

■ Urban Transport Planning and Analysis (A2 2019)

Fridays 10:25~12:10

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■ **Course Overview:**

The goal of this course is to give you a practical overview of some of the tools which planners and researchers use to address transportation-related problems in urban areas. Specifically, we will focus on discrete choice theory, which is one of the working horses of transportation planning analysis. Rather than one-way lectures, this course emphasizes hands-on learning, so the theory discussed in class will be put into practice on several assignments and problem sets.

■ **Pre-requisites and Grading:**

In principle, there are no pre-requisites for this class. However, a basic understanding of university level algebra, some calculus, and statistics (e.g. Wooldridge's Introductory Econometrics) might facilitate things along the way. It is also recommended to take the Urban Transport Policy course which provides an overview of the transportation planning process from a policy making perspective.

The final grade will be based on:

- **Attendance and Class Participation: 10%**
- **Assignments (2): 40% each**
- **Pop quizzes (2): 5% each**

■ **Required Software:**

For this course we will be using the following software:

R: a free statistical analysis programming software. You can download it from:

<https://www.r-project.org/>

You can also find an introduction to programming in R here :

<https://cran.r-project.org/doc/manuals/R-intro.pdf>

In addition, we recommend you install R-studio, which is an Integrated Development Environment (IDE) for R. It will make things a lot easier along the way. Especially if you have never used R before. Downloading R packages requires an internet connection, so make sure you make the necessary procedures to be able to do so beforehand (Especially if your main campus is not Hongo). **R must be installed before the December 14th session!**

■ **Assignments**

Details will be posted on the class website. Necessary datasets will be shared in class.

- *Assignment #1.* Multinomial logit estimation and basic statistical tests
- *Assignment #2.* Nested logit estimation and validation tests

Submission instructions: Submit via e-mail to gtroncoso@ut.t.u-tokyo.ac.jp Please write the name of the class and assignment number in the e-mail subject. **No late submissions accepted.**

■ **Calendar**

Urban Transport Planning and Analysis		
Class no.	Date	Session
1	11/29	Class guidance The role of models in urban transport planning
2	12/6	Introduction to discrete choice models <ul style="list-style-type: none"> • Binary Logit • Multinomial Logit
3	12/13	Introduction to programming in R ▲ Discrete choice model estimation in R (MNL) Come to class with R already installed on your computer
4	12/20	Practical issues in discrete choice modeling (I) <ul style="list-style-type: none"> • Aggregate forecasting techniques • Relevant statistical tests • Aggregation and sampling of alternatives
5	12/24* (Tue)	Practical issues in discrete choice modeling (II) <ul style="list-style-type: none"> • Validation methods GEV: The Nested Logit model (I) ◆ Assignment#1 submission deadline
6	12/27	◇ In-class discussion of Assignment #1 GEV: The Nested Logit model (II) ▲ Discrete choice model estimation in R (NL)
7	1/10	◇ In-class discussion of Assignment #2 (in-progress) The Generalized Nested Logit and other extensions System of models
8	1/24	◆ Assignment #2 submission deadline and in-class presentation

*Note that in these days class is NOT on Fridays.

■ Readings

Readings are classified as mandatory and recommended. Mandatory readings should be read by the time stated in the header to be able to smoothly follow the lectures content. Recommended readings are not mandatory, but if you feel like challenging yourself and going deeper into transportation planning research this list should get you going a bit further than the material covered in class. Some sources are also provided to review your background knowledge for this course, in case you are feeling a bit rusty.

- Journal article links are provided below. Some of these links are only accessible from in-campus networks, or from home via you ESS account.
- Books recommended in this list are available in the **Urban Transportation Research Unit library in the 11th floor of building 14, room 1114** (Department Urban Engineering)
- Note that not all the content in the mandatory readings will be necessarily covered directly in class, but when giving the lectures it is assumed that you are familiar with the material)

◇ Background knowledge review

Not mandatory, but you should be familiar with these topics, so if you feel a bit rusty on basic statistics and probability, review these documents:

Hensher, D., Rose, J., Greene; W., 2005. *Applied choice analysis: A primer*. Cambridge University Press (Chapter 2)

Wooldridge, J., 2009. *Introductory Econometrics: A modern approach (4th edition)* South Western, Cengage Learning (Appendix A-D)

