EURO PhD Summer School on Retail Operations

Stockholm, Sep 17-20 2023

Final Report

In September 2023 the EURO Working Group Retail Operations convened for their 6th annual meeting, this time at Stockholm Business School, Stockholm University in Stockholm, Sweden. This year the annual meeting was preceded by the first ever EURO PhD Summer School on Retail Operations.

25 students from Europe and North America participated (and more were on the waiting list). The idea of the summer school was two-fold. First, to provide Ph.D. students with state-of-the-art tools to analyze and solve operations problems in the retail industry using data; there are many recent developments in both computer science and econometrics that are relevant for operations researchers. Second, to help students build their professional network and learn from each other.

Aims and scope:

The aim of the summer school was to further develop doctoral students' skills and knowledge on how machine learning and analytics can be used to analyze and solve Operations Management problems in the retail industry.

Over the last decade, the retail industry has transformed completely. Having been dominated by brick-and-mortar retailers, the retail industry now consists of a smorgasbord of hybrid omni-channel formats combining online and brick-and-mortar channels in different ways. This shift has lead to numerous challenges for retailers on how to best organize and operate to meet the needs of its customers in a financially and environmentally sustainable way. At the same time, numerous digital tools means there is more data available than ever to help retailers in making these decisions.

During the course, students were taught how novel methods for data analysis can be used to analyze and improve retail operations. They learned how machine learning models can be applied in the best ways, as well as tools and metrics that can be used to evaluate assumptions and correct for endogeneity.

Teaching and learning activities:

The course consisted of three full days of course work, together with four weeks of individual studies on a case assignment and a full day to report the case assignment. Students were also expected to participate in the EWG annual meeting which was held in the days following the summer school.

The course work combined hands-on tutorials on selected topics on the interface of operations research and retail operations. The first day of the summer school focused on machine learning applied to operations management problems in the retail industry. Ali Aouad from London Business School and Antoine Desir from INSEAD lead a full-day workshop where students were exposed to theory and worked with solving several examples using Python. On the second day Fredrik Eng-Larsson and Olov Isaksson from Stockholm Business School lead a full day on causal inference. Students were introduced to important ideas, concepts and tools when analyzing causal mechanisms in operations settings where there might be endogeneity issues, which is often the case in the retail industry. The third and final day was lead by Victor Martinéz-de-Albéniz from IESE Business School. Together with the students he went through a last-mile delivery case. After the case discussion, the students were introduced to two large data sets and were tasked to form groups and write a "mini research paper" using the data and the tools they had learned over the week. Students worked in multidisciplinary teams and after four weeks of individual case work the class met online to present and discuss the case assignment.

Day 1, 18 Sep. - From Operations to Machine Learning: The Case of Choice Modelling

Day 2, 19 Sep. - Causal Inference in Operations Analytics

Day 3, 20 Sep. - Case study on analytics in retail operations

While the days were filled with academically intense workshops, evenings focused on equally intense, albeit not academically so, pétanque tournaments at Boulebar, and karaoke and Eurovision-flavored entertainment at the ABBA museum.

Course faculty and scientific committee:

Fredrik Eng Larsson, Stockholm Business School
Olov Isaksson, Stockholm Business School
Ali Aouad, London Business School
Antoine Desir, INSEAD
Victor Albeniz, IESE Business School
Alexander Hübner, Technical University Munich
Pedro Amorim, University of Porto

Supporting entities and financing:

The summer school was generally financed by EURO and Stockholm Business School, and supported by the national OR societies in Sweden, Germany, and Portugal as well as the Swedish Retail and Wholesale council.

Readings:

Aouad, A., & Désir, A. (2022). Representing random utility choice models with neural networks. arXiv preprint arXiv:2207.12877.

Berbeglia, G., Garassino, A., & Vulcano, G. (2022). A comparative empirical study of discrete choice models in retail operations. Management Science, 68(6), 4005-4023.

Feldman, J., Zhang, D. J., Liu, X., & Zhang, N. (2022). Customer choice models vs. machine learning: Finding optimal product displays on Alibaba. Operations Research, 70(1), 309-328.

Sumida, M., Gallego, G., Rusmevichientong, P., Topaloglu, H., & Davis, J. (2021). Revenue-utility tradeoff in assortment optimization under the multinomial logit model with totally unimodular constraints. Management Science, 67(5), 2845-2869.

Imbens/Wooldridge, What's New in Econometrics? NBER, Summer 2007

Lecture 11: https://users.nber.org/~confer/2007/si2007/WNE/lect_11_dc_fig.pdf

Markakis, G., & Martínz-de-Albeníz (2022) Improving Last-Mile Productivity at Paack. IESE Business School Case

Merchán, D., Arora, J., Pachon, J., Konduri, K., Winkenbach, M., Parks, S., & Noszek, J. (2022). 2021 Amazon last mile routing research challenge: Data set. Transportation Science.

Wu, L., Wen, H., Hu, H., Mao, X., Xia, Y., Shan, E., ... & Wan, H. (2023). LaDe: The First Comprehensive Last-mile Delivery Dataset from Industry. arXiv preprint arXiv:2306.10675.

List of participants

Ali	Aouad	London Business School
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Bouchra	Bacha	Kedge Business School
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Photos from the classroom, social activities and annual meting