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Analyzing the Influence of Socio-demographics and Distance to School on Mode Choice for School Trips: A Case Study of Roorkee

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Introduction

Atleast **60-minute of moderate physical activity** in a day is advised for children under the age of 18 years. (Source: World Health Organization, 2020)

68% of adolescents in India **do not meet** the WHOs recommendations of daily physical activity.

(Source: Bhawra et al., 2023)

Physical Health

Mental Health

Possible Solution: Promotion of Children's Active Mobility (CAM)

Global Initiatives

Program, administered by the Federal Highway Administration (FHWA), United Sates.

Hosted at, and coordinated by, the Fédération Internationale de l'Automobile (FIA) Foundation.

Indian Government Initiatives

Rashtriya Bal Swasthya Karyakram, program Launched under National Health Mission by The Ministry of Health & Family Welfare.

Under Fit India Movement, launched by Hon'ble Prime Minister Narendra Modi

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Introduction

Benefits of CAM (Walking & Cycling)

Physical Benefits

Mental Benefits

Independence & Self-reliance

Aim of the Study

To identify the **user group of active modes for school commute**, and the target group **who do not use active modes**, through a broader investigation of **mode choice for school trips.**

Modes of School Commute

Active Modes

Parental Chauffeuring

School Bus

Rickshaw

Objectives

1. **Identifying methods** used to find the **relationship** between **distance, socio-demographics, and mode choice** for school commute in existing studies.
2. **Collecting mode choice and socio-demographic information** of school children in the study area.
3. **Modelling the said relationship** for the study area and identifying the existing user group of active modes for school commute

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Study Area

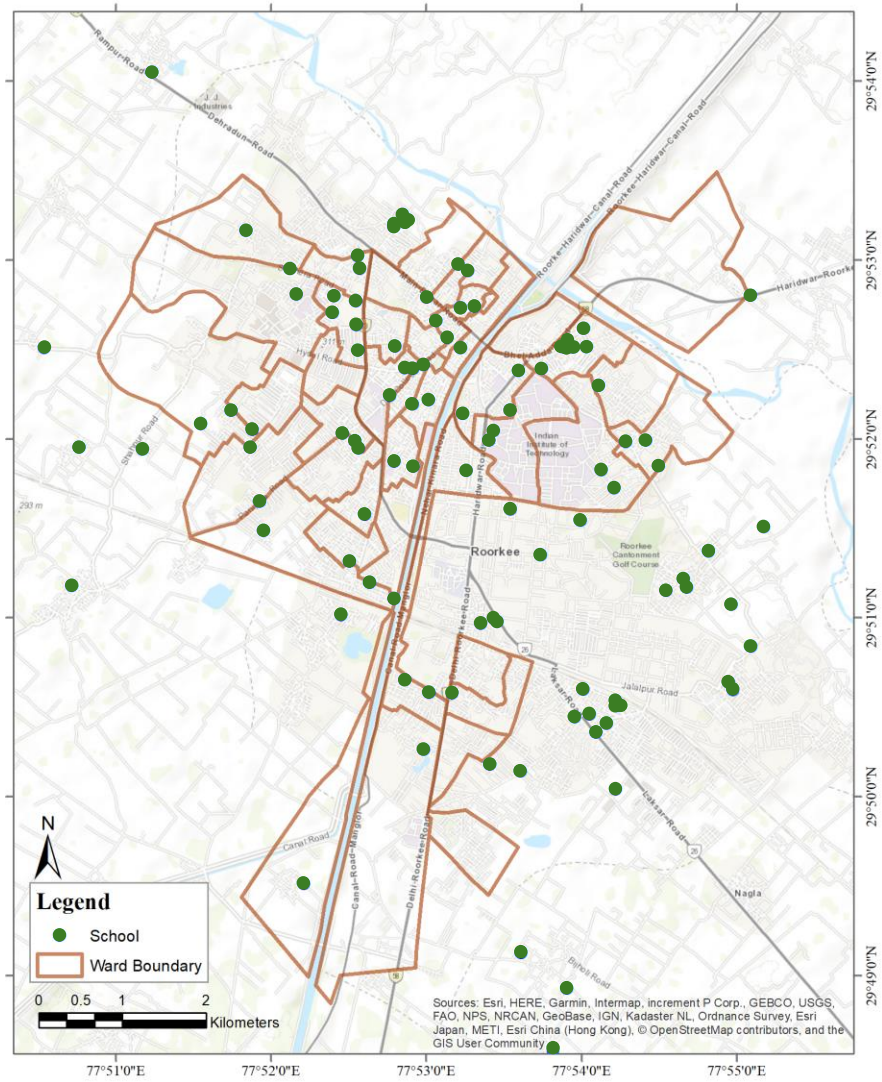
Roorkee

- Roorkee, Haridwar district, Uttarakhand.
- Population: 1,18,200 (2011 Census).
- Geography: Linear city layout along the Ganga Canal.
- Urban Area: 8.11 sq km under Roorkee Nagar Nigam.

