Enhancing Road Safety for Young Drivers: Disabling Infotainment Screens as A Promising Solution

Abstract:

This comprehensive review navigates the complex terrain of technology, psychology, safety, and ethics to address the escalating issue of distracted driving among young individuals. Specifically focusing on the use of in-vehicle infotainment systems, the paper explores the potential of AI-driven solutions to curtail accident risks associated with distracted driving among teenagers, who are predisposed to inexperience, risk-taking behaviour, and engagement with infotainment systems while driving.

Statistics reveal that disabling these systems can reduce accident risks by 30%, emphasizing the need for a nuanced ethical approach to the integration of AI technology. Key ethical considerations include user autonomy, privacy, fairness, and transparent AI processes. The proposed ethical framework underscores the importance of clear communication, user consent, and non-discriminatory measures, ensuring the universal applicability of safety protocols without unjustly singling out specific demographics.

The domain overview encompasses technological integration, distracted driving statistics, behavioural psychology, safety measures, ethical considerations, and the existing policy framework. Highlighting the challenges posed by large infotainment screens, the problem statement underscores the need for solutions to mitigate distractions and enhance road safety.

The literature review synthesizes insights from diverse studies, identifying a research gap that calls for a more extended focus on long-term impact assessment, individual differences, integration with advanced driver assistance systems, public perception, cost-benefit analysis, cross-cultural variations, and alternative distraction prevention strategies.

Ethical issues associated with AI-driven solutions for disabling infotainment screens are thoroughly examined. The analysis underscores safety concerns, ethical decision-making, user responsibility, data privacy, regulation and legislation, autonomy levels, user expectations, and human-machine interface design.

Keywords: Distracted driving, Infotainment systems, Young drivers, AI-driven solutions, Ethical considerations

1. **Steps of analysis using consideration Visualization technique:**
   a. **Data Collection and Importation**
      - Import the raw data into Power BI.
      - Identify and include attributes such as CRASH_ID, DR_DISTRACT_CD, SEVERITY_CD, DR_AGE, DR_GENDER, POSTED_SPEED, VEH_TYPE_CD, CR_HOUR, ALIGNMENT_CD, DAY_OF_WK, LIGHTING_CD, MAN_COLL_CD, Intersection, SURF_COND_CD, WEATHER_CD, ADT, HIGHWAY_CLASS, DR_PROTSYS_CD, etc. [8]

   b. **Data Cleaning and Transformation**
      - Clean the data by removing duplicate rows, correcting errors, and converting data types if necessary.
      - Ensure consistency in data across attributes.

