| **Feature** | **Seaborn** | **Matplotlib** |
| --- | --- | --- |
| **Purpose** | Statistical visualization library | General-purpose plotting library |
| **Level of abstraction** | High-level | Low-level |
| **Default styles** | Stylish default themes and color palettes | Basic default styles, requires more customization |
| **Plot types** | Specialized for statistical plots | Provides a wide variety of plot types |
| **Customization** | Limited, but easy to use | Extensive, allows fine-grained control |
| **Code complexity** | Less code required for common plots | More code required for complex visualizations |
| **Interactivity** | Limited | Supports static, interactive, and animated plots |
| **Integration with Pandas** | Seamless integration, works well with DataFrames | Can work with DataFrames but requires more manual handling |
| **Community support** | Large and active | Large and active |

**Libraries**

1. **NumPy (numpy)**:
   * A fundamental package for scientific computing in Python. It provides support for large, multi-dimensional arrays and matrices, along with a large collection of high-level mathematical functions to operate on these arrays.
2. **Pandas (pandas)**:
   * A data manipulation and analysis library. It offers data structures and operations for manipulating numerical tables and time series, making it ideal for data cleaning, transformation, and analysis.
3. **Matplotlib (matplotlib)**:
   * A plotting library for creating static, interactive, and animated visualizations in Python. It is highly customizable and works well for creating complex graphs and charts.
4. **os**:
   * A standard Python module that provides functions for interacting with the operating system. It is used for file and directory operations like reading and writing files, listing contents of a directory, etc.
5. **scikit-image (skimage)**:
   * An image processing library in Python that includes algorithms for segmentation, geometric transformations, color space manipulation, analysis, filtering, morphology, feature detection, and more.
6. **scikit-learn (sklearn)**:
   * A machine learning library for Python. It features various classification, regression and clustering algorithms including support vector machines, random forests, gradient boosting, k-means, and DBSCAN, and is designed to interoperate with NumPy and Pandas.
7. **warnings**:
   * A standard Python module used to warn the developer of situations that aren’t necessarily exceptions. Typically used in development to alert about conditions in code that could cause potential errors.
8. **Seaborn (seaborn)**:
   * A statistical data visualization library based on Matplotlib. It provides a high-level interface for drawing attractive and informative statistical graphics, such as heat maps, time series, and violin plots.
9. Point Interval Estimation:
10. Confidence Interval
11. Hypothesis Test
12. One-Tailed T-Test
13. Two-Tailed T-Test
14. **Point Interval Estimation**:
    * Point interval estimation involves using sample data to estimate an unknown population parameter (like a mean or proportion) with a single value or point. This estimate provides a specific value as the most likely approximation of the population parameter based on the data.
15. **Confidence Interval**:
    * A confidence interval is a range of values, derived from the sample data, that is likely to contain the value of an unknown population parameter. The interval has an associated confidence level that quantifies the probability that the parameter lies within the interval (commonly set at 95% or 99%).
16. **Hypothesis Test**:
    * Hypothesis testing is a method of making decisions or inferences about population parameters based on sample data. It typically involves formulating a null hypothesis (stating no effect or no difference) and an alternative hypothesis (stating some effect or difference), then using test statistics to determine whether to reject the null hypothesis.
17. **One-Tailed T-Test**:
    * A one-tailed t-test is a statistical test used to determine if a sample mean significantly differs from a known or hypothesized population mean, in one specified direction (either greater than or less than). It tests for the possibility of an effect in one direction, ignoring the other.
18. **Two-Tailed T-Test**:
    * A two-tailed t-test is used to determine if there is a significant difference between a sample mean and a known or hypothesized population mean, without specifying the direction of the difference. This test checks for the possibility of an effect in both directions, higher or lower, and is more conservative than a one-tailed test.

**Inferential Statistics**: Inferential statistics involves using data from a sample to make generalizations or inferences about a larger population. It employs various techniques like estimation (using point estimates and confidence intervals) and hypothesis testing to make predictions or decisions about population parameters based on sample data.

**Hypothesis Testing**: Hypothesis testing is a specific type of inferential statistic that involves formulating and statistically testing hypotheses regarding population parameters. It uses observed data to test whether there is enough evidence to reject a predefined null hypothesis (no effect or difference) in favor of an alternative hypothesis (some effect or difference).

**Descriptive Statistics using SciPy**:

SciPy provides tools for calculating descriptive statistics to summarize data characteristics. Functions in the **scipy.stats** module allow computation of measures such as mean, median, variance, and skewness, helping you understand data distribution and central tendencies efficiently.