A. What is the URL of your narrative visualization?

1. **[1 point]** Does the URL connect to a functioning web page?

B. Upload a PDF file essay describing your narrative visualization as required by the assignment instructions.

1. **[5 points]** Does the essay state what messaging was intended by the narrative visualization?

* **Messaging.** What is the message you are trying to communicate with the narrative visualization.

This narrative visualization enables users to understand how India has been dealing with its population growth. The role of education in stabilizing the population of a country.

With this narrative visualization we leverage data visualization to communicate how India’s population compares to the top 10 populated countries of the world based on factors like - 'Population', 'Population Density', 'Fertility Rate', 'Growth Rate'. We then enable the user to explore and understand the decadal population growth of the states (categorizing them into EAG and Non EAG states) to identify key focus areas for the government to slow its population growth.

The message we communicate with this narrative visualization is the impact of education (literacy rate) with population control by demonstrating the correlation between fertility rate and literacy rate for all Indian states. It is important since overpopulation puts additional pressure on the environment, natural resources, and economy. The final message being the importance of putting the focus and introduce policies for the EAG states to improve the literacy rate to further reduce the fertility rate.

**Note:**

* **EAG state** refers to the eight socioeconomically backward states of Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Orissa, Rajasthan, Uttaranchal, and Uttar Pradesh which lag in the demographic transition and have the low literacy rate and high fertility rate.
* **Fertility rate** of a population refers to the average number of children that would be born to a woman over her lifetime
* This project aims to provide a narrative around how urbanization across the globe in different countries is driving GDP and mobilizing the population to certain big cities.  
  As a result of this the cities are getting bigger and bigger in area with each passing day and finally resulting in depletion of forest area. This trend might prove harmful by severly damaging the environment with less forests and incresed pollution in certain parts of the country.

C. Narrative Structure

1. **[2 points]** Does the essay indicate which structure the narrative visualization was designed to follow (martini glass, interactive slide show or drop-down story)?
2. **[3 points]** Does the narrative visualization follow that structure?

* **Narrative Structure.** Which structure was your narrative visualization designed to follow (martini glass, interactive slide show or drop-down story)? How does your narrative visualization follow that structure? (All of these structures can include the opportunity to "drill-down" and explore. The difference is where that opportunity happens in the structure.)

This visualization follows the ‘Interactive Slide Show’ structure which enables the user to navigate through the different slides/ scenes while giving them the ability to access/ interact with the data presented to them on each slide/ scene. This follows the hybrid structure mixing author led and reader led paths i.e. it follows an author led path through the slideshow – using link in the nav bar – ‘Home’, ‘Next’ and ‘Previous’ to enable the user navigate from one scene/ slide to another while also giving them an ability to interact with data presented using charts on each scene/ slide – like drill down (tool tip), change state of a chart by selected different parameters (buttons), etc (or they can chose to continue to the next/ previous slide).

3, 4Our narrative visualization follows “Martini glass” structure. This visualization has total three visible scenes. In first two scenes, we follow author driven approach where we begin the narrative visualization by showing interesting default views and annotations allowing very limited interaction. Here we summarize top level data of top 5 emitters’ contribution to world’s total CO2 emission and annotate that with interesting summary statistic to increase user interest in further exploration.

3, 4After conveying the message that few countries do most CO2 emission and their progress in fixing this problem in first two scenes. We move on to the next, reader driven stage where we allow user to explore data by interacting with visualization. At this stage (third scene), we allow user

* •  to use slider so that user can go back and forward in time and see trend of all countries together.
* •  to drill down specific country’s CO2 emission trend by allowing them to click on the country bubble.
* •  to filter countries based on their income group so that correlation between GDP and CO2 emission can be explored.
* •  to view summary of each country using tooltip.

D. Visual Structure

1. **[2 points]** Does the essay indicate what visual structure is used for each scene?
2. **[1 point]** Does the essay indicate how the visual structure ensures the viewer can understand the data?
3. **[1 point]** Does the essay indicate how highlighting is used to get the viewer to focus on the important parts of the data in each scene?
4. **[1 point]** Does the essay indicate how the visual structure helps the viewer transition to other scenes, to understand how the data connects to the data in other scenes? Linear

* **Visual Structure.** What visual structure is used for each scene? How does it ensure the viewer can understand the data and navigate the scene? How does it highlight to urge the viewer to focus on the important parts of the data in each scene? How does it help the viewer transition to other scenes, to understand how the data connects to the data in other scenes?