School Children commuting to School; Location: Roorkee

School; Location: Adarsh Nagar, Roorkee

Locations of Schools in Roorkee



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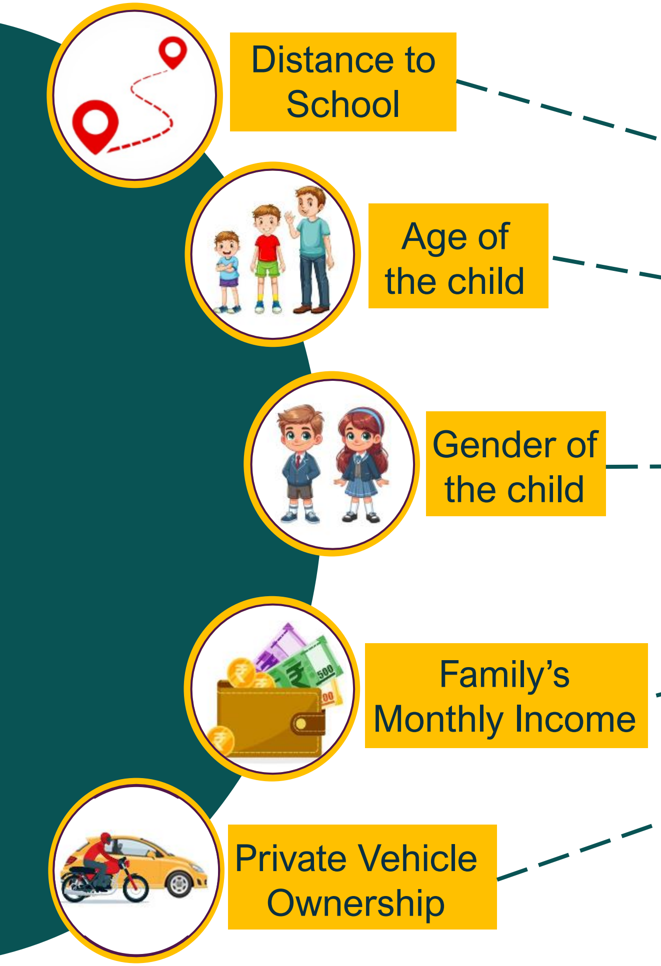
Identification of the Factors



- **Walking and cycling** are the **preferred modes of commute for shorter distances** (Black et al., 2001; Ewing et al., 2004; Wong et al., 2011),
- **School bus, moto**… **ansit** are the preferred modes when the **school dist**… (Ewing et al., 2004; Mackett, 2013; Stark et al., 2018…
- **Distance, car o**… **'s age** dominate the mode choice decision for scho… 2011).
- In the **Indian cont**… **motorized modes** is more prominent for school trips with … **distances** while **walking or cycling to school** is preferred when the children live **close to their schools** in the city of Hyderabad (Tetali et al., 2016).

- The **probability of walking** to school **declines** by 0.85% for every 1% **increase in distance** to school (Ermagun & Samimi, 2018).
- **A 10% increase** … from home to school **raises the probability** of tak… % (He, 2011).
- A **significant difference** … **in mode preferences** for school based trips across **age and gender groups** (Dias et al., 2022; Hatamzadeh et al., 2017).

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Data Collection

- **Stratified random sampling** Technique was followed for Conducting pen and paper-based survey in Roorkee
- **Mode of school commute**, **gender** of the children, the **class** in which they study, **family's monthly income**, **distance to school**, and **vehicle ownership** data collected
- Valid responses received from the **parents** of **529 school-going children** in Roorkee

