# Final Project - Shiny Dashboard using R-Studio (Coursera)

Estimated time needed: **60** minutes

## Objectives

You work for a company who provides career services for those with lower incomes. The marketing team has a small budget and wants your help to find out which demographics (age, education, gender, etc) to target advertise to in the US.

You will create an interactive dashboard with Shiny to explore census data to figure out what trends in different demographics you can find and tell the marketing team your findings.

Create a dashboard with the UCI Adult dataset that can give insight on the following questions:

- Does education level impact the salary?
- Impact of age and sex on salary?
- People from which native countries are given less income in spite of having good education?
- Does number of hours working contribute to less income?
- Which workclass faces less income?

### Dataset Used

The dataset you will use is the UCI Adult dataset. The dataset was taken from the Census database and contains demographic information on people. The variables you will focus on are:

- `native_country` : the person's native country
- `age` : age of person
- `hours_per_week` : number of hours the person works per week
- `education` : education level
- `workclass` : class of work like federal government or private etc.
- `sex` : male or female
- `prediction` : the income level, either `"<=50K"` or `">50K"`, you will facet your graphs by this variable

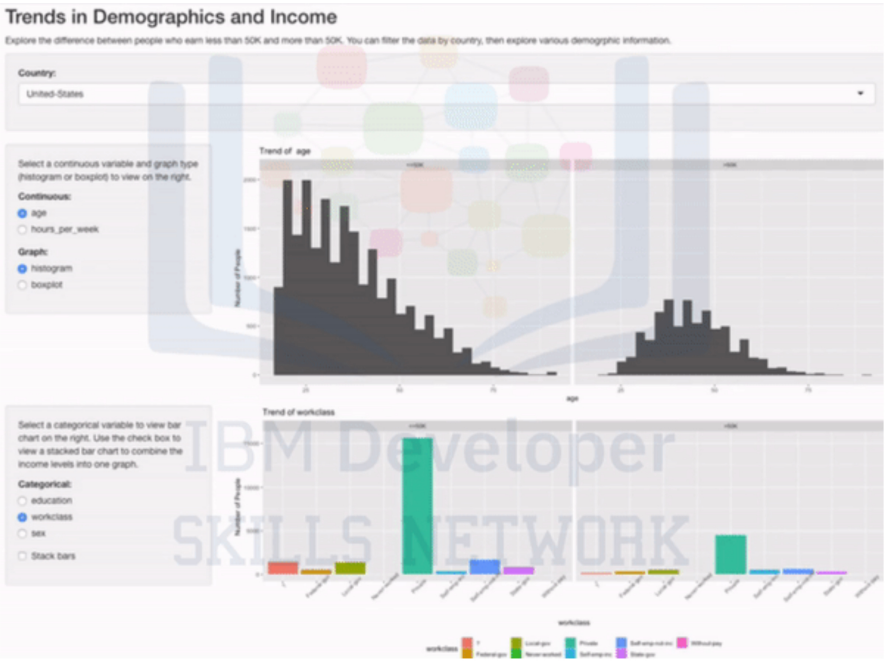
### RStudio with Coursera

This lab will use RStudio lab environment on Coursera.

### Expected Output

Below is the expected result of the project. The dashboard will allow users to select the native country of people to look at. Then users can select which continuous variables to display, age or hours per week. For the continuous variables, the user can choose to display a histogram or boxplot. Both types of graphs are faceted by the income level ( `"<=50K"` or `">50K"` )

In the next section, the user can choose which categorical variables to plot with a bar chart. There is also a checkbox to stack the bar charts or facet them by income level ( `"<=50K"` or `">50K"` ).

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## Let's start creating the Shiny dashboard

### This project includes the following tasks:

- Task 1. Add application title in the UI
- Task 2. Add first fluidRow to select input for country in UI
- Task 3. Add second fluidRow to control how to plot the continuous variables in UI
- Task 4. Add third fluidRow to control how to plot the categorical variables in UI
- Task 5. Create logic to plot histogram or boxplot in server
- Task 6. Create logic to plot faceted bar chart or stacked bar chart in server
- Task 7. Optionally change the themes to the graphs

