ORIGIN® 8.1
Data Analysis and Graphing Software

Feature List

Importing Data

Overview

- Drag-and-drop import of data and images
- Save import settings to a worksheet or external files for repeated use
- Use saved settings to re-import files with a single click
- Post-process imported data
- Import Wizard with visual feedback
- Handle non-standard files by programming

ASCII Data

- Unicode support
- Support for delimited and fixed formats
- Multiple delimiter support
- Separate header and data lines
- Extract metadata from filenames and header lines
- Control treatment of leading zeros, quotation marks, missing data points and alternate numeric separators
- Partial data import support
- Many date and time formats recognized
- Support for categorical data

Third-Party Formats

- Binary and instrument formats:
  - CDF, HDF5
  - Data Translation (DCF, HPF)
  - EarthProbe (EPA)
  - Famos (DAT, RAW)
  - ETAS INCA MDF (DAT, MDF)
  - Heka (DAT)
  - JCAMP-DX (DX, DX1, JDX, JCM)
  - NetCDF (NC)
  - NI DIAdem (DAT)
  - NI TDM (TDM)
  - pCLAMP (ABF, DAT)
  - Princeton Instruments (SPE)
  - Somat SIE (SIE)
  - Sound (WAV)
  - Thermo (SPC, CGM)
- Software-specific formats:
  - IgorPro (PXP, IBW)
  - KaleidaGraph (QDA)
  - MATLAB (Mat)
  - Minitab (MTW, MPJ)
  - Excel (XLS, XLSX)

Image Formats

- Support formats: PNG, GIF, TIF, JPG, BMP, TGA, PCX, PSD, WMF (Convert to Raster)

Database Access

- Graphically construct SQL queries, save named SQL query with workbook or to disk
- Database connecting interface: ADO and ODBC

Collaboration & Connectivity

Collaboration

- Share files such as templates, themes, custom tools, using group folder
- Share files using user files folder across multiple computers
- Pack selected files including toolbars and custom code to external file (.OPX) for sharing
- Export toolbar and floating window configuration to a file
- Option to switch language of interface

Connectivity

- Import or directly open Excel 97-2007 workbooks (XLS, XLSX). Drag-and-drop data from an Excel book opened in Origin directly into a graph
- Copy-and-paste Origin graphs directly into MS Word and PowerPoint
- Send data directly to Origin from LabVIEW with Origin Sub Vi's; send results back to LABVIEW as well
- MATLAB Console and Mathematica Link allow data exchange with Origin
- Use Origin as an Automation (COM) Server to send commands and exchange data from any COM-enabled client application

Exporting and Presentation

Exporting Graphs

- Raster formats: BMP, GIF, JPG, PCX, PNG, PSD, TGA, TIF
- Vector formats: AI, CGM, DXF, EMF, EPS, PDF, WMF
- Export dialog with settings for precise width/height and resolution (DPI)
- Save graph export settings as theme for repeated use
- Copy graphs or layout pages to clipboard and paste to other applications such as Microsoft Word or PowerPoint
- Paste link using Origin as an OLE 2 server
- Use layout page or worksheet with cell formatting to arrange multiple graphs and numeric data tables
- Batch print multiple graphs
- Master page for global annotation of graphs

Exporting Data

- Export data to ASCII file with options to append to, or replace existing files
- Print entire worksheet/matrix sheet or a selected range
- Batch print multiple windows
- Export workbook as NI TDM/TDMS file
- Export worksheet data as wave file
- Export matrix as ASCII or image file

Exporting Reports

- Export a report sheet as a multi-page PDF document

Exporting Images

- Raster formats supported: BMP, GIF, JPG, PCX, PNG, PSD, TGA, TIF

Presentation

- Slide-show of selected, all, or dependent graphs
- Export graphs directly to MS PowerPoint

Data Management

Origin Project File (OPJ)

- Ideal for storing all of your data, graphs, and analyses
- 5 page types for data storage and display: Workbooks, graphs, matrix books, layout pages, and notes windows
- Attach external files to a project
- Store analysis results in worksheets or the Results Log
- Support for auto-save and backup for projects
- Password protection of project files
- Audit log of project saves, with optional password protection

Project Explorer

- View and organize the contents of your Origin project (OPJ) using an interface similar to Windows explorer.
- Organize and quickly access your work using hierarchical user-defined folders.
- Create a favorites folder with shortcuts to important workbooks, graphs and notes.

