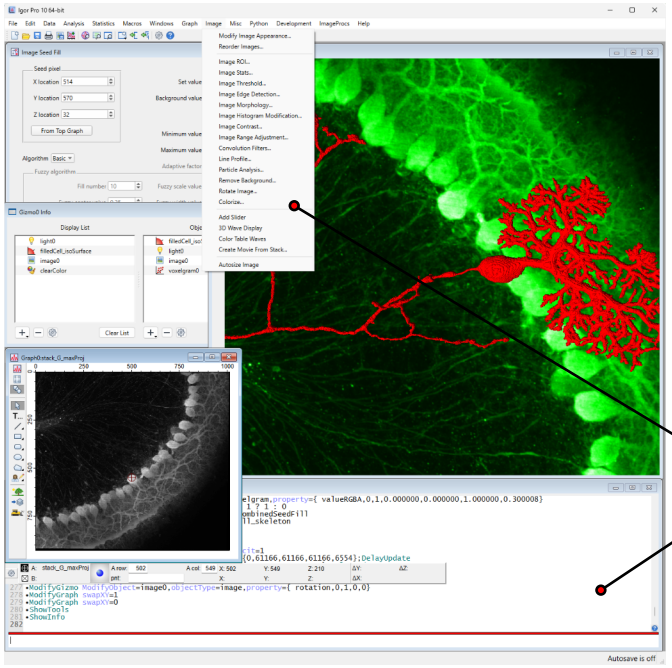
Igor Pro

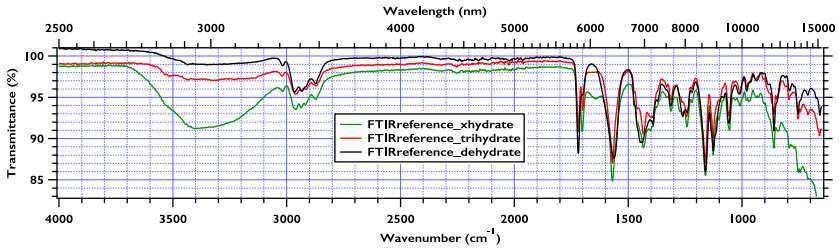
Technical Computing for Scientists and Engineers

from WaveMetrics, a division of SUTTER INSTRUMENT

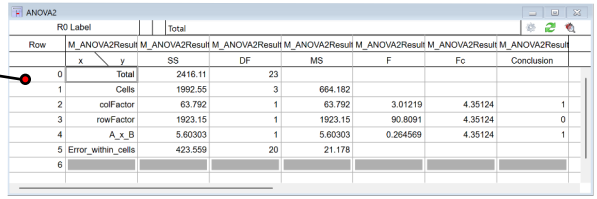


Unique user interface combines a point-and-click GUI with command-line operations

An Igor Pro graph is a powerful tool for data exploration, analysis and presentation: graphs quickly display thousands, even millions of values

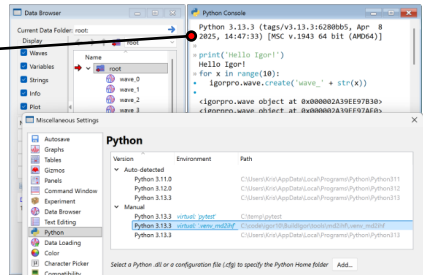


Enter data directly into a table, import many data file formats, or acquire data from instruments

