



# Lancaster University Management School

**Location:** Department of Management Science, Lancaster University Management School, UK.

**Supervisor:** Ahmed Kheiri (<https://ahmedkheiri.bitbucket.io/>)

## Short CV:

Dr Ahmed Kheiri is a Lecturer (equivalent to Assistant Professor) in Operations Research at Lancaster University Management School, Department of Management Science. He received his B.Sc. (Hons - First Class) from the University of Khartoum, and received his M.Sc. (Distinction) and PhD. from the University of Nottingham, UK. He then held research positions at the University of Exeter, and the Cardiff School of Mathematics in Wales. He participated in an EPSRC funded project (EP/K000519/1) focusing on selection hyper-heuristics and in a Health and Care Research Wales funded project entitled Prudent Elective Surgery Scheduling: A Whole Systems Approach, which involved the investigation of how scheduling and modelling techniques can be used to help improve the throughput of patients in operating theatres in Wales. His research interests lie at the intersection of operational research and computer science, investigating flexible and general cross domain optimisation methods to solve combinatorial optimisation problems. He has designed and implemented intelligent, flexible, ready-to-use high level hyper-heuristic methods for decision support and applied them to a wide range of real-world problems. Dr Kheiri has published more than 30 refereed papers in reputable journals (the vast majority indexed in SCI/SCI-Expanded) and highly respected international conferences. He has published an invited review paper on selection hyper-heuristics in EJOR. During his career, he received several academic awards some are awarded from participation in international optimisation challenges. He was recently awarded a prize by EURO/ROADEF for work in inventory routing. He has co-chaired several workshops, edited several books, given many invited talks, reviewed numerous academic journal articles and has served on many program/technical committees in major international conferences. He was Keynote Editor for the OR Society Annual Conference (OR60).

## Description of the research group:

The Department of Management Science has one of the largest number of Operational Research and Systems teaching staff in the country, with an outstanding research and publishing record. With a worldwide reputation as an international centre of excellence, this department has a distinguished history of helping organisations solve real problems. Originally founded as the Department of Operational Research in 1964, the first of its type in Europe, the department has grown and evolved, so that it now also covers Operations Management, Information Systems and Business Analytics. The Department takes the lead in the Centre for Marketing Analytics and Forecasting, the Centre for Productivity and Efficiency and the Centre for Transport and Logistics. It is also a key partner in the Data Science Institute and STOR-i Centre for Doctoral Training.

## **Description of the work to be carried out by the student:**

Project: Hyper-heuristics and Data Science Techniques for Inventory Routing Problem

Due to the extreme difficulties in inventory routing problem (IRP), this area of study appeals to strong interest of many researchers and practitioners. An exact method often fails to find a feasible solution to such problems. On the other hand, heuristics may be able to find a good quality solution that is significantly better than those produced by an expert human planner. There is a growing interest towards self configuring automated general-purpose reusable heuristic approaches for combinatorial optimisation combined with data science techniques. This research will investigate a new breed of heuristic methods combined with data science techniques to solve an inventory routing problem. Together with AirLiquide, world frontrunner company in gases, technologies and services for Industry and Health in almost 80 countries, we will address some of the following: Improving the performance of hyper-heuristic techniques for IRP; Minimising product supply disruption; Developing a reliable demand forecasting technique for specific customers; and/or Developing solutions that takes the unavailability of transportation resources into account.

## **Other information:**

Lancaster University was established by Royal Charter in 1964, one of seven new universities created in the 1960s. Operational Research was one of the founding departments, the first in the country. Lancaster University is among the best in the UK. Top 10 in three main league tables, we also have a TEF Gold rating for teaching and we're highly ranked in international league tables such as the QS World Rankings. We're proud to have been named International University of the Year by The Times and The Sunday Times Good University Guide 2020.

## **History of Lancaster City**

Small enough to explore on foot, you can follow the stories of Lancaster's rich history all the way back to the 12th Century. As one of England's Heritage Cities, there is history around every corner, from the conviction of the Lancaster Witches in 1612 to Charles Dickens' hotel room!

## **Castle**

Dating back almost 1000 years, Lancaster Castle is still owned by Her