◇ **Mandatory readings**

■ **12/6** Discrete choice I: Introduction to discrete choice models

Ben-Akiva, M., Lerman, S., 1985. *Discrete choice analysis: Theory and application to travel demand*. MIT Press (Chapters 1-3)

Ben-Akiva, M., Lerman, S., 1985. *Discrete choice analysis: Theory and application to travel demand*. MIT Press (Chapters 4-5)

[Train, K., 2009. *Discrete choice method with simulation \(Second Edition\)* Cambridge University Press. \(Chapters 2-3\) \(Alternative option to Ben-Akiva and Lerman\)](#)

■ **12/20** Practical issues in discrete choice modeling

Ben-Akiva, M., Lerman, S., 1985. *Discrete choice analysis: Theory and application to travel demand*. MIT Press (Chapters 6,7,9)

■ **12/24** GEV: The Joint Logit and the Nested Logit model

Parady G., Ory, D., Walker, J. (2019) "[The overreliance on statistical goodness of fit and under-reliance on empirical validation in discrete choice models: A review of validation practices in the transportation academic literature](#)" Presented at the 6th International choice modelling conference, Kobe, Japan, August 19-21, 2019.

Ben-Akiva, M., Lerman, S., 1985. *Discrete choice analysis: Theory and application to travel demand*. MIT Press (Chapter 10)

[Train, K., 2009. *Discrete choice method with simulation \(Second Edition\)* Cambridge University Press. \(Chapter 4,6\) \(Alternative option to Ben-Akiva and Lerman\)](#)

[Hensher, David A., and William H. Greene. "Specification and estimation of the nested logit model: alternative normalisations." *Transportation Research Part B: Methodological* 36.1 \(2002\): 1-17.](#)

■ **1/10** The Generalized Nested Logit and other extensions

[Wen, C., Koppelman, F., 2001. *The generalized nested logit model*. Transportation Research Part B 35, pp. 627-641.](#)

[Bekhor, S., Prashker, J., 2008. *GEV-based destination choice models that account for unobserved similarities among alternatives*. Transportation Research Part B 42, pp. 243-262.](#)

Ben-Akiva, M., Lerman, S., 1985. *Discrete choice analysis: Theory and application to travel demand*. MIT Press (Chapter 11)

◇ **Recommended readings**

[Ben-Akiva, M., & Bowman, J. L. \(1998\). Integration of an activity-based model system and a residential location model. *Urban Studies*, 35\(7\), 1131-1153.](#)

[Bowman, J.L. and Ben-Akiva, M., 2001. Activity-based disaggregate travel demand model system with activity schedules. *Transportation Research Part A* 35. Pp 1-28.](#)

[Bhat, C.R., 2005. A Multiple Discrete-Continuous Extreme Value Model: Formulation and Application to Discretionary Time-Use Decisions *Transportation Research Part B*, 39\(8\), 679-707.](#)

[Bierlaire, M. \(2006\). A theoretical analysis of the cross-nested logit model. *Annals of operations research*, 144\(1\), 287-300.](#)

[Fosgerau, M., & Bierlaire, M. \(2009\). Discrete choice models with multiplicative error terms. *Transportation Research Part B: Methodological*, 43\(5\), 494-505.](#)

[Hägerstrand, T. \(1970\). What about people in regional science? *Papers in regional science*, 24\(1\), 7-24.](#)

[Kitamura, R., 1988. An evaluation of activity based travel analysis. *Transportation* 15, pp.9-34](#)

[Koppelman, F. S., & Wen, C. H. \(2000\). The paired combinatorial logit model: properties, estimation and application. *Transportation Research Part B: Methodological*, 34\(2\), 75-89.](#)

[Mai, T., Fosgerau, M., & Frejinger, E. \(2015\). A nested recursive logit model for route choice analysis. *Transportation Research Part B: Methodological*, 75, 100-112.](#)

[Papola, A. \(2004\). Some developments on the cross-nested logit model. *Transportation Research Part B: Methodological*, 38\(9\), 833-851.](#)

[Swait, J., 2009. Choice model based on mixed discrete/continuous PDFs. *Transportation Research Part B*, Vol. 43\(7\), pp.766-783.](#)

◇ **Basic programming and data analysis in R**

[Wickman H., Grolemond G., *R for data science*](#)