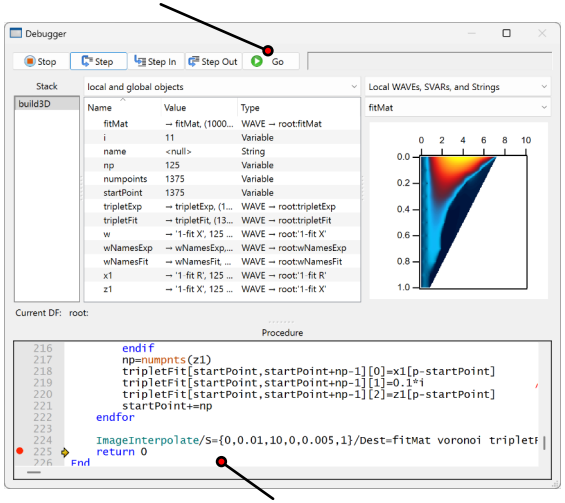


Row	x	y	SS	DF	MS	F	Fc	Conclusion
0		Total	2416.11	23				
1		Cells	1992.55	3	664.182			
2		colFactor	63.792	1	63.792	3.01219	4.35124	1
3		rowFactor	1923.15	1	1923.15	90.8091	4.35124	0
4		A_x_B	5.60303	1	5.60303	0.264569	4.35124	1
5		Error_within_cells	423.559	20	21.178			
6								

Integrated Python
Run your favorite scripts from Igor Pro 10
Easily create graphs with Igor's GUI



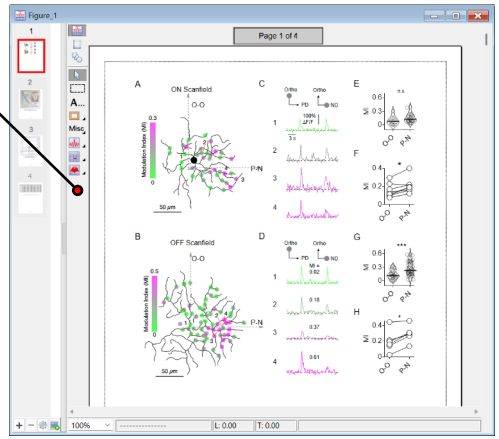
The Symbolic Debugger makes it easy to step through code to track down bugs



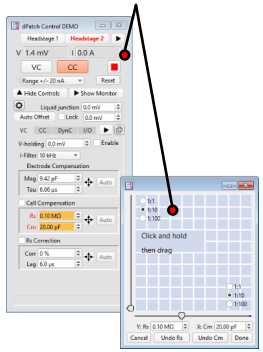

```
endif
np=numpnts(z1)
tripletFit[startPoint,startPoint+np-1][0]=x1[p-startPoint]
tripletFit[startPoint,startPoint+np-1][1]=0.1*i
tripletFit[startPoint,startPoint+np-1][2]=z1[p-startPoint]
startPoint+=np
endfor

ImageInterpolate/S={0,0.01,10,0,0.005,1}/Dest=fitMat voronoi tripletF
return 0
End
```

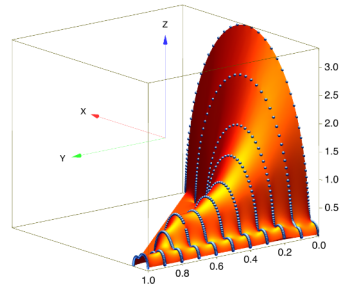
Sophisticated programming environment – write your own code or build on the work of others

Using only Igor Pro, you can create multi-panel figures and slide shows containing graphs, Gizmo plots, tables, annotations, drawn objects, and imported graphics

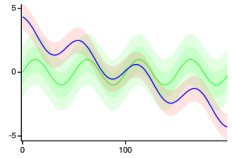


Define your own buttons, readouts and inputs to produce custom control panels

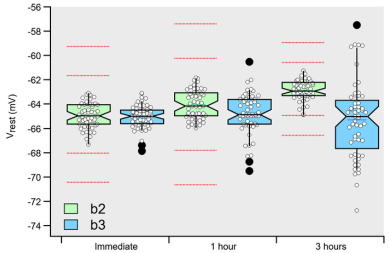




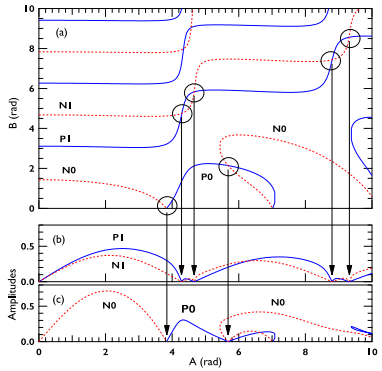
An Igor Pro "Gizmo" displays 3D data using OpenGL



