# ORIGIN® 9
Data Analysis and Graphing Software

## Comparison of Origin and OriginPro

OriginPro provides all of the features of Origin, plus additional analysis tools and capabilities. The following tables provide comparisons between Origin and OriginPro in such areas as curve fitting, peak analysis, statistics, signal analysis, and image handling.

| CURVE FITTING | | Origin | OriginPro |
|---|---|:---:|:---:|
| **Linear and Polynomial Fitting** | Linear Regression | ✓ | ✓ |
| | Linear Fit with X Error | | ✓ |
| | Confidence Ellipse for Linear Fit | ✓ | ✓ |
| | Polynomial Regression | ✓ | ✓ |
| | Multiple Linear Regression | ✓ | ✓ |
| | Partial Leverage Plots in Multiple Regression | ✓ | ✓ |
| | Residual Analysis | ✓ | ✓ |
| **Nonlinear Fitting** | Fitting Multiple Datasets | ✓ | ✓ |
| | Built-in Fitting Function and User-defined Fitting Function | ✓ | ✓ |
| | Parameter Initialization and Derived Parameter Definition | ✓ | ✓ |
| | Bounds and Constraints | ✓ | ✓ |
| | Weighted Fitting | ✓ | ✓ |
| | Fitting with Error | ✓ | ✓ |
| | Global Fit with Parameter Sharing | ✓ | ✓ |
| | Fitting Replica Data | ✓ | ✓ |
| | Residual Analysis | ✓ | ✓ |
| | Orthogonal Regression for Implicit Functions | | ✓ |
| | Fitting Comparison | | ✓ |
| | Surface Fitting | | ✓ |

| PEAK ANALYSIS | | Origin | OriginPro |
|---|---|:---:|:---:|
| **Peak Analysis** | Baseline Detection | ✓ | ✓ |
| | Baseline Subtraction | ✓ | ✓ |
| | Peak Finding | ✓ | ✓ |
| | Peak Integration | ✓ | ✓ |
| | Peak Fitting | ✓ | ✓ |
| | Fit Baseline with Peaks | | ✓ |
| | Fit Individual Peaks with Different Fitting Functions | | ✓ |
| | Batch Peak Analysis | | ✓ |

| STATISTICS | | Origin | OriginPro |
|---|---|:---:|:---:|
| **Descriptive Statistics** | Basic Descriptive Statistics | ✓ | ✓ |
| | 1D and 2D Frequency Counts | ✓ | ✓ |
| | Correlation Coefficient | | ✓ |
| | Discrete Frequency | | ✓ |
| | Normality Test (Shaprio-Wilk, Lilliefors, Kolmogorov-Smirnov, Anderson-Darling, D'Agostino-K Squared, Chen-Shapiro) | ✓ | ✓ |
| | Statistics Charts: Histogram, Box Chart, Scatter Matrix, QC Chart, Probability Plot, Q-Q Plot, and Pareto Chart | ✓ | ✓ |
| | Grubbs Test and Q-test to Detect Outliers | ✓ | ✓ |
| **Hypothesis Testing** | One Sample and Two-Sample t-Test, Pair-Sample t-Test | ✓ | ✓ |
| | One Sample and Two Sample Hypothesis Tests for Variance | | ✓ |
| | Welch Corrected t-Test | ✓ | ✓ |
| **Analysis of Variance** | One Way ANOVA, Two Way ANOVA | ✓ | ✓ |
| | ANOVA: Mean Comparison (Tukey, Bonferroni, Scheffe, Dunn-Sidak, Fisher LSD, Holm-Bonferroni, Holm-Sidak) | ✓ | ✓ |
| | One Way and Two Way Repeated Measure ANOVA | | ✓ |
| **Nonparametric Tests** | Sign Test | | ✓ |
| | Wilcoxon Test for One Sample and Paired Sample | | ✓ |
| | Two Sample Kolmogorov-Smirnov Test | | ✓ |
| | Mann-Whitney Test | | ✓ |
| | Kruskal-Wallis ANOVA | | ✓ |
| | Mood's Median Test | | ✓ |
| | Friedman ANOVA | | ✓ |
| **Multivariate Analysis** | Principal Component Analysis | | ✓ |
| | Cluster Analysis | | ✓ |
| | Discrimininant Analysis | | ✓ |
| | Canonical Discriminant Analysis | | ✓ |
| **Survival Analysis** | Kaplan-Meier Estimator | | ✓ |
| | Test Equality of Survival Functions (Log-Rank, Breslow and Tarone-Ware) | | ✓ |
| | Cox Proportional Hazard Model | | ✓ |
| | Weibull Fit | | ✓ |
| **Power and Sample Size** | One, Two and Paired-Sample t-Test, One Way ANOVA | | ✓ |
| **ROC Curve** | ROC Curve | | ✓ |

| SIGNAL ANALYSIS | | Origin | OriginPro |
|---|---|:---:|:---:|
| **Smoothing and Filtering** | Smoothing using Satvitzky-Golay Filter, Adjacent Averaging, FFT Filter, and Percentile Filter | ✓ | ✓ |
| | FFT Filters: Low Pass, Low Pass Parabolic, High Pass, Band Pass, Band Block, and Threshold | ✓ | ✓ |
| | IIR Filter Design | | ✓ |
| **Fast Fourier Transform (FFT)** | FFT with Basic Options | ✓ | ✓ |
| | 2D FFT and 2D FFT Basic Filtering | | ✓ |
| | Short-Time Fourier Transform (STFT) | | ✓ |
| **Wavelet Analysis** | Discrete Wavelet Transform (DWT) and Inverse Discrete Wavelet Transform (IDWT) | | ✓ |
| | Wavelet Smoothing | | ✓ |
| | Wavelet Denoising | | ✓ |
| | Continuous Wavelet Transform (CWT) | | ✓ |
| | Evaluation of Continuous Wavelet Function | | ✓ |
| **Others** | Convolution and Deconvolution | ✓ | ✓ |
| | Coherence | | ✓ |
| | 1D Correlation | ✓ | ✓ |
| | 2D Correlation | | ✓ |
| | Hilbert Transform | | ✓ |
| | Signal Envelope | | ✓ |
| | Signal Decimation | | ✓ |
| | Rise and Fall Time Analysis | | ✓ |