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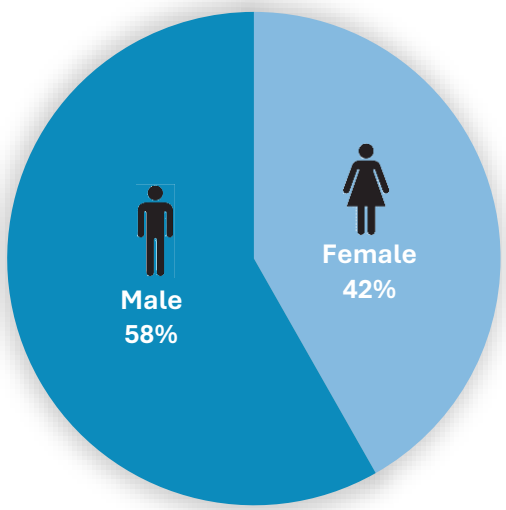
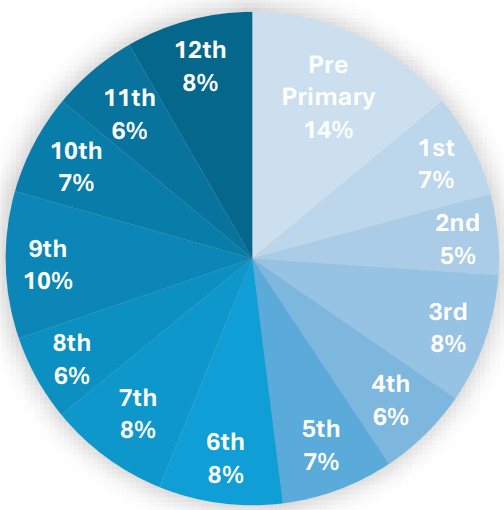
Socio-Demographic Data

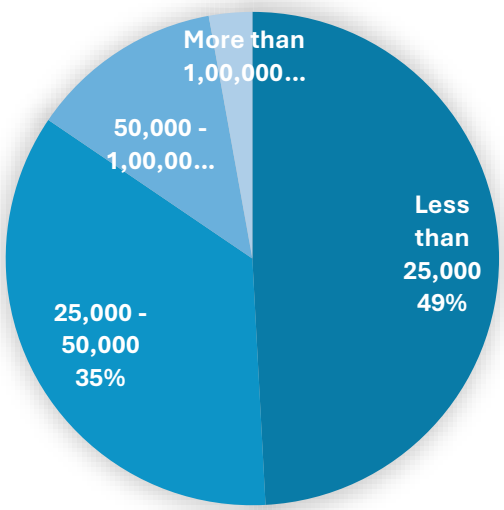
Socio-Demographic Profile of the Respondents' Children



