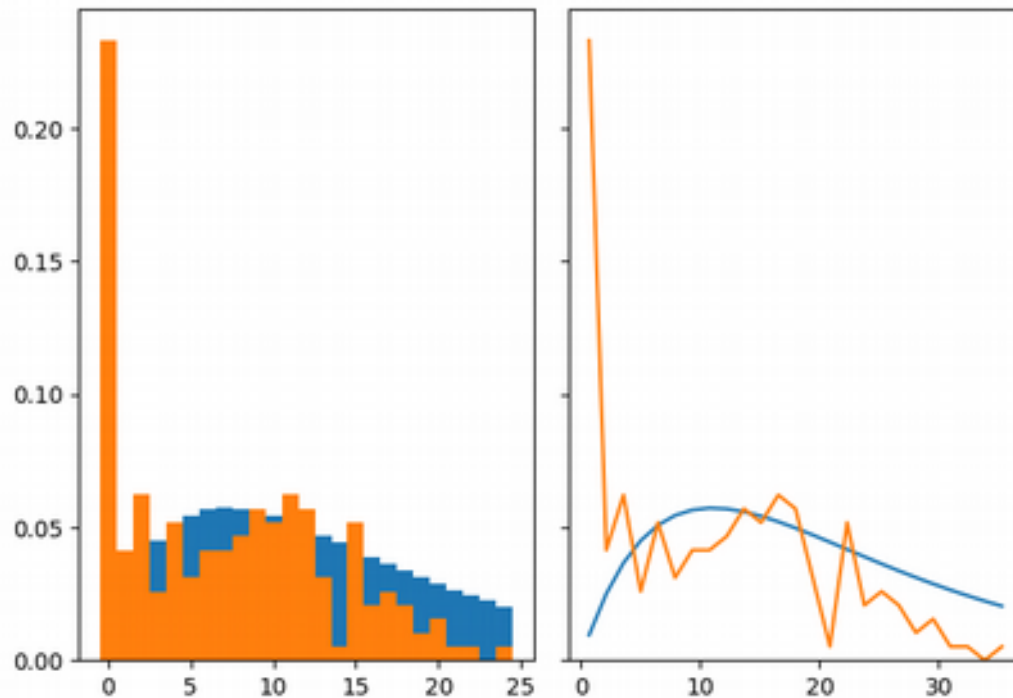
## Piaui - Obitos Novos - COVID-19

### MLE - DISTRIBUICAO EXPONENCIAL:

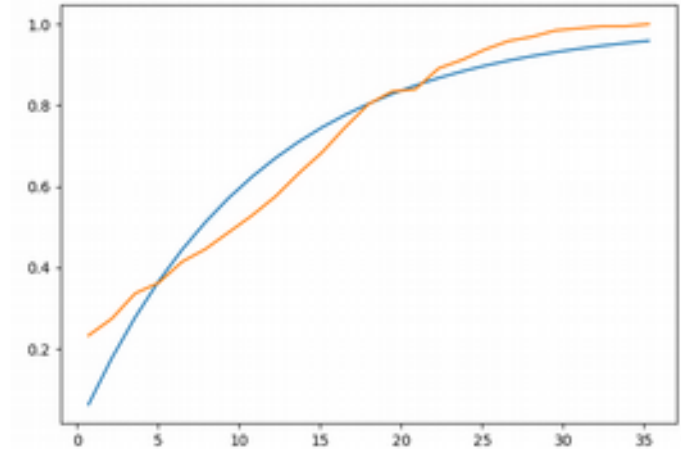
C1: 0.15572731990549366

LAMBDA: 0.09052872528049832

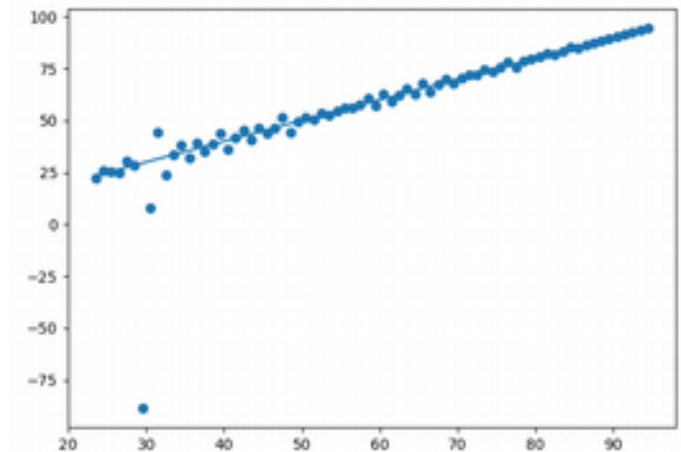
PDF-EXPONENCIAL-COVID19-Obitos\_Novos-Piaui-SOBREPOSICAO



CDF-EXPONENCIAL-COVID19-Obitos\_Novos-Piaui-SOBREPOSICAO



QQ-EXPONENCIAL-COVID19-Obitos\_Novos-Piaui-SOBREPOSICAO



# NORMAL - MLE + PDF + CDF + QQ-PLOT

## Piaui - Obitos Novos - COVID-19

### MLE - DISTRIBUICAO NORMAL:

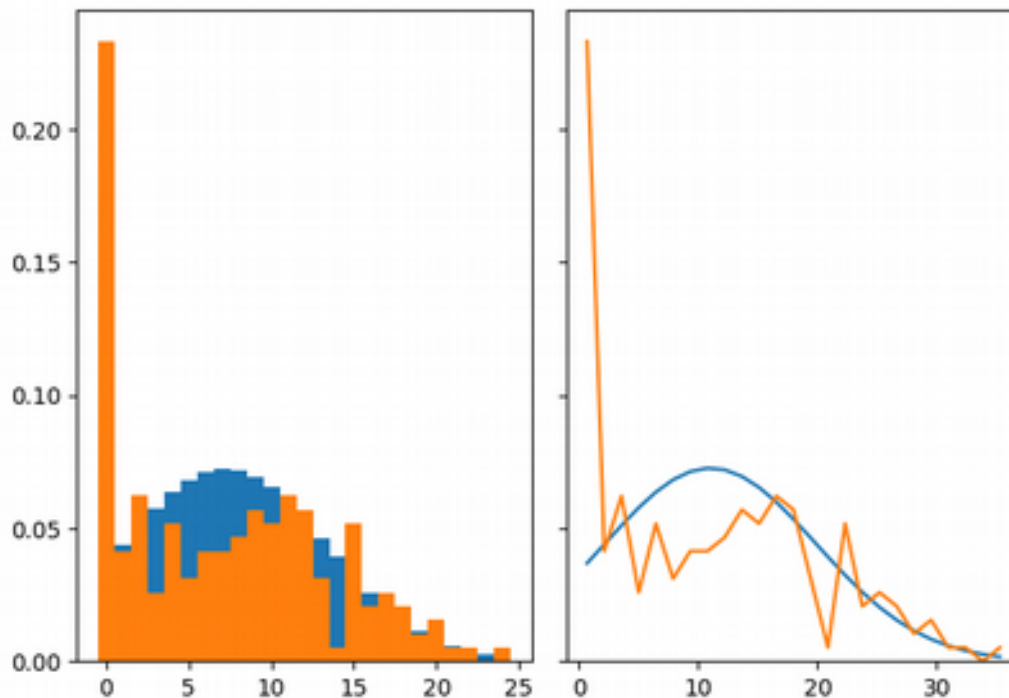
C1: 1.61545822030537

MEDIA: 11.046217616580313

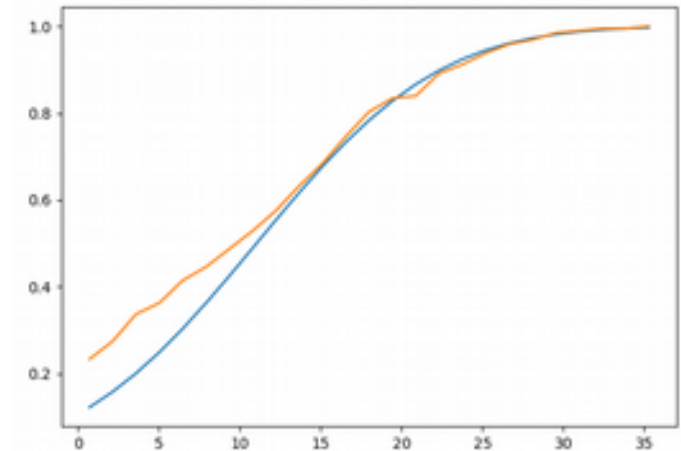
STD: 8.86761885680946

VAR: 78.63466418964269

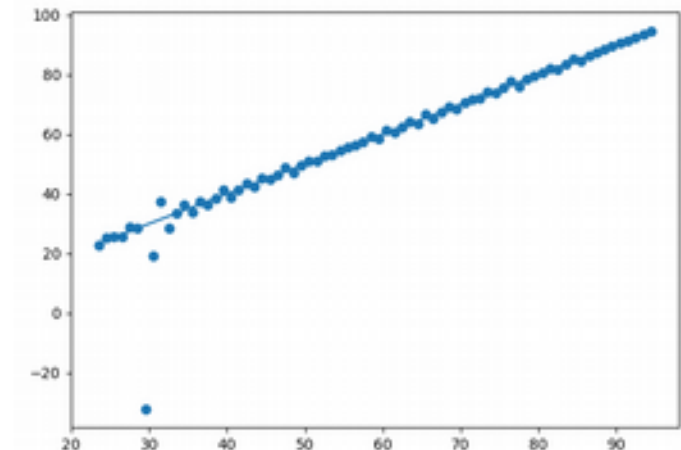
PDF-NORMAL-COVID19-Obitos\_Novos-Piaui-SOBREPOSICAO



