Slide 1

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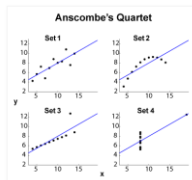# MATLAB

interactive plotting

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Slide 2

Topics

- Create various types of graphs
- Select variables to plot directly from a workspace browser
- Easily create and manipulate subplots in the figure
- Add annotations such as arrows, lines, and text
- Set properties on graphics objects

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Slide 3

Visualize your data?

- Anscombe Quartet
- *File: anscombe_quartet.m*

	I		II		III		IV	
x	y	x	y	x	y	x	y
10	8.04	10	9.14	10	7.46	8	6.58
8	6.95	8	8.14	8	6.77	8	5.76
13	7.58	13	8.74	13	12.74	8	7.71
9	8.81	9	8.77	9	7.11	8	8.84
11	8.33	11	9.26	11	7.81	8	8.47
14	9.96	14	8.10	14	8.84	8	7.04
6	7.24	6	6.13	6	6.08	8	5.25
4	4.26	4	3.10	4	5.39	19	12.50
12	10.84	12	9.13	12	8.15	8	5.56
7	4.82	7	7.26	7	6.42	8	7.91
5	5.68	5	4.74	5	5.73	8	6.89

http://neurochannels.blogspot.be/2008/07/anscombes-quartet.html

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Slide 5

MATLAB plot gallery

- https://nl.mathworks.com/products/matlab/plot-gallery.html
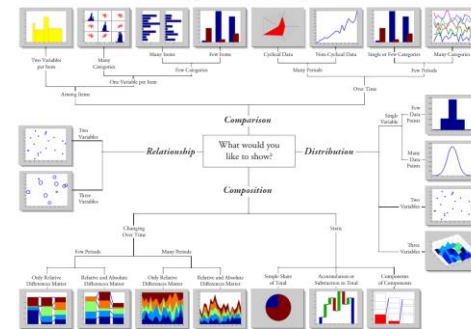
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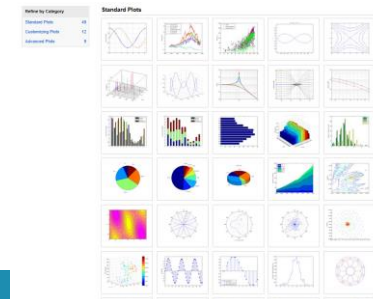
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Choosing a good chart

- Before creating a chart, ask yourself: what story do I need to tell?
- Graph works best when the message is contained in the shape of the data (patterns, trends, exceptions, ...) (Stephen Few)
- Chart-Thought-Starter (Andrew Abela- extremepresentation.typepad.com)
- Check MATLAB Blog (http://blogs.mathworks.com/videos/2009/01/16/flow-chart-shows-which-visualization-to-use/)
- Check also MATLABcentral

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Plotting your data

Prepare your data	
Call elementary plotting function	
Select line and marker characteristics	
Set axis limits, tick marks, and grid lines marks, and grid lines	
Annotate the graph with axis labels, legend and text	

- Steps in plotting your data
- If only previewing or exploring data, steps 1 and 2 may be all you need.
- If creating presentation graphics, you may want to finetune your graph by positioning it on the page, setting line styles and colors, adding annotations, etc.

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interactive plot editing

- MATLAB supports two ways to edit the plots you create:
  - Interactively: use the mouse to select and edit objects
  - Programmatically: using MATLAB functions at the command line or in an M-file
- Interactive mode:
  - perform point-and-click editing of graphs
  - modify the appearance of a graphics object by double-clicking on the object and changing the values of its properties
  - access the properties through a gui

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Plotting your data

- Have your data prepared in the workspace
- 2 ways to work interactively:
1. Start from variables
   1. Select variables in workspace
   2. Select plot from menu
2. Start graphic figure window
   1. `plottools`

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Plotting your data

- Prepare your data
  - `X = [1:50];`
  - `Y = sin(x);`
- Use Toolstrip > Plot
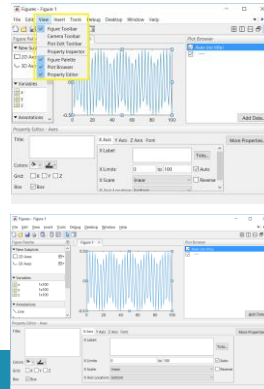 - Select variables from workspace (ctrl + mouse click)
  - Select plot type

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Plotting Tools

- Start:
  - use the `plottools` command.
  - from the figure toolbar – View menu
- 3 basic plotting tools
  - Figure Palette,
  - Plot Browser,
 - Property Editor.

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Basic plotting tools

- Figure Palette: create and arrange subplot axes, view and plot workspace variables, and add annotations.
- Plot Browser:
  - select and control the visibility of the axes or graphic objects plotted in the figure.
  - add data to any selected axes by clicking the Add Data button.
- Property Editor: set common properties of the selected object.