Use transparency in graphs to indicate overlapping data



Plot types include Box Plots, Violin Plots, and "Rug" Plots



Igor Pro graphs are publication-quality, with EPS, PDF, PNG, TIFF and SVG export options

Igor Pro

Technical Computing for Scientists and Engineers

Runs on Windows 10 and Later

Integrated Python

Interactive Plot Creation

Interactive Data Exploration

Journal-Quality Graphics

Powerful Curve Fitting

Extensive Data Analysis & Statistics

Image Processing

Direct Data Acquisition

Built-In Programming IDE

Automate the Import, Analysis, and Display of Data

Instrument Control via µManager APIs

Fast Display of Large Data Sets

Customizable User Interface

User forums and programming library

Used by Scientists and Engineers Worldwide Since 1989

www.wavemetrics.com

Graphing

- Highly customizable X-Y plots, contour, image, category, waterfall, box, violin, and rug plots
- Interactive 3D visualization graphics
- 62 built-in marker symbols, text markers (either a character or from other data), arrow markers, error bars, 17 customizable dashed line types
- Specify marker color, marker size, or marker type as functions of other data
- 76 fill patterns, positive and negative fills, fill between curves, and transparency
- Interactive zoom and pan
- Multiple cursors for data inspection
- Overlay graphs with annotations, legends, color scale bars; text with subscripts, superscripts, mixed fonts and styles, Unicode, mathematical symbols and most languages
- High resolution drawing tools in data or relative coordinates
- Fully customizable, unlimited axes
- Date and time axes in a wide variety of formats

Image Plots

- Matrix and XYZ data
- 63 built-in color tables; create custom color tables; limit colors to a range of data
- Fully customizable color scale bars

Contour Plots

- Automatic and user-defined, arbitrary contour levels
- Color or fill contours according to level, indexed from data, or all the same
- Control contour label style, appearance, and position

3D Visualization

- Surface, 3D path, ribbon plots, 3D scatter and object plots, iso-surface voxelgrams and volume slices with transparencies and textures

Curve Fitting

- Levenberg-Marquardt nonlinear fitting
- Built-in fit functions: linear, polynomial (1D & 2D), single and double exponential, power law, sine, Gaussian (1D & 2D), Lorentzian, lognormal, Hill equation, sigmoid, Voight
- Arbitrarily complex user-defined functions for unlimited independent variables and parameters
- Fit to subsets and coefficient holding
- Weighting and linear constraints
- Orthogonal Distance Regression with built-in parallelization, errors in X, Global Analysis
- Outputs: parameter values, standard deviation, confidence intervals; model curves; residuals; confidence bands; covariance matrix; chi-square

Presentation

Layouts

- Precisely arrange multi-panel graphs, tables, pictures, annotations, and drawing elements for printing or export
- Present slide shows inside Igor

Notebooks

- Built-in, programmable word-processor
- Record experiment results using text, tables and graphs

Export

- High-resolution graphics in PDF, enhanced metafile, TIFF, BMP, SVG, PNG, and JPEG formats

Analysis & Statistics

- Parallel-threaded operations
- Single and multidimensional mixed-radix FFTs, STFT, continuous and discrete wavelet transforms, Hilbert, Hough, Wigner and Fast Gauss Transforms, DSP and Lomb periodograms, and Slepian (DPSS) tapers
- Smoothing (binomial, Savitzky-Golay, box, median, Loess), integration, differentiation, IIR and FIR filtering, convolution, ordinary differential equations, histograms, sorting, area, mean, array arithmetic, windowing, peak and level detection
- Full suite of matrix operations using standard LAPACK routines
- Find function roots or extrema using direct methods or simulated annealing
- Special functions and orthogonal polynomials
- Probability distribution functions, cumulative and inverse cumulative distribution functions
- Statistical analysis including moments, quantiles, correlations and serial randomness
- Statistical tests including ANOVA, Bartlet, Cochran, Chi-squared, F, Jarque-Bera, Kolmogorov-Smirnov, Levin, Scheffe, t, and Tukey
- Statistical multi-comparison tests
- Non-parametric hypothesis tests including Friedman, Mann-Kendal, Kruskal-Wallis, Spearman and Wilcoxon's
- Statistical analysis for angular data
- Random number generators for various distributions
- Cluster analysis with K-means and farthest-point algorithms
- Computational geometry including 2D and 3D triangulation and interpolation

