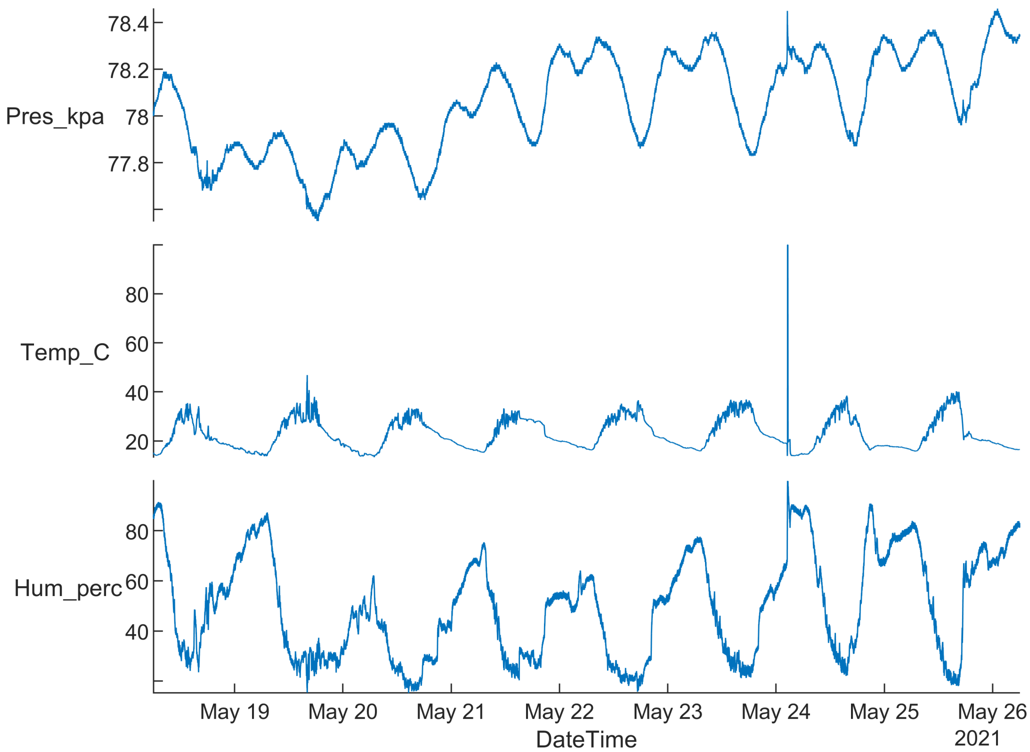
Estadística la venganza

Importamo los datos:

```
load("..\Utils4SP\Datasets\S5_Estadistica101_LaVenganza.mat")
```

Plots exploratorios

```
figure

% Vamos a graficar las columnas Pres,Temp y Hum. En el eje x (XVariable)
% se va a poner la fecha "DateTime"
stackedplot(atmosfera,'XVariable','DateTime')
```




```
summary(atmosfera)
```

```
Variables:

    Fecha: 137522×1 cell array of character vectors

    Hora: 137522×1 cell array of character vectors

    Pres_kpa: 137522×1 double

        Values:

            Min         77.55
            Median      78.06
```

```
        Max         78.46

    Temp_C: 137522×1 double

        Values:

            Min             13.38
            Median          21.01
            Max             100
            NumMissing      11

    Hum_perc: 137522×1 double

        Values:

            Min             15.27
            Median          50.16
            Max             99.97
            NumMissing      61

    DateTime: 137522×1 datetime

        Values:

            Min        20210518 06:00:03
            Median     20210522 05:59:48
            Max        20210526 05:59:55
```

```
%Exploración de Números faltantes
% Todas las lecturas de atmosfera
% tal que existan Nan's en su campo "humedad"
% y que sean todos los campos (columnas)
atmosfera(ismissing(atmosfera.Hum_perc),:)
```

ans = 61×6 table

	Fecha	Hora	Pres_kpa	Temp_C	Hum_perc	DateTime
1	'210519'	'01:55:14'	77.8600	16.5900	NaN	20210519 01:...
2	'210523'	'04:27:47'	78.2000	17.2300	NaN	20210523 04:...
3	'210523'	'05:17:37'	78.2000	17.2000	NaN	20210523 05:...
4	'210524'	'02:32:46'	78.3800	100	NaN	20210524 02:...
5	'210524'	'02:32:56'	78.3800	100	NaN	20210524 02:...
6	'210524'	'02:33:06'	78.3800	100	NaN	20210524 02:...
7	'210524'	'02:33:11'	78.3800	100	NaN	20210524 02:...
8	'210524'	'02:33:16'	78.3900	100	NaN	20210524 02:...
9	'210524'	'02:33:21'	78.3800	100	NaN	20210524 02:...
10	'210524'	'02:33:26'	78.3800	100	NaN	20210524 02:...
11	'210524'	'02:33:31'	78.3700	100	NaN	20210524 02:...
12	'210524'	'02:33:36'	78.3700	100	NaN	20210524 02:...
13	'210524'	'02:33:41'	78.3600	100	NaN	20210524 02:...