Workbooks & Worksheets

Data Storage

- Multiple worksheets per workbook
- Multiple matrix sheets per matrix book, and multiple matrix objects per matrix sheet
- Data Size: Workbook: Up to 121 sheets, and 65,535 columns versus millions of rows per sheet. Matrix: Up to 90 million cells, depending on data type. Note: Memory limitations may prevent reaching these values
- Column-oriented data type can be general or free form(cells can hold both numbers and text), or can be fix-sized array (numeric cells)
- Numeric cells can be time, date, or basic numeric types, including 4 or 8-byte float; 1, 2, and 4-byte, signed or unsigned integer; or 16-byte complex numbers
- Global setting for default significant or decimal digits

Data Organization and Metadata Support

- Reserved rows for long name, units, comments, sampling interval, sparklines, and user-defined parameters
- Sparklines on column headers display small graph of data for quick inspection
- Workbook organizer shows file import info including variables extracted from file header
- Manually or programmatically add meta data to workbook
- Sampling interval support for columns
- Drag range selection to auto fill data by extending or duplicating existing data
- Lock Icon on output columns to indicate recalculate mode for operations
- Drag and drop sheets to remove from, or add to, workbooks and matrix books
- Click-and-drag to adjust row height and column width in worksheets and matrices
- Extract worksheet data by condition

Formatting

- Support for rich text cell formatting
- Embed graphs, images, and notes in worksheet cells
- Merge cells to flexibly arrange and present graphs and numeric data
- Insert links in worksheet cells to other cells, including cells from analysis report sheets
- Auto-size option for worksheet and matrix Columns
- Save formatting of worksheet and matrix sheets to theme/template for repeat use

Graphs

Overview

- Quick access to all built-in graph types from toolbars
- Page, Layer, Plot hierarchy to organize data plot
- Plot with graph templates and organize templates using Template Library
- Plot Setup dialog for quick plotting of data from multiple worksheets, common columns, Excel workbook and matrix book
- Create custom multi-panel plots.
- Merge multiple graphs with preview
- Drag-and-drop data columns into graph
- Plot same column multiple times, such as different ranges, in a single graph layer
- Speed mode control for plotting large datasets
- Select and customize single data points in a plot
- Quick edit graph element style with toolbars; In depth editing of graph element details with Plot Details dialog

- Customize symbol color or size by column data (Can be used to represent another dimension)
- Custom color palettes and increment lists for grouped data
- Customize the format increment lists and color palettes for grouped data
- Add tables to graphs, table cells may be linked to other worksheet and report cells. Copy-paste cells from worksheet to create table.
- Full-screen view for graphs, maintaining aspect ratio

2D Graphs

- Line - 10 types
- Scatter - 9 types
- Line and Symbol - 6 types
- Column/Bar - 8 types (also 3D)
- Area - 7 types
- Bubble/Color Mapped - 3 types
- Multiple Panel - 5 types or create your own
- Multiple Axes Plot - 5 types or create your own
- Pie Chart
- Polar (r, theta)
- Ternary Diagram
- Smith® Chart
- High Low Close
- Vector - 2 types: XYXY and X, Y, Angle, Magnitude
- Stacked lines by Y offsets with customizable offsets
- Waterfall
- Windrose: raw or binned data
- Function graphs for plotting mathematical equations

3D Graphs

- XYZ Scatter/Trajectory. Optional drop lines/projections
- XYY Bars, Ribbons, Walls, and Waterfall
- Color map surface with optional projected contour
- Wire Frame and Wire Surface
- Surface with constant slices in X or Y direction
- Pie Chart
- Stretch any 3D graph axis to change aspect ratio
- Rotate 3D plots graphically by clicking and dragging
- Missing value and grid-line skip support for 3D surface plots
- Color mapping of 3D bar plots using Z values
- Major and minor level support for 3D surface plots

Contour Graphs

- Create contour plot directly from XYZ data using triangulation
- Ternary contour
- Polar contour
- Color filled contour
- Black and white contour with Lines and Labels
- Gray scale map
- Custom level formatting using color, contour lines and labels
- Specify label prefix and/or suffix
- Set label decimal points
- Include color scale legend
- Individual contour line and level control
- Color palette support
- Specify custom boundary for contour graphs using datasets
- Extract data points for any or all contour lines