| MATHEMATICS | | Origin | OriginPro |
|---|---|:---:|:---:|
| **Simple Mathematics Operations** | Simple Mathematics Operations on or Between Datasets | ✓ | ✓ |
| | Set Column or Matrix Values by Using Mathematics Operations | ✓ | ✓ |
| | Normalization | ✓ | ✓ |
| **Interpolation and Extrapolation** | 1D Interpolation and Extrapolation | ✓ | ✓ |
| | Interpolation and Extrapolation of Y From X | ✓ | ✓ |
| | Trace Interpolation on XY Data | | ✓ |
| | Trace Interpolation on XYZ Data | ✓ | ✓ |
| | 2D Interpolation and Extrapolation | | ✓ |
| | 3D Interpolation | | ✓ |
| **Differentiation and Integration** | Numerical Differentiation | ✓ | ✓ |
| | 1D Numerical Integration | ✓ | ✓ |
| | 2D Volume Integration | | ✓ |
| **Area Calculation** | Polygon Area | ✓ | ✓ |
| | XYZ Surface Area | | ✓ |
| | Matrix Surface Area | | ✓ |
| **Others** | Average Multiple Curves | ✓ | ✓ |
| | Inverse of a Matrix | ✓ | ✓ |

| DATA MANIPULATION | | Origin | OriginPro |
|---|---|:---:|:---:|
| **Reorganization** | Sort Worksheet or Columns | ✓ | ✓ |
| | Stack and Unstack Columns | ✓ | ✓ |
| | Pivot Table | ✓ | ✓ |
| | Split Worksheet | ✓ | ✓ |
| **Transformation** | Converting XYZ Data to a Matrix | ✓ | ✓ |
| | Transpose Worksheet or Matrix | ✓ | ✓ |
| | Shrink or Expand a Matrix | ✓ | ✓ |
| **Extraction and Reduction** | Worksheet Query | ✓ | ✓ |
| | Reduce Duplicate X Data | ✓ | ✓ |
| | Reduce Data by Skipping Every N Points | ✓ | ✓ |
| | Reduce Data to Evenly Spaced X | | ✓ |
| | Reduce XY Data by Group | | ✓ |
| **Others** | Find and Replace Numeric and Text Values | ✓ | ✓ |
| | Translate Curve Vertically or Horizontally | ✓ | ✓ |
| | Data Filter for Worksheets | | ✓ |

| IMAGE HANDLING | | ORIGIN | ORIGINPRO |
|---|---|:---:|:---:|
| **Image Adjustments** | Brightness | ✓ | ✓ |
| | Contrast | ✓ | ✓ |
| | Gamma | ✓ | ✓ |
| | Hue | ✓ | ✓ |
| | Invert | ✓ | ✓ |
| | Saturation | ✓ | ✓ |
| | Histogram Contrast | ✓ | ✓ |
| | Histogram Equalization | ✓ | ✓ |
| | Auto Leveling | ✓ | ✓ |
| | Color Level | ✓ | ✓ |
| | Function Look Up Table | | ✓ |
| | Leveling | | ✓ |
| | Balance | ✓ | ✓ |
| | Color Replace | ✓ | ✓ |
| **Arithmetic Transforms** | Alpha Blend | | ✓ |
| | Extract to XYZ | | ✓ |
| | Image Simple Math | | ✓ |
| | Math Function | | ✓ |
| | Morphological Filter | | ✓ |
| | Pixel Logic | | ✓ |
| | Replace Background | | ✓ |
| | Subtract Background | | ✓ |
| | Subtract Interpolated Background | | ✓ |
| **Image Conversion** | Convert Image to Data | ✓ | ✓ |
| | Convert Color Image to Grayscale | ✓ | ✓ |
| | Convert Data to Image | ✓ | ✓ |
| | Binary and Auto Binary | ✓ | ✓ |
| | Dynamic Binary | | ✓ |
| | Threshold | | ✓ |
| | RGB Merge / RGB Split | | ✓ |
| | Image Scale | | ✓ |
| | Image Palette | ✓ | ✓ |
| **Geometric Transforms** | Auto Trim Image | ✓ | ✓ |
| | Crop Image | ✓ | ✓ |
| | Flip Image Horizontally or Vertically | ✓ | ✓ |
| | Offset Image | ✓ | ✓ |
| | Resize Image | ✓ | ✓ |
| | Image Rotation | ✓ | ✓ |
| | Shear Image | ✓ | ✓ |
| **Spatial Filters** | Average Filter, Gaussian Filter, and Median Filter | ✓ | ✓ |
| | Add Random Noise to Image | ✓ | ✓ |
| | Edge Detection | ✓ | ✓ |
| | Increase or Decrease Image Sharpness | ✓ | ✓ |
| | Apply Unsharp Mask | ✓ | ✓ |
| | User-Defined Spatial Filter | | ✓ |