	Fecha	Hora	Pres_kpa	Temp_C	Hum_perc	DateTime
14	'210524'	'02:33:47'	78.3600	100	NaN	20210524 02:...
15	'210524'	'02:33:52'	78.3600	100	NaN	20210524 02:...
16	'210524'	'02:33:57'	78.3600	100	NaN	20210524 02:...
17	'210524'	'02:34:02'	78.3500	100	NaN	20210524 02:...
18	'210524'	'02:34:07'	78.3500	100	NaN	20210524 02:...
19	'210524'	'02:34:12'	78.3500	100	NaN	20210524 02:...
20	'210524'	'02:34:17'	78.3500	100	NaN	20210524 02:...
21	'210524'	'02:34:22'	78.3500	100	NaN	20210524 02:...
22	'210524'	'02:34:27'	78.3400	100	NaN	20210524 02:...
23	'210524'	'02:34:32'	78.3400	100	NaN	20210524 02:...
24	'210524'	'02:34:37'	78.3400	100	NaN	20210524 02:...
25	'210524'	'02:34:42'	78.3500	100	NaN	20210524 02:...
26	'210524'	'02:34:47'	78.3400	100	NaN	20210524 02:...
27	'210524'	'02:34:52'	78.3400	100	NaN	20210524 02:...
28	'210524'	'02:34:57'	78.3500	100	NaN	20210524 02:...
29	'210524'	'02:35:02'	78.3400	100	NaN	20210524 02:...
30	'210524'	'02:35:07'	78.3400	100	NaN	20210524 02:...
31	'210524'	'02:35:12'	78.3400	100	NaN	20210524 02:...
32	'210524'	'02:35:17'	78.3400	100	NaN	20210524 02:...
33	'210524'	'02:35:22'	78.3400	100	NaN	20210524 02:...
34	'210524'	'02:35:27'	78.3300	100	NaN	20210524 02:...
35	'210524'	'02:35:32'	78.3300	100	NaN	20210524 02:...
36	'210524'	'02:35:37'	78.3300	100	NaN	20210524 02:...
37	'210524'	'02:35:42'	78.3300	100	NaN	20210524 02:...
38	'210524'	'02:35:47'	78.3300	100	NaN	20210524 02:...
39	'210524'	'02:35:52'	78.3200	100	NaN	20210524 02:...
40	'210524'	'02:35:57'	78.3300	100	NaN	20210524 02:...
41	'210524'	'02:36:02'	78.3200	100	NaN	20210524 02:...
42	'210524'	'02:36:07'	78.3200	100	NaN	20210524 02:...
43	'210524'	'02:36:12'	78.3200	100	NaN	20210524 02:...
44	'210524'	'02:36:17'	78.3200	100	NaN	20210524 02:...
45	'210524'	'02:36:22'	78.3200	100	NaN	20210524 02:...
46	'210524'	'02:36:27'	78.3200	100	NaN	20210524 02:...

	Fecha	Hora	Pres_kpa	Temp_C	Hum_perc	DateTime
47	'210524'	'02:36:32'	78.3300	100	NaN	20210524 02:...
48	'210524'	'02:36:37'	78.3100	100	NaN	20210524 02:...
49	'210524'	'02:36:42'	78.3000	100	NaN	20210524 02:...
50	'210524'	'02:36:47'	78.3100	100	NaN	20210524 02:...
51	'210524'	'02:36:53'	78.3100	100	NaN	20210524 02:...
52	'210524'	'02:36:58'	78.3000	100	NaN	20210524 02:...
53	'210524'	'02:37:03'	78.3100	100	NaN	20210524 02:...
54	'210524'	'02:37:08'	78.3100	100	NaN	20210524 02:...
55	'210524'	'02:37:13'	78.3100	100	NaN	20210524 02:...
56	'210524'	'02:37:18'	78.3200	100	NaN	20210524 02:...
57	'210524'	'02:37:24'	78.3100	100	NaN	20210524 02:...
58	'210524'	'02:37:34'	78.3100	100	NaN	20210524 02:...
59	'210524'	'02:37:39'	78.3200	100	NaN	20210524 02:...
60	'210524'	'08:33:50'	78.2800	18.3700	NaN	20210524 08:...
61	'210526'	'01:52:49'	78.4100	18.4400	NaN	20210526 01:...

```
%Exploración de Números faltantes
% Todas las lecturas de atmosfera
% tal que existan Nan's en su campo "Temperatura"
% y que sean todos los campos
atmosfera(ismissing(atmosfera.Temp_C),:)
```

ans = 11×6 table

	Fecha	Hora	Pres_kpa	Temp_C	Hum_perc	DateTime
1	'210518'	'17:59:58'	77.7100	NaN	49.6800	20210518 17:...
2	'210520'	'09:27:14'	77.9500	NaN	38.9700	20210520 09:...
3	'210520'	'09:37:27'	77.9500	NaN	39.4700	20210520 09:...
4	'210520'	'21:22:43'	77.8400	NaN	44.8400	20210520 21:...
5	'210521'	'20:50:27'	78.0400	NaN	48.0700	20210521 20:...
6	'210522'	'20:57:34'	78.0700	NaN	51.3400	20210522 20:...
7	'210522'	'20:57:44'	78.0800	NaN	51.2100	20210522 20:...
8	'210522'	'20:58:39'	78.0700	NaN	51.2900	20210522 20:...
9	'210523'	'10:19:08'	78.3200	NaN	53.7100	20210523 10:...
10	'210523'	'21:44:54'	78.0100	NaN	52.8200	20210523 21:...
11	'210525'	'18:14:48'	78	NaN	61.0600	20210525 18:...

```
%Exploración de Números faltantes
% Todas las lecturas de atmosfera
```

```
% tal que existan Nan's en su campo "Presión"
% y que sean todos los campos
atmosfera(ismissing(atmosfera.Pres_kpa),:)
```

