Coursework Description Sheet

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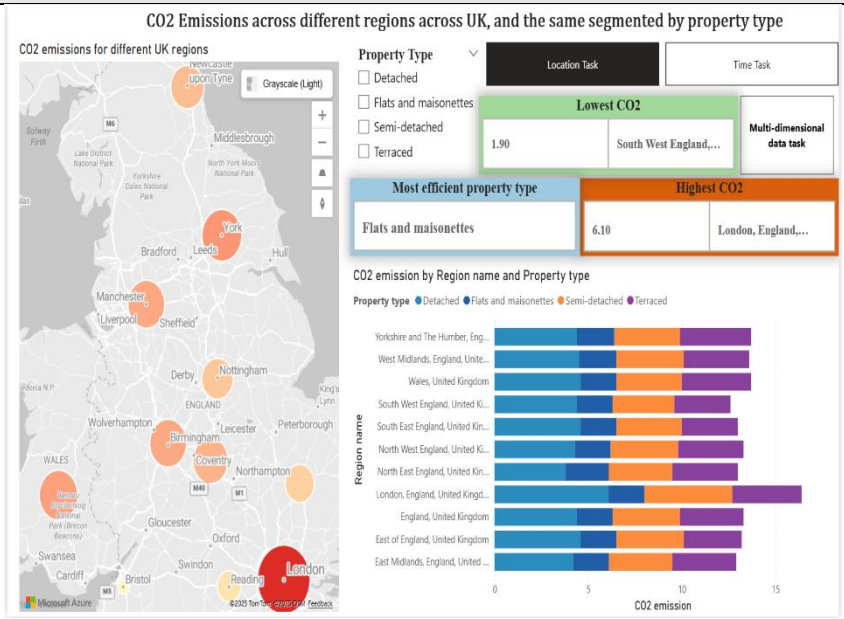
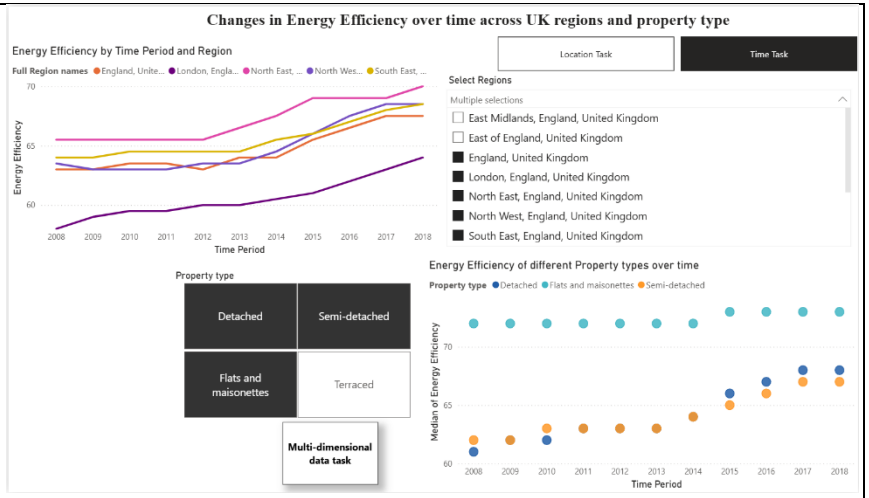
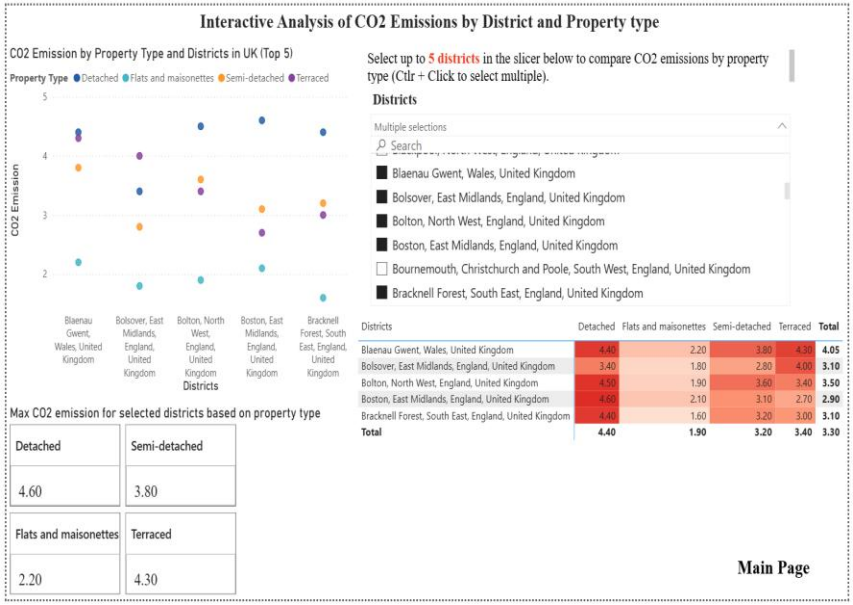
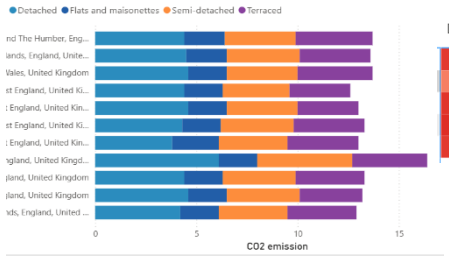
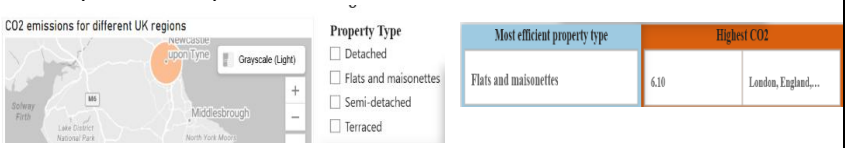
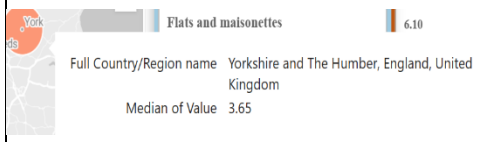
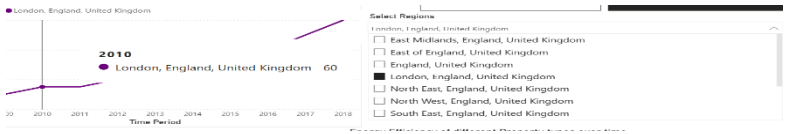
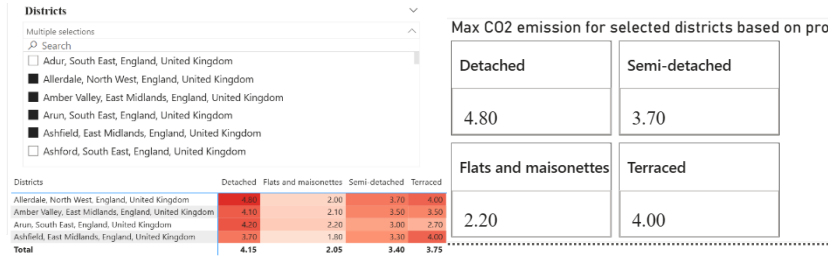
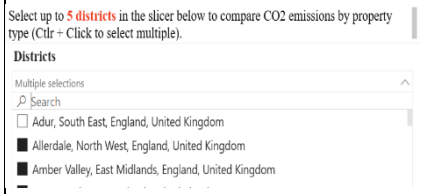
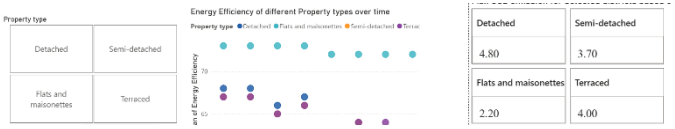
Question	Description	Figure
Fit to Task/User needs		
Location task - How does the visualisation allow users to access the spread of carbon dioxide emission across the UK based on the property type?	The dashboard for Location Task uses an interactive Azure Map visual to display regional CO2 emission values in the UK. Each region is represented by a colored bubble layer, with color intensity which follows a color-blind friendly, print friendly sequential pattern and size indicating the magnitude of CO2 emission in that area. A stacked bar chart beside the azure map displays the CO2 emission breakdowns by both region and property type, allowing users to analyze how different property types contribute to regional CO2 emission patterns. A property type slicer enables user to select/deselect each property type to view and analyze the trends in CO2 emission for specific property type. Highlighted summary cards display the highest, lowest CO2 emissions in particular region as well as most efficient property type among all. The navigation buttons in the dashboard (Location task, Time task and multi-dimensional task) help the user navigate to various other analysis.	