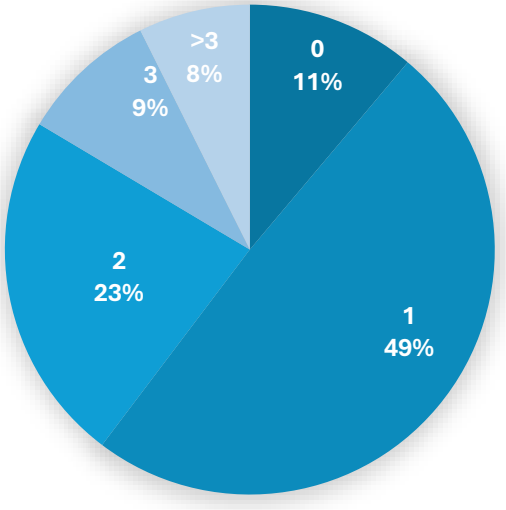
Gender of the child



Class in which the child studies

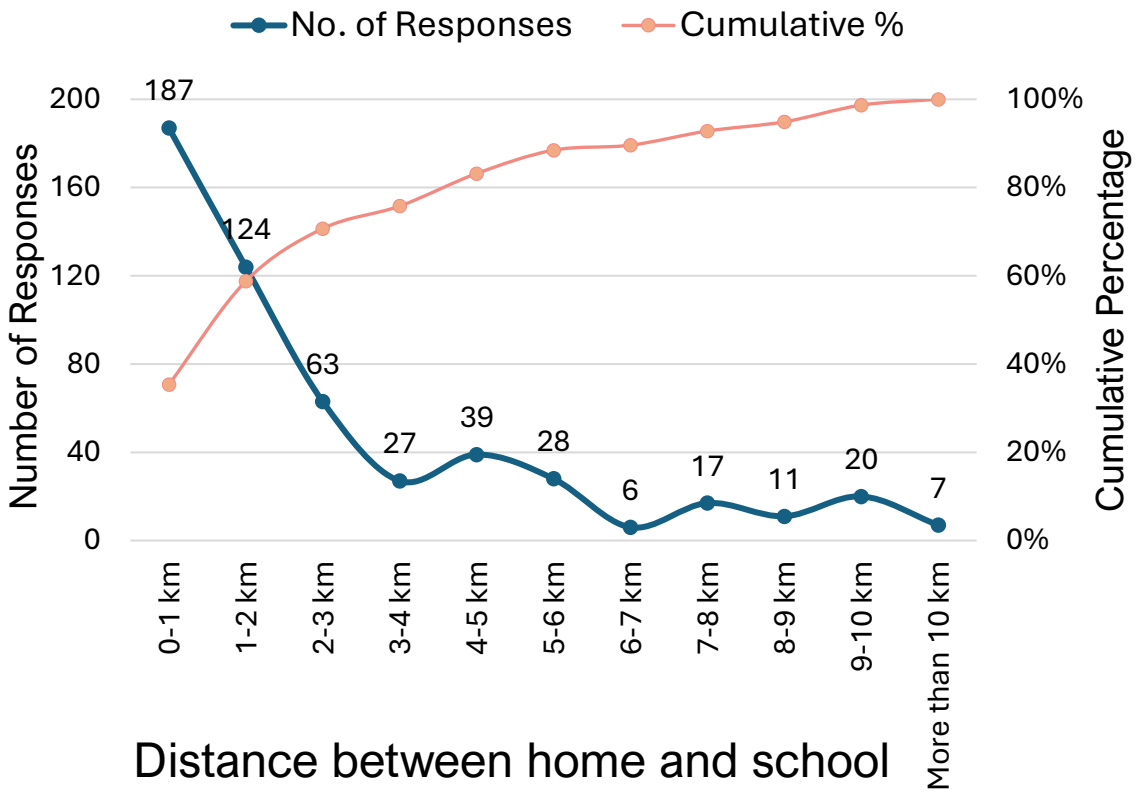


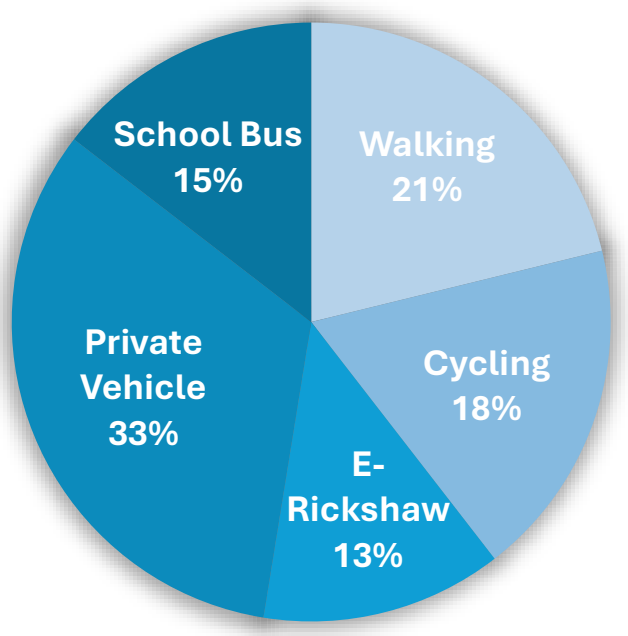
Monthly Family Income (in INR)