CDF-NORMAL-COVID19-Obitos\_Novos-Piaui-SOBREPOSICAO



QQ-NORMAL-COVID19-Obitos\_Novos-Piaui-SOBREPOSICAO



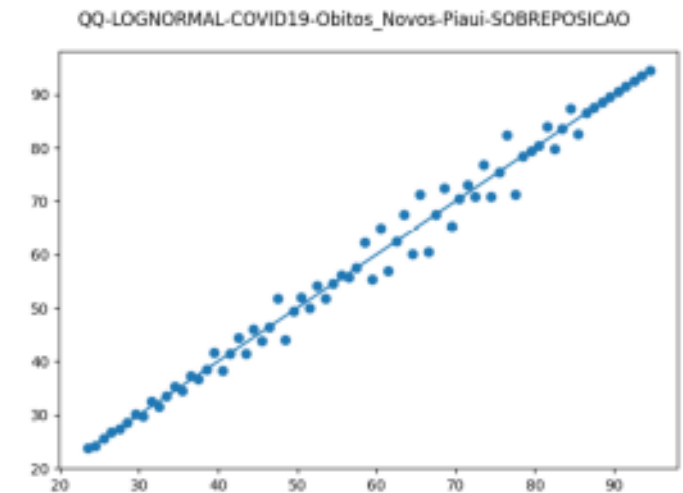
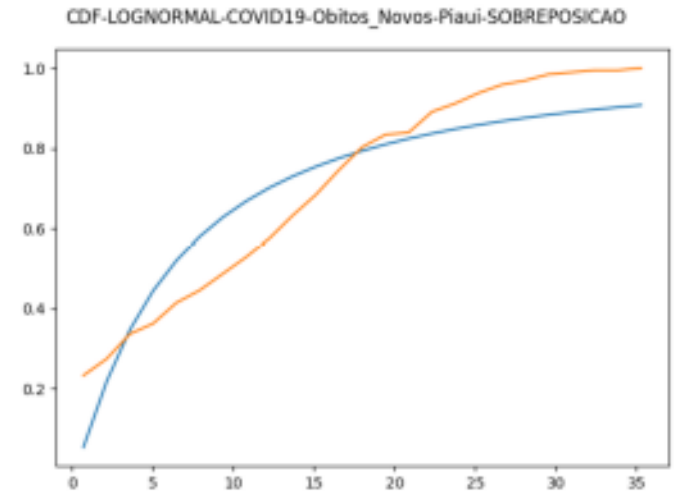
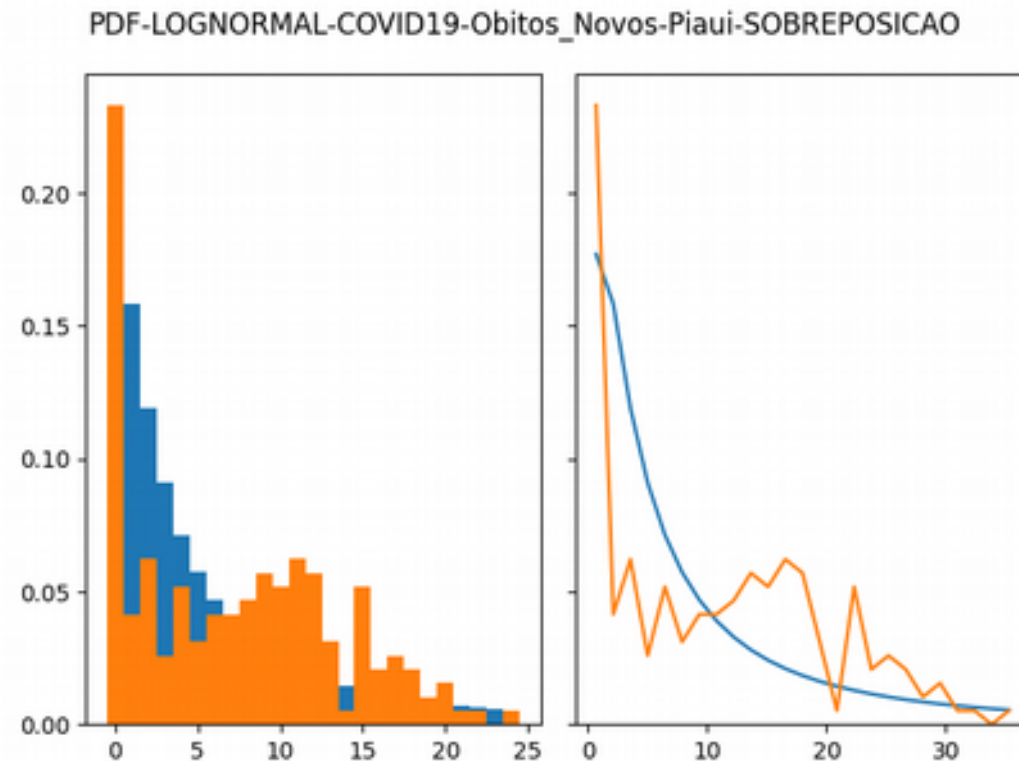


# LOG-NORMAL - MLE + PDF + CDF + QQ-PLOT

## Piauí - Óbitos Novos - COVID-19

### MLE - DISTRIBUICAO LOG-NORMAL:

C1: 1.540147679046113  
MEDIA: 1.802884583092547  
STD: 1.32714038175868  
VAR: 1.7613015928945748



# WEIBULL - MLE + PDF + CDF + QQ-PLOT

## Piauí - Óbitos Novos - COVID-19

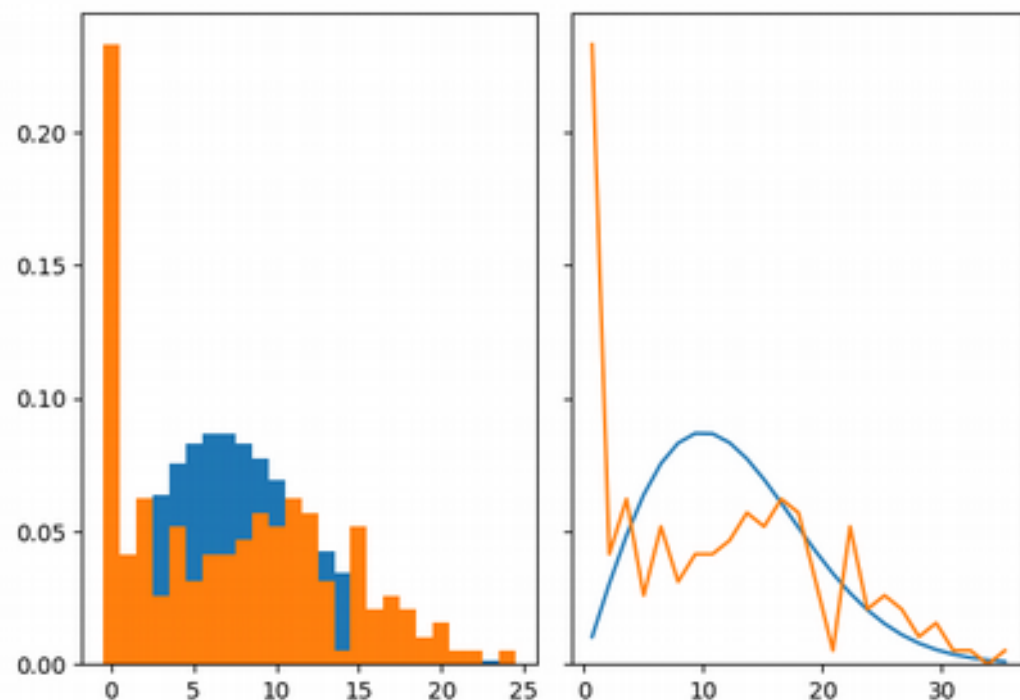
### MLE - DISTRIBUICAO WEIBULL:

C1: 1.4409897761988766

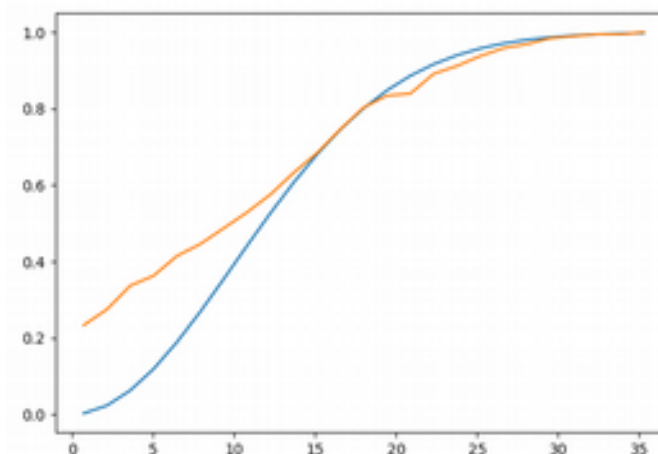
LAMBDA: 14.1646361076512

K: 2.0 (valor fixo - considerado)

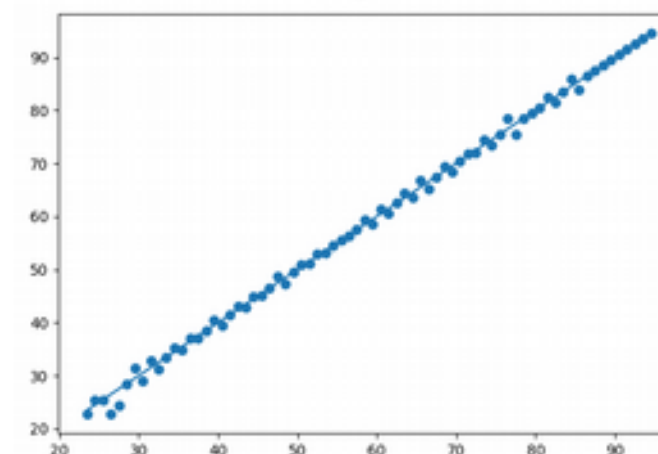
PDF-WEIBULL-COVID19-Obitos\_Novos-Piaui-SOBREPOSICAO



CDF-WEIBULL-COVID19-Obitos\_Novos-Piaui-SOBREPOSICAO



QQ-WEIBULL-COVID19-Obitos\_Novos-Piaui-SOBREPOSICAO



# TESTE KOLMOGOROV-SMIRNOV

## Piauí – Óbitos Novos - COVID-19

### ANÁLISE DO TESTE KOLMOGOROV-SMIRNOV:

KS-confidence: 0.95

KS-alfa: 0.05

$D_{25,0,05}$ : 0,264 (vide anexo I)

### 1. DISTRIBUIÇÃO EXPONENCIAL

Exp-Dn:  $0.17005878902125265 < D_{25,0,05}$  (H0: ACCEPTED)

**Dn < D-25;0.05**

H0: The exponential distribution fit the data is ACCEPTED

Ha: The exponential distribution don't fit the data is UNKNOW

### 2. DISTRIBUIÇÃO NORMAL

Norm-Dn:  $0.8935590952001632 > D_{25,0,05}$  (H0: REJECTED)

**Dn > D-25;0.05**

H0: The normal distribution fit the data is REJECTED

Ha: The normal distribution don't fit the data is ACCEPTED

### 3. DISTRIBUIÇÃO LOG-NORMAL

Lognorm-Dn:  $0.9135166886058861 > D_{25,0,05}$  (H0: REJECTED)