Statistics Graphs

- Probability plot including Weibull distribution
- Q-Q Plot
- Box and/or column scatter - 2 types
- Rectangular box or diamond Box
- Histogram, Stacked Histograms, and Histogram + Probabilities
- Scatter Matrix (Linear fit, R-square, confidence ellipse options)
- QC charts
- Optional distribution curves

Image Graphs

- Image Graph
- Image Profiles Plot
- Image Histogram

Customizing Graphs

Graph Themes

- Copy and paste the format of one graph or element onto another graph
- Save a collection of formatting elements as a graph theme
- Set system theme to apply desired settings to all newly created graphs

Data Plot Color

- Independently set color for page, axes, labels, symbols, lines, area or bar fill
- Independent custom color support for all properties
- Color-mapped or color-indexed symbol
- Color stretching for grouped data plots
- Apply built-in/user-defined color palettes
- Categorical data support for symbol color
- Color scale legends
- RGB color settings
- Labels on color scale legend can be showed on Major levels or by increments

Data Plot Labels

- Add or modify title text for layers
- Worksheet parameter row for annotating each curve in 2D Waterfall plot
- Associate dataset with data plot points, X, or Y axis
- Graphically attach text labels to individual data points
- Control color, font type, style, size, rotation, offset, background, and justification
- Tool to annotate a specific data point

Line Styles

- Data point connection types: Straight, B-Spline, Spline, Step (horizontal, vertical, center), Bezier, 2 Point Segment, 3 Point Segment, Solid, dashed, dotted, etc.
- Customize line style for groups of data plots
- Customize dash and dot definitions (point values for widths)
- Masking support in line plots

Symbols

- Expanded set of over 100 built-in symbols
- Create custom symbols from bitmaps
- Offset Plotting of Duplicate Points
- Categorical data support
- Color-mapped, as well as indexed symbol color/shape/size - up to 8 dimensions
- Custom symbol lists for grouped data plots
- Individual symbol edit control, with display in legend

Text Labels and Legends

- In-place editing of text labels with Character Map access, TrueType fonts, bold, underline, italic, Greek, super/subscript or both, increase/decrease size, rotate, date/time stamp.
- Easily insert import file header information and other meta data into text labels
- Add symbol shapes with the Origin TrueType font
- Unicode support for text labels
- Legends created automatically using meta data.
- Customize legend to show desired data such as long name, comments, book/sheet name, or user-defined parameters
- Automatically create a single legend for all layers in a graph
- Update or reconstruct legend at graph layer or page level
- Legend displays individually edited data points

Error Bars

- Display error bar as % of data, standard deviation, or from a dataset
- Asymmetric error bar support
- Specify X and/or Y error bar
- Control error bar color, line width and cap width
- Error bars can go up to or through symbols
- Set as absolute or relative error bar

Axes

- Double-Log Reciprocal Axis scale, ln(-ln(1-x)), for Weibull plot
- Custom color support for axes and grid Lines
- Technical types: Linear, Log10, Probability, Probit, Reciprocal, Offset Reciprocal, Logit, Ln, Log2, Polar, Smith®, Double-Log Reciprocal(ln(-ln(1-x)))
- Special tick mark types: Draw from a column of values
- Scale options: Set rescale mode to normal, auto, or fixed from/to. Specify increment, # of major ticks, # of minor ticks, first tick. Reverse axis scales
- Control color, line style, and thickness
- Axis titles use long name and units from worksheet
- Offset Axes - Multiple based on percent or axis position
- Grid Lines: Control color, line style, thickness, and density of major and minor grid lines for X, Y, and Z axes
- Axis Break: Define break region, break position along axis, scale type and increment before/after break
- Frame Options: 2D or 3D Axis Graph Page
- Display layer icons on visible axes for each layer
- Add axis scrollbar to zoom or pan graph
- Manually specify tick marks and tick labels
- Multiple Y axes customization

Layers

- Up to 121 layers per page
- Align and size multiple layers and text using Object Edit toolbar
- Support for naming layers
- Merge multiple graph pages. Select graphs using Graph Browser
- Add and arrange multiple layers using Layer Management dialog
- Create inset layers
- Link axes: specify formula for relationship
- Support layer title

