



XXXV EURO Summer Institute on Location Science
11 – 24 June 2022
Edinburgh, United Kingdom

Final Report

The XXXV EURO Summer Institute (ESI) on Location Science took place in Edinburgh from 11 to 24 June 2022. The scientific activities were held at the Bayes Centre, which is located in the centre of Edinburgh, and the participants stayed a bit outside at Pollock Halls, a large university venue that is within a 20-minute walk from the Bayes Centre.

The interest in the ESI was very high. We received a total of 41 applications, 32 of which came from EURO candidates and 9 from IFORS candidates. While we were very happy about the high interest, it put us in a difficult spot as we had only planned with 24 laureates. But our goal as organisers was to have the best possible institute within the budget available. It was clear to us that we wanted to invite as many participants as possible because the level of the submissions was very high it was clear that the PhD students and early career researchers would not have another opportunity to attend an ESWI on location science. We also knew that we wanted the institute to last for two weeks, so that every laureate would have time to present their research and interact with the other laureates and plenary speakers. Last, but not least, Edinburgh is an expensive place, especially in summer. For example, the laureates shared double rooms at a price of £95 per room per night. This is cheap for Edinburgh standards for the month of June, but clearly unaffordable with just the funding awarded by EURO.

With all this in mind, we started planning early and applied to different funding bodies. In this way, we managed to more than double our budget. We secured funding from the UK OR Society, the Edinburgh Mathematical Society, the Glasgow Mathematical Journal Trust, the International Centre for Mathematical Sciences, and the Spanish Network on Location. This allowed us to have a 14-day ESI with a total of 28 laureates (14 women and 14 men), including travel support for one of them whose national OR society was not willing to support her travel costs. This was not the only national OR society not willing to contribute to the laureates' travel

costs, but the only one for whom attendance would have been very difficult without our support.

The 28 laureates came from 12 different countries. We received a high number of applications from a few countries with a strong community and a long-standing tradition in location science: 7 from Spain, 7 from Italy, 5 from the UK (not a top 3 in participants usually, but in the last 10 years several academics have arrived to places like Edinburgh and Sheffield, creating new groups; in 2018 the EWGLA conference was held in Edinburgh), and 4 from Germany. It was decided to have a balanced and proportional number of participants so that these countries would not take up most of the positions, but still acknowledge their importance. At the same time, the Spanish Network on Location funded the participation of 2 Spanish candidates. In this way, the split per country was as follows:

Country	Number of laureates
Belgium	1
Canada (IFORS)	1
France	3
Germany	3
Hungary	1
Ireland	1
Italy	5
Luxembourg	1
Portugal	2
Spain	5
Turkey	1
United Kingdom	4

In addition to these 28 participants, there was one laureate from Spain and one from India (IFORS) who were not able to attend at the last minute.

Concerning the scientific programme, each laureate presented their recent work. The talks covered a broad range of topics, including the location of vaccination centres, ambulance stations, and alternative refuelling stations, the design of humanitarian and evacuation logistics networks, and the determination of hubs for supply chains or in influence networks. The laureates' talks were complemented by keynote talks from 11 internationally renowned experts (5 women and 6 men), many of them themselves participants of previous ESWI on location science (held in 1984, 1995, and 2007).

In order to instigate collaborations among the laureates, we organised a group workshop in which the laureates had to work on a case study for the fictional Scottish company Whiskey & Haggis. The company was selling Scottish produce to households in Scotland, and was seeking help for re-designing their food supply chain. After having been briefed the laureates on the available data and the goals of the company, the groups had to work with the data, decide on a model, and devise a solution method. The laureates had daily working sessions and each group presented their work on the last day. The winner group was decided by all the groups by secret voting, each group ranking all the groups except themselves. The last two plenary speakers, Martine Labbé and Elena Fernández, still present in Edinburgh, also voted. As a prize, each of the winners received a hardcover copy of the Springer book "Location Science, 2nd edition". All the plenary speakers and four of the five organizers had contributed to this book with a chapter. The winner and the runner-up team were also awarded free registration at the IWOLCA workshop to be held in Edinburgh in 7-8 September 2023, a meeting also focused on location science.