**Dn > D-25;0.05**

H0: The log-normal distribution fit the data is REJECTED

Ha: The log-normal distribution don't fit the data is ACCEPTED

### 4. DISTRIBUIÇÃO WEIBULL

Weibull-Dn:  $0.4437691744151926 > D_{25,0,05}$  (H0: REJECTED)

**Dn > D-25;0.05**

H0: The weibull distribution fit the data is REJECTED

Ha: The weibull distribution don't fit the data is ACCEPTED

# **DADOS DO ALAGOAS**

## **Casos Novos - COVID-19**

# Estatísticas Preliminares

## Alagoas - Casos Novos - COVID-19

### DADOS DE ENTRADA:

N: 202.0  
SOMA: 86393.0  
MEDIA: 427.6881  
STD: 363.2185  
VAR: 131927.6503  
MIN: 0.0  
MAX: 1312.0  
Z: 3.0 (confianca = 99.73%)  
LIMITES: [ -661.9673 , 1517.3435 ]  
OUTLIERS: []

### DADOS DE TRABALHO (S/OUTLIERS):

N: 202.0  
SOMA: 86393.0  
MEDIA: 427.6881  
STD: 363.2185  
VAR: 131927.6503  
MIN: 0.0  
MAX: 1312.0  
Z: 3.0 (confianca = 99.73%)  
LIMITES: [ 0.0 , 1517.3435 ]

### DISTRIBUIÇÃO DOS DADOS

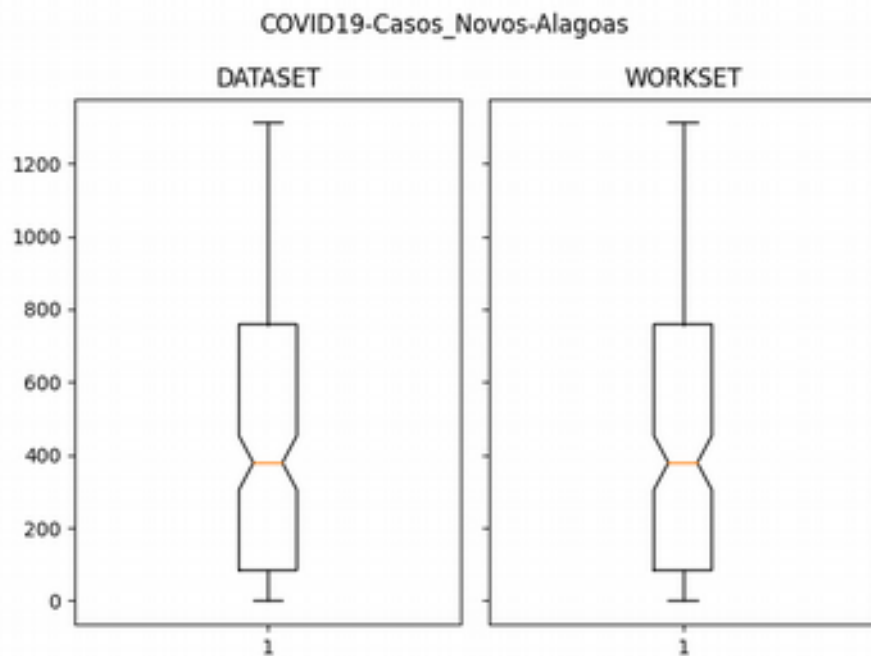
**N. FAIXAS-calculado: 8** (Equação Fornecida em Aula)

**N. FAIXAS-usado: 25**

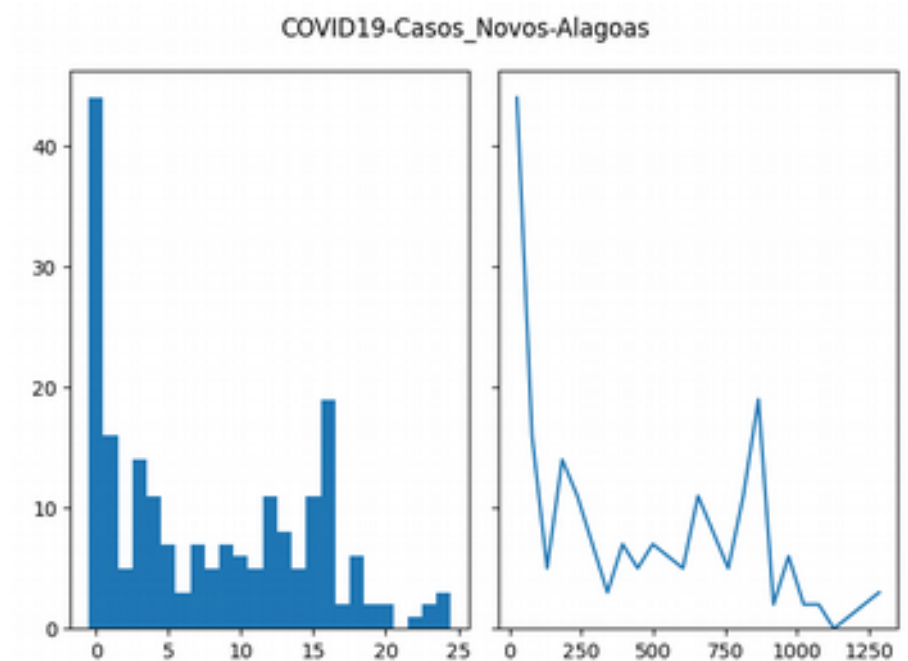
Faixa: 0	Limites: [ 0.0 , 52.48 ]	Freq: 44.0	P[X]: 21.7822
Faixa: 1	Limites: [ 52.48 , 104.96 ]	Freq: 16.0	P[X]: 7.9208
Faixa: 2	Limites: [ 104.96 , 157.44 ]	Freq: 5.0	P[X]: 2.4752
Faixa: 3	Limites: [ 157.44 , 209.92 ]	Freq: 14.0	P[X]: 6.9307
Faixa: 4	Limites: [ 209.92 , 262.4 ]	Freq: 11.0	P[X]: 5.4455
Faixa: 5	Limites: [ 262.4 , 314.88 ]	Freq: 7.0	P[X]: 3.4653
Faixa: 6	Limites: [ 314.88 , 367.36 ]	Freq: 3.0	P[X]: 1.4851
Faixa: 7	Limites: [ 367.36 , 419.84 ]	Freq: 7.0	P[X]: 3.4653
Faixa: 8	Limites: [ 419.84 , 472.32 ]	Freq: 5.0	P[X]: 2.4752
Faixa: 9	Limites: [ 472.32 , 524.8 ]	Freq: 7.0	P[X]: 3.4653
Faixa: 10	Limites: [ 524.8 , 577.28 ]	Freq: 6.0	P[X]: 2.9703
Faixa: 11	Limites: [ 577.28 , 629.76 ]	Freq: 5.0	P[X]: 2.4752
Faixa: 12	Limites: [ 629.76 , 682.24 ]	Freq: 11.0	P[X]: 5.4455
Faixa: 13	Limites: [ 682.24 , 734.72 ]	Freq: 8.0	P[X]: 3.9604
Faixa: 14	Limites: [ 734.72 , 787.2 ]	Freq: 5.0	P[X]: 2.4752
Faixa: 15	Limites: [ 787.2 , 839.68 ]	Freq: 11.0	P[X]: 5.4455
Faixa: 16	Limites: [ 839.68 , 892.16 ]	Freq: 19.0	P[X]: 9.4059
Faixa: 17	Limites: [ 892.16 , 944.64 ]	Freq: 2.0	P[X]: 0.9901
Faixa: 18	Limites: [ 944.64 , 997.12 ]	Freq: 6.0	P[X]: 2.9703
Faixa: 19	Limites: [ 997.12 , 1049.6 ]	Freq: 2.0	P[X]: 0.9901
Faixa: 20	Limites: [ 1049.6 , 1102.08 ]	Freq: 2.0	P[X]: 0.9901
Faixa: 21	Limites: [ 1102.08 , 1154.56 ]	Freq: 0.0	P[X]: 0.0
Faixa: 22	Limites: [ 1154.56 , 1207.04 ]	Freq: 1.0	P[X]: 0.495
Faixa: 23	Limites: [ 1207.04 , 1259.52 ]	Freq: 2.0	P[X]: 0.9901
Faixa: 24	Limites: [ 1259.52 , 1312.0 ]	Freq: 3.0	P[X]: 1.4851