Tick Labels

- Basic Types: Numeric, Text from Dataset, Time (includes IRIG), Date, Month, Day of Week, Column Headings, Indexed from Dataset, Categorical (binned text data)
- Special Types: Specify a user-defined formula or draw from a column of values
- Control the direction (In, Out, Both, None) and length of major and minor tick marks for X, Y, and Z axes
- Control color, font, size, number of decimal places, rotation, offset, display of first, last, and custom tick labels
- Align, rotate, offset, show/hide
- Include minor tick labels
- Apply a divide by factor
- Include a prefix and suffix
- Include plus and minus signs

Drawing objects

- Lines: straight, poly line, freehand. Solid, dashed, dot. Begin/end arrow control
- Shapes: rectangles, ellipses, polygons, regions. Hollow, fill color, fill pattern
- Resize/Rotate/Skew all lines/shapes
- Align, send to front/back
- Group/ungroup objects

Data Analysis

Overview

- Standardized analysis tools with tree structure for settings
- Analysis markers to indicate range used for analysis
- Preview of results in most analysis dialogs
- Analysis report sheets with collapsible tables

Recalculation

- Manually or automatically update the results of any previously run analysis operation when data or parameters change

Analysis Themes

- Save settings of analysis dialogs to theme for repeat use
- Access saved analysis themes from fly-out menu or script

Analysis Templates

- Save workbook as Analysis Template, with desired analysis routines and custom settings, including custom report sheets to present results
- Re-use Analysis Template manually or in Batch Processing mode, to analyze multiple files or datasets

Analysis Results

- Keep analysis results organized in same workbook as source data
- Embedded graphs and numerical results to create custom reports
- Create separate reports per dataset for same analysis routine, or combine in one results sheet
- Report results to Results Log to establish analysis history
- Residual Analysis (PRO) (Linear, Polynomial, Multiple Regression, Nonlinear Fitting)- 4 residual types (Regular, Standardized (PRO), Studentized (PRO), Studentized deleted (PRO)) and 5 plot types (PRO)

Batch Processing

- Batch processing with summary report using Analysis Templates™
- Batch peak analysis of multiple datasets using theme (PRO)

Data Exploration

- Read data point coordinates, screen coordinates
- Inspect data point values/distances on/between curves using dockable Data Information window and Cursor tool
- Graphically attach data labels with pinned connecting lines to individual data points
- Zoom in on any graph region
- Launch separate graph with movable zoomed in region
- Vertical and horizontal scroll bars to scroll and pan
- Move individual data points graphically
- Mask/Unmask data points on all or active data plot
- Data/Mask selection can be restricted to active plot or expanded to all plots within selection window
- Toolbar for data markers and locks

Data Manipulation

Setting Column Values

- Large collection of categorized functions for setting column values, including date/time and string functions
- Easily define variables from meta data and other books and sheets for use in setting column values
- Auto update Set Column Values output when source data changes

Worksheet

- Sorting, including support for nested sort
- Trim missing values in a worksheet
- Remove duplicate data in a column
- Find and Replace numeric and text values
- Unstack worksheet columns using grouping variables
- Pivot Table
- Reduce data: Remove duplicate values, remove every Nth point or remove points at a specified X increment (PRO)
- Normalize data across multiple columns
- Merge XY Data According to X Values (worksheet only)
- Convert XYZ worksheet data to matrix using XYZ Gridding: Regular, Sparse, Random - Renka-Kline, Shepard, Thin Plate Spline, Kriging, 2D B-spline
- Convert worksheet data directly to matrix
- Convert matrix data to XYZ worksheet data
- Convert matrix data directly to worksheet
- Shrink and expand matrix
- Transpose data, and paste transpose

Curve

- Average multiple curves
- Translate curves (vertical/horizontal)
- Subtract straight line or reference data
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Gadgets

- Gadgets for quick and easy exploratory analysis of a region of interest (ROI) on graphed data
- Results displayed on graph, and update immediately when ROI object is moved
- Save custom settings as theme for repeat use

Quick Fit Gadget

- Easy fitting of graphed data using ROI
- Fit parameter values update as ROI is moved on graph
- Fit multiple datasets and send results to a consolidated report sheet
- Easily change fitting function and other settings

