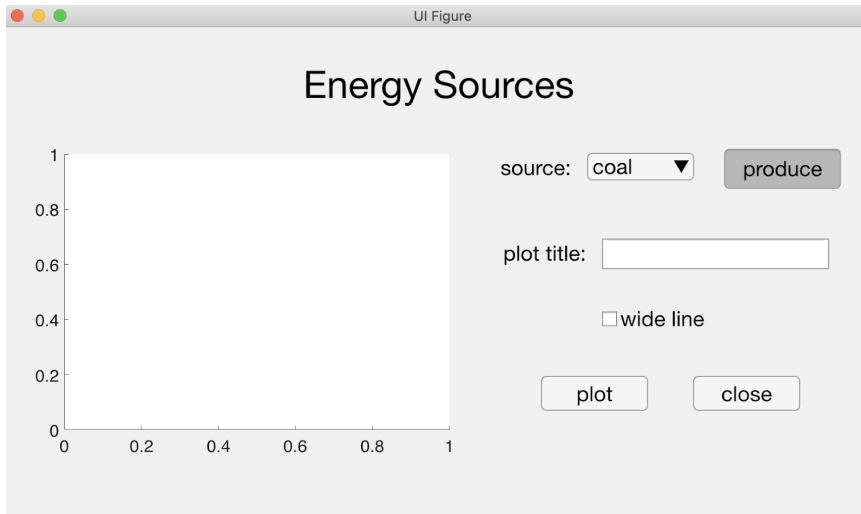
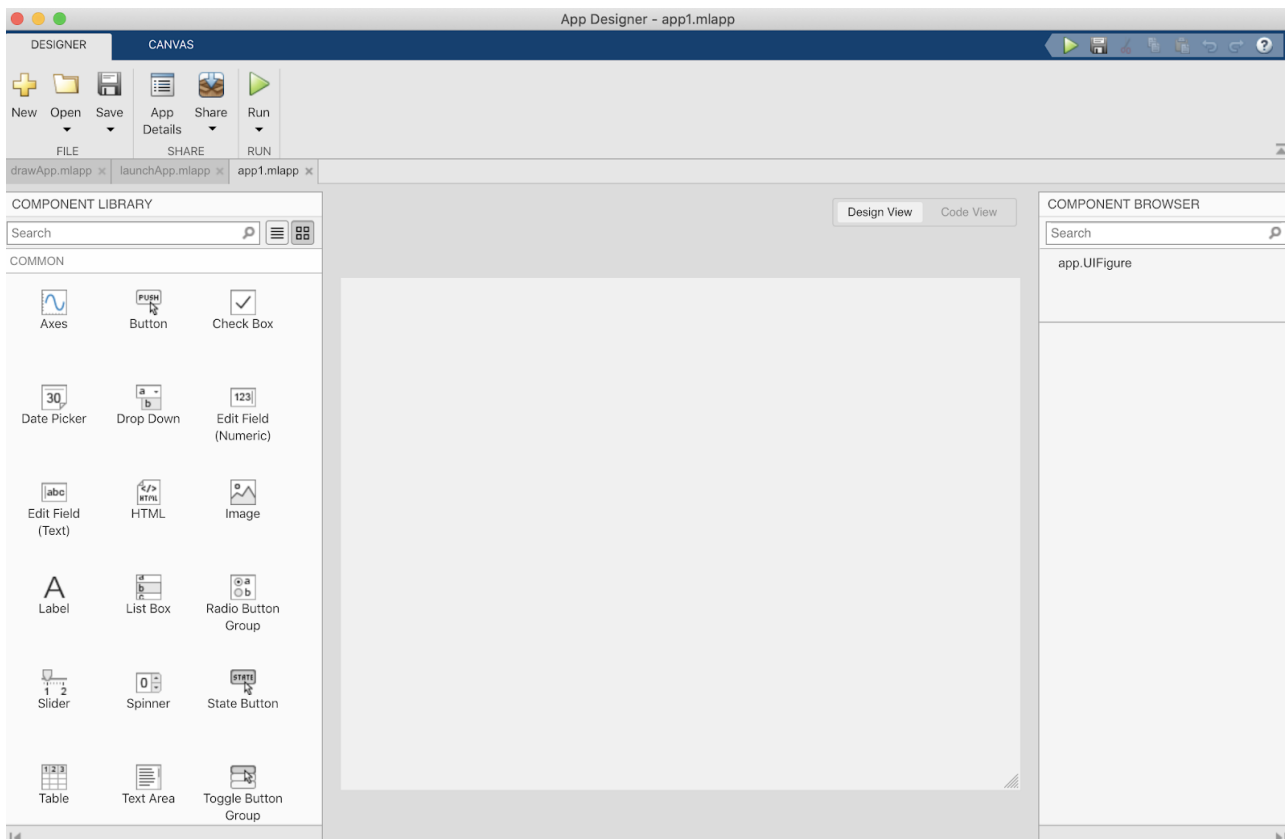