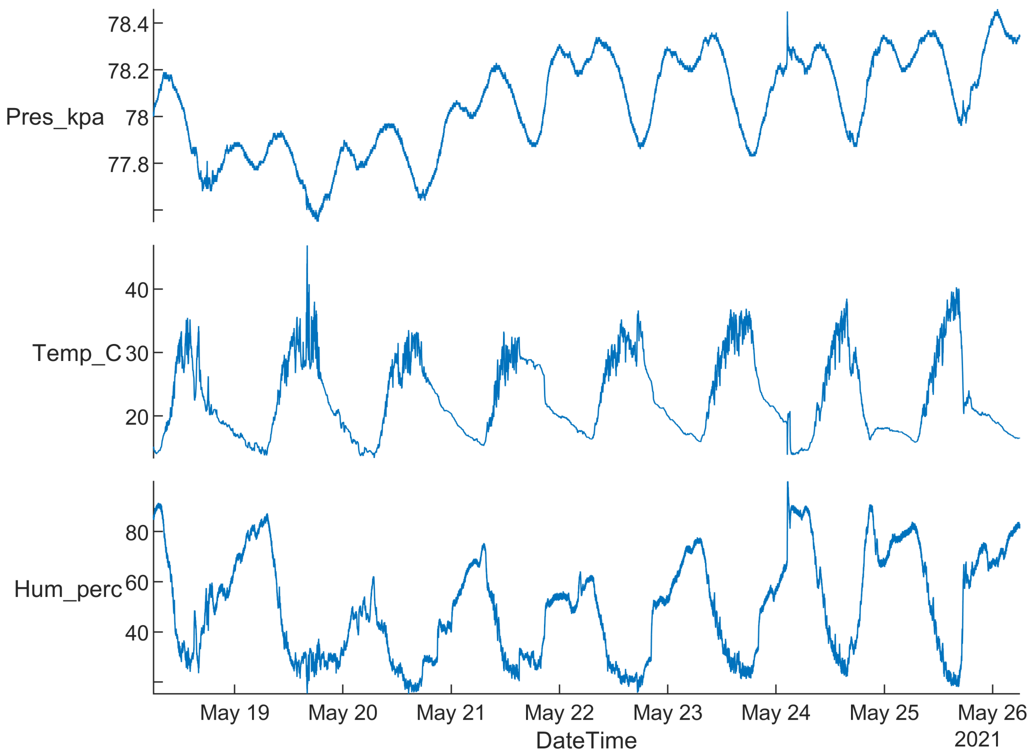
```
ans =

  0×6 empty table
```

```

% Podemos especificar qué columnas sean las únicas que queramos que se
% muestren

atmosfera(ismissing(atmosfera.Temp_C),["DateTime","Hum_perc"])
```

ans = 11×2 table

	DateTime	Hum_perc
1	20210518 17:...	49.6800
2	20210520 09:...	38.9700
3	20210520 09:...	39.4700
4	20210520 21:...	44.8400
5	20210521 20:...	48.0700
6	20210522 20:...	51.3400
7	20210522 20:...	51.2100
8	20210522 20:...	51.2900
9	20210523 10:...	53.7100
10	20210523 21:...	52.8200
11	20210525 18:...	61.0600

```
%Quitamos los Nans (rmissing) de la tabla atmosfera:
atmosfera_clean = rmmissing(atmosfera);

%Y vemos cómo se ven las gráficas sin los Nans
figure
stackedplot(atmosfera_clean,'XVariable','DateTime')
```



Obtenemos datos estadísticos

```
%Obtenemos el promedio
hum_mean = mean(atmosfera_clean.Hum_perc)
```

```
hum_mean = 49.6841
```

```
%y la mediana
hum_median = median(atmosfera_clean.Hum_perc)
```

```
hum_median = 50.1550
```

```
%y la moda:
hum_mode = mode(atmosfera_clean.Hum_perc)
```

```
hum_mode = 28.9200
```

```
%Quantiles
hum_1Q = quantile(atmosfera_clean.Hum_perc,0.25)
```

```
hum_1Q = 29.8800
```

```

hum_3Q = quantile(atmosfera_clean.Hum_perc,0.75)
```