Time task - How does the visualization allow user to understand the evolution of energy efficiency based on the property type, and location?	The dashboard visualization makes use of a multi-series line chart to display the time trend of energy efficiency in different regions across the UK over a period, with each line color coded for a different region. Users can filter regions using a slicer which enables the user to make multiple region selections and zoom in on the trends for one or multiple areas. A scatter plot at the bottom right depicts the changes/trends in energy efficiency over time based on different property types (Detached, Flats & maisonettes, Terraced, Semi-detached). Users can also filter different property type using the property slicer beside the scatter plot which enables the user to focus on a specific property type trend over a period. These visuals help users identify both overall trends (e.g., improvements in efficiency over time) and property type or region-specific patterns. The navigation button at the bottom "multi-dimensional task" enables user to navigate to next visual.	
Multi-dimentional data task - How does the visualization allow user to identify correlation amongst at least three of the following parameters: property type, tenure, location, energy efficiency, and carbon dioxide emission?	This analyses page uses a scatterplot to map CO2 emission by property type and different districts in the UK, with color distinctions for each property type. A "**Districts**" multiple selection slicer beside the scatter plot lets the user dynamically compare up to 5 districts at a time, either by selecting the districts from the dropdown or searching the desired district the user wants to analyse. A matrix shows the user raw and aggregated CO2 emission values segmented by districts and property type with conditional formatting to highlight high/low emissions making use of color-blind friendly color's to show the intensity of the emissions for a specified district, allowing for easy pattern recognition. Dynamic grid cards display the maximum CO2 emission for each property type within the currently selected districts, providing immediate summary insights. By filtering and cross-comparing property type, districts and CO2 emissions, users can visually detect patterns compare emissions, and spot correlations among the variables. A "Main Page" navigation button at the bottom right lets the user to navigate back to the main page.	