No. of Vehicles Owned

Distance and Mode Choice





Modal Split for School Trips

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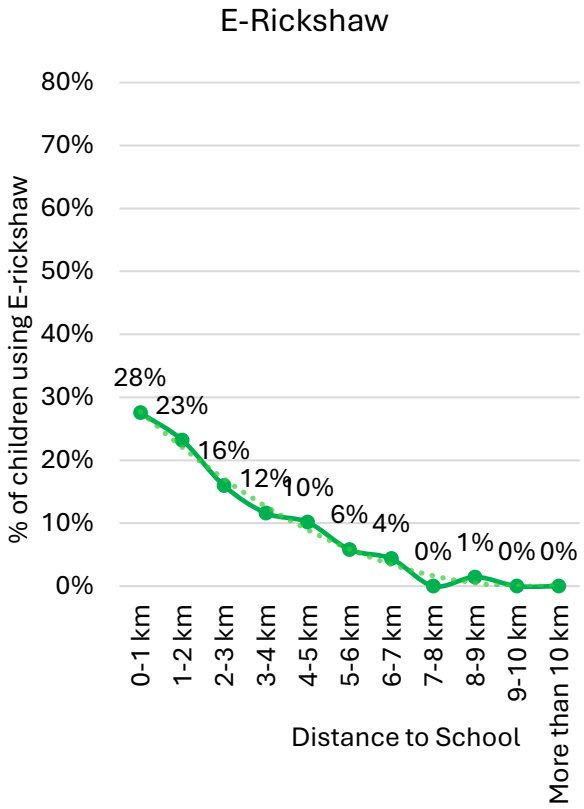
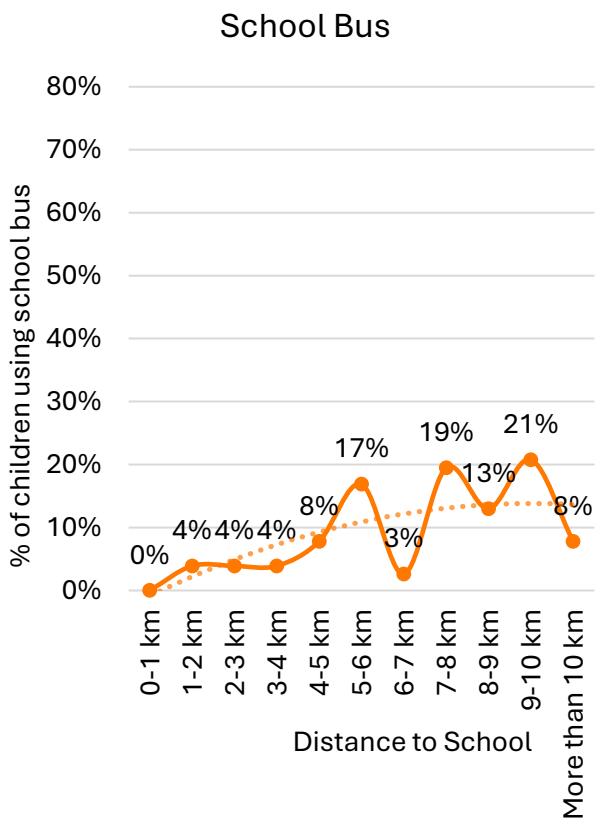
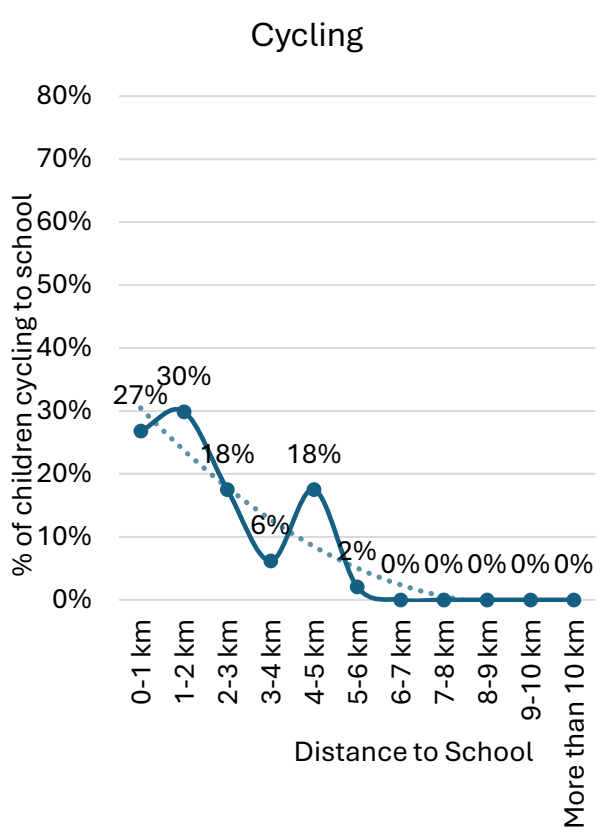
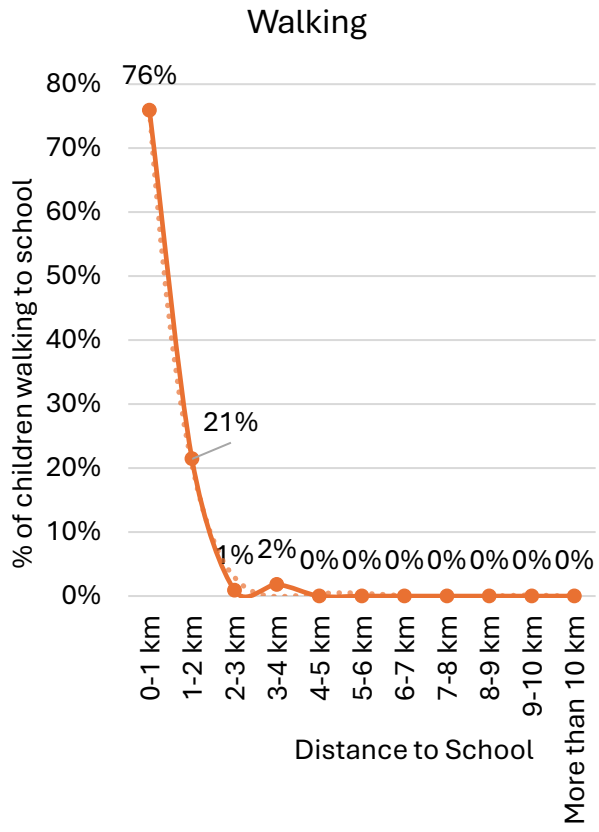
Mode Choice Analysis