The visual structure used for this narrative visualization if of a form of a website (narrative journalism) where each webpage represents a scene. We have used a consistent visual structure to depict each scene where each scene follows the same template and color scheme to maintain consistency to keep our user oriented throughout the visualization.

1. Header: This section shows the title of visualization along with the author information. We have used light red color (Hex: #FF6654) for the background and while to display the visualization title, author information. The text is center aligned.
2. Navigation Bar: This section displays the links – ‘Home’, ‘Next >>’, ‘<< Previous’ to enable the user to navigate between the different scenes. The navigation bar is placed at header and footer of the template. We have used brown color for the background and white to display the text. The navigation bar links are right aligned.
3. Body: We have divided the body section into two columns – ‘Article’ and ‘Chart’. The article section is used to display the text we want the reader to read to convey the story. The chart selection is used to display the charts to enable to user to explore and interact with the data. We have used the while color for the background and black color to display the text. For buttons we have used green color for the background and while to display the button text. We have used different chart types to ensure we are able to present the data to our user in the most efficient manner.

The consistent theme and ordering (we have placed the scenes in the story telling structure) across all scenes help in setting up the context for visualization. It allows the users to get familiarize with the visualization. This narrative visualization follows a journalism format to tell user a story to keep them engaged and help them understand the data for them to interact with them. For example, the first scene tells a story of how India compares to the top 10 most populous countries of the world in terms of population. It sets a context (article section) to enable the user to start exploring the charts (Interactive Bar Chart and Line Chart) and interact with the data presented to them to visually see how India compares with the remaining countries (chart section).

To further enhance user’s engagement, we have used explicit (set of instructions on each scene) and implicit (buttons, links, etc) affordances. It helps the users to act and interact with the data to both explore and understand. In addition, we have used several techniques to highlight sections of the visualization to draw user’s attention important data elements of the scene.

These highlighting techniques include the choice of the visual structure of each scene where we have separated the body i.e., the area where we display the information separate from the header and navigation bar. Within the body, we have further divided the section into article and chart sections to display the text on the left half of the screen and charts on the right side of the scene. As the user navigates through the scenes their attention is drawn to the text on the left and the charts on the right. We have also used color, size, shape and length to highlight the important aspects of data. For example, on the first scene, the two charts – ‘Ton Ten Countries In The World By Population’ and ‘Population Growth Rate Trajectories’ follow the same color code for the countries. In addition, we used annotations and legends to highlight the key data points to draw user attention and assists user to further understand and interact with the data. For example, as user navigates to each scene, we display annotations but only after a brief interval to give the user a chance to see the chart in the context of the article and then display the annotations. We also highlight key data elements using tool tips as user hovers over the mouse on the chart elements – bars of the bar chart, line of the line chart. We have used legend technique on the third scene to highlight the three categories of data on the chart. We have also used animation to draw users’ attention and highlight the data. For example, in the first scene, we have an animation that starts on the page load that show the population growth rate trajectories for each of the ten countries over a period. The user can replay the animation using the ‘Play’ button.

We have also used transitions to build animation on the charts. For example, on the first scene, when the user clicks on the buttons – ‘Population ‘, ‘Population Density’ and ‘Fertility Rate’ the bars on the bar chart increase or decrease Another example in on the third scene, the user can view the movement of the states represented by a solid filled circle based on year selection on the top.

As discussed above, the visual structure – its template, storytelling approach, techniques like – affordance, annotation, transition, animation, etc incorporated in the narrative visualization allows the users to freely navigate through the scenes in the visualization and understand and connect to the data and presentation. The template and color scheme across each template keeps our user oriented and engaged with each scene i.e. while navigating they can only focus on the data and message communicated using the text, visual charts since the general visual structure remains the same.

E. Scenes and Visual Ordering

1. **[2 points]** Does the essay identify the scenes of the narrative visualization?
2. **[1 point]** Does the essay discuss ordering (e.g. the order of elements in a chart or the ordering of scenes)?
3. **[2 point]** Do the charts used as scenes effectively present the data?