Visualisation Principles		
Use of colour - How does the use of colour in this dashboard enhance the readability and effectiveness of the data presentation?	Following bertin's semiology of graphics, distinct color hues are used for each property type (#225EA8 for Flats & maisonettes, ##2B8CBE for Detached etc.) as colour hue has selective and associative perceptual properties and best for distinguishing categories with studies showing only 6-12 very distinct colours are effective for differentiation. [1]	Colour hue for categorical data:  Detached Flats and maisonettes Semi-detached Terraced 4.40 2.20 3.80 4.30 3.40 1.80 2.80 4.00 4.50 1.90 3.60 3.40 4.60 2.10 3.10 2.70 4.40 1.60 3.20 3.00
Use of graphic design principles -How does the application of graphic design principles enhance the clarity and effectiveness of the data presentation in this dashboard?	Gesalt Principles: The dashboard applies Gestalt laws of proximity and similarity by grouping related visual elements - slicers are positioned near their affected visualizations, and similar chart types use consistent styling to create perceptual grouping. Key insights utilize popout characteristics through strategic use of colour, brightness, and position to make important data points immediately visible without requiring focused attention, enhancing the dashboard's selective properties. Following information hierarchy principles important metrics like highest/lowest emissions are presented prominently through size, colour, and positioning to guide user attention to key insights. As shown in the screenshot here the grid cards depict the values of the CO2 emission as per property type based on the selection of districts made by the user. [2]	Proximity & Similarity:  Visual Hierarchy: Detached Flats and maisonettes Semi-detached Terraced 4.80 2.00 3.70 4.00 4.10 2.10 3.50 3.50 3.70 1.80 3.30 4.00 
Use of interaction - How does the use of interactive design elements improve the user's ability to explore and interpret data on this dashboard?	Shneiderman's Mantra: The dashboard implements "Overview First, Zoom and Filter, Details on Demand" allowing users to start with the complete dataset view, then filter by property type and district, and access detailed information through tooltips. Multiple Coordinated Views: Following multiple and coordinated views principles, the scatter plot, matrix, and cards are linked through coordinated interactions and highlighting, enabling users to understand data from multiple perspectives simultaneously.	ToolTips:  Navigation: 

	Navigation Design: Clear navigation buttons support user-centered design principles, allowing seamless movement between analytical tasks while maintaining consistency across dashboard pages. [3]	Details on Demand:  Multiple Coordinated views: 
Use of text and legend - How do the use of text and legends contribute to the clarity and user comprehension of the data presented in this dashboard?	Cognitive Load Management: Titles and labels follow chunking principles, keeping text concise (3-4 key words) to work within short-term memory capacity of 7±2 chunks. Instructions like "Select up to 5 districts" provide clear guidance without overwhelming users. [4] Semantic Clarity: All visual encodings maintain semantic relevance where colour meanings match data types and legends clearly explain the mapping between visual variables and data attributes. Consistency in Text: Following consistency heuristics, similar contexts use maintained design choices while different contexts use appropriately different styling, supporting recognition rather than recall. [5]	Cognitive Load Management:  Semantic Clarity:  Consistency in Text (Time Task & Multi-dimensional task): 

References

[1] *Lecture 2: Visual Variables & Existing Representations, Credits: Nick Holliman, Sara Fernstad Johansson, Alma Cantu, Daniel Archambault*

[2] *Lecture 6: Pre-Attentive Processing and Gestalt, Credits: Nick Holliman, Sara Fernstad Johansson, Alma Cantu, Daniel Archambault*

[3] *Lecture 7: Shneiderman's Mantra & Multiple and Coordinated Views, Credits: Nick Holliman, Sara Fernstad Johansson, Alma Cantu, Daniel Archambault*

[4] *Lecture 5: Cognitive Load Management, Credits: Nick Holliman, Sara Fernstad Johansson, Alma Cantu, Daniel Archambault*

[5] Lecture 8: Semantic Clarity & Consistency in Text, Credits: Nick Holliman, Sara Fernstad Johansson, Alma Cantu, Daniel Archambault

ColourBrewer 2.0 for sequential, Color-blind safe, print safe color codes, Credits: https://colorbrewer2.org/#type=sequential&scheme=YlGnBu&n=4