To further enhance relations between the laureates, we organised several social activities. We started with a walk to Arthur's Seat and a guided city tour on Sunday 12 July. On Tuesday 14 we went to a very cheerful Cèilidh at Summerhall. Rounding up the first week, on Saturday 18 we made an excursion to Tantallon Castle and North Berwick. In the following week, we took a guided tasting tour at Holyrood distillery on Tuesday 21 and had our conference dinner on Wednesday 22. The institute was rounded up by an informal farewell dinner on Friday 24.

As if it was not enough of a challenge to organize an ESI of these dimensions, there was a covid outbreak on Tuesday 21, the second working day of the second week. With four full days still left, the outbreak spread until half the laureates were ill (showing that a high degree of socialization had indeed been achieved). So that the ESI would not stop, we transitioned to hybrid format from Wednesday 22 with the incredible support of the ICMS staff. Those laureates who were sick and still had to present were able to do so from their accommodation. Thanks to the additional funding that we had secured, we were able to cover the unexpected expenses from this disruption: covid tests, laureates not being able to attend in person for the last few days were reimbursed for their subsistence expenses, and we were able to pay the re-scheduled flights for two laureates. The total amount was slightly over £1,000.

The feedback we received from the laureates, the plenary speakers, and from the supervisors of some laureates was very positive. Apart from the scientific value of the institute, the laureates have grown very close to each other through the various joint activities, providing an excellent foundation for future collaborations among the laureates and between laureates and experts. We were able to see that already at the EURO Conference in Espoo in July and at the annual meeting of the EURO Working Group on Location Analysis (EWGLA) in Aveiro, Portugal, in September. Last but not least, it rooted in them deeply the spirit of the institutes on location, where laureates of one edition organise the next edition after a reasonable number of years has passed.

Finally, with the collaboration of Elsevier and the editor-in-chief of the journal Computers & Operations Research, it was arranged a special issue on Recent Advances on Location Science with submission deadline 31 December 2022 for which two of the guest editors are the local organisers of this ESI, Sergio García Quiles and Jörg Kalcsics. All the laureates have been invited to contribute to this special issue with a paper based on the research that they presented in Edinburgh in June.

Organizing Committee:

- Valentina Cacchiani (University of Bologna, Italy).
- Sergio García Quiles (University of Edinburgh, United Kingdom).
- Boglárka G.-Tóth (University of Szeged, Hungary).
- Jörg Kalcsics (University of Edinburgh, United Kingdom).
- Francisco Saldanha da Gama (University of Lisbon, Portugal).
- Dawn Wasley, Jane Walker and Alex Liu (ICMS, United Kingdom).

Plenary Speakers:

- Boglárka G.-Tóth (University of Szeged, Hungary).
- Francisco Saldanha da Gama (University of Lisbon, Portugal).
- Anita Schöbel (Technical University of Kaiserslautern, Germany).
- Stefan Nickel (Karlsruhe Institute of Technology, Germany).
- Dmitry Krass (University of Toronto, Canada).
- Justo Puerto (University of Seville, Spain).
- Ioannis Giannikos (University of Patras, Greece).

- Bahar Yetis Kara (Bilkent University, Ankara, Turkey).
- Alfredo Marín (University of Murcia, Spain).
- Elena Fernández (University of Cádiz, Spain).
- Martine Labbé (Université Libre de Bruxelles, Belgium).

Laureates:

- Afaf Aloullal (Université Polytechnique Hauts-de-France, France).
- Hannah Bakker (Karlsruhe Institute of Technology, Germany).
- Silvia Baldassarre (University of Naples Federico II, Italy).
- Marta Baldomero Naranjo (University of Cádiz, Spain).
- Thomas Byrne (University of Strathclyde, United Kingdom).
- Zehranaz Dönmez (Bilkent University, Turkey).
- Cristian Durán Mateluna (Polytechnique Institute of Paris, France).
- Xiaochen Feng (University of Sheffield, United Kingdom).
- Serena Fugaro (National Research Council of Italy, Italy).
- Imanol Gago (Basque Center for Applied Mathematics, Spain).
- Ricardo Gázquez (University of Granada, Spain).
- Ricardo Giusti (Politecnico di Torino, Italy).
- Yun Hui Lin (University College Dublin, Ireland).
- Syu-Ning John (University of Edinburgh, United Kingdom).
- Maria Lopes (Universidade de Lisboa, Portugal).
- Özlem Mahmutogullari (KU Leuven, Belgium).
- Andrea Mancuso (University of Naples Federico II, Italy).
- Paulo Moreira (Universidade de Lisboa, Portugal).
- Juan Manuel Muñoz Ocaña (University of Cádiz, Spain).
- Alan Osorio Mora (University of Bologna, Italy).
- David Pinzón (University of Montreal, Canada).
- Anika Pomes (Karlsruhe Institute of Technology, Germany).
- Bonn Kleiford Seranilla (University of Luxembourg, Luxembourg).
- Gyöngyvér Vass (University of Szeged, Hungary).
- Isabel Wiemer (University Duisburg-Essen, Germany).
- Wenjin Yan (ESSEC Business School, France).
- Nicolás Zerega (University of Cádiz, Spain).
- Haoyue Zhang (University of Edinburgh, United Kingdom).

SOCIAL PROGRAM

Social Program

Saturday, 11 June

On the day of arrival, we will start the Institute with an informal get-together in the evening at St Leonard's Hall (Pollock Halls).

Sunday, 12 June

We start with a joint hike to Arthur's Seat in the morning, an extinct volcano located just in front of Pollock Halls, followed by a guided city tour of Edinburgh at 2 pm. In the unlikely case that the weather is too bad for hiking, the activity will be replaced by a guided visit to the National Museum of Scotland, located also in the city centre and close to the Bayes Centre.

Tuesday, 14 June

We are going to have a night of jolly dancing to relax from a long and intensive working day with a traditional Scottish Cèilidh at Summerhall from 8-10 pm.

Saturday, 18 June

The second outdoors social event will lead us 25 miles east of Edinburgh to the scenic seaside village of North Berwick. We will head on a walk along the coast to Tantallon Castle, a ruined mid-14th-century fortress. After a typical fish & chips lunch in the village, we are going on a boat trip to the famous Bass Rock, with its stunning population of gannets and puffins.

Sunday, 19 June

This is a free day for resting or for some further excursions, for example to Stirling, once a capital of Scotland, and its scenic castle and Wallace monument.

Tuesday, 21 June

We are visiting Holyrood Distillery at the foot of Arthur's Seat for a whiskey tasting and tour from 5-7 pm.

Wednesday, 22 June

We will head to Blonde restaurant for a gala dinner.

SCIENTIFIC PROGRAM

Scientific Program

Monday, 13 June

- 9:00 Opening Session
- 9:30 **Boglárka G.-Tóth**, *Competitive location models* 15
- 11:00 Coffee break
- 11:30 **Marta Baldomero-Naranjo**, *Upgrading edges in the maximal covering location problem* 41
- 12:20 **Gyöngyvér Vass**, *Solving influence maximization by covering models* 45
- 13:10 Lunch
- 15:00 **Ricardo Gázquez**, *Multitype maximal covering location problems: Hybridizing discrete and continuous problems* 49
- 15:50 Coffee break
- 16:20 **Serena Fugaro**, *Multi-objective covering location problems with advanced connectivity features and zonal requirements* 53
- 17:10 End

Tuesday, 14 June

- 9:30 **Francisco Saldanha-da-Gama**, *Facility location under uncertainty* 17
- 11:00 Coffee break
- 11:30 **Afaf Aloullal**, *Multi-period single-allocation hub location-routing: Models and heuristic solution* 57

- 12:20 **Wenjin Yan**, *Exact solution methods for the r -allocation p -hub median problem with hose demand uncertainty* 59
- 13:10 Lunch
- 15:00 **Workshop**
- 15:50 Coffee break
- 16:20 **Andrea Mancuso**, *A multi-echelon facility location model for the reorganization of the blood supply chain at regional scale* 61
- 17:10 End

Wednesday, 15 June

- 9:30 **Anita Schöbel**, *From computational geometry and statistics to public transport: Results and methods in continuous location* 19
- 11:00 Coffee break
- 11:30 **Imanol Gago**, *A stochastic optimization model for ambulance (re)location-allocation under fair coverage and multi-level response time* 65
- 12:20 **Isabel Wiemer**, *Evaluation of EMS location models using different performance criteria* 69
- 13:10 Lunch
- 15:00 **Workshop**
- 15:50 Coffee break
- 16:20 **Yun Hui Lin**, *Exact algorithms for Stackelberg p -median problem with user preferences* 73
- 17:10 End