Video #2: Creating the visual layout of a GUI in Design View of MATLAB's App Designer

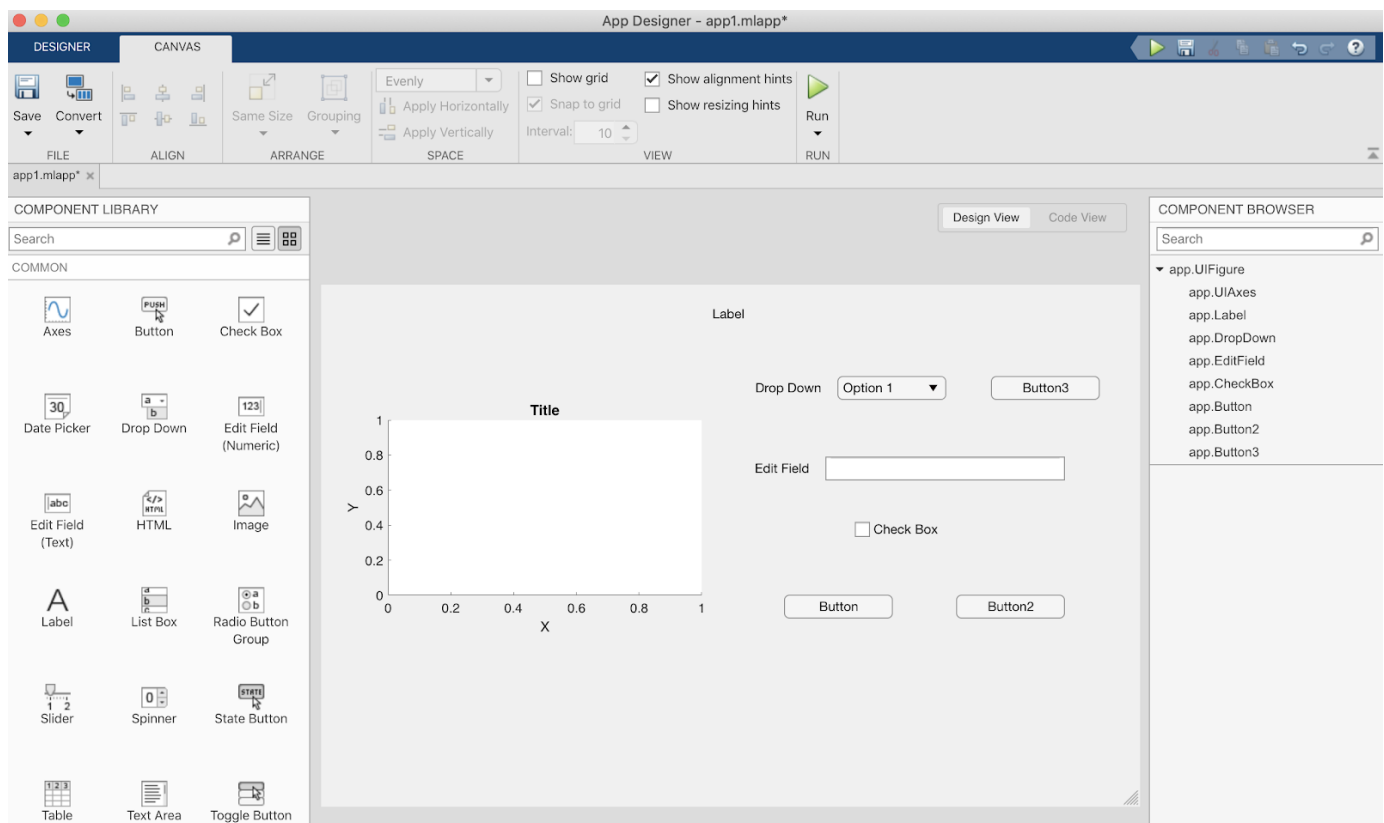
In this video, we'll look more deeply into how we create the visual layout of a graphical user interface from scratch, using MATLAB's App Designer. The goal is to create the visual layout for this simple program that I introduced in the last video <quick demo> that allows the user to select an energy source from a set of possibilities, indicate whether they want to view production or consumption data, enter a title for the plot, check whether they'd like to display the plot with a wide line, and then plot the data. I'm going to keep the program running in the background so we can look at it while we build the layout from scratch.