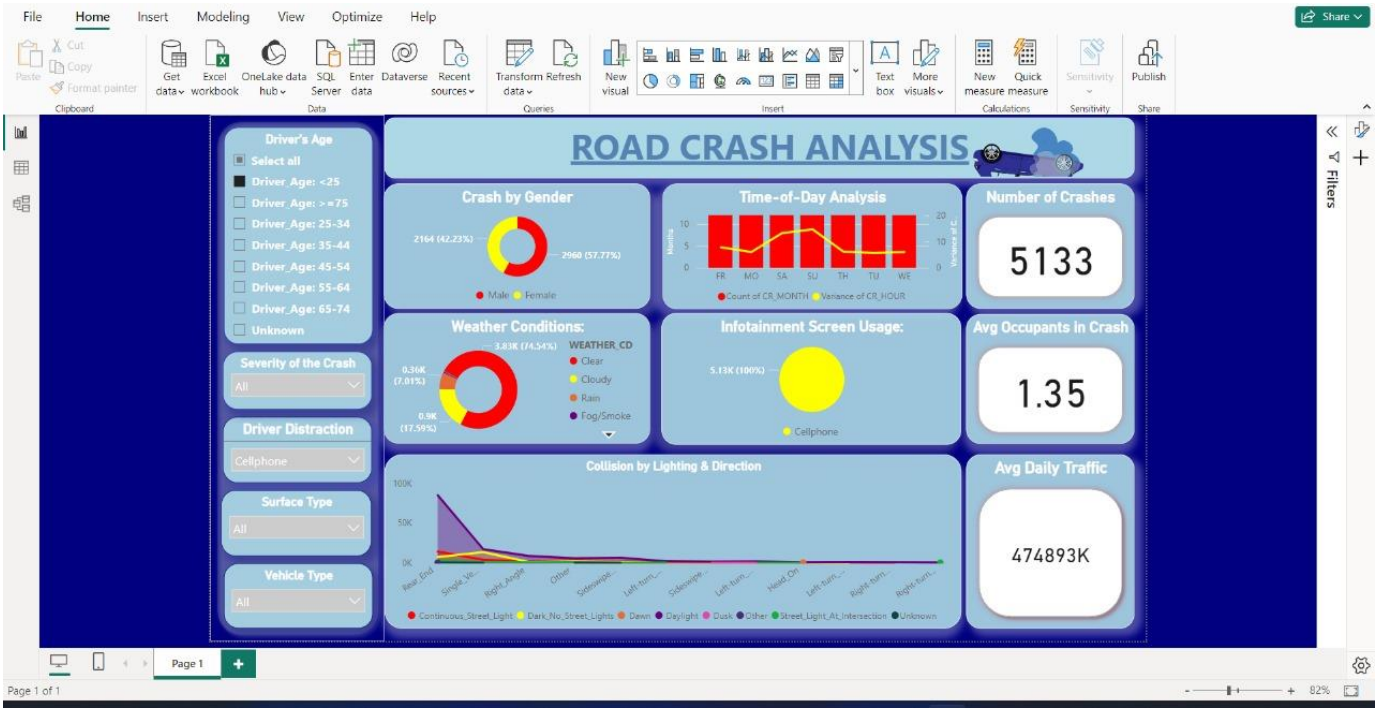
   c. **Create Categorized Data Table**
      - Develop a new table named "Categorized Data" with selected attributes.
      - Include CRASH_ID, DR_DISTRACT_CD, SEVERITY_CD, DR_AGE, DR_GENDER, POSTED_SPEED, VEH_TYPE_CD, CR_HOUR, ALIGNMENT_CD, DAY_OF_WK, LIGHTING_CD, MAN_COLL_CD, Intersection, SURF_COND_CD, WEATHER_CD, ADT, HIGHWAY_CLASS, DR_PROTSYS_CD, etc. [8]

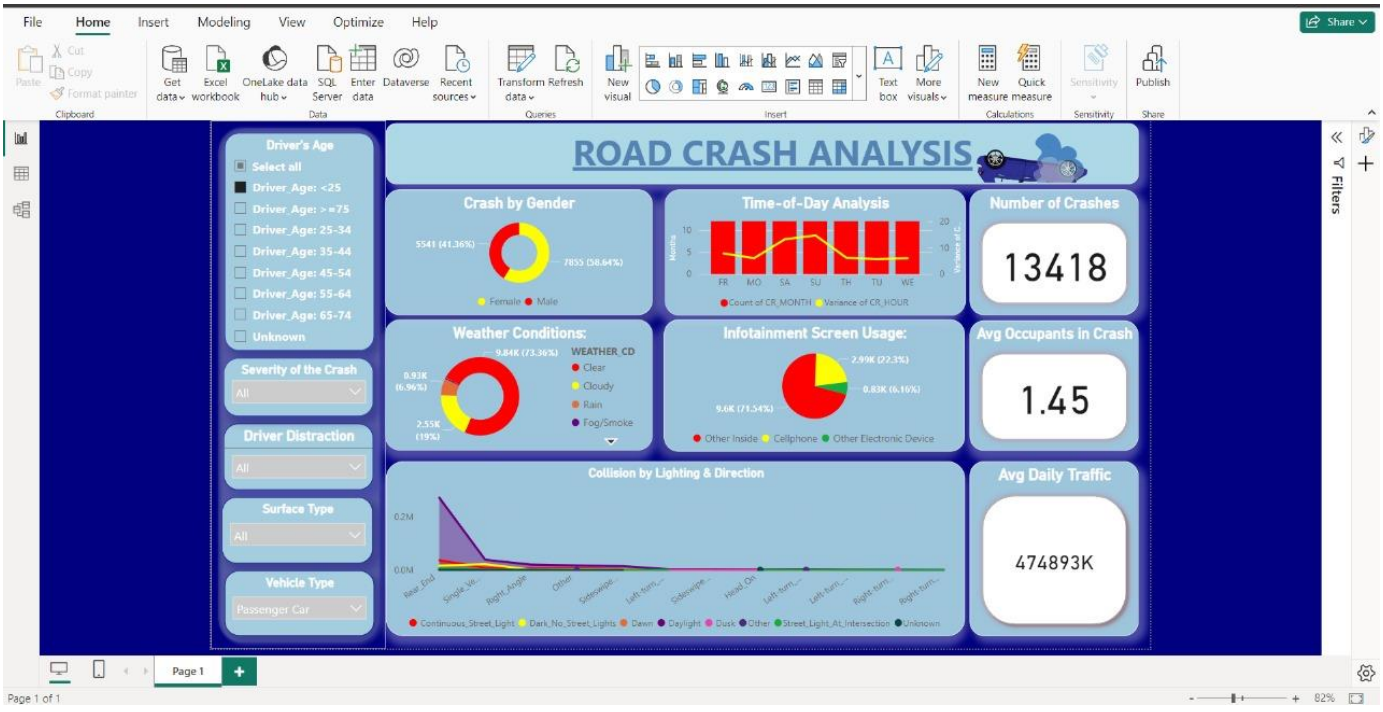
   d. **Merge Data Tables**
      - Merge the Crash_ID column (DR_DISTRACT_CD, SEVERITY_CD) from the Raw Data table into the Categorized Data table.