Thursday, 16 June

- 9:30 **Stefan Nickel**, *The day after optimal: Location models for modern logistics* 21
- 11:00 Coffee break
- 11:30 **Hannah Bakker**, *A second glance at multi-period capacitated facility location: What to consider when modeling time* 77
- 12:20 **Riccardo Giusti**, *The location-transshipment problem with synchronized multi-commodity flows on a time-space multi-network* 79

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13:10	Lunch	
15:00	Workshop	
15:50	Coffee break	
16:20	Anika Pomes , <i>Multi-period stochastic districting</i>	82
17:10	End	

Friday, 17 June

9:30	Dmitry Krass , <i>Coverage objective and its generalizations in location analysis</i>	23
11:00	Coffee break	
11:30	Claire Zhang , <i>Stochastic facility location with service level constraints</i>	84
12:20	Maria Lopes , <i>Hospital network design: A bi-objective two-level hierarchical stochastic model</i>	87
13:10	Lunch	
15:00	Workshop	
15:50	Coffee break	
16:20	Paulo Moreira , <i>On forecast and decision horizons for stochastic multi-period facility location</i>	91
17:10	End	

Monday, 20 June

9:30	Justo Puerto , <i>A tour of perspective through the ordered median location problems</i>	25
11:00	Coffee break	
11:30	Ioannis Giannikos , <i>Location analysis and GIS: Emerging opportunities and continuing (?) challenges</i>	29
13:00	Lunch	
15:00	Thomas Byrne , <i>Conditional facility location problems with continuous demand and a rapid transit line</i>	93
15:50	End	

Tuesday, 21 June

- 9:30 **Bahar Yetis Kara**, *Network design and location decisions in humanitarian logistics* 31
- 11:00 Coffee break
- 11:30 **Zehranaz Dönmez**, *Humanitarian supply chain planning: The effect of location decisions on fair allocations of donations* 99
- 12:20 **Xiaochen Feng**, *The quickest evacuation location problem (QELP) in humanitarian operations: Introduction, applications and a matheuristic approach* 101
- 13:10 Lunch
- 15:00 **Bonn Kleiford Seranilla**, *Optimizing vaccine distribution for developing countries under natural disaster risk* 105
- 15:50 Coffee break
- 16:20 End

Wednesday, 22 June

- 9:30 **Alfredo Marín**, *Improving discrete location formulations* 33
- 11:00 Coffee break
- 11:30 **Cristian Duran Mateluna**, *Robust MILP formulations for the two-stage weighted vertex p -center problem* 109
- 12:20 **Nicolas Zerega**, *2-Index formulations for hub location problems* 113
- 13:10 Lunch
- 15:00 **Workshop**
- 15:50 Coffee break
- 16:20 **Juan Manuel Muñoz Ocaña**, *Electron tomography segmentations with flexible criteria* 115
- 17:10 End

Thursday, 23 June

- 9:30 **Elena Fernández**, *Hub networks: What to take into account* 35
- 11:00 Coffee break
- 11:30 **Özlem Mahmutogulları**, *Robust alternative fuel refueling station location problem with routing under decision-dependent flow uncertainty* 117
- 12:20 **Syu-Ning Johnn**, *A location-routing-districting (LoRD) model for the food delivery supply chain network design* 119
- 13:10 Lunch
- 15:00 **Workshop**
- 15:50 Coffee break
- 16:20 **Alan Osorio-Mora**, *Metaheuristics for the latency location routing problem* 123
- 17:10 End

Friday, 24 June

- 9:30 **Martine Labbé**, *On some bilevel location and network design problems* 37
- 11:00 Coffee break
- 11:30 **David Pinzon**, *A bilevel pricing and facility location model with random utility maximizing followers and service-level cost structure* 125
- 12:20 **Silvia Baldassarre**, *Multi-channel distribution in banking sector and branch network restructuring* 129
- 13:10 Lunch
- 15:00 **Workshop**
- 15:50 Coffee break
- 16:10 End