# Estatísticas Preliminares

## Alagoas – Casos Novos - COVID-19



**BOX PLOT**



**HISTOGRAMA**

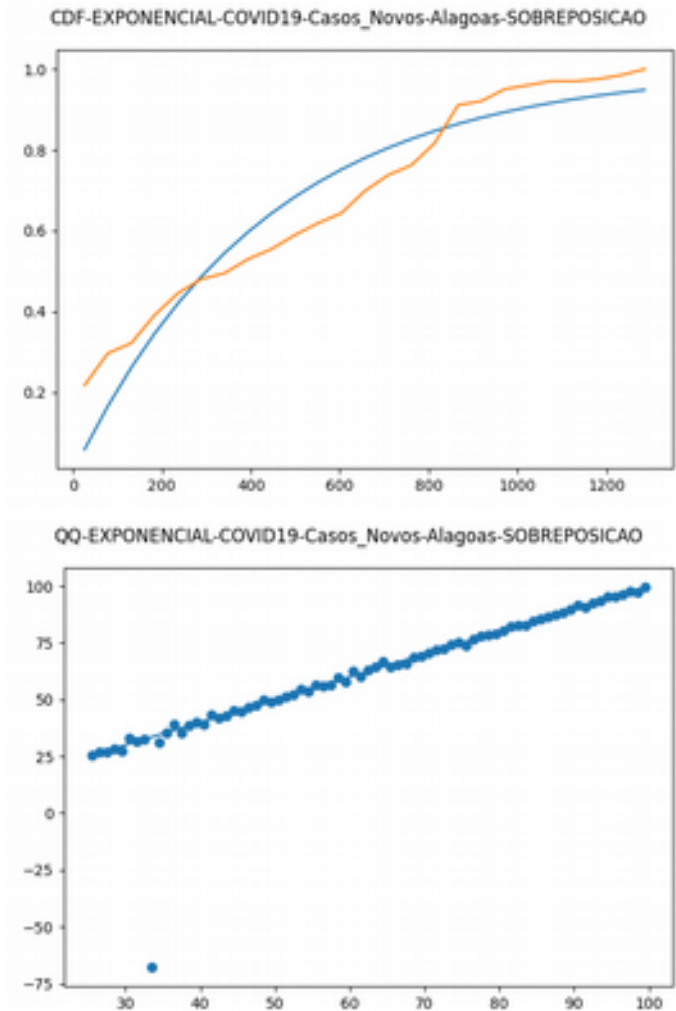
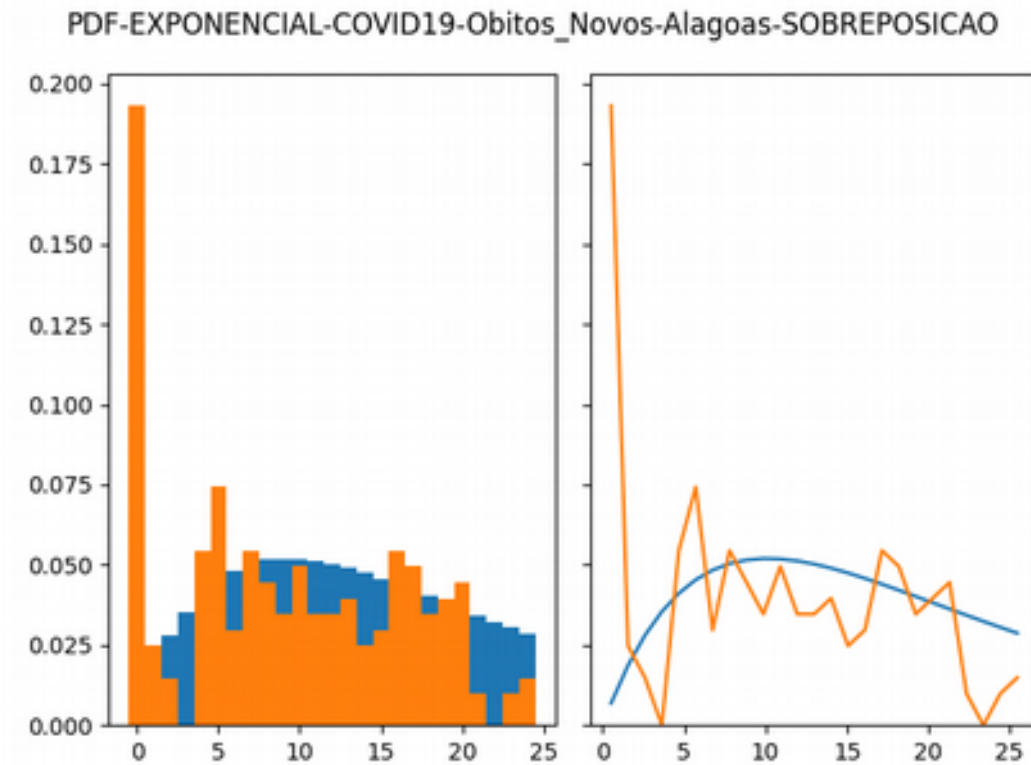
# EXPONENCIAL - MLE + PDF + CDF + QQ-PLOT

## Alagoas - Casos Novos - COVID-19

### MLE - DISTRIBUICAO EXPONENCIAL:

C1: 0.150325973133483

LAMBDA: 0.002307605135403871



# NORMAL - MLE + PDF + CDF + QQ-PLOT

## Alagoas - Casos Novos - COVID-19

### MLE - DISTRIBUICAO NORMAL:

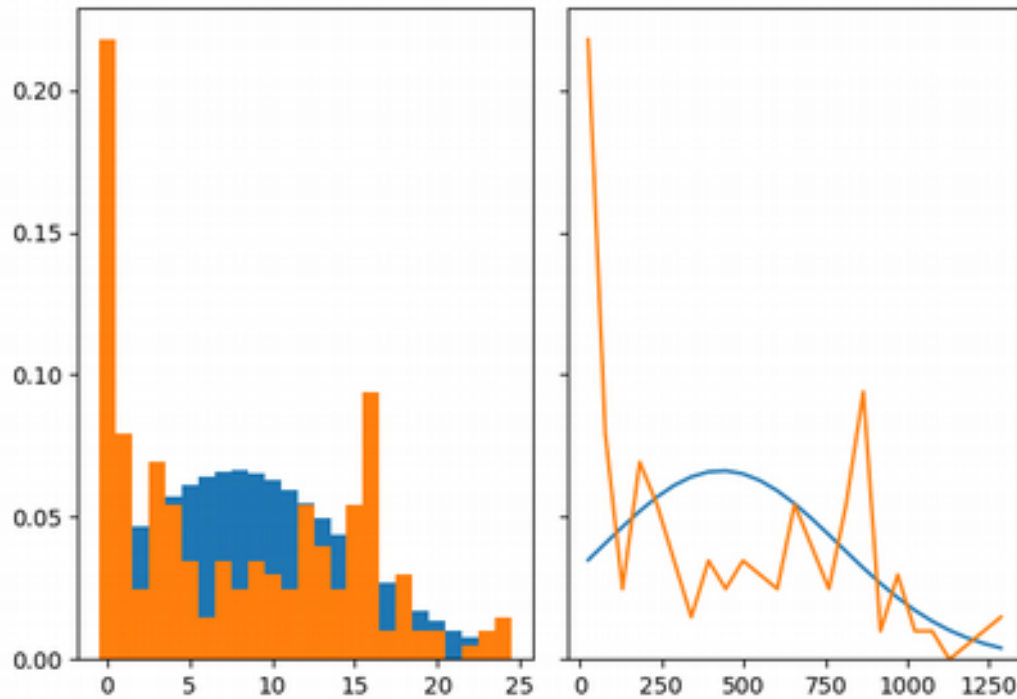
C1: 59.698695952225776

MEDIA: 433.3497029702972

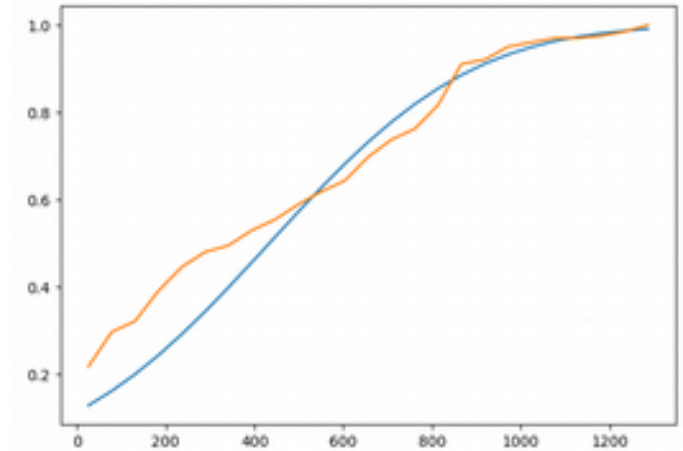
STD: 359.35750245368206

VAR: 129137.81456974811

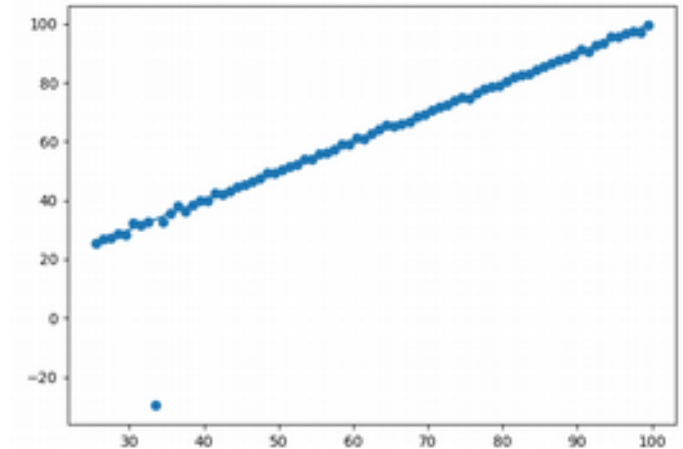
PDF-NORMAL-COVID19-Casos\_Novos-Alagoas-SOBREPOSICAO



CDF-NORMAL-COVID19-Casos\_Novos-Alagoas-SOBREPOSICAO



QQ-NORMAL-COVID19-Casos\_Novos-Alagoas-SOBREPOSICAO





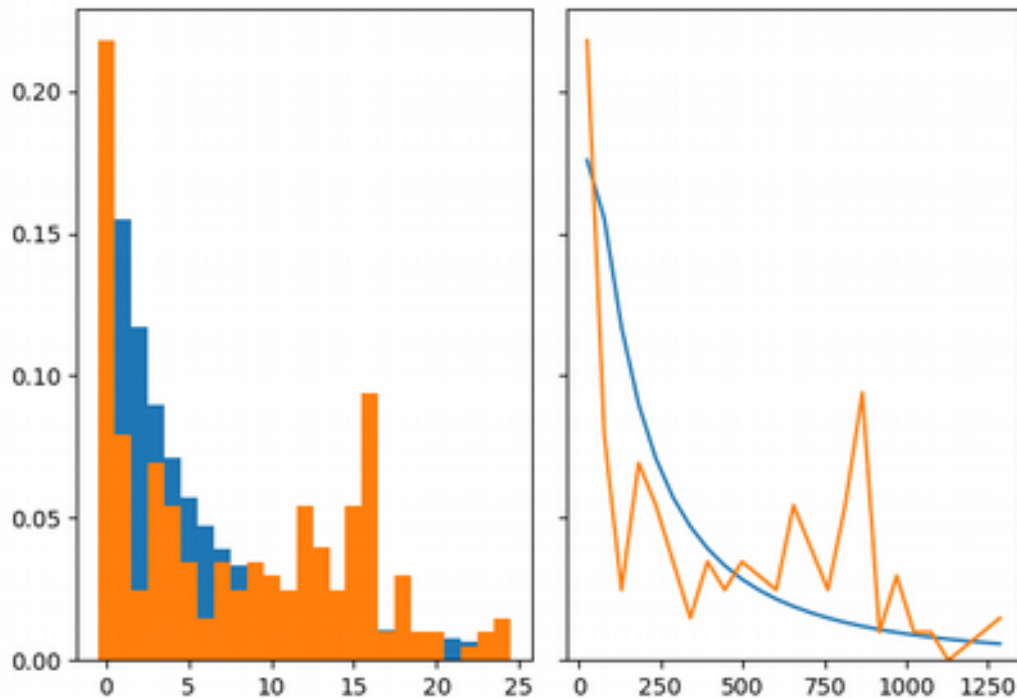
# LOG-NORMAL - MLE + PDF + CDF + QQ-PLOT