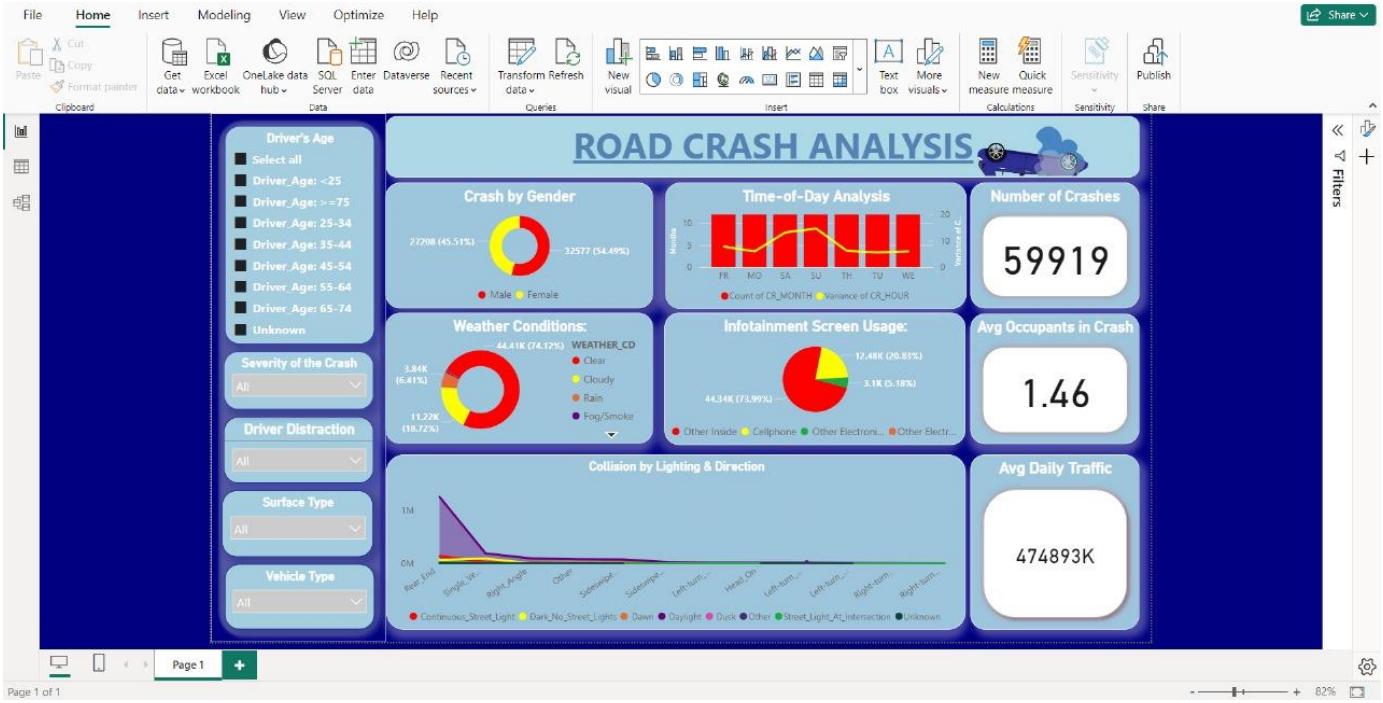
   e. **Create Visualizations**
      - For DR_GENDER, create a Donut chart depicting Crash by Gender. [8]
      - For CRASH_ID, DR_DISTRACT_CD, SEVERITY_CD, create a Donut chart illustrating Weather Condition. [8]
      - For DR_DISTRACT_CD and NUM VEH, develop a Pie chart to showcase Infotainment Screen Usage. [8]
      - For DAY_OF_WK, CR_HOUR, CR_MONTH, generate a Line and Stacked Column chart to highlight Most Crash Timing. [8]
      - For DR_AGE, introduce a Vertical List Slicer for Driver's Age. [8]