To create a new App from scratch, we select +New, then App, from the main toolbar, and select Blank App. App Designer opens with a blank canvas in the middle.



We have a palette of possible GUI components on the left, and I'm going to start by dragging the ones I want to their rough place on the canvas, and adjusting their size. Before I start, I'll adjust the overall size of the canvas a bit, by dragging the edges. <drag & drop each component> This area where we'll display the plot is an Axes, so let's drag that to the left side of the canvas and resize. Then I'll drag a Label to the top of the window (it's tiny at first, but we'll make it bigger later), then we have a Drop Down menu where we'll put our list of energy sources. A box like this, where the user can enter information, is referred to as an Edit Field, and there are two kinds - Edit Field (Text) is used when we expect the user to enter a string of text, like the title of the plot. That's what we want here, so I'll drag an Edit Field (Text) to the canvas. We'll use an Edit Field (Numeric) in contexts where we want the user to enter numerical information, like a parameter to use for a model. We then have a Check Box for the wide line choice. There are two kinds of buttons that we'll use for this GUI. The first is a simple Button - in general, we use this kind of button when we just want to perform some action whenever the user presses the button. We'll use it here for the plot button and close button <drag to canvas>. The second kind of button is called a State Button - we use this in contexts where pressing the button toggles between two states, like whether we want to view production or consumption data. So I'll drag a State Button to the upper right corner of the canvas.



So that's the rough layout, but things don't yet appear the way we want. Next, we're going to alter the appearance of the GUI components using the property inspector on the right. To view the properties for a particular component, we can either click on its name in the COMPONENT BROWSER or we can select the component on the canvas.

Let's start with the Label at the top. A Label has a Text property - by default, it's just the word "Label". We can change it in two ways - we can double-click on the label in the canvas, and

change it to Energy Sources, or we can change the text in the box labeled Text in the Inspector. The font is small, so let's increase its size in the Inspector to 36 (after I change the number, I'll hit the Return key on my keyboard, which then changes the font size on the canvas), and let's adjust position. Something you may have noticed is that when I changed the text of the Label, MATLAB automatically changed its name in the Component Browser to `app.EnergySourcesLabel`, figuring this might be a more informative name. We can keep MATLAB's name choices here, or we can change names to something else if we'd like, maybe a more compact name. To change a name, double-click on the name - here I'll change it to something shorter, `app.sourcesLabel`.

Let's now move to the Edit Field - we want the label for the box to say plot title, so let's change that in the Inspector, and adjust its size to 20. The Check Box also has a text label, which we'll change to wide line, and increase the font size to 20. There's also a checkbox in the inspector (labeled Value) that we can use to indicate what we want the initial state to be when the user first starts the program - do we want it to be checked at the outset, or not (I'll leave this unchecked).