## Alagoas - Casos Novos - COVID-19

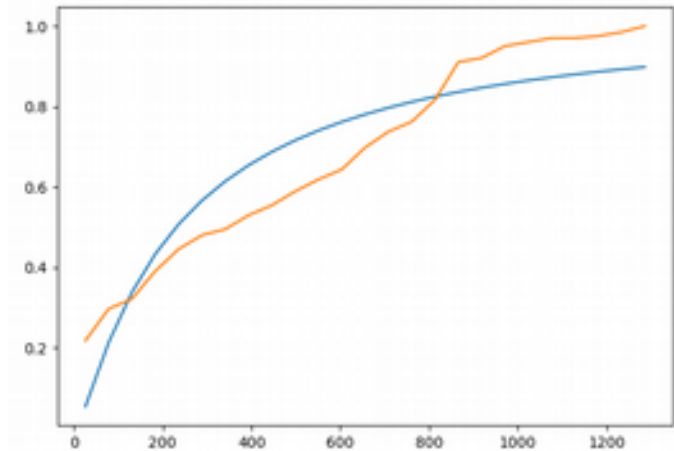
### MLE - DISTRIBUICAO LOG-NORMAL:

C1: 56.749281333210504  
MEDIA: 5.439198879765025  
STD: 1.3524850928233298  
VAR: 1.829215926309331

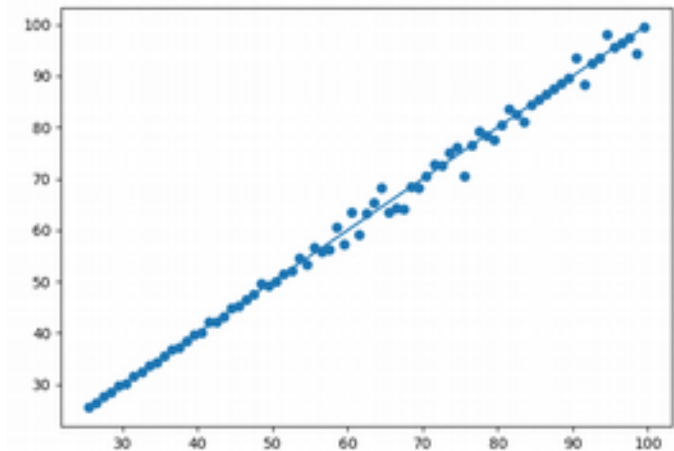
PDF-LOGNORMAL-COVID19-Casos\_Novos-Alagoas-SOBREPOSICAO



CDF-LOGNORMAL-COVID19-Casos\_Novos-Alagoas-SOBREPOSICAO



QQ-LOGNORMAL-COVID19-Casos\_Novos-Alagoas-SOBREPOSICAO



# WEIBULL - MLE + PDF + CDF + QQ-PLOT

## Alagoas - Casos Novos - COVID-19

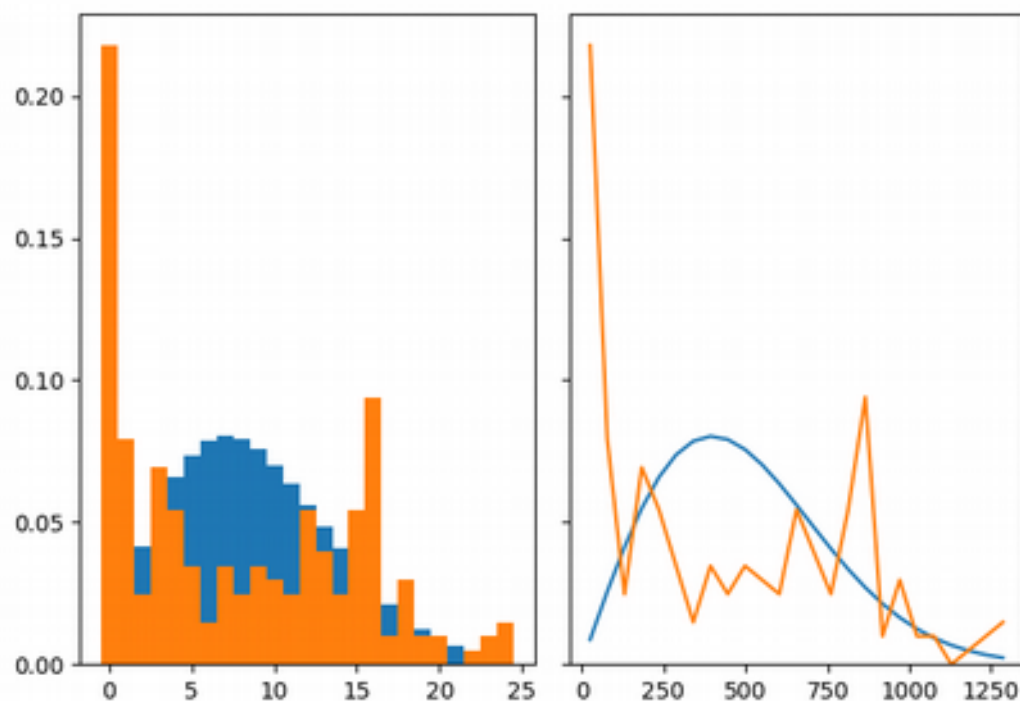
### MLE - DISTRIBUICAO WEIBULL:

C1: 52.67058513918129

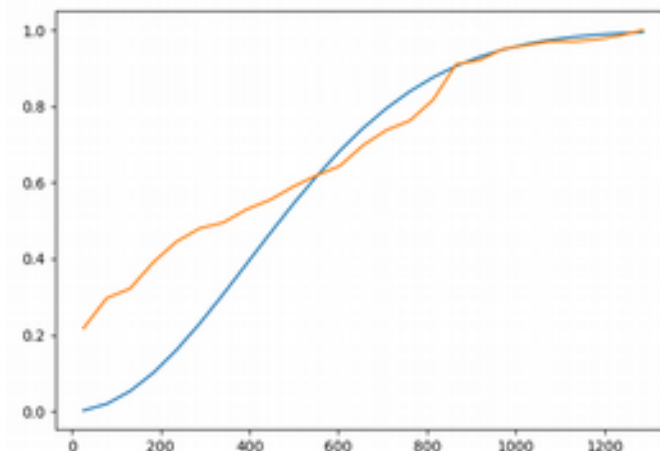
LAMBDA: 562.9366981277824

K: 2.0 (valor fixo - considerado)

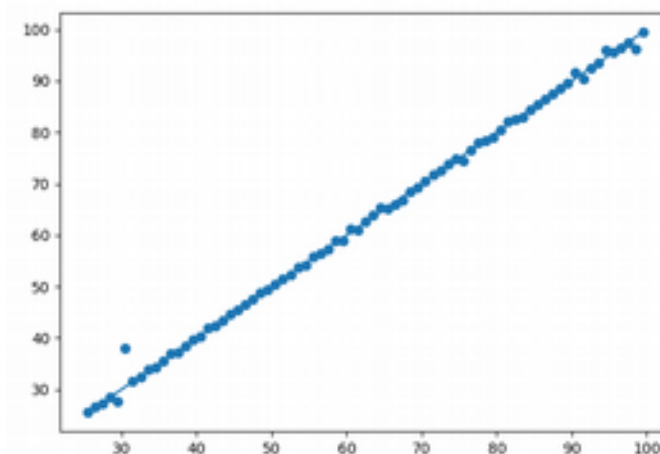
PDF-WEIBULL-COVID19-Casos\_Novos-Alagoas-SOBREPOSICAO



CDF-WEIBULL-COVID19-Casos\_Novos-Alagoas-SOBREPOSICAO



QQ-WEIBULL-COVID19-Casos\_Novos-Alagoas-SOBREPOSICAO



# TESTE KOLMOGOROV-SMIRNOV

## Alagoas - Casos Novos - COVID-19

### ANALISE DO TESTE KOLMOGOROV-SMIRNOV:

KS-confidence: 0.95

KS-alfa: 0.05

$D_{25,0,05}$ : 0,264 (vide anexo I)

### 1. DISTRIBUIÇÃO EXPONENCIAL

Exp-Dn: 0.15906702051479008 <  $D_{25,0,05}$  (H0: ACCEPTED)

**Dn < D-25;0.05**

H0: The exponential distribution fit the data is ACCEPTED

Ha: The exponential distribution don't fit the data is UNKNOW

### 2. DISTRIBUIÇÃO NORMAL

Norm-Dn: 0.8855455564648751 >  $D_{25,0,05}$  (H0: REJECTED)

**Dn > D-25;0.05**

H0: The normal distribution fit the data is REJECTED

Ha: The normal distribution don't fit the data is ACCEPTED

### 3. DISTRIBUIÇÃO LOG-NORMAL

Lognorm-Dn: 0.9999713565892262 >  $D_{25,0,05}$  (H0: REJECTED)

**Dn > D-25;0.05**

H0: The log-normal distribution fit the data is REJECTED

Ha: The log-normal distribution don't fit the data is ACCEPTED

### 4. DISTRIBUIÇÃO WEIBULL

Weibull-Dn: 51.38485313364479 >  $D_{25,0,05}$  (H0: REJECTED)

**Dn > D-25;0.05**

H0: The weibull distribution fit the data is REJECTED

Ha: The weibull distribution don't fit the data is ACCEPTED

# **DADOS DE ALAGOAS**

## **Obitos Novos - COVID-19**

# Estatísticas Preliminares

## Alagoas – Obitos Novos - COVID-19

### DADOS DE ENTRADA:

N: 202.0  
SOMA: 2062.0  
MEDIA: 10.2079  
STD: 7.2656  
VAR: 52.7885  
MIN: 0.0  
MAX: 26.0  
Z: 3.0 (confianca = 99.73%)  
LIMITES: [ -11.5888 , 32.0046 ]  
OUTLIERS: [ ]

### DADOS DE TRABALHO (S/OUTLIERS):

N: 202.0  
SOMA: 2062.0  
MEDIA: 10.2079  
STD: 7.2656  
VAR: 52.7885  
MIN: 0.0  
MAX: 26.0  
Z: 3.0 (confianca = 99.73%)  
LIMITES: [ 0.0 , 32.0046 ]