- Task 7: Optionally change the themes to the graphs

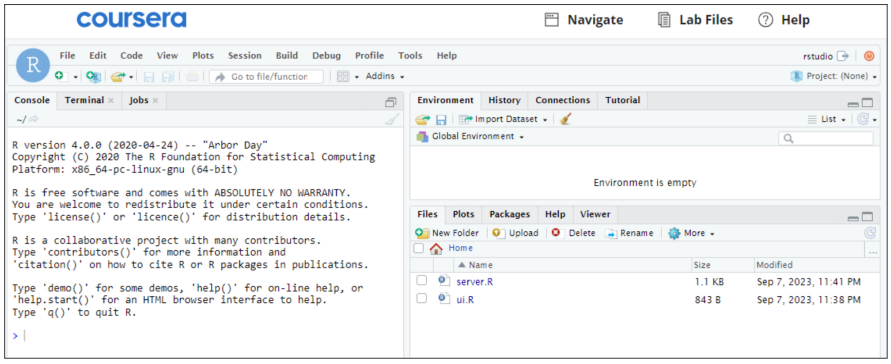
Before starting these tasks, you will download and become familiar with the starter code. The next two sections will guide you with these.

## Launch RStudio in Coursera

In this project, you will be building the R Shiny app using RStudio, hosted by Coursera.

Launch RStudio lab using the `Launch App` button.

You will be directed to the RStudio IDE as shown in the screenshot below. Now you are all set to get started on the lab.



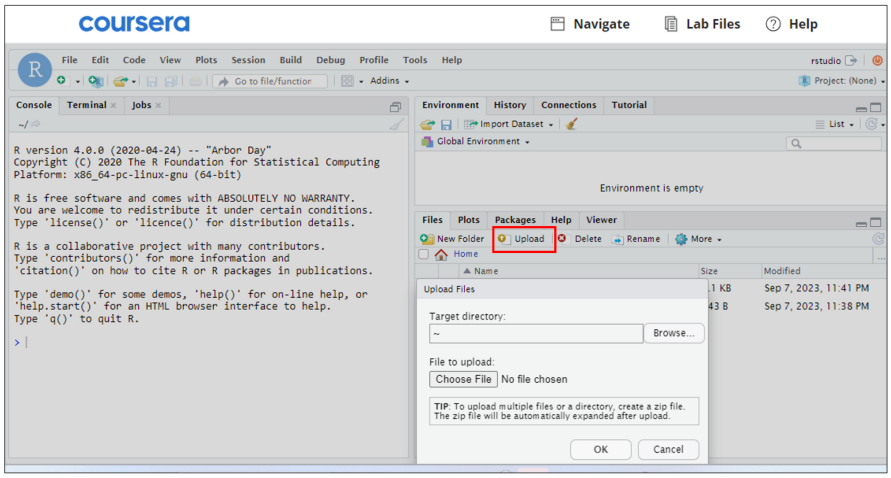

## Dataset and Starter codes (ui.R and Server.R files)

As you learned, a Shiny app contains two parts: the **ui.R** and the **Server.R** script files. This lab comes with the pre-loaded **UCI Adult dataset** along with the starter UI and Server R scripts within lab environment. These files are available under **DV0151EN_Week4_FinaProject_StarterCodes** directory when you launch the lab.

If these files are not available within the lab, use the links given below to download the files and upload them manually.

- Starter code for UI
- Starter code for Server
- UCI Adult Dataset

After downloading, use the **Upload** button under the **Files** tab to upload files the to lab environment as shown in the screenshot below.




Once these files are uploaded, click on these files to open and then edit as per the instructions given in this lab.

## Edit Starter codes - ui.R and Serve.R files

Before we begin, let's review the code. Some sections of the code within these files are marked as `...` , and it's essential to replace these placeholders with the correct code to obtain the desired output.

### ui.R

You will work on the UI code in the first four tasks, then move on to the server code.
First, it loads the shiny library, if you want to run this locally make sure to install first:

```
1  install.packages("shiny")
```

Then, the UI uses a fluid row layout, which you have learned about but not used in the labs so far. The base code will give a skeleton of the layout. To help you understand it more, see the below section.

### Fluid Row Layouts

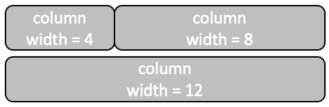
In the past lessons you learned more about using the sidebar layout and the vertical layout. In this project, you will use fluid rows which allows for more customization.