- Easily switch to NLFit for complete control

Other Gadgets

- Statistics: Basic statistics, including display of mean and standard deviation lines inside ROI
- Integration: Peak parameters with choices for baseline
- Rise Time: Compute rise or fall time with options for setting high and low levels
- FFT: View frequency spectrum of data inside ROI in a separate window
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Curve Fitting

General Fitting Features

- Analysis report sheets with collapsible tables
- Analyze multiple datasets independently (consolidated or separate reports) or as a concatenated dataset
- Weighted Fitting with multiple weighting methods
- Confidence/prediction bands
- Fit Parameters: Value, Standard Errors, LCL/UCL, t-Value, Prob>|t|, CI Half-Width
- Fit Statistics: Number of points, DOF, R value, Residual Sum of Squares, R-Square (COD), Adjusted R-Square, Root-MSE (SD), Norm of Residuals, ANOVA Table, Covariance Matrix, Correlation Matrix
- Residual Analysis (PRO) (Linear, Polynomial, Multiple Regression, Nonlinear Fitting)- 4 residual types (Regular, Standardized (PRO), Studentized (PRO), Studentized deleted (PRO)) and 5 plot types (PRO)
- Generate result using same X values as the original data, uniform linear, or uniform log X values
- Find X/Y values for new Y/X values based on fit parameters

Linear and Polynomial Fitting

- Linear fit: Fix Intercept or slope
- Linear fit: Support for x-error values (PRO)
- Polynomial fit: Fix Intercept
- Apparent Fit
- Confidence bands, Prediction bands, Confidence Ellipse (PRO).

Multiple Dataset Linear Fitting

- Partial leverage plot in multiple regression
- Fix intercept

Nonlinear Fitting

- Nearly 200 built-in fitting functions
- Organize all fitting functions by category in an intuitive dialog, with equation and sample curve preview.
- Create and edit user-defined fitting functions
- Define derived parameters that are computed using fit parameter values
- Global Fitting with sharing of parameters
- Multiple Peak Fitting with auto initialization
- Automatic parameter initialization for built-in function, and support for adding initialization by value or by code, for user-defined functions
- Simulate curve or surface using desired function and parameter values
- Levenberg-Marquardt and simplex algorithms for iteration
- Weighting - 13 methods including several iteratively reweighted least squares methods
- Control number of iterations, tolerance, derivative delta
- Fix parameter values, set bounds, or linear constraints
- Replicate (Concatenate) Data Fitting - Fits all data, not an average, then present result as average curve with SE or SD error bars
- Fit Comparison (PRO): Compare two datasets fit with one model, or two models fit to same dataset. AIC and F-test
- Surface (XYZ or matrix) fitting (PRO)
- Rotated 2D Gaussian function for surface fitting (PRO)
- Find-Z tool for nonlinear surface/matrix fitting

Baseline and Peak Analysis

Baseline

- Create baseline using multiple methods including user-defined anchors, and existing dataset

Peak Finding

- Find and mark positive and negative peaks
- Multiple methods for peak detection

Peak Integration

- Integrate peaks with fixed or arbitrary window width for each peak

Peak Fitting (PRO)

- Find and fit multiple peaks
- Multiple methods for peak finding including hidden peak finding
- Use built-in or user-defined peak fitting functions
- Assign same or different peak functions to different peaks
- Support for linear constraints and bounds on parameters
- Batch peak analysis using pre-defined theme

Signal Processing

- Correlation
- Coherence (PRO)
- 2D Correlation (PRO)
- Convolution and deconvolution
- Create upper and lower envelopes for curves
- Decimation to reduce data

Transforms

- FFT/IFFT
- STFT (PRO)
- Hilbert Transform (PRO)
- 2D FFT/2D IFFT (PRO)
- Image Profiling: Simple Line Profiling: Horizontal,

Vertical, Straight Line

Filtering

- FFT Filter: Low Pass, High Pass, Band Pass, Band Block, Noise Threshold

Smoothing

- Smoothing: Savitzky-Golay smoothing, Adjacent Averaging (running average), FFT filter smoothing, Percentile Filter (including Median Filter)

Wavelet Analysis

- Decompose (Discrete Wavelet Transform - DWT) (PRO): 1 and 2D
- Reconstruct (Inverse DWT - IDWT) (PRO): 1 and 2D
- Continuous Transform (PRO)
- Wavelet Smooth (PRO)
- Denoise (PRO)