### DISTRIBUIÇÃO DOS DADOS

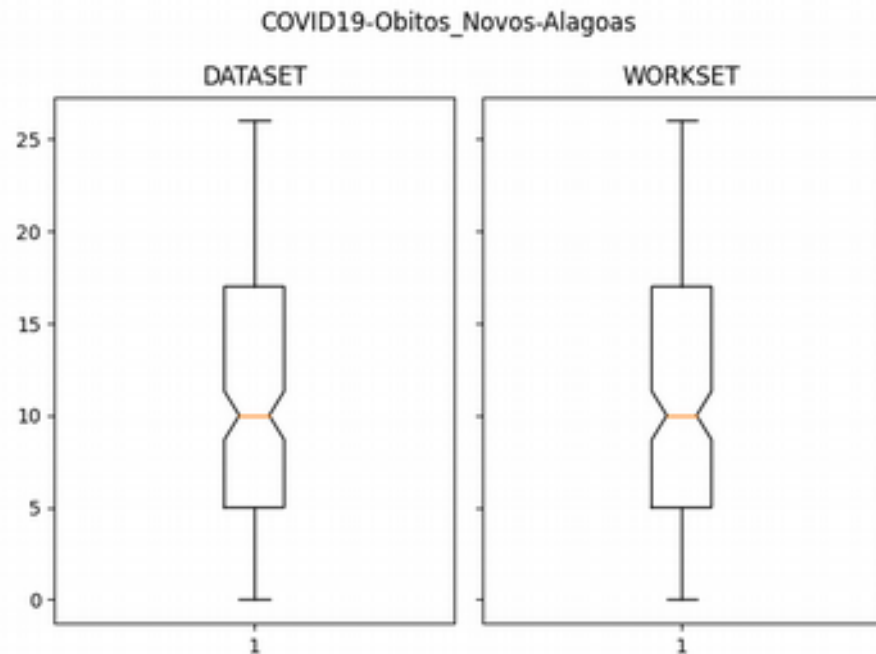
**N. FAIXAS-calculado: 8** (Equação Fornecida em Aula)

**N. FAIXAS-usado: 25**

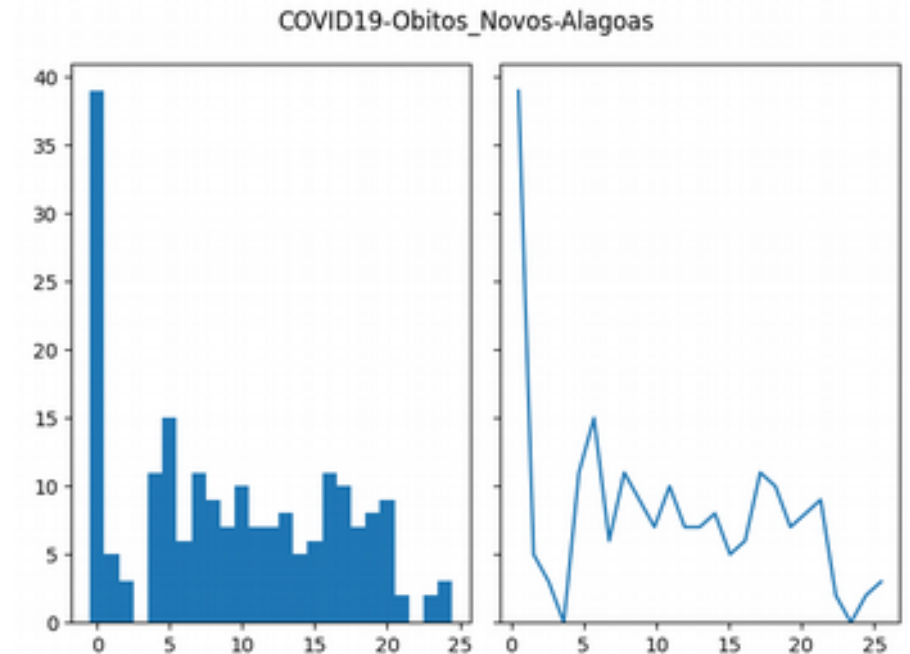
Faixa: 0	Limites: [ 0.0 , 1.04 ]	Freq: 39.0	P[X]: 19.3069
Faixa: 1	Limites: [ 1.04 , 2.08 ]	Freq: 5.0	P[X]: 2.4752
Faixa: 2	Limites: [ 2.08 , 3.12 ]	Freq: 3.0	P[X]: 1.4851
Faixa: 3	Limites: [ 3.12 , 4.16 ]	Freq: 0.0	P[X]: 0.0
Faixa: 4	Limites: [ 4.16 , 5.2 ]	Freq: 11.0	P[X]: 5.4455
Faixa: 5	Limites: [ 5.2 , 6.24 ]	Freq: 15.0	P[X]: 7.4257
Faixa: 6	Limites: [ 6.24 , 7.28 ]	Freq: 6.0	P[X]: 2.9703
Faixa: 7	Limites: [ 7.28 , 8.32 ]	Freq: 11.0	P[X]: 5.4455
Faixa: 8	Limites: [ 8.32 , 9.36 ]	Freq: 9.0	P[X]: 4.4554
Faixa: 9	Limites: [ 9.36 , 10.4 ]	Freq: 7.0	P[X]: 3.4653
Faixa: 10	Limites: [ 10.4 , 11.44 ]	Freq: 10.0	P[X]: 4.9505
Faixa: 11	Limites: [ 11.44 , 12.48 ]	Freq: 7.0	P[X]: 3.4653
Faixa: 12	Limites: [ 12.48 , 13.52 ]	Freq: 7.0	P[X]: 3.4653
Faixa: 13	Limites: [ 13.52 , 14.56 ]	Freq: 8.0	P[X]: 3.9604
Faixa: 14	Limites: [ 14.56 , 15.6 ]	Freq: 5.0	P[X]: 2.4752
Faixa: 15	Limites: [ 15.6 , 16.64 ]	Freq: 6.0	P[X]: 2.9703
Faixa: 16	Limites: [ 16.64 , 17.68 ]	Freq: 11.0	P[X]: 5.4455
Faixa: 17	Limites: [ 17.68 , 18.72 ]	Freq: 10.0	P[X]: 4.9505
Faixa: 18	Limites: [ 18.72 , 19.76 ]	Freq: 7.0	P[X]: 3.4653
Faixa: 19	Limites: [ 19.76 , 20.8 ]	Freq: 8.0	P[X]: 3.9604
Faixa: 20	Limites: [ 20.8 , 21.84 ]	Freq: 9.0	P[X]: 4.4554
Faixa: 21	Limites: [ 21.84 , 22.88 ]	Freq: 2.0	P[X]: 0.9901
Faixa: 22	Limites: [ 22.88 , 23.92 ]	Freq: 0.0	P[X]: 0.0
Faixa: 23	Limites: [ 23.92 , 24.96 ]	Freq: 2.0	P[X]: 0.9901
Faixa: 24	Limites: [ 24.96 , 26.0 ]	Freq: 3.0	P[X]: 1.4851

# Estatísticas Preliminares

## Alagoas - Obitos Novos - COVID-19



**BOX PLOT**



**HISTOGRAMA**

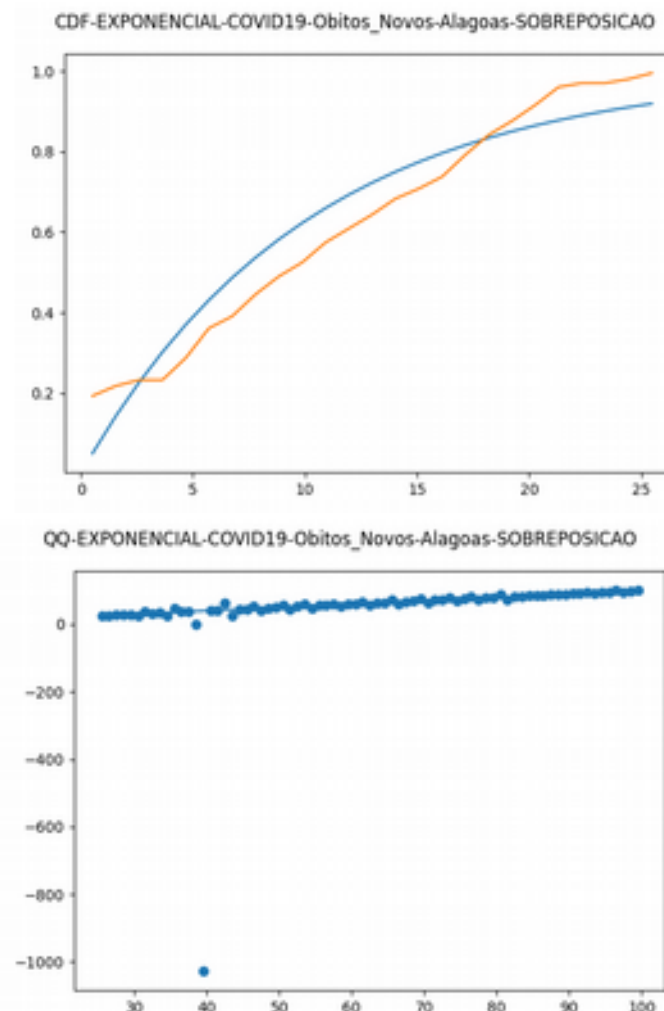
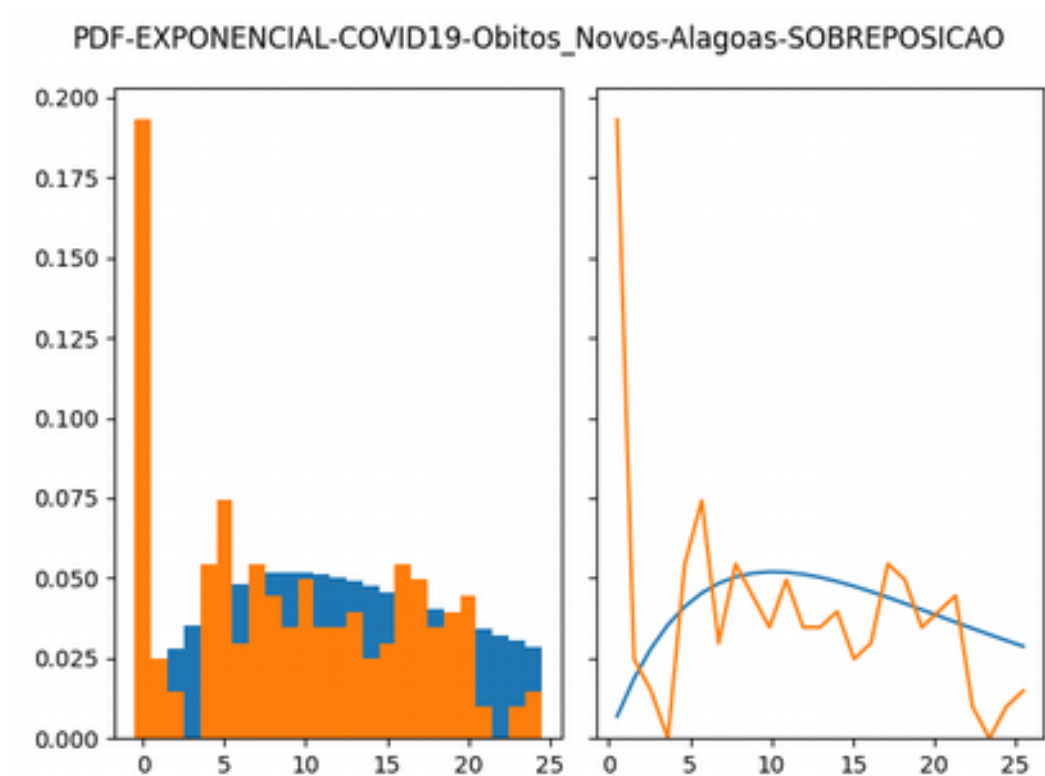
# EXPONENCIAL - MLE + PDF + CDF + QQ-PLOT