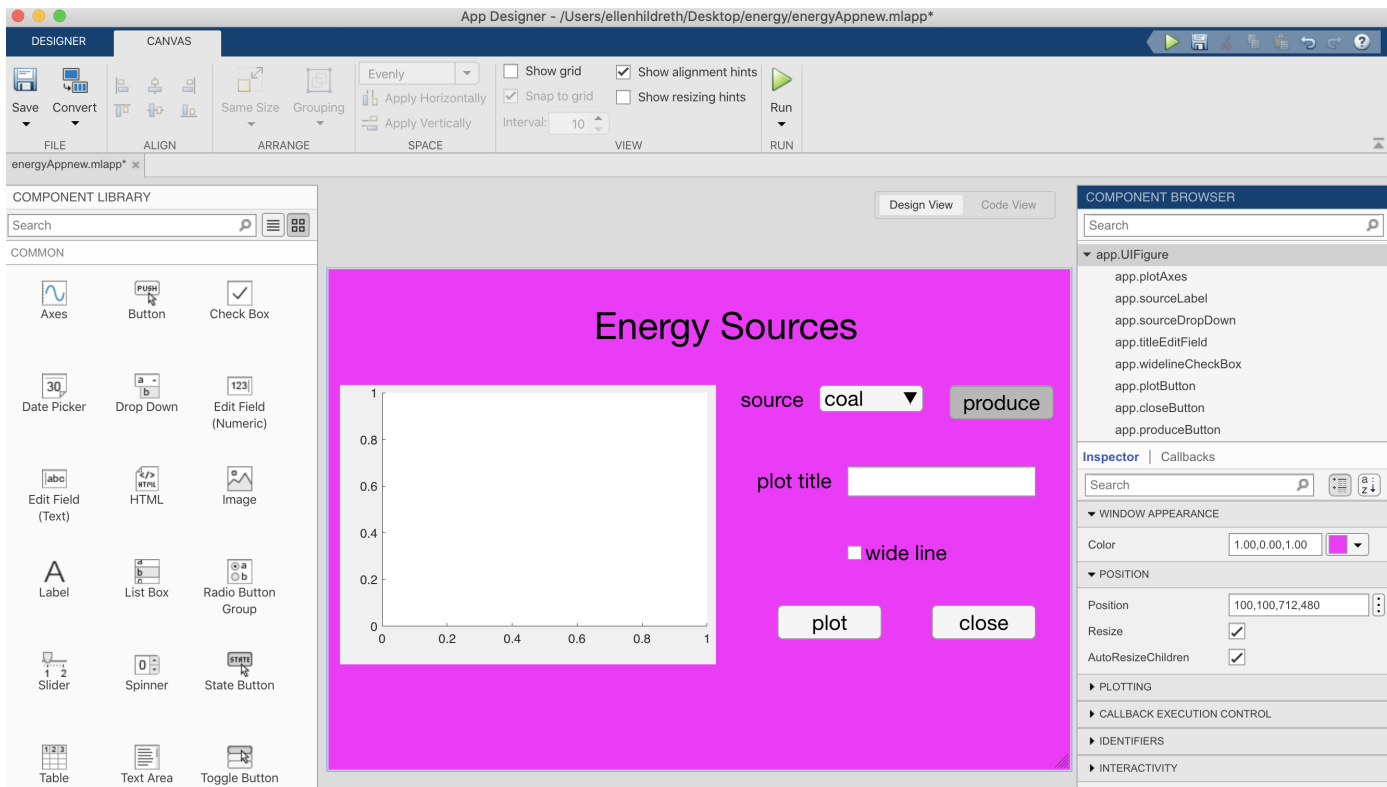
Next let's tackle the buttons. The first thing to note is that the default names of the buttons are very generic - `app.button`, `app.button2`, `app.button3`. But let's see what happens when we change the text that appears on the buttons. First the plot button, I'll change its Text to plot with font size 20, and note - MATLAB changed its name to `app.plotButton`, much better. Let me then do the same for the close button. For the State Button, we'll use the text that we want the button to have when the program first starts up, produce, and here, we also have a Value property that can be on or off at the outset. We can change the initial state by checking this box, and note that the background of the button on the canvas changes between light and dark as I change this initial value. We'll start it in the on state, which is dark.

The Drop Down menu is a bit different - there are multiple items in the menu list, and just one of these items appears in the box when the program starts. So I'll click on `app.DropDown` on the canvas to see what properties I can set. We'll first change the label to source, with font size 20 (this also changed the font size of Option 1). To enter all the options for the energy sources, I'll click on the box labeled Items - this opens a larger box where we can enter the items - coal, gas, oil, nuclear, renewable. The item that appears as the selection is in the Value property - by default, it starts out as the first item in the list, coal in this case, but we can change that here if we want (I'll leave it as the first item).

We're almost done, let's finally consider the Axes on the left. The display starts with default labels, X, Y, and title. For our application, the axes will have labels (years on the horizontal axis and quadrillion btu on the vertical axis), but the code will add these labels, so let's start the program with no labels. We can do this by changing the three Label properties to empty strings. Note that we can still set the font size, which will be used when the labels are added, but let's keep this at the default size. As an aside, note these other properties that we're familiar with, like `XTick`, `XTickLabels`, and so on, and properties under Rulers that can control the range of values on the axes, but we'll leave these alone for now.

Let's now save our work - I'll name it `energyAppnew` to distinguish the new program from the finished `energyApp` program in my Current Folder. Then Run the new program - it has the look that I want, but no actions yet <demo no actions>. Let's suppose we're done for now, and want to

come back at a later time and make additional changes to the appearance. I'll close App Designer to illustrate this, then go to Open in the main toolbar on my MATLAB window, and navigate to energyAppnew.mlapp. Let's change some other properties, like the background color of the figure window <click on the background canvas to see what properties we can set for the figure window>, which I'll change to hot pink. Let's save the changes and Run again.



As a final note, you can work on multiple Apps at the same time - we can open other programs from the Designer tab in App Designer <open two versions of energyApp> - note the different tabs for each program. So that's the basics of how we create the visual layout of a graphical user interface, using the App Designer tool. In the next video, we'll look more closely at how we add code to implement new actions for our App.