* **Scenes.** What are the scenes of your narrative visualization? How are the scenes ordered, and why

This narrative visualization follows ‘Interactive Slide Show’ format and storytelling approach and consists of three scenes. It follows a linear and storytelling ordering to structure the scenes. The user can navigate from one scene to the another using the hyperlinks provided in the navigation bar of the scene (liner ordering).

Scene 1: The first scene provides an overview of India’s population and how is compares against other populous countries of the world. In this scene, we first learn about India with respect to its population and provide our users an overview of overall visualization. We then let our user explore, learn, and understand how India compares to other populated countries using ‘Population’, ‘Population Density’, ‘Fertility Rate’ and ‘Growth Rate’. The scene is structured linearly i.e., user can navigate to the next scene (second scene) using ‘Next >>’ hyperlink. This scene consists of two charts and allows users to interact with the charts.

Chart 1: The first chart compares the top ten populated countries in the world based on ‘Population’, ‘Population Density’ and ‘Fertility Rate’. The user can interact with the chart by selection the buttons to display the data based on the parameters listed above. We have used bar chart to effectively communicate the data as we are plotting the country (ordinal) and population, population density and fertility rate (quantitative continuous). The user can also get more information as a toll tip if they hover their mouse over any bar.

Chart 2: The second chart uses animation (transition) to demonstrate population growth rate of India and other most populated countries (ton ten populated countries) over a period (of time). We used the line chart as it effectively communicates the data since it is a plot between time in terms of year (quantitative continuous) and growth rate (quantitative continuous).

The two charts use the same color scheme to represent the countries.

Scene 2: The second scene provides information regarding the states in India and their categorization as EAG and Non-EAG states. It then provides a comparison on how the two categories of states along with India in general compares against each other with regards to the population growth. The user can visually see and understand that EAG states have constantly had a higher population rate and is driving India’s population growth. We have used the line chart to effectively represent the data as the plot is between time in terms of year (quantitative continuous) and growth rate (quantitative continuous). The user can interact with the chart by clicking on the links on top of the chart – ‘India’, ‘EAG’, ‘Non-EAG’. The user can also get more information as a toll tip if they hover their mouse over the solid filled points on the chart.

Scene 3: The third scene provides a message to the users around the correlation of education and family planning. It enables the user to understand the impact of education on the population growth over a period (of time). It use a scatterplot chart to depict the correlation of literacy rate and the fertility rate of the Indian states over three decades. We used scatterplot to effectively communicate the message in the scene to plot the literacy rate (quantitative continuous) and fertility rate (quantitative continuous) along with the color encoding based on the state categorization as EAG and Non-EAG states. The user can interact with the chart by clicking on the buttons on top of the chart to view data for the decade. The user can also get more information as a toll tip if they hover their mouse over the solid filled points on the chart.

F. Annotations

1. **[2 points]** Does the essay discuss annotations?
2. **[1 point]** Does the essay discuss a template for the annotations?
3. **[2 points]** Are the annotations in the narrative visualization effective and consistent?

* **Annotations.** What template was followed for the annotations, and why that template? How are the annotations used to support the messaging? Do the annotations change within a single scene, and if so, how and why

G. Parameters and States

1. **[1 point]** Does the essay identify the parameters of the narrative visualization?
2. **[1 point]** Does the essay identify the states of the narrative visualization?
3. **[1 point]** Does the essay indicate how are the parameters are used to define the state and each scene?
4. **[1 point]** Does the narrative visualization use parameters to control its state?
5. **[1 point]** Does the narrative visualization use parameters to control each scene?

* **Parameters.** What are the parameters of the narrative visualization? What are the states of the narrative visualization? How are the parameters used to define the state and each scene?

H. Triggers

1. **[2 points]** Does the essay indicate the triggers that connect user actions to changes of state in the narrative visualization?
2. **[1 point]** Does the essay indicate what affordances are provided to the user to communicate to them what options are available to them in the narrative visualization?
3. **[1 point]** Does the narrative visualization implement and respond to user events properly?
4. **[1 point]** Does the narrative visualization make any effort at all to communicate what options are available to the user?

* **Triggers.** What are the triggers that connect user actions to changes of state in the narrative visualization? What affordances are provided to the user to communicate to them what options are available to them in the narrative visualization?