Relationship between Distance and Mode Choice









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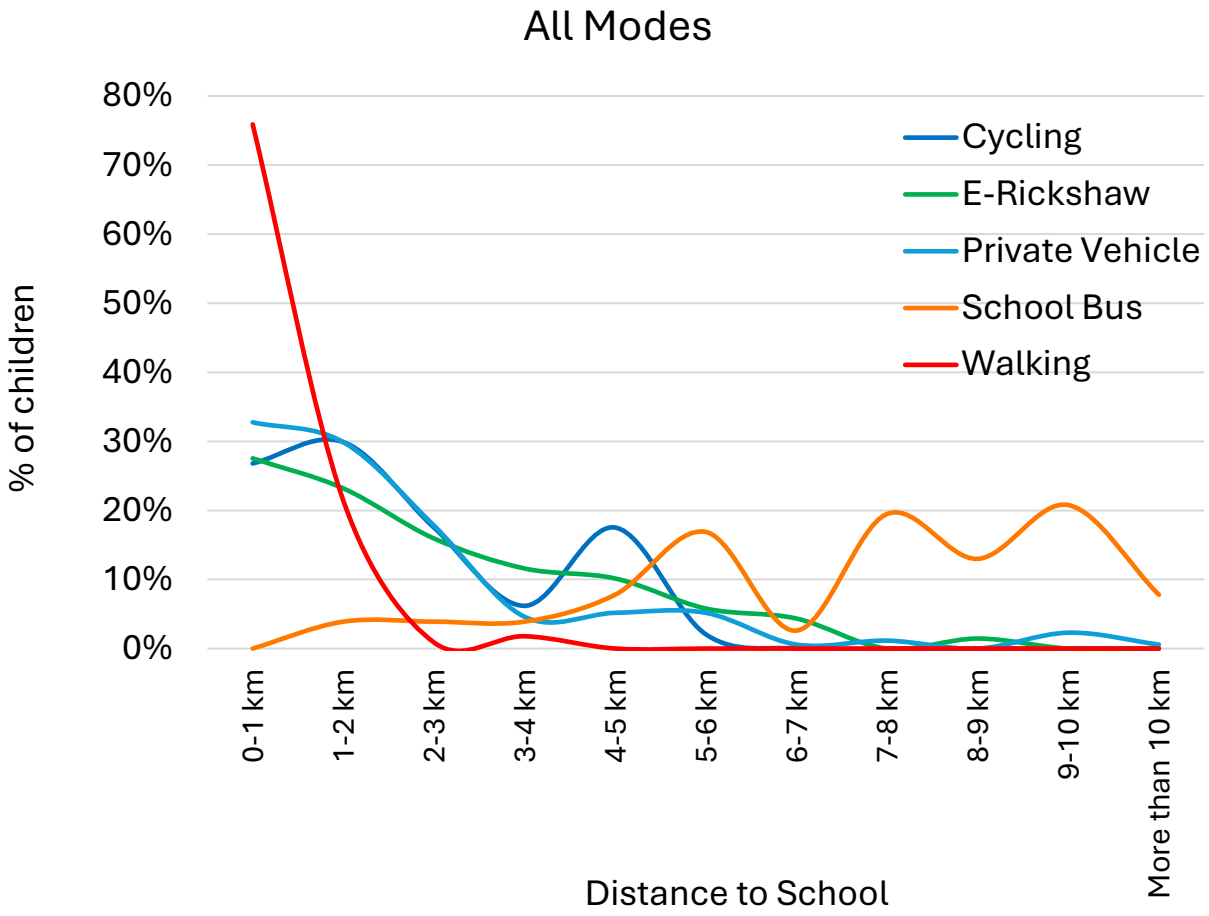
Mode Choice Analysis

Relationship between Distance and Mode Choice



Mode Choice is not linearly dependent on School Distance.

