Assignment 5: Introduction to activity base model (ABM)
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<mark>Ans No 1</mark>   Day activity pattern model.

a) Write down the alternatives for the day activity pattern model.

The model defines 19 alternatives for the day-long activity pattern based on primary activity and tour types. If secondary tour is included then total 114 alternatives. Alternatives are determined based on all possible combinations. So including all, total 114 alternatives.

b)   How many utility equations do you need to code if you want to estimate a multinomial logit model for the full day activity pattern?

For a multinomial logit model, the number of utility equations is equal to the number of alternatives minus one (one alternative is used as a reference).

So Based on primary tour 19-1 = 18 multinomial equation i need
If secondary tour is added, then a 114-1 = 113 multinomial equation is needed.

c) Identify the variables that the report has used for the day activity pattern model.

the following type of variables used for the day activity pattern model, Basically based on personal and household characteristics like -

  - Employment status (full-time, part-time, not employed).
  - Income group.
  - Number of household vehicles.
  - Number of workers in the household.
  - Age group and gender.
  - Presence of children in the household etc.

d) Do you think the identified variable set in question c is logical to be included in the utility of the day activity pattern model? Explain why or why not.

Yes, the identified variables are logical for determining the utility function of the day activity pattern model. Individual employment status, household characteristics, and demographic factors influence activity patterns.

But I think another important factor should be added to predict activity patterns, which is weather. For example, When it is raining, a significant number of children go to school. So the activity pattern may change significantly if the weather factor is included. But it is okay to not include weather if the weather pattern is near constant.

Ans No 2 Tour time of day model

a. How many alternatives are used for the tour time of day model? What are the alternatives? Explain the process of deriving the alternatives for the tour time of day model.

There are five different time periods based on activity frequency and demand peaks.(EA, AM, MD , PM, LA)

The alternatives are derived by considering all possible combinations of departure and return time periods. This results in 15 alternative time periods.

b. Identify the variables that the report has used for the tour time of day model.

Variables includes like -

- Person and household variables (For example, Job type: Full/Part time, income status, age group, presence of children in house etc)
- Tour purpose and tour type (with the help of the output from the Activity model). For example variables like Intermediate stop on way back home , no intermediate stops, work tour made during the day, secondary tour etc.

c. Do you think the identified variable set in question b is logical to be included in the utility of the tour time of day model? Explain why or why not.

Yes, the identified variables in 2(b) are logical for the tour time of day model. Job type, income, and age group influence travel times based on work schedules and personal routines, while household characteristics like the presence of children affect travel patterns, especially for school runs. Tour purpose and type further refine the model by reflecting when different activities, such as work or errands, are likely to occur.

But, factors haven't been used like - weather, seasonal changes, and traffic conditions could also impact travel times. For example, bad weather may delay travel, while public holidays or traffic congestion could shift typical travel times. Including such factors could improve the model's accuracy.

Ans No 3 Home-based tour primary destination and mode choice model

a. How many alternatives are used for this model? Explain the process of deriving the combined alternatives for the joint destination and mode choice model.

In this paper there are 22 zones and 9 main modes. So in the joint model 22x9 = 198 mode-destination alternatives exist(198 choice per tour). The alternatives are derived by combining every potential destination zone with each available mode of travel.

b. How are the destination zones stratified from a full set of 1244 zones? Please explain the process in your own words and don't copy from the paper.

From 1244 zone , 21 destination (21+1 =22 zone, one is from zone) by stratified sampling approach in which 1244 zones are grouped in terms -

Employment**:** Zones with similar employment opportunities are grouped together.
Distance: Zones within similar travel distances are aggregated with key characteristics.

c. Identify the variables that the report has used for the home-based tour primary destination and mode choice model.

The variables used for this model include like -

Tour characteristics: Purpose (work, school, discretionary), type (primary or secondary), and time of day for both legs of the tour.
Person-level variables: Age group, income group, employment status(part time/ full time) , gender etc.
Household-level variables: vehicle ownership, and presence of children , vehicle per worker etc.
Land use: Destination characteristics like mixed use, employment in origin and destination etc.

d. Do you think the identified variable set in question c is logical to be included in the utility of the primary destination and mode choice model? Explain why or why not.

Yes, the identified variables in question 3/c are logical for the primary destination and mode choice model, as they directly influence both the choice of destination and travel mode. Tour characteristics, such as purpose and type, along with person-level variables like age, income, and employment status, impact travel decisions. Household factors like vehicle ownership and the presence of children play a significant role. Additionally, land use factors, such as employment density, help determine destination attraction.

However, to improve model accuracy variables like weather conditions, time of day, and traffic congestion should be used, as these factors can influence travel choices, especially in varying weather or traffic conditions. For example-if it is raining, some people will choose cars over walking or bicycles.