## Alagoas - Obitos Novos - COVID-19

### MLE - DISTRIBUICAO EXPONENCIAL:

C1: 0.14129741049062214

LAMBDA: 0.09871957775388529



# NORMAL - MLE + PDF + CDF + QQ-PLOT

## Alagoas - Obitos Novos - COVID-19

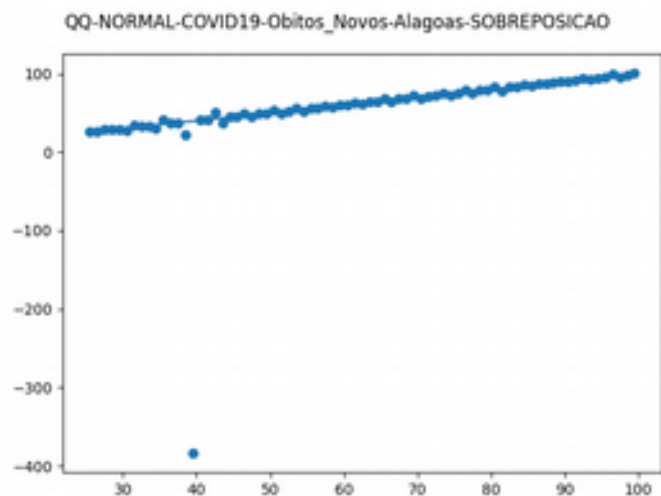
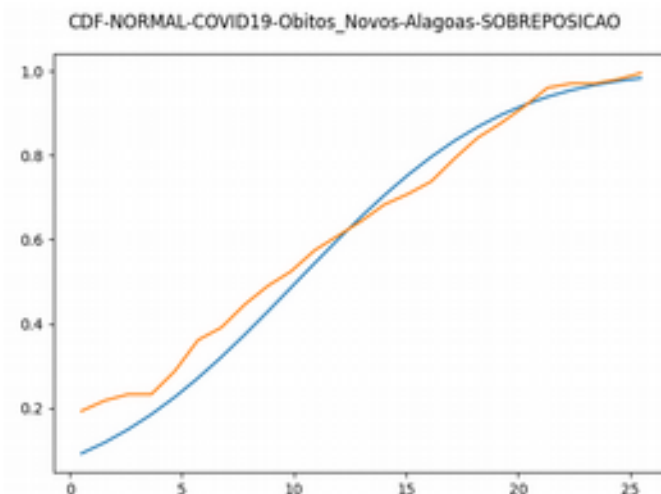
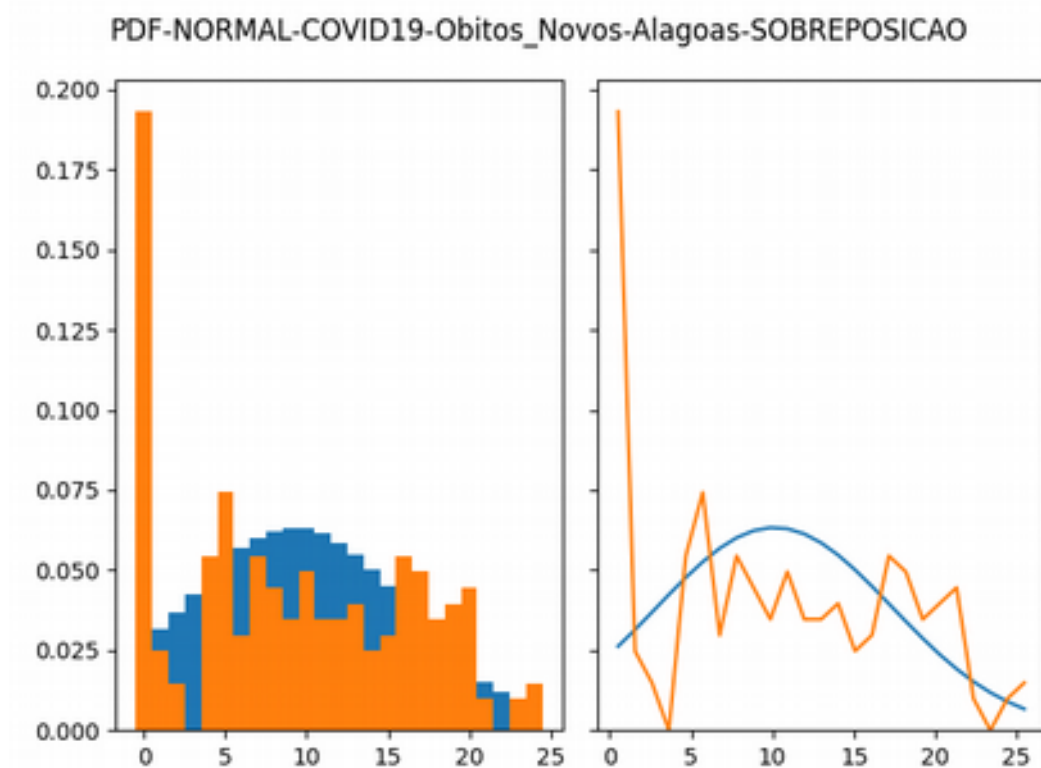
### MLE - DISTRIBUICAO NORMAL:

C1: 1.1489871084834677

MEDIA: 10.129702970297025

STD: 7.2406943956374015

VAR: 52.42765533101487





# LOG-NORMAL - MLE + PDF + CDF + QQ-PLOT

## Alagoas - Obitos Novos - COVID-19

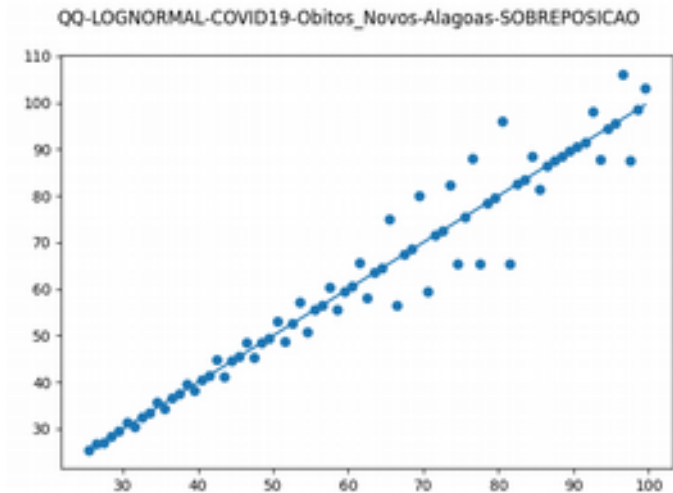
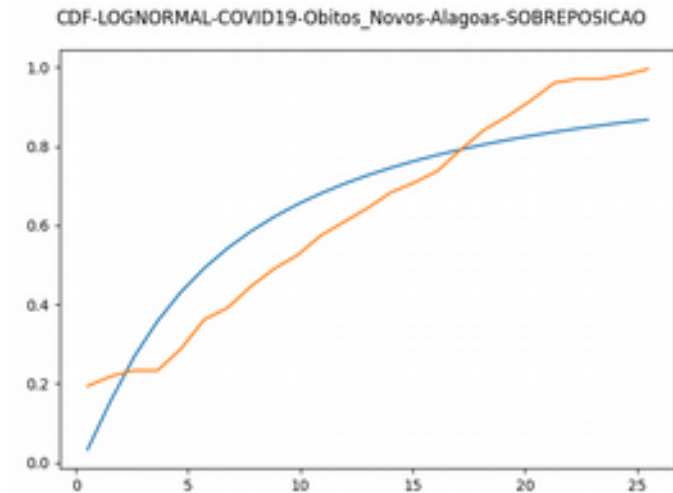
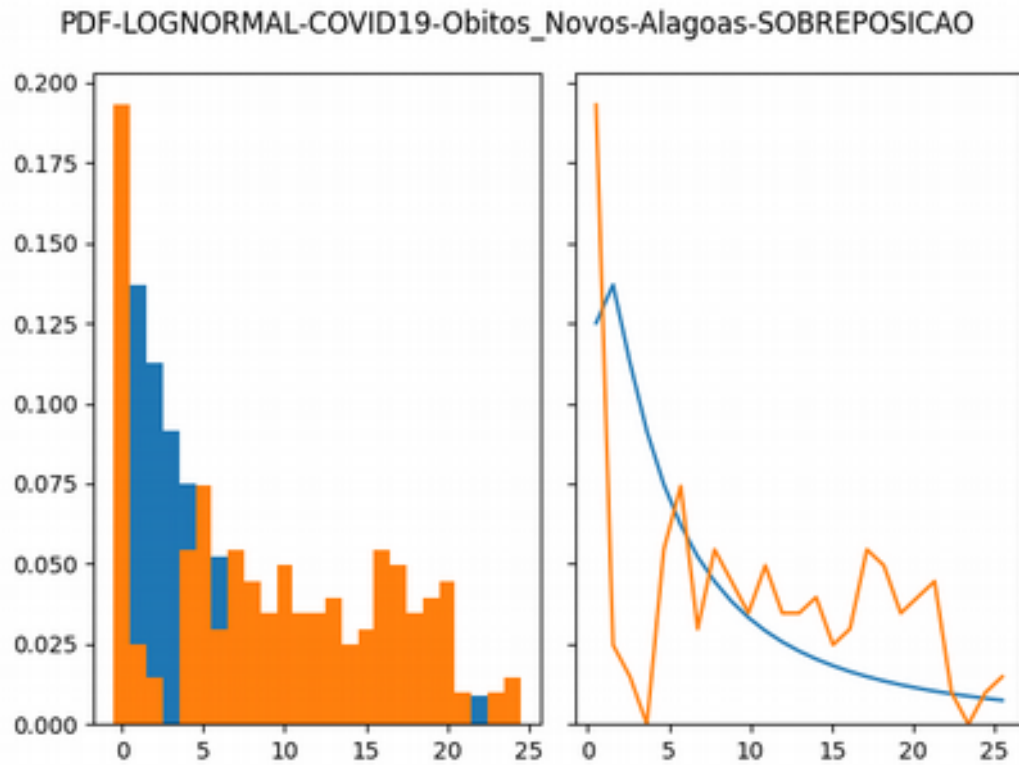
### MLE - DISTRIBUICAO LOG-NORMAL:

C1: 1.1721921278574166

MEDIA: 1.7720866100390373

STD: 1.316412840515201

VAR: 1.7329427666732997



# WEIBULL - MLE + PDF + CDF + QQ-PLOT

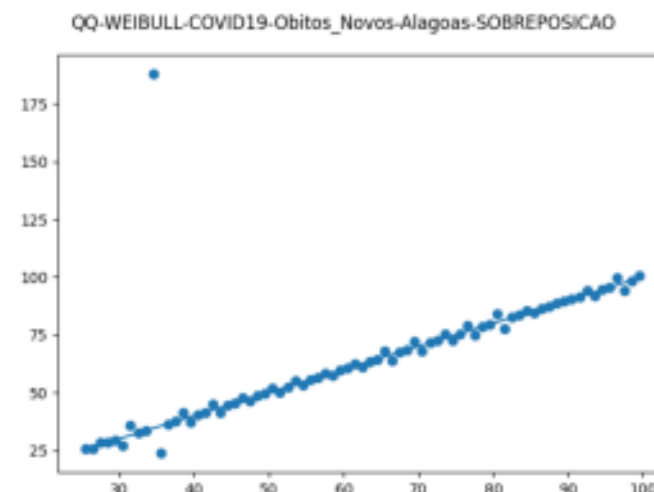
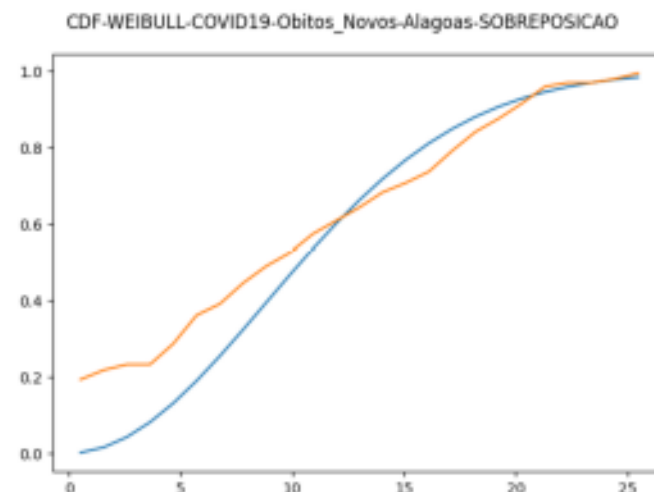
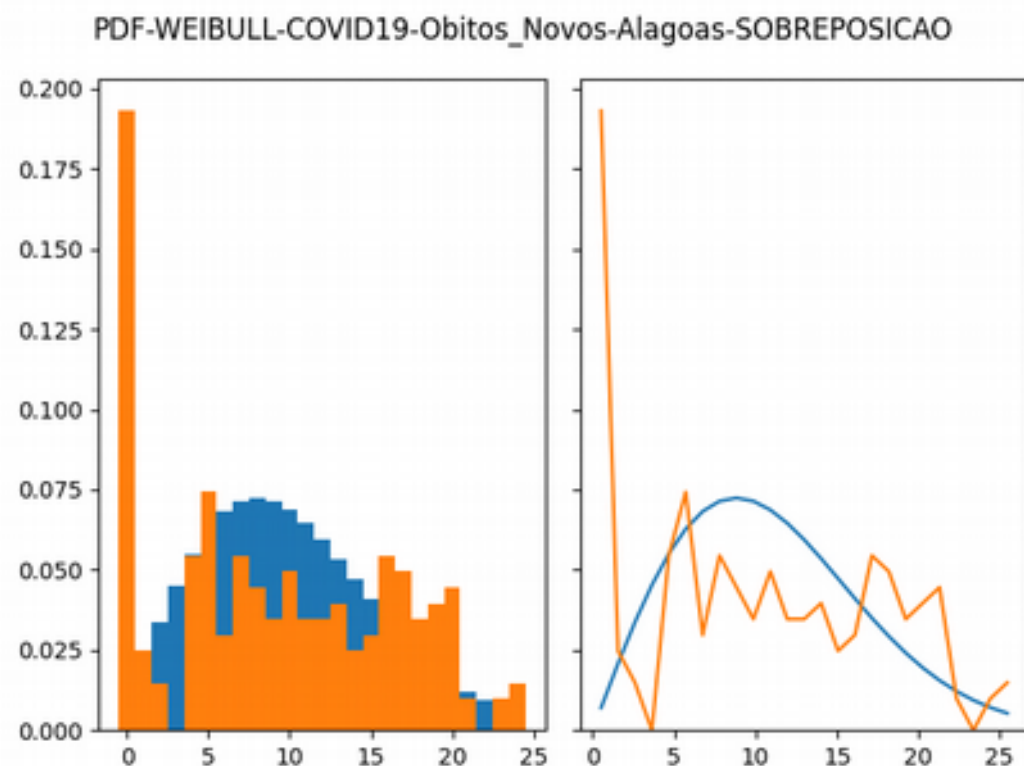
## Alagoas - Obitos Novos - COVID-19

### MLE - DISTRIBUICAO WEIBULL:

C1: 1.0529745035731408

LAMBDA: 12.47189918604743

K: 2.0 (valor fixo - considerado)



# TESTE KOLMOGOROV-SMIRNOV

## Alagoas - Obitos Novos - COVID-19

### ANALISE DO TESTE KOLMOGOROV-SMIRNOV:

KS-confidence: 0.95

KS-alfa: 0.05

$D_{25,0,05}$ : 0,264 (vide anexo I)

### 1. DISTRIBUIÇÃO EXPONENCIAL

Exp-Dn: 0.14303046598247854 <  $D_{25,0,05}$  (H0: ACCEPTED)

**Dn < D-25;0.05**

H0: The exponential distribution fit the data is ACCEPTED

Ha: The exponential distribution don't fit the data is UNKNOW

### 2. DISTRIBUIÇÃO NORMAL

Norm-Dn: 0.8918716530832337 >  $D_{25,0,05}$  (H0: REJECTED)

**Dn > D-25;0.05**

H0: The normal distribution fit the data is REJECTED

Ha: The normal distribution don't fit the data is ACCEPTED

### 3. DISTRIBUIÇÃO LOG-NORMAL

Lognorm-Dn: 0.9066814604587891 >  $D_{25,0,05}$  (H0: REJECTED)

**Dn > D-25;0.05**

H0: The log-normal distribution fit the data is REJECTED

Ha: The log-normal distribution don't fit the data is ACCEPTED

### 4. DISTRIBUIÇÃO WEIBULL

Weibull-Dn: 0.20147587744291676 <  $D_{25,0,05}$  (H0: ACCEPTED)

**Dn < D-25;0.05**

H0: The weibull distribution fit the data is ACCEPTED

Ha: The weibull distribution don't fit the data is UNKNOW

# ANEXO I - Tabela de Valores Críticos

**TABELA VII**

**Valores Críticos da Distribuição da Estatística  $D_n$  (Kolmogorov-Smirnov)**

Os valores tabelados correspondem aos pontos  $D_{n,\alpha}$  tais que:  $P(D_n \geq D_{n,\alpha}) = \alpha$ .

n	$\alpha$				
	0.20	0.10	0.05	0.02	0.01
1	0.900	0.95	0.975	0.990	0.995
2	0.684	0.776	0.842	0.900	0.929
3	0.565	0.636	0.708	0.785	0.829
4	0.493	0.565	0.624	0.689	0.734
5	0.447	0.509	0.563	0.627	0.669
6	0.410	0.468	0.519	0.577	0.617
7	0.381	0.436	0.483	0.538	0.576
8	0.358	0.410	0.454	0.497	0.542
9	0.339	0.387	0.430	0.480	0.513
10	0.323	0.369	0.409	0.457	0.489
11	0.308	0.352	0.391	0.437	0.468
12	0.296	0.338	0.375	0.419	0.449
13	0.285	0.325	0.361	0.404	0.432
14	0.275	0.314	0.349	0.390	0.418
15	0.266	0.304	0.338	0.377	0.404
16	0.258	0.295	0.327	0.366	0.392
17	0.250	0.286	0.318	0.355	0.381
18	0.244	0.279	0.309	0.346	0.371
19	0.237	0.271	0.301	0.337	0.361
20	0.232	0.265	0.294	0.329	0.352

n	$\alpha$				
	0.20	0.10	0.05	0.02	0.01
21	0.226	0.259	0.287	0.321	0.344
22	0.221	0.253	0.281	0.314	0.337
23	0.216	0.247	0.275	0.307	0.330
24	0.212	0.242	0.269	0.301	0.323
25	0.208	0.238	0.264	0.295	0.317
26	0.204	0.233	0.259	0.290	0.311
27	0.200	0.229	0.254	0.284	0.305
28	0.197	0.225	0.250	0.279	0.300
29	0.193	0.221	0.246	0.275	0.295
30	0.190	0.218	0.242	0.270	0.290
31	0.187	0.214	0.238	0.266	0.285
32	0.184	0.211	0.234	0.262	0.181
33	0.182	0.208	0.231	0.258	0.277
34	0.179	0.205	0.227	0.254	0.273
35	0.177	0.202	0.224	0.251	0.269
36	0.174	0.199	0.221	0.247	0.265
37	0.172	0.196	0.218	0.244	0.262
38	0.170	0.194	0.215	0.241	0.258
39	0.168	0.191	0.213	0.238	0.255
40	0.165	0.189	0.210	0.235	0.252

Para  $n > 40$  os valores críticos de  $D_n$  podem ser aproximados pelas seguintes expressões:

$\alpha$				
0.20	0.10	0.05	0.02	0.01
1.07	1.22	1.36	1.52	1.63
$\frac{1.07}{\sqrt{n}}$	$\frac{1.22}{\sqrt{n}}$	$\frac{1.36}{\sqrt{n}}$	$\frac{1.52}{\sqrt{n}}$	$\frac{1.63}{\sqrt{n}}$

# Dúvidas