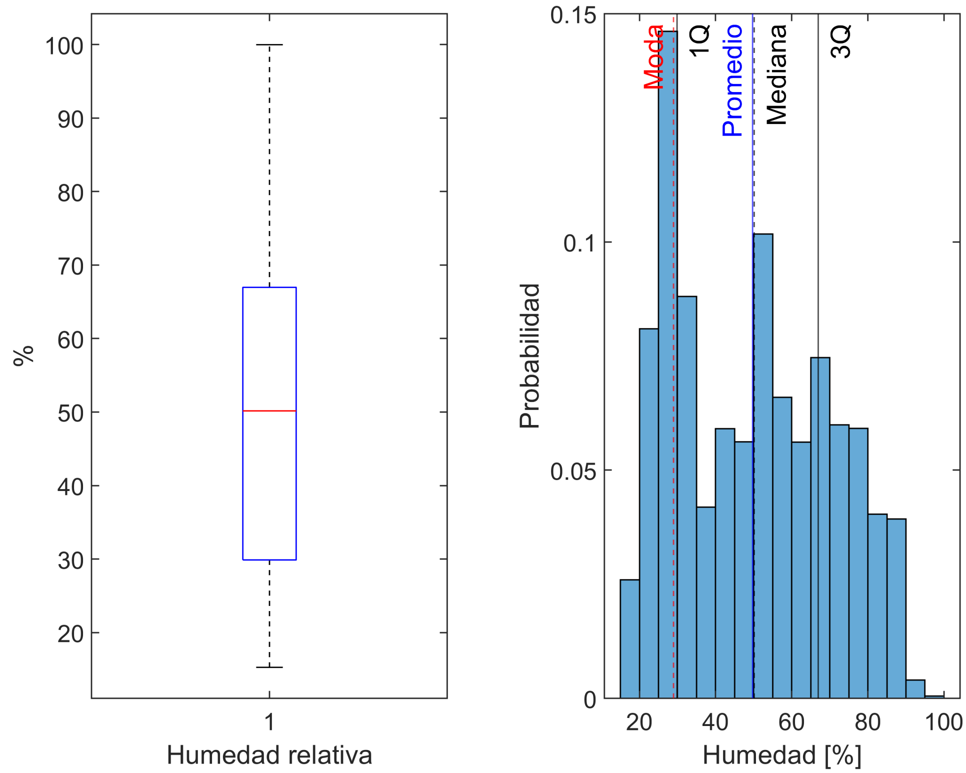
```
hum_3Q = 66.9600
```

Métricas de tendencia central

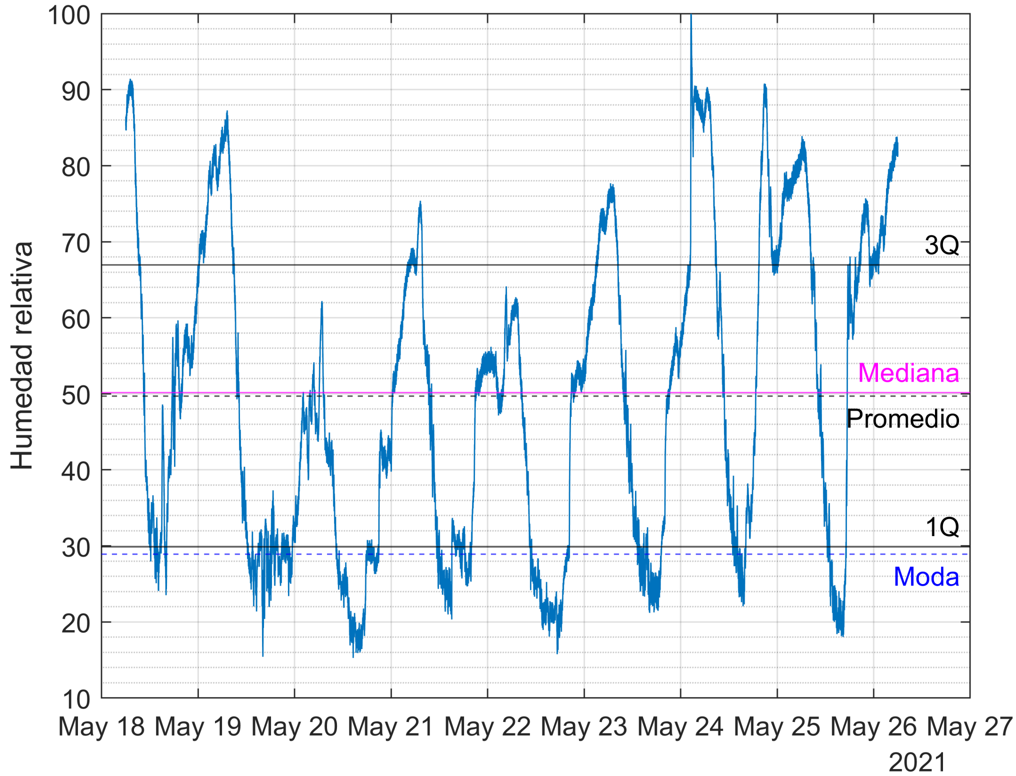
```
%Una gráfica con boxplot e histograma

figure

% Es como hacer subplots en Python
tiledlayout(1,2)

% nexttile es para ir colocando las gráficas en cada subplot que creamos
nexttile

% El contenido en la primera gráfica
boxplot(atmosfera_clean.Hum_perc)
```

```
Warning: Unable to set 'Position', 'InnerPosition', 'OuterPosition', or 'PositionConstraint' for objects in
a TiledChartLayout
```

```
xlabel("Humedad relativa")
ylabel("%")

% Siguiente subplot
nexttile
histogram(atmosfera_clean.Hum_perc,'BinWidth',5,'Normalization',"probability")

%El siguiente paso agrega líneas verticales que representan varios valores
%estadísticos
hold on
xline(hum_mean,'b','Promedio',"LabelHorizontalAlignment","left")
xline(hum_median,'--k','Mediana',"LabelHorizontalAlignment","right")
xline(hum_mode,'--r','Moda',"LabelHorizontalAlignment","left")
xline(hum_1Q,'k','1Q',"LabelHorizontalAlignment","right")
xline(hum_3Q,'k','3Q',"LabelHorizontalAlignment","right")

hold off

xlabel("Humedad [%]")
ylabel("Probabilidad")
```

