

### Actividad 3 Modelamiento de Datos

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#### 1. Ejercicio 1:

A. Escriba las fórmulas de interpolación de Lagrange y Lineal ajustada a los puntos dados en la siguiente tabla:

$i$	$x_i$	$f(x_i)$
1	0	0.9162
2	0.25	0.8109
3	0.5	0.6931
4	0.75	0.5596
5	1.0	0.4055

Polinomio de Lagrange:

$$L_1(x) = \frac{(x-0.25)(x-0.5)(x-0.75)(x-1.0)}{(0-0.25)(0-0.5)(0-0.75)(0-1.0)}$$

$$L_2(x) = \frac{x(x-0.5)(x-0.75)(x-1.0)}{(0.25-0)(0.25-0.5)(0.25-0.75)(0.25-1.0)}$$

$$L_3(x) = \frac{x(x-0.25)(x-0.75)(x-1.0)}{(0.5-0)(0.5-0.25)(0.5-0.75)(0.5-1.0)}$$

$$L_4(x) = \frac{x(x-0.25)(x-0.5)(x-1.0)}{(0.75-0)(0.75-0.25)(0.75-0.5)(0.75-1.0)}$$

$$L_5(x) = \frac{x(x-0.25)(x-0.5)(x-0.75)}{(1.0-0)(1.0-0.25)(1.0-0.5)(1.0-0.75)}$$

$$P(x) = 0.9162 * \frac{(x-0.25)(x-0.5)(x-0.75)(x-1.0)}{(0-0.25)(0-0.5)(0-0.75)(0-1.0)} + 0.8109 * \frac{(x-0)(x-0.5)(x-0.75)(x-1.0)}{(0.25-0)(0.25-0.5)(0.25-0.75)(0.25-1.0)} + 0.6931 * \frac{(x-0)(x-0.25)(x-0.75)(x-1.0)}{(0.5-0)(0.5-0.25)(0.5-0.75)(0.5-1.0)} + 0.5596 * \frac{(x-0)(x-0.25)(x-0.5)(x-1.0)}{(0.75-0)(0.75-0.25)(0.75-0.5)(0.75-1.0)} + 0.4055 * \frac{(x-0)(x-0.25)(x-0.5)(x-0.75)}{(1.0-0)(1.0-0.25)(1.0-0.5)(1.0-0.75)}$$

Lineal:

$$y = \frac{y_{i+1}-y_i}{x_{i+1}-x_i}(x - x_i) + y_i$$

- Intervalo [0, 0.25]:

$$y = -0.42120x + 0.9162$$

- Intervalo [0.25, 0.5]:

$$y = -0.4712x + 0.9287$$

- Intervalo [0.5, 0.75]:

$$y = -0.534x + 0.9601$$

- Intervalo [0.75, 1.0]:

$$y = -0.6164x + 1.0219$$

B. Calculo a mano del valor estimado de y

Implementación de Lagrange en el punto x=0.6

- Primer término (i = 1):

$$L_1(0.6) = \frac{(0.6 - 0.25)(0.6 - 0.5)(0.6 - 0.75)(0.6 - 1.0)}{(0 - 0.25)(0 - 0.5)(0 - 0.75)(0 - 1.0)} = -0.1536$$

$$0.9162 * (-0.1536) = -0.0205$$

- Segundo término (i = 2):

$$L_2(0.6) = \frac{0.6 * 0.1 * (-0.15)(-0.4)}{0.015625} = 0.8064$$

$$0.8109 * (-0.1536) = -0.1245$$

- Tercer termino (i = 3):

$$L_3(0.6) = \frac{0.6 * 0.35 * (-0.15)(-0.4)}{0.015625} = 0.8064$$

$$0.6931 * 0.8164 = 0.559$$

- Cuarto termino (i = 4):

$$L_4(0.6) = \frac{0.6 * 0.35 * 0.1(-0.4)}{-0.0234375} = 0.3584$$

$$0.5596 - 0.3584 = 0.2005$$

- Quinto termino (i = 5):

$$L_5(0.6) = \frac{0.6 * 0.35 * 0.1 * (-0.15)}{0.09375} = -0.0336$$

$$0.4055 * (-0.0336) = -0.0136$$

$$P(0.6) = 0.0205 - 0.1245 + 0.559 + 0.2005 - 0.0136 = 0.642$$

El valor interpolado de y en x = 0.6 es 0.642

Implementación de interpolación lineal en el punto x = 0.6

$$m = \frac{0.5596 - 0.6931}{0.75 - 0.5} = -\frac{0.1335}{0.25} = -0.534$$

Sustitución de valores:

$$\begin{aligned} y &= -0.534 * (0.6 - 0.5) + 0.6931 = -0.534 * 0.1 + 0.6931 \\ &= -0.0534 + 0.6931 = 0.6397 \end{aligned}$$

- El valor está entre y3 = 0.6931 y y4 = 0.5596, sigue coherente con la tendencia creciente de los datos.
- El valor interpolado de y = 0.6 es 0.6397

### C. Aplicación de fórmulas en Octave

- Lagrange:

```
>> X=[0, 0.25, 0.5, 0.75, 1.0];
>> Y=[0.9162, 0.8109, 0.6931, 0.5596, 0.4055];
>> x=0.6;
>> y=Polylagrange(x, X, Y)
y = 0.6418
>> regresionLineal
```

- Regresión lineal:

```
>> [m, b] = regresionLineal(X, Y)
m = -0.5091
b = 0.9316
>> y = (m*x)+b
y = 0.6262
```

### 2. Ejercicio 2:

$i$	$x_i$	$y_i$
1	0.1	9.9
2	0.2	9.2
3	0.3	8.4
4	0.4	6.6
5	0.5	5.9
6	0.6	5.0
7	0.7	4.1
8	0.8	3.1
9	0.9	1.9
10	1.0	1.1

A. Cálculo del valor estimado de  $y$ , mediante regresión lineal.

- Cálculo de  $m$ :

$$m = \frac{10 * 22.1 - 5.5 * 50.2}{10 * 3.85 - (5.5)^2} = \frac{221 - 276.1}{38.5 - 30.25} = -\frac{55.1}{8.25} = -6.6788$$

- Cálculo de  $b$ :

$$b = \frac{50.2 - (-6.6788) * 5.5}{10} = \frac{50.2 + 36.7334}{10} = 8.6933$$

- Ecuación final de la recta:

$$y = -6.6788x + 8.6933$$

B. Obtener valores de  $m$  y  $b$  mediante Octave

```
>> X=[0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0];
>> Y=[9.9, 9.2, 8.4, 6.6, 5.9, 5.0, 4.1, 3.1, 1.9, 1.1];
>> [m, b] = regresionLineal(X, Y)
m = -10.012
b = 11.027
>> |
```