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## Figure Palette / subplots
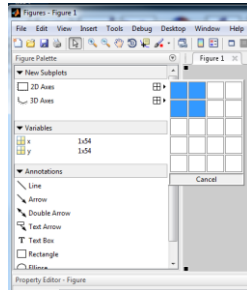
- **New Subplots** — Add 2-D or 3-D axes to the figure.
  - create a grid of either 2-D or 3-D axes.
  - click the grid icon next to the axes type.
  - move the cursor, squares darken to indicate the layout of axes

Figure Palette / variables

- displays current workspace variables.
- double-clicking a variable opens that variable
- select a variable and right-click to display the context menu, select a graphics function to plot the variable.
- If the desired plotting function is not available from the context menu, you can select More Plots to display the Plot Catalog tool.
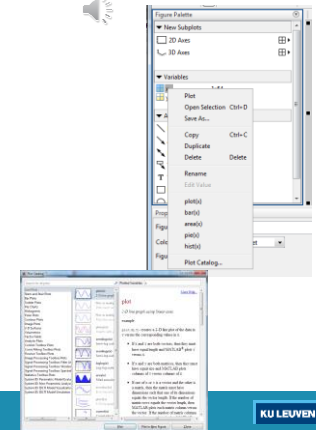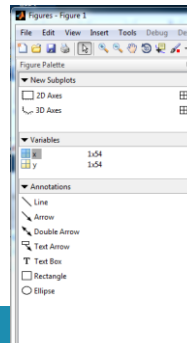
## Figure Palette / annotations

- Add text, lines and arrows, rectangles, ellipses, and other annotation objects anywhere on the figure
- Anchor annotations to locations in data space
- Add a legend and colorbar
- Add axis labels and titles
- Edit the properties of graphics objects

Plot Browser

- provides a legend of all the graphs in the figure. It lists each axes and the objects (lines, surfaces, etc.) used to create the graph.
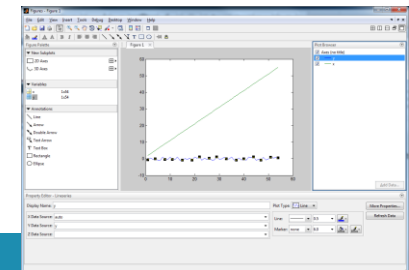
Property Editor

- Property Editor enables you to change the most commonly used object
- select an object, the property editor changes accordingly
- to access all object properties, use the Property Inspector.
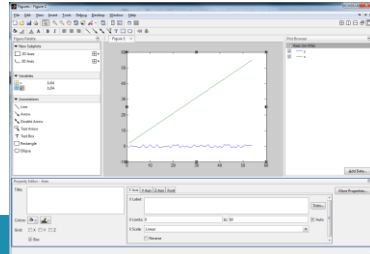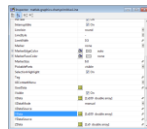

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Saving Your Work (*.fig)

- in a format that can be opened during another MATLAB session
  - Select **Save** from the figure window **File** menu or click the **Save** button on the toolbar. If this is the first time you are saving the file, the **Save As** dialog box appears.
  - Make sure that the **Save as type** is **Fig-File**.
  - Specify the name you want assigned to the figure file.
  - Click **OK**.

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Saving Your Work (*.fig)

- Information is kept in fig file
  - Cannot be used in MS Office
- Test:
  - Create a plot
  - Save it as fig
  - Clear all data
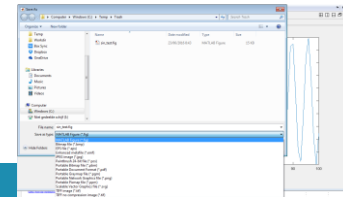 - Open fig file
  - Use Property Inspector
- https://nl.mathworks.com/matlabcentral/answers/100687-how-do-i-extract-data-from-matlab-figures

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Saving Your Work (image file format)

- in a format that can be used by other applications
  - Select the format from the list of formats in the **Save as type** drop-down menu.
  - Enter the name you want to give the file.
 - Click **Save**.

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Saving Your Work (image file format)

Raster Format	Characteristics
tif	Lossless: Document scanning and imaging format.
jpg	Lossy: big compression ratio, good for photographic images
bmp	Uncompressed format (windows os).
png	Lossless: improve and replace GIF.
bmp	Uncompressed format (windows os).

Vector / Compound Format	Characteristics
svg	Created to provide a vector format for the web. It can be created in Illustrator and a few online image editing programs.
pdf	The PDF has to be saved from a vector program to be a true vector PDF. If you save a PDF from Photoshop, it will still get pixelated
eps	The EPS was the PDFs predecessor. Nowadays, this format is dying off

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Export setup

- https://www.mathworks.com/help/matlab/creating_plots/customize-figure-before-saving.html
- Clicking **File** > **Export Setup**
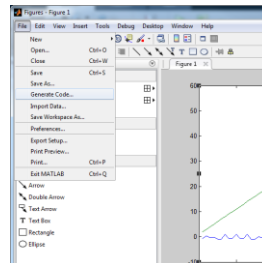- Changes are applied to the figure
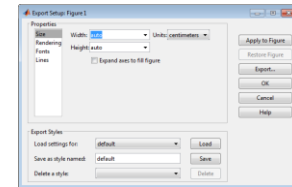
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Generate code

- generate code to reproduce this graph by selecting **Generate M-File** from the **Figure** menu.
  MATLAB creates a function that recreates the graph and opens the generated M-File in the editor.
- This feature is particularly useful for capturing property settings and other modifications made using the plot tools GUI.
- **Data Arguments**
  Generated functions do not store the data necessary to recreate the graph.
  You must supply the data arguments
- **Limitations**
  Attempting to generate code for graphs containing a large number of graphics objects (e.g., greater than 20 plotted lines) might be impractical.

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