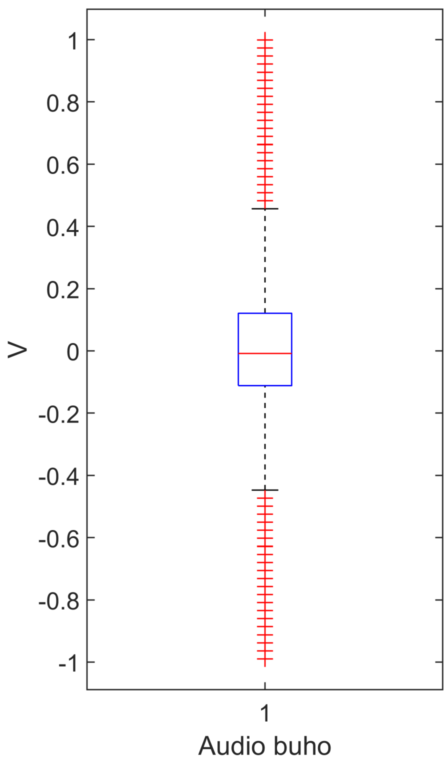


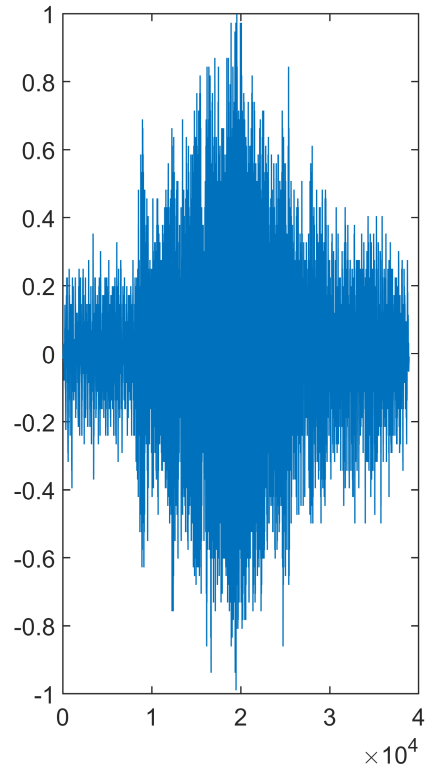

```
%Serie de tiempo
figure
% plot(x,y)
plot(atmosfera_clean.DateTime,atmosfera_clean.Hum_perc)
ylabel("Humedad relativa")

%El siguiente paso agrega líneas horizontales que representan varios valores
%estadísticos
hold on
yline(hum_mean,'--k','Promedio',"LabelVerticalAlignment","bottom")
yline(hum_median,'m','Mediana',"LabelVerticalAlignment","top")
yline(hum_mode,'--b','Moda',"LabelVerticalAlignment","bottom")

yline(hum_1Q,'k','1Q',"LabelVerticalAlignment","top")
yline(hum_3Q,'k','3Q',"LabelVerticalAlignment","top")
hold off


% Ponemos una rejilla
grid on
grid minor
```



Dispersión

```
% Vamos a graficar las muestras de sonido de "buho":
% Tomamos el canal izquierdo:
buho_left = buho(:,1);
plot(buho_left)
```



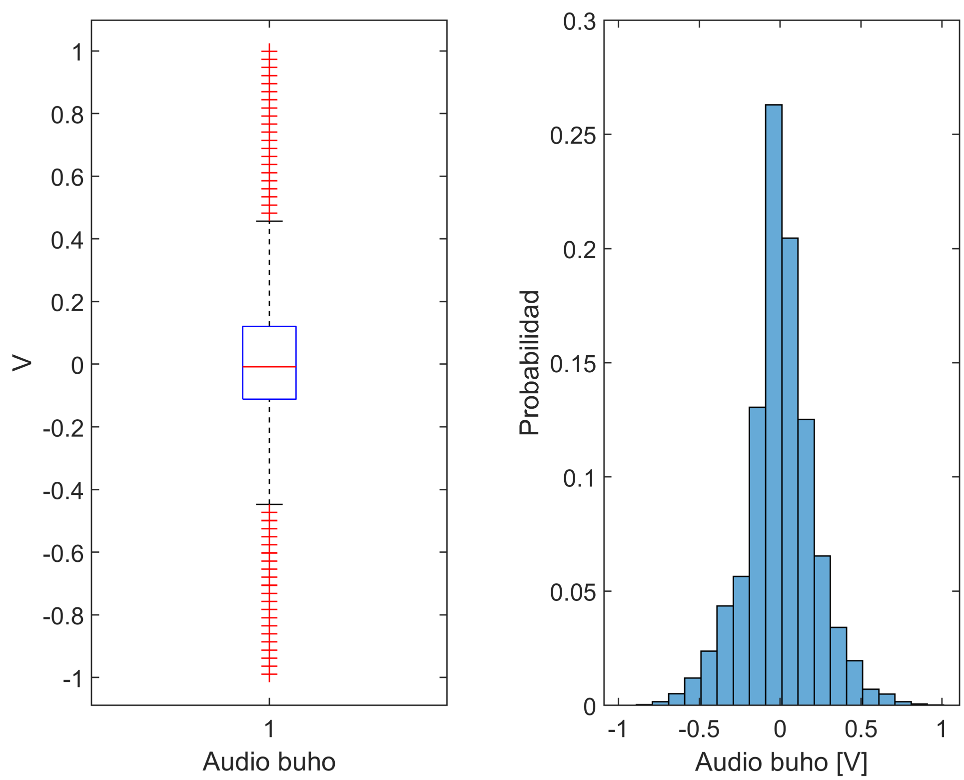



```
%Copiamos y pegamos los códigos de las gráficas anteriores:
%Una gráfica con boxplot e histograma

figure

% Es como hacer subplots en Python
tiledlayout(1,2)

% nexttile es para ir colocando las gráficas en cada subplot que creamos
nexttile

% El contenido en la primera gráfica
boxplot(buho_left)
```