You can think of each fluidRow as having 12 columns, so all the widths should add up to 12. For example:

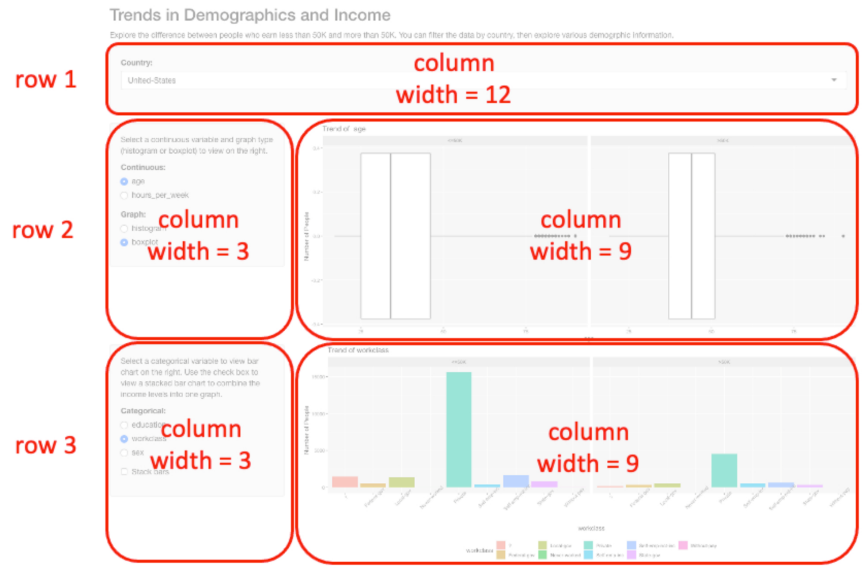
```
1  ui <- fluidPage(
2   fluidRow(
```

```
    column(width = 4),
    column(width = 8)
  ),
  fluidRow(column(width = 12))
)
```

Which would look like:




Now, for this application, we want the layout to look like:




The first four tasks will walk you through the title panel and then each **row** of the layout.

Additionally in the starter code, you will see `wellPanel()` used. Well panels simply just hold other objects, like a group of input widgets. They create a panel with a border and gray background. For example, you could put a selectInput and radioButtons inside a well panel like so:

```
fluidRow(
    column(width = 4,
      wellPanel(
        selectInput(...),
        radioButtons(...))
      ),
    column(width = 8, plotOutput('p1'))
)
```

### server.R - Tasks

After completing the UI, you will work on the server code.
Inside the `shinyServer()` , there is first this given code

```
df_country <- reactive({
  adult %>% filter(native_country == input$country)
})
```

This uses the input value `country` to filter the dataset. The new data is stored as `df_country` and can be accessed using `df_country()` .

There are two parts for you to complete

- The histogram and boxplot section. Based on the input graph type, you will create a histogram or boxplot, both will be faceted by the `prediction` (which is either `"<=50K"` or `">50K"` ).
- The bar chart. Based on the check box `is_stacked` , you will create a stacked bar chart or a bar chart faceted by `prediction` .

The `...` will be where you modify the code.

Now that you understand the UI and server starter code, let's get started.

### TASK 1 - Add application title in the UI

In the ui.R file, add a title to the application with `titlePanel()` .

### TASK 2 - Add first fluidRow to select input for country in UI

In the first fluidRow, add a `selectInput()` in the `wellPanel()` . This select input will be used to filter the data by the person's native country. Use the ID `country` , give it any label you think fits, and as `choices` use the five countries: `"United-States", "Canada", "Mexico", "Germany", "Philippines"`

### TASK 3 - Add second fluidRow to control how to plot the continuous variables in UI

In the second fluidRow, add two `radioButtons` and the output plot.

- The first radio buttons are to choose `"continuous_variable"` (input ID), the choices are `"age"` and `"hours_per_week"`. Add a label.
- The second radio buttons are to choose the "`graph_type`" (input ID), the choices are `"histogram"` and `"boxplot"`. Add a label.
- Add a plot output, `"p1"`, with `plotOutput()`

**Hint**: You can always find more information about functions by going in the RStudio console and using for example

```
?radioButtons
```

### TASK 4 - Add third fluidRow to control how to plot the categorical variables in UI

In the last fluidRow, you will add `radioButtons()`, `checkboxInput()`, and the output plot.