Communication

- Bi-directional communication with web servers, including encrypted HTTPS connections
- Serial communications via NIGPIB, VDT, and VISA

Image Analysis

- Image filtering, manipulation, and quantification
- Image thresholding: iterated, bimodal, adaptive, fuzzy entropy, and fuzzy means
- Image arithmetic, arbitrary non-contiguous region of interest (ROI) masking, background removal, color segmentation, windowing (Hanning, Hamming, Bartlett, Blackman, Kaiser), blending, histograms, equalization, stack focus, registration, rotation, statistics
- Particle analysis: number, area, perimeter, circularity, rectangularity, location, raw moments
- Image morphology: binary and grayscale erosion, dilation, close, open, watershed, tophat, seed fill
- Edge detection using Canny, Frei, Kirsch, Marr, Prewitt, Roberts, Shen, and Sobel methods
- Image transformations: FFT Hartley, Hough, convolution filters (Gauss, gradients, median, sharpen, thin, min rank, max rank) color space conversions (RGB, HSL, XYZ), derivatives, correlations, extract and manipulate image data
- Image import of TIFF, JPEG, PNG, Raw PNG, BMP, SUN Raster

Data Formats/Import/Export

- Billions of data points; 1-4 dimensions
- Multiple floating-point and integer, strings, and date and time data types
- Elegant handling of waveform (equally-spaced) data
- General binary, delimited text, Excel, Fortran fixed-field, FITS, HDF5, JCAMP, MATLAB, Nicolet, TDM, JPEG, TIFF, BMP, Sun Raster, DEM, MP3, AIFF, and WAVE sound files
- Access SQL databases through ODBC
- Create and extract MPEG movies
- Organize data into a meaningful hierarchy, graphical preview of data, view and edit wave and variable properties
- Import/export custom file formats
- Automate file and data operations
- Regular expressions for data parsing

Data Acquisition

- Direct data acquisition from instrument into Igor waves
- High-speed streaming acquisition and simultaneous HDF5 file-streaming
- Real-time analysis during acquisition
- Rich, consistent µManager APIs
- Create custom GUIs for instruments
- Instrument automation for data collection, timing, retrieval, and analysis
- USB port, National Instruments GPIB boards, VISA through GPIB, serial port, TCP/IP, and other VISA-capable hardware

Python Integration

- Integrated Python interpreter window directly in Igor IDE
- Run native Python inside the Igor Pro
- Call Igor functions from Igor Pro's Python console
- Pass Python data directly back to Igor
- Python return data automatically converted into native Igor data types
- Pass Igor data directly into Python sessions
- Run Python code directly from Igor procedures and command window
- Easily swap between Python environments without restarting Igor

Programmability

- Full-featured structured programming language to control Igor Pro with over 1300 commands
- Automate data analysis and acquisition
- Multi-processor and threading for built-in and user-defined routines
- Symbolic run-time debugger
- Quickly find and filter symbols (functions, macros, etc.)
- Create custom interfaces: control panels with buttons, popup menus, lists, sliders, inputs, outputs
- Add your own menus, or replace Igor's built-in menus
- Scriptable via ActiveX Automation

Igor Filter Design Lab Included

- Design, apply, and evaluate Finite and Infinite Impulse Response (FIR and IIR) filters in Igor Pro

Additional Software

Igor XOP Toolkit

- Enhance Igor Pro's capabilities with your own C or C++ external code modules
- Create portable modules for yourself and others
- Add customized functions, data loaders, data acquisition systems, menus, dialogs, and windows

Igor NIDAQ Tools MX

- Acquire data directly into Igor Pro using National Instruments "multifunction" data acquisition boards
- Pre-programmed control panels
- Point-and-click acquisition and control
- Create custom applications using Igor programming and NIDAQ Tools MX
- Create custom graphical user interfaces for DAQ systems

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