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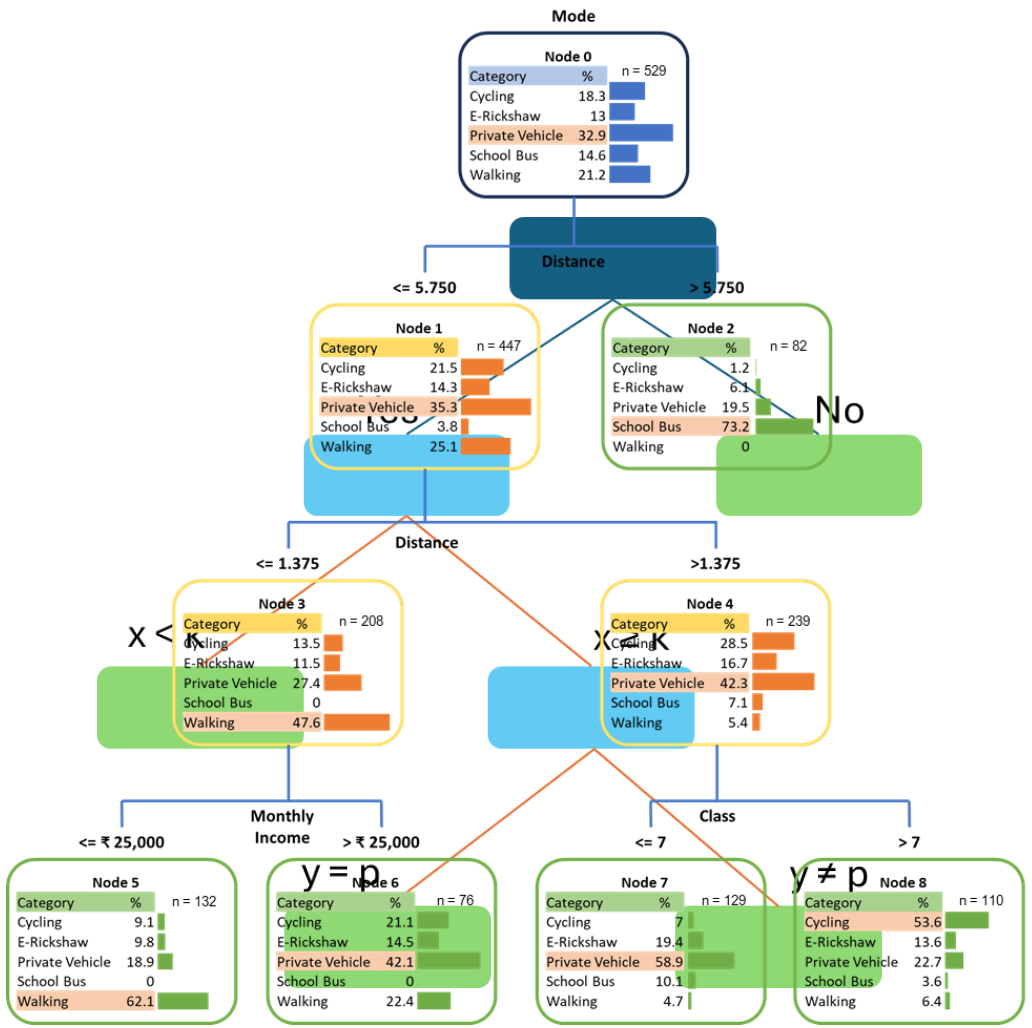
Mode Choice Analysis



Classification and Regression Trees

- A **predictive modelling technique** widely used in statistics, machine learning, and data mining
- Suitably used to **graphically represent** the **non-linear relationship** between the response variable and multiple explanatory variables (Uddin et al., 2021)
- Can work with explanatory variables of **different data types** (continuous and categorical) (Uddin et al., 2021)
- Constructs a **tree-like structure** by **recursive partitioning** of the data using a particular rule at each split that **maximizes the homogeneity of each of the two groups** formed after the split (De'Ath & Fabricius, 2000)