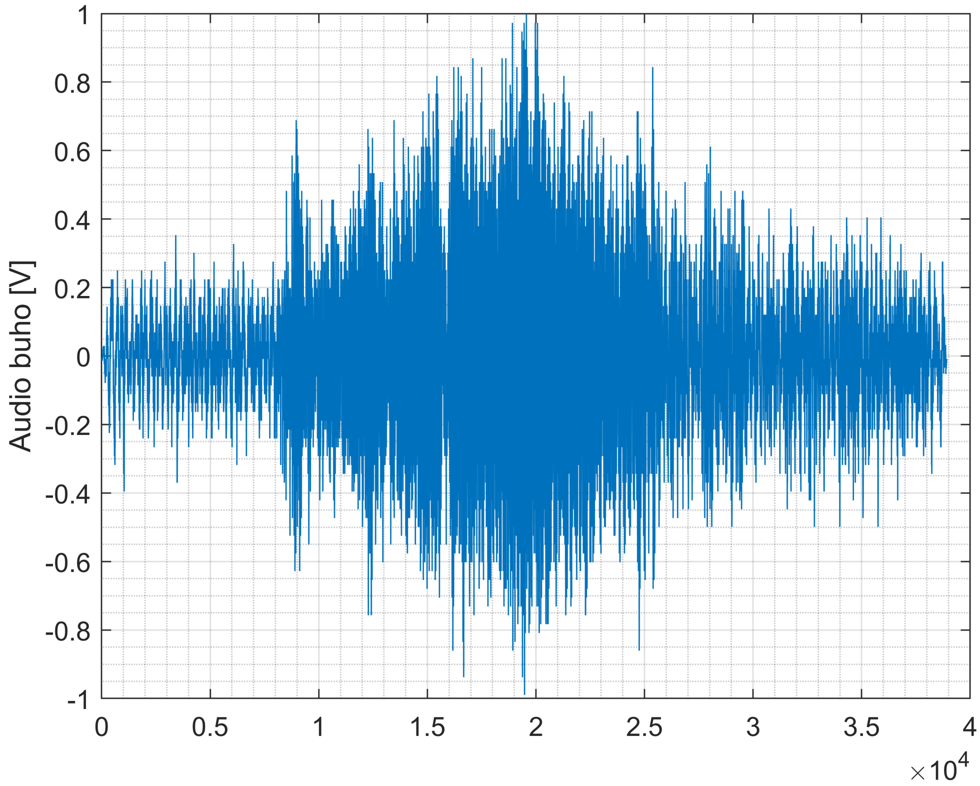
```
Warning: Unable to set 'Position', 'InnerPosition', 'OuterPosition', or 'PositionConstraint' for objects in
a TiledChartLayout
```

```
xlabel("Audio buho")
ylabel("V")

% Siguiente subplot
nexttile
histogram(buho_left,20,'Normalization',"probability")

hold off

xlabel("Audio buho [V]")
```

```
ylabel("Probabilidad")
```




```
%Serie de tiempo
figure
plot(buho_left)
ylabel("Audio buho [V]")
% Ponemos una rejilla
grid on
grid minor
```



Actividad:

- Sacar desviación estándar, varianza y promedio
- Colocar promedio
- Actividad: colocar promedio + σ y promedio -σ

```
%Obtenemos el promedio
buho_mean = mean(buho_left)
```

```
buho_mean = 8.1547e-08
```

```
%Obtenemos la varianza
buho_var = var(buho_left)
```

```
buho_var = 0.0451
```

```
%Obtenemos la std
buho_std = std(buho_left)
```

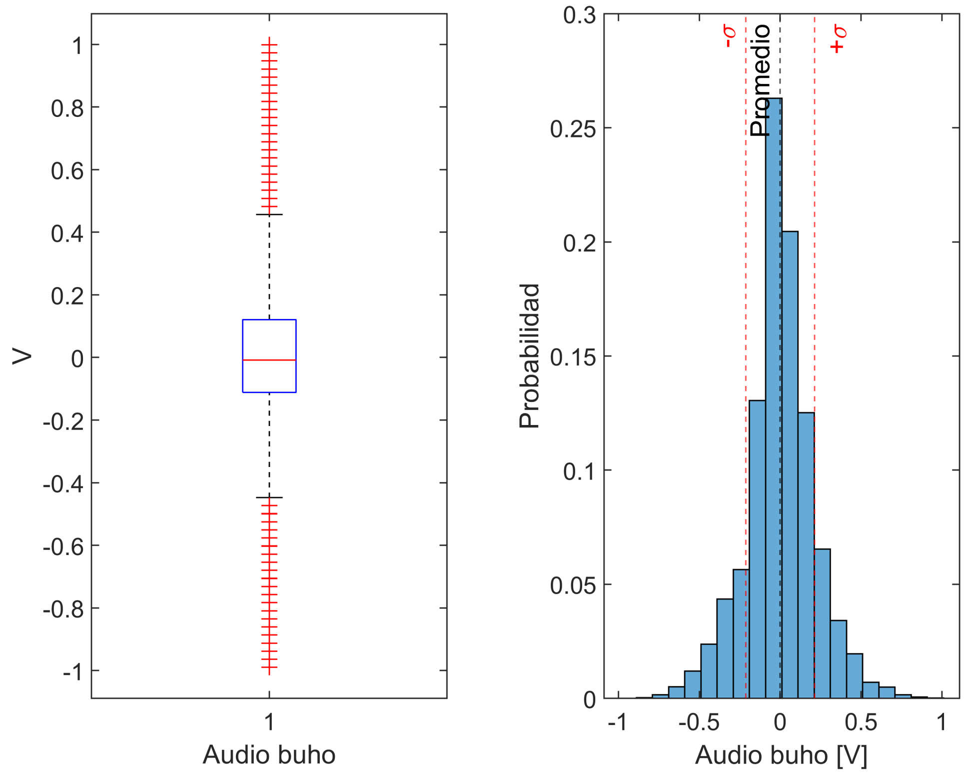
```
buho_std = 0.2124
```

```
%Hacemos el plot:
```