Image Processing

Image Adjustment

- Color Adjustments: Intensity (Brightness, Contrast, Gamma), Color (Hue, Invert, Saturation, Color Balance)
- Equalizer (PRO): Histogram Equalize, Histogram Contrast, Auto Level

Conversion

- Select region of interest: cut, copy, create new matrix
- Channels (PRO): RGB Split, RGB Merge
- Color Resolution Conversions: Color to Gray, Color to B/W (Binary, Dynamic Binary (PRO)), Thresholding (PRO)
- Image Scale: Reset X/Y Coordinates (PRO)

Geometric Transformations

- Geometric Transforms: Rotate, Flip (H/V), Shear, Auto Trim, Crop, Resize, Offset (PRO)

Spatial Filters

- Spatial filters: Blur (Average, Gaussian), Noise (Add Noise, Median), Sharpen (Sharpen, Unsharp Mask), Edge Detect, User Filter (PRO)

Arithmetic Transform

- Lookup Table (PRO): Function LUT, User Define
- Arithmetic Transforms (PRO): Pixel Logic, Math Function, Image Combine, Alpha Blend, Background Subtract, Extract to XYZ, Morphological Filter, Replace Background, Subtract Interpolated Background.
- Color Detect (PRO): Detect, Segment, Replace

Mathematics

Simple Math

- Simple math between datasets: =, +, -, x, ÷
- Subtract reference data or straight line
- Normalization across single/multiple columns or curves

Interpolation/Extrapolation

- 1D Interpolation/Extrapolation - Linear, Cubic Spline, B-Spline
- Interpolate XY dataset to find Y values based on an existing set of X values
- 2D Interpolation (PRO) - Nearest, Bilinear, Bicubic, Spline, Biquadratic
- Trace Interpolation (PRO)
- 3D Interpolation (PRO)

Calculus

- Calculus: Integration and differentiation including Savitzky-Golay smoothing during differentiation

Matrix Mathematics

- Matrix Inverse
- Compute surface area of matrix data

Statistics

Descriptive Statistics

- Column and row statistics
- Analyze input data independently (consolidated or separate reports) or combined
- Support for grouping and weighting with row/column statistics and many other statistical analyses
- Moments: N total, N missing, Sum, Mean, Mode, Geometric Mean (PRO), Geometric SD (PRO), Lower CI of the Mean, Upper CI of the Mean, Standard Deviation (SD), SD*2 (PRO), SD*3 (PRO), Standard Error of Mean, Variance, Coefficient of Variation, Skewness, Kurtosis, Mean Absolute Deviation (PRO), Uncorrected Sum of Squares (PRO), Corrected Sum of Squares (PRO), Sum of Weights (Statistics on Columns only) (PRO)
- Quantiles: Minimum, Index of Minimum, 1st Quantile (Q1), Median, 3rd Quantile (Q3), Maximum, Index of Maximum, Interquartiles Range (IQR = Q3 - Q1), Range (Maximum - Minimum), Custom Percentile(s)
- Extreme Values
- Variance Divisor of Moment (PRO): DF, N, WDF, WS, WVR
- Interpolation of Quantiles (PRO): Weighted Average Left, Weighted Average Right, Nearest Neighbor, Empirical Distribution (None), Empirical Distribution with Average, Tukey Hinges
- Frequency Count
- Discrete Frequency (PRO)
- 2D Binning (Also Support Periodic Data)
- Normality Tests: Shapiro-Wilk, Kolmogorov-Smirnov, Lilliefors (PRO)
- Correlation: Pearson R, Spearman R, and Kendall Coefficients (PRO)

Parametric Hypothesis Tests

- One and Two Sample t-tests

- Paired Sample t-test
- Welch Corrected t-test
- One Sample Chi-Square Test for Variance (PRO)
- Two Sample F Test for Variance (PRO)
- Confidence Levels for One Sample Chi-Square Variance (PRO)
- Confidence Levels for Two Sample F Variance (PRO)

ANOVA

- One-way and Two-way ANOVA
- One-way and Two-way Repeated Measures ANOVA (PRO)
- Indexed or raw data
- Means Comparison Tests: Bonferroni, Scheffe, Tukey, Dunn-Sidak (PRO), Dunnett (Repeated Measures only) (PRO), Fisher LSD (PRO), Holm-Bonferroni (PRO), Holm-Sidak (PRO)
- Tests for Equal Variance: Levene, Levene Square, Brown Forsythe
- Power Analysis