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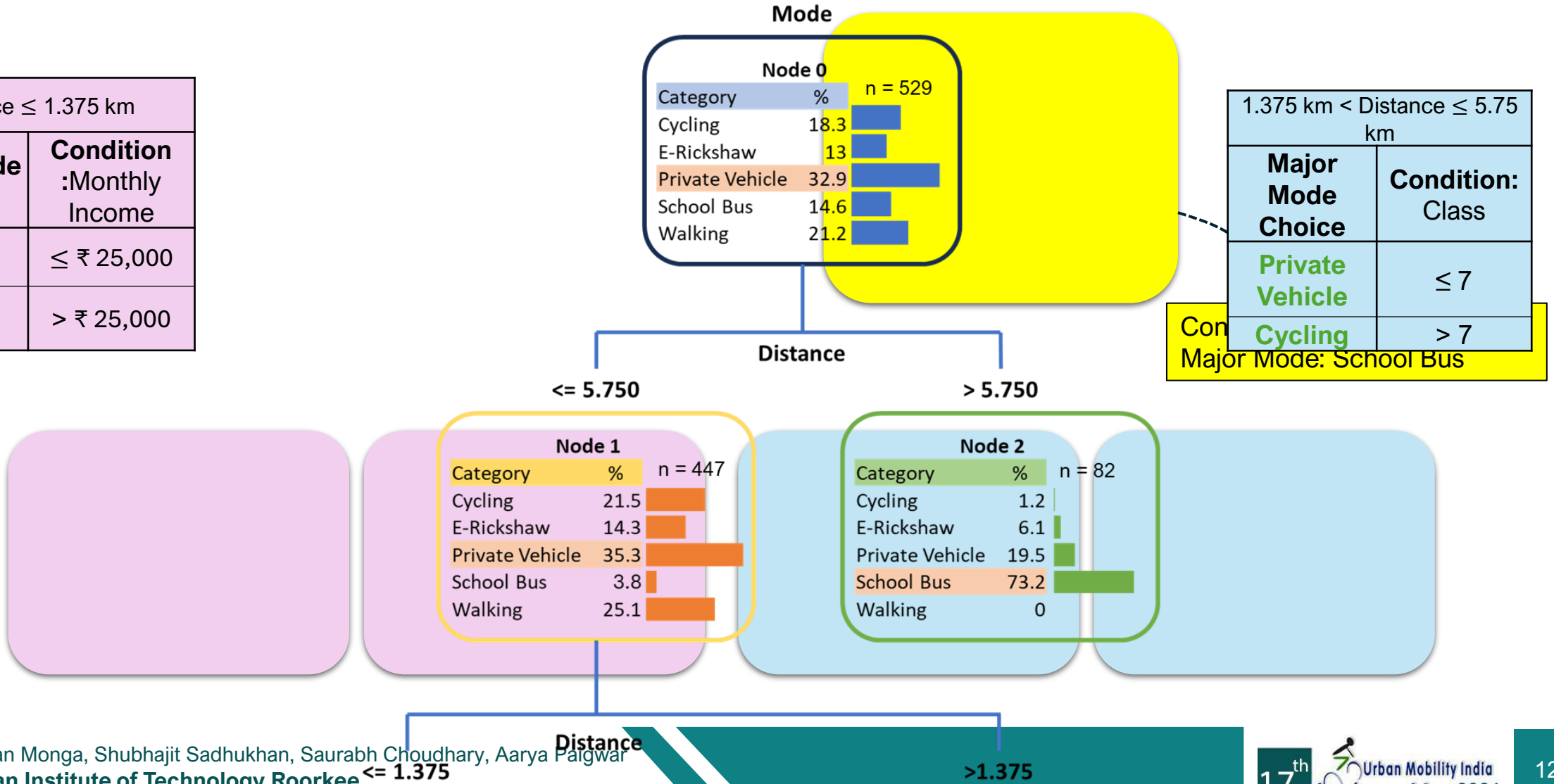
Mode Choice Analysis

Distance ≤ 1.375 km	
Major Mode Choice	**Condition** :Monthly Income
Walking	≤ ₹ 25,000
Private Vehicle	> ₹ 25,000



1.375 km < Distance ≤ 5.75 km	
Major Mode Choice	**Condition:** Class
Private Vehicle	≤ 7
Cycling	> 7

Con
Major Mode: School Bus

Discussion & Conclusion

- The developed **CART model can predict** the impact of changes in income or school distance on **mode choices** for school trips.
- Supported by distance distribution graphs, the **CART model predicts** the favorable **distance for different modes** of travel.
- For **distances greater than 5.75 km**, **school bus** is the **major model of travel**, marking a **physiological barrier for Active Modes of Travel.**
- Among Active Modes, **walking** is more favorable for **distances less than 1.375 km**, and **cycling is preferred** for **distances between 1.375 km and 5.75 km**, mostly by students in class 8 and above.
- Planned interventions for Active Modes should **target areas within 5.75 km of school zones**, where 46.6% of children already walk (25.1%) or cycle (21.5%).
- Within the 1.375 km distance, **Active Modes are preferred by** both **low- and high-income groups**, with shares of 71.2% and 43.5%, respectively.

Discussion & Conclusion

- **Significant proportion of children** falling **under** the favorable setting for **ATS**, **avoid** using **active modes to travel to school.** Future research in this domain needs to make an attempt at identifying reasons for this and addressing them.
- **Investigating** existing **infrastructural, regulatory, environmental, and social factors** affecting school commute choices can offer insights for **enhancing active mobility.**
- **Improvements** in **facilities and road infrastructure** can further enhance **child commuters' safety** and potentially **expand** the identified **limits for Active Modes** of Travel.
- Further Promoting **active mobility** among children would foster **healthier lifestyles**, contributing to the **long-term health** and **well-being** of the society at large**.**

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Thank You

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