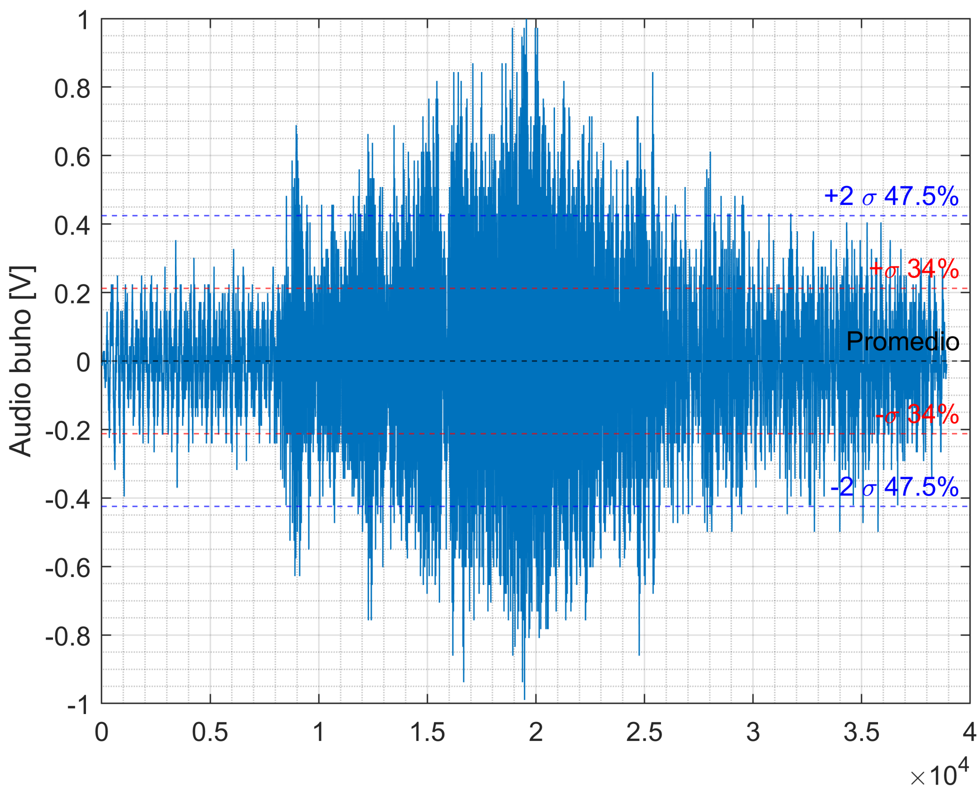
```
%Una gráfica con boxplot e histograma

figure

% Es como hacer subplots en Python
tiledlayout(1,2)

% nexttile es para ir colocando las gráficas en cada subplot que creamos
nexttile

% El contenido en la primera gráfica
boxplot(buho_left)
```

```
Warning: Unable to set 'Position', 'InnerPosition', 'OuterPosition', or 'PositionConstraint' for objects in
a TiledChartLayout
```

```
xlabel("Audio buho")
ylabel("V")

% Siguiente subplot
nexttile
histogram(buho_left,20,'Normalization',"probability")
xlabel("Audio buho [V]")
ylabel("Probabilidad")

hold on
xline(buho_mean,'k--','Promedio',"LabelHorizontalAlignment","left")
xline(buho_mean + buho_std,'--r','+\sigma',"LabelHorizontalAlignment","right")
xline(buho_mean - buho_std,'--r','-\sigma',"LabelHorizontalAlignment","left")

hold off
```




```
%Serie de tiempo
figure
plot(buho_left)
ylabel("Audio buho [V]")

%Ploteamos líneas euivalentes a +/- 1 sigman y 2 sigma
hold on
yline(buho_mean,'k--','Promedio')
%+/- 1 sigma
yline(buho_mean + buho_std,'--r','+\sigma 34%')
yline(buho_mean - buho_std,'--r','-\sigma 34%')
%+/- 2 sigma
yline(buho_mean + 2.*buho_std,'--b','+2 \sigma 47.5%')
yline(buho_mean - 2.*buho_std,'--b','-2 \sigma 47.5%')

hold off
% Ponemos una rejilla
grid on
grid minor
```