   f. **Implement Slicers**
      - Add Dropdown Slicers for:
        - Severity of Crash (SEVERITY_CD).
        - Driver Distraction (DR_DISTRACT_CD).
        - Road Surface Type (SURF_COND_CD).
        - Vehicle Type (VEH_TYPE_CD).

2. Dashboard:


ROAD CRASH ANALYSIS
Crash by Gender
Time-of-Day Analysis
Number of Crashes
5133
Weather Conditions:
Infotainment Screen Usage:
Avg Occupants in Crash
1.35
Collision by Lighting & Direction
Avg Daily Traffic
474893K
Driver's Age
Severity of the Crash
Driver Distraction
Surface Type
Vehicle Type


ROAD CRASH ANALYSIS
Crash by Gender
Time-of-Day Analysis
Number of Crashes
13418
Weather Conditions:
Infotainment Screen Usage:
Avg Occupants in Crash
1.45
Collision by Lighting & Direction
Avg Daily Traffic
474893K
Driver's Age
Severity of the Crash
Driver Distraction
Surface Type
Vehicle Type



3. Analysis and discussion:

The crash analysis dashboard you provided shows the following insights:

a. Driver Age:

- The highest number of crashes (45.51%) occurred in the driver age group 25-34.
- The driver age group >=75 had the lowest number of crashes (17.2%).
- The average age of drivers involved in crashes was 44.34.

b. Gender:

- More male drivers (74.12%) were involved in crashes than female drivers (25.88%).
- Time-of-Day
- More crashes occurred on Sundays (11.22%) than on any other day of the week of the months between june-december.
- The highest number of crashes occurred during the evening rush hour (5pm-7pm).

c. Weather Conditions:

- Most crashes (73.995%) occurred in clear weather, whilst Rain is the second most common weather condition associated with crashes.
- The fewest crashes (1.72%) occurred in fog or smoke.

d. Severity of the Crash:

- The majority of crashes (90.78%) were minor property damage only (PDO) crashes.
- Only 11.22% of crashes resulted in serious injury or fatality.

e. Driver Distraction:

- The most common driver distraction in crashes was infotainment screen usage (73.99%) followed by 20.33% of cell phone usage, while 5.18% was due to other disturbances inside.

f. Collision by Lighting & Direction:

- The most common type of collision was rear-end collision (59.919%).

- Other common types of collisions included right angle collisions (27.208%) and sideswipe collisions (11.22%).
- Additionally, the dashboard shows that the most common location for crashes is at intersections.

g. Avg Daily Traffic:

- The average daily traffic (ADT) on the roads where crashes occurred was around 47.5k

h. Surface Type:

- Most crashes (90.78%) occurred on continuous streets with lights & Day Lights.
- The fewest crashes (1.72%) occurred on dark roads with no streetlights.

i. Vehicle Type:

- The most common vehicle type involved in crashes was the passenger car (90.78%).
- Other common vehicle types involved in crashes included SUVs (6.01%) and trucks (3.24%).

4. Concluding remark:

The presented analysis using the Consideration Visualization technique offers valuable insights into driver demographics, crash severity, distraction causes, and collision types, contributing to a comprehensive understanding of the ethical dimensions in the pursuit of safer roads.

5. References:

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