Nonparametric Hypothesis Tests

- Wilcoxon Signed Rank Test (PRO)
- Mann-Whitney Test (PRO)
- Wilcoxon Matched Pair Test (PRO)
- Kruskal-Wallis ANOVA (PRO)
- Friedman ANOVA (PRO)
- Sign Test (PRO)
- Kolmogorov-Smirnov Two-Sample Test (PRO)
- Mood's Median Test (PRO)

Survival Analysis

- Kaplan-Meier Analysis (PRO)
- Cox Proportional Hazards Model (PRO)
- Survival Function Comparison (PRO): Log-rank, Breslow, Tarone Ware
- Weibull Fit (PRO)

ROC Curves

- ROC Curves (PRO)

Power and Sample Size

- One Sample t-test (PRO)
- Two Sample t-test (PRO)
- Paired-Sample t-test (PRO)
- One Way ANOVA (PRO)

Programming

LabTalk Scripting

Overview

- High-level, full-featured, easy-to-learn programming language
- More than 15 years of language stability and progressive development
- Access to Origin objects and operations to easily automate or customize Origin
- Detailed documentation and practical examples shipped with Origin
- Wiki site available to offer timely updated documentation
- Large Origin user community participating in LabTalk programming forum

LabTalk Features

- A variety of basic data types including Numeric (integer, double, constant), Dataset, String, StringArray, Tree
- Variables can be strongly and dynamically typed
- Range notation for flexible data access
- Organize script by sections or files
- Define variables with different scopes: project, Session, Local
- LabTalk Variable Viewer to view, update, or delete variables including support for tree variables
- System variables for controlling various options in Origin
- Internal and external objects with methods and properties
- C-like programming with loops (repeat, loop, for), and decision structures.
- Define macro with arguments
- Support for event-driven execution
- Easy increment of objects using ": " operator and "end " keyword
- Interactively execute scripts
- Debug script using Code Builder
- Protect multiple lines of code using "{ " and "}"
- Over 60 built-in commands for data manipulation, display control, user interface, etc.
- Built-in immediately programmable GUI construction
- Built-in functions for string manipulations, dates and times processing
- Create user-defined function
- Add or customize menu commands
- Create buttons to execute any built-in or user-defined task
- Perform batch processing
- Easy access to Origin C functions from script
- Access to hundreds of built-in X-Functions for performing various tasks in Origin

Origin C

Overview

- Advanced programming language that supports ANSI C and some C++, C# features
- Easy access to Origin objects and operations to automate and customize Origin
- X-Functions framework that provide a structured programming environment for building Origin tools
- Detailed documentation and practical examples shipped with Origin

- Wiki site available to offer timely updated documentation
- Large Origin user community participating in Origin C programming forum

Origin C Features

- Origin C supports a nearly complete ANSI C language syntax
- Supports a subset of C++ features including mid-stream variable declarations, overloaded functions, built-in and user-defined classes, references to variables and default function arguments
- Supports a subset of C# features including Collections of objects, *foreach* and *using* statements
- Built-in C++ classes for programmatic access to most Origin objects
- Built-in immediately programmable user interface development
- Immediate vector, matrix, tree structures programming
- Immediate access to all routines in the NAG® Mark VII function libraries for a wide range of mathematical and statistical functions
- Built-in global functions organized in 25+ categories
- Create complex user-defined curve fitting functions for use in Origin's advanced curve fitting tool
- Support error and exception handling using Throw, Try, and Catch statements
- Support to access database
- Easy integration with LabTalk scripts
- Hundreds of built-in X-Functions can be easily accessed and extended
- Create user-defined X-Functions
- Call external DLLs created with other languages such as C, C++ and Fortran

Origin as Automation (COM) Server

- Access Origin as an automation server from client applications such as Microsoft® Excel®, National Instruments™ LabVIEW™, or any COM-capable client application
- Run Origin visible or hidden
- Send data and commands to Origin for graphing and analysis tasks fetch results back to client application
- Utilize Origin’s Analysis Template capability to automate routine tasks
- Large collection of Classes to access various Origin objects and properties
- Run LabTalk script or Origin C code