Ajustes

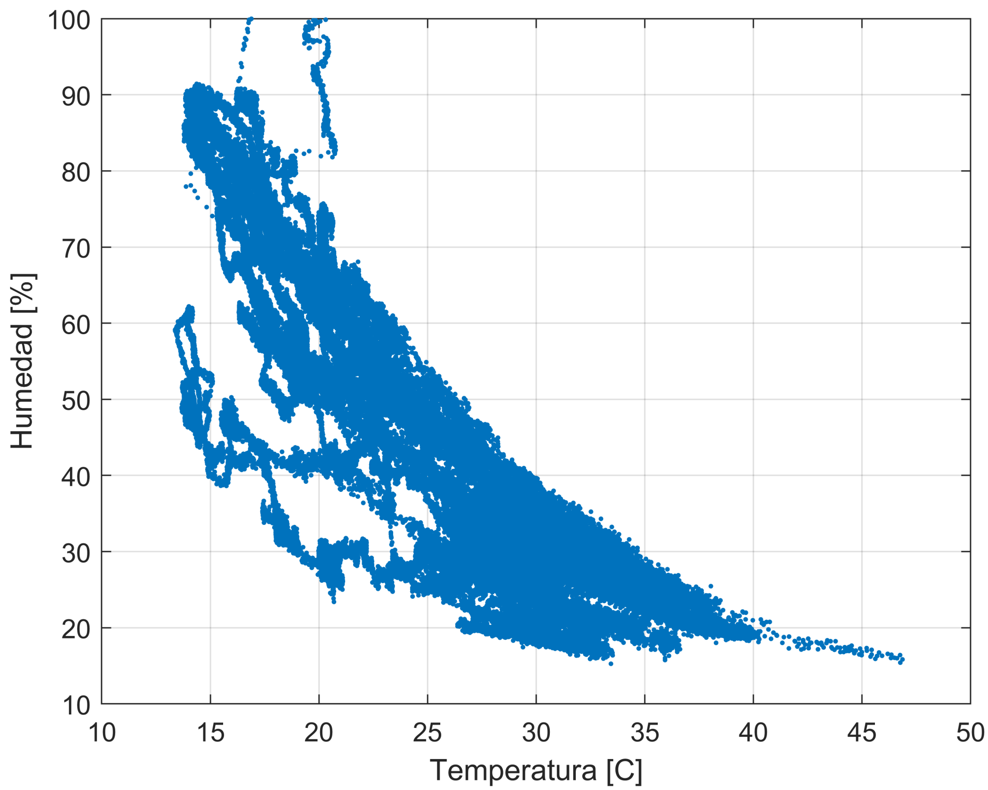
```
plot(atmosfera_clean.Temp_C,atmosfera_clean.Hum_perc,'.')
xlabel ("Temperatura [C]")
ylabel("Humedad [%]")
grid on

% Hacemos el fit
% El primer argumento es el fit y el 2o es gof=goodness of fit
% la función fit recibe tres parámetros, el tercero se refiere al grado del
% polinomio. 'Poly1' es un polinomio de grado 1
[fit_relacion,gof] = fit(atmosfera_clean.Temp_C,atmosfera_clean.Hum_perc,'poly1')
```

```
fit_relacion =
     Linear model Poly1:
     fit_relacion(x) = p1*x + p2
     Coefficients (with 95% confidence bounds):
       p1 =      -2.772  (-2.781, -2.763)
       p2 =       113.2  (112.9, 113.4)
gof = struct with fields:
           sse: 1.5967e+07
       rsquare: 0.7212
           dfe: 137448
    adjrsquare: 0.7212
          rmse: 10.7783
```

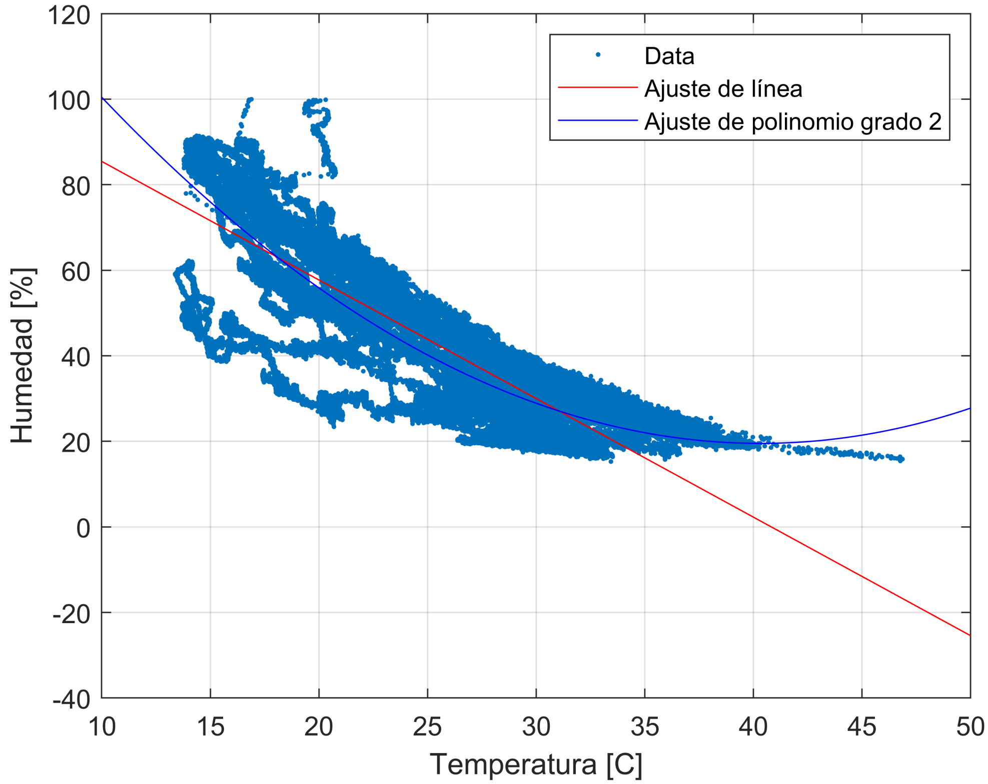
```
[fit_relacion2,gof] = fit(atmosfera_clean.Temp_C,atmosfera_clean.Hum_perc,'poly2')
```

```
fit_relacion2 =
     Linear model Poly2:
     fit_relacion2(x) = p1*x^2 + p2*x + p3
     Coefficients (with 95% confidence bounds):
       p1 =       0.088  (0.08654, 0.08946)
       p2 =      -7.097  (-7.169, -7.024)
       p3 =       162.6  (161.8, 163.5)
gof = struct with fields:
           sse: 1.4498e+07
       rsquare: 0.7468
           dfe: 137447
    adjrsquare: 0.7468
          rmse: 10.2703
```

```
figure
plot(atmosfera_clean.Temp_C,atmosfera_clean.Hum_perc,'.')
hold on
plot(fit_relacion, 'r')
plot(fit_relacion2, 'b')
```




```
hold off
xlabel ("Temperatura [C]")
ylabel("Humedad [%]")
grid on
legend("Data","Ajuste de línea","Ajuste de polinomio grado 2")
```


Data
Ajuste de línea
Ajuste de polinomio grado 2
Humedad [%]
Temperatura [C]
120
100
80
60
40
20
0
-20
-40
10
15
20
25
30
35
40
45
50