- Add the radio buttons to select the `"categorical_variable"` (input ID) with choices `"education"`, "`workclass`", and "`sex`". Add a label as well.
- Add a checkbox to check if the bars `"is_stacked"` (input ID), that is, if the checkbox is checked then the bars will be stacked. Otherwise, they will be faceted and unstacked. Add a label. The initial `value` can be either `FALSE` or `TRUE`.
- Add a plot output, `"p2"`, with `plotOutput()`

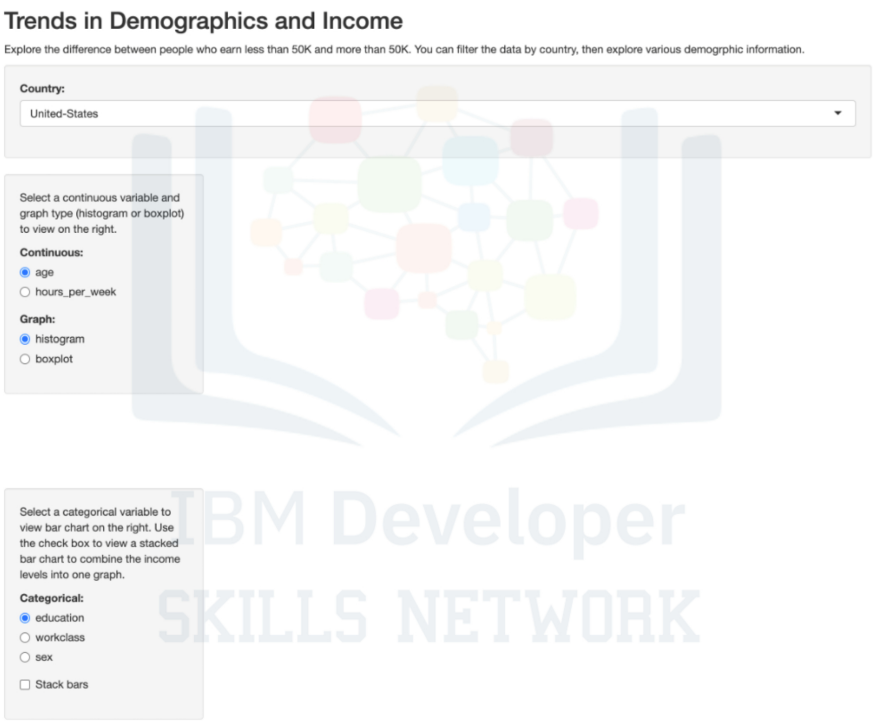
**Test UI code**

You have completed the UI code. If you want to test that it is working, in the server.R file you can comment out everything in `shinyServer()` so that the server side functions doesn't break. Or you could clear everything in `shinyServer()` like:

```
shinyServer(function(input, output) {

})
```

Then if you click `Run App`, you should see all the components and input widgets like the image below




You will notice that the graphs are not there, this logic will be handled in the server code.

### TASK 5 - Create logic to plot histogram or boxplot in server

You can now go to the server.R file. Follow the comments and fill in the `...`. The input variable you want to use for the histogram and boxplot is the continuous variable.

The first part will be to complete the histogram and boxplot logic. There is a conditional statement, so if the graph type the user input with the radio button is "histogram", then you will plot a histogram. You will

- add the continuous variable to use for the x-axis,
- add the labels for the y axis and title, and
- facet the graph by `prediction`

Otherwise, create a boxplot. You will:

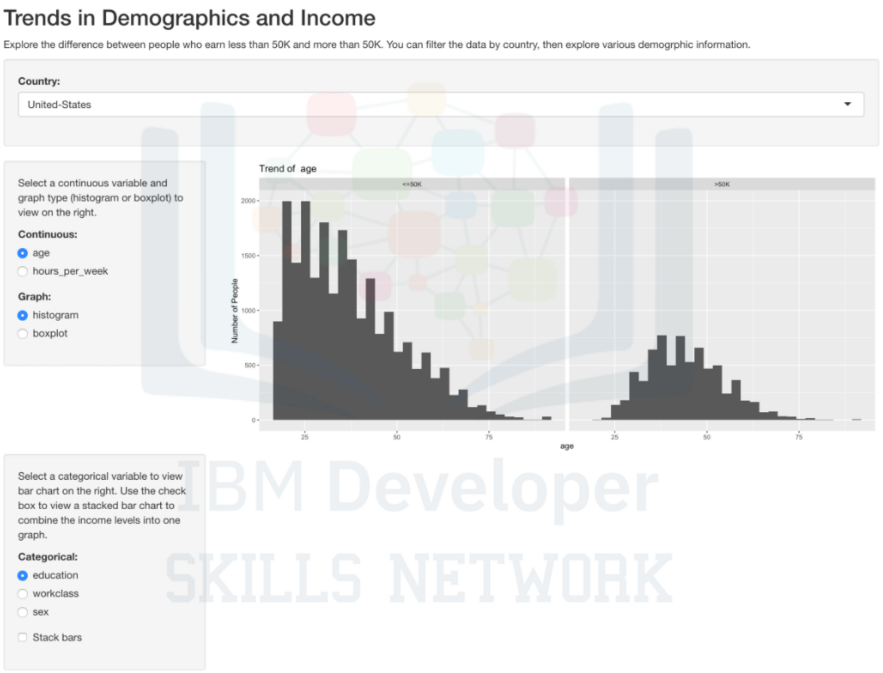
- add the continuous variable to use for the y-axis,
- flip the coordinates
- add the labels for the y axis and title, and
- facet the graph by `prediction`

### Hints:

- You can use something like `input$continuous_variable` to get the input IDs you set in the UI.
- In ggplot, you used `aes()` before. There is another similar function called `aes_string()`. The difference is that it takes as inputs strings. For example: `ggplot(mtcars, aes(mpg))` is equivalent to `ggplot(mtcars, aes_string("mpg"))`. When you call `input$continuous_variable`, it will give you back a string so you can use `aes_string(x = input$continuous_variable)`.

- Facet your plots using `facet_warp(~variable)`
- You can use `paste()` to paste together strings

To test your work, you can comment out all of the "TASK 6" code and select `Run App` . Try changing the country and try the different options for radio buttons "Continuous" and "Graphs". Your dashboard should look similar to:






### TASK 6 - Create logic to plot faceted bar chart or stacked bar chart in server

The final section of the dashboard is the bar chart. Follow the comments and fill in the `...` . The input variable you want to use for the bar chart is the categorical variable.

The first part is a base ggplot object `p` . You will have to:

- add the categorical variable to use for the x-axis,
- add the labels for the y axis and title, and
- change the theme so that
  - the x axis text labels are at a 45 degree angle
  - the legend position is the bottom

The geometry object (bar) will be different based on a condition. If the check box is checked, then you will:

- create a stacked bar chart that uses `prediction` as the fill

Otherwise, you will:

- create a bar chart (not stacked) faceted by `prediction` , the fill should be the input categorical variable

### Hints:

- You can use something like `input$categorical_variable` to get the input IDs you set in the UI
- You can use `aes_string()` in `geom_bar` to change the `fill`
- To change the x-axis text angle, use parameter `axis.text.x` in `theme()`
  - since you are changing the text, use `element_text()` and modify the `angle` parameter
- To change the legend position, use parameter `legend.position` in `theme()`
- Facet your plots using `facet_warp(~variable)`
- You can use `paste()` to paste together strings

### TASK 7 - Optionally change the themes to the graphs

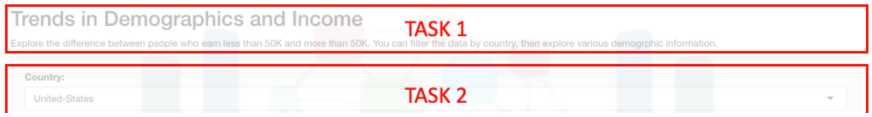
Feel free to add any more customizations to the graphs. You can add a different theme or color palettes to any of the plots. If you want to use `ggthemes` , install the package first:

```
install.packages("ggthemes")
library(ggthemes)
```

## Submission

Congratulations, you have completed the Shiny dashboard! To test that it's working, click `Run App` . It may take a few seconds for the graphs to load initially. You can play around with the dashboard and see what kinds of insights you can find.

To submit your project, you will take screen shots of components of your dashboard and a peer will review your work. Below is an image that breaks down what area of the dashboard you should submit for each task for the peer review.





## Author(s)

Tiffany Zhu
Saishruthi Swaminathan
Shilpa Giridhar