Interpolation

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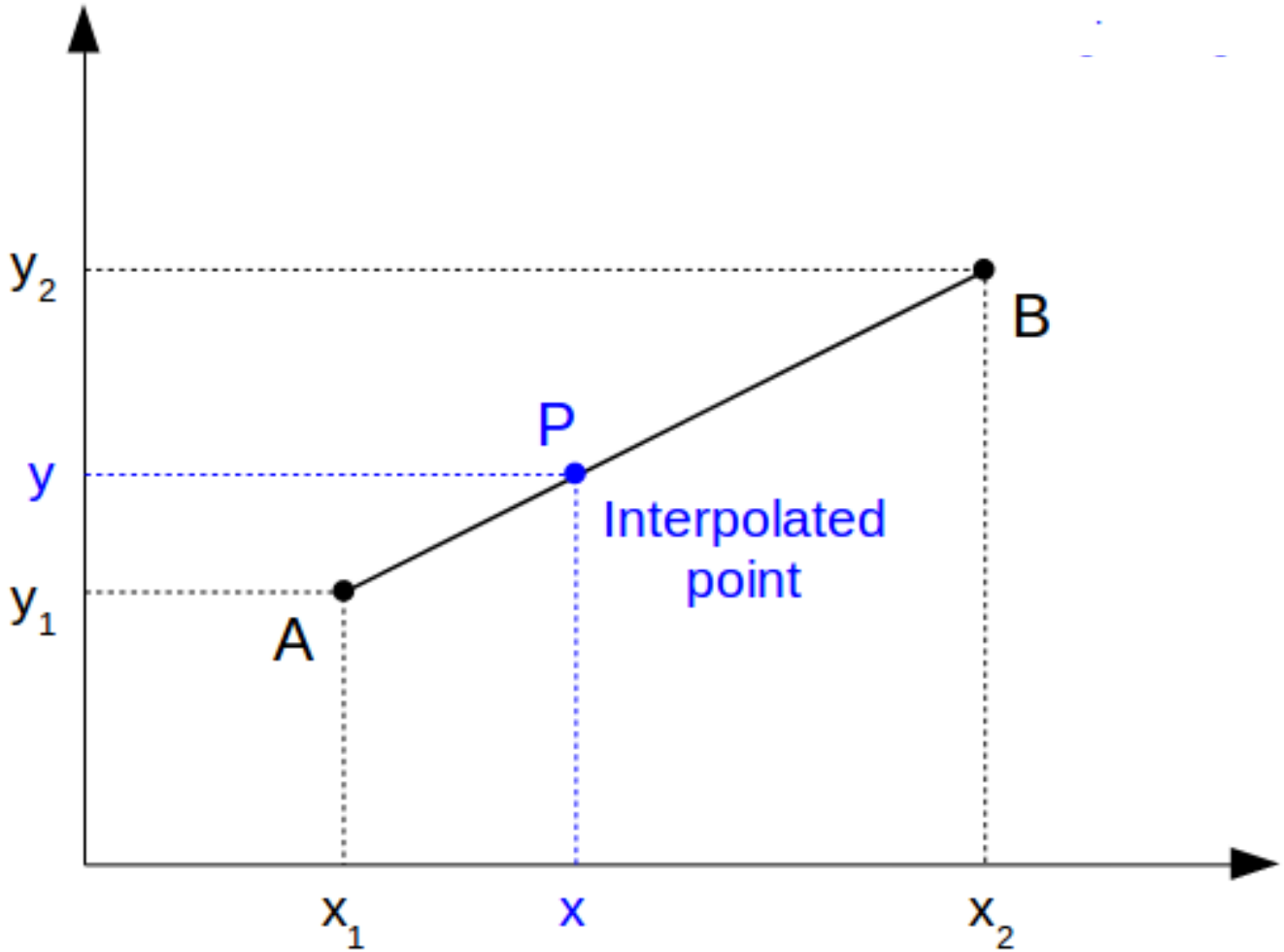
Interpolation

- is a process of determining the **unknown values** that lie in between the **known data points** (position).
- is commonly used when you have **limited data** points.
- In statistics, interpolation can be used to estimate values like **quartiles**, **percentiles**, or other summary statistics for datasets.
- provides useful estimates **within the range** of known data set.
- doesn't provide accurate estimates about **outside the range** of the given data points. Then **Extrapolation** is used

Graphical Presentation



Linear Interpolation Formula:

- **Interpolated Value**: The estimated value between A and B at a given position X.
- Interpolated Value = $\mathbf{A + (X - X_1) * (B - A) / (X_2 - X_1)}$
- Where,
- **A**: The value at the lower known point (X_1).
- **B**: The value at the higher known point (X_2).
- $\mathbf{X_1}$: The lower known point (position) where A is located.
- $\mathbf{X_2}$: The higher known point (position) where B is located.
- **X**: The desired point (position) where you want to interpolate the value.

Dataset: 65, 72, 78, 82, 89, 90, 91, 95, 98

- For Q1 (25th percentile):

  Position (P1) = **(1/4) * (N + 1)**

Where N is the number of data points in the dataset.

P1 = (1/4) * (9 + 1) = 0.25 * 10 = 2.5

- Since the position is not a whole number, we need to interpolate between the 2nd and 3rd values.

- We want to interpolate the lower quartile (Q1) at position 2.5.

Here,

A: The value at the lower known point (Qk) = 72
B: The value at the higher known point (Qk+1) = 78
$\mathbf{X_1}$: The lower known position (Pk) = 2
$\mathbf{X_2}$: The higher known position (Pk+1) = 3
X: The desired position for interpolation = 2.5

Using the linear interpolation formula:

Interpolated Q1 = $\mathbf{A + (X - X_1) * (B - A) / (X_2 - X_1)}$
Interpolated Q1 = 72 + (2.5 - 2) * (78 - 72) / (3 - 2)
Interpolated Q1 = 72 + 0.5 * 6 / 1
Interpolated Q1 = 72 + 3
Interpolated Q1 = 75

So, the interpolated value of the lower quartile (Q1) at position 2.5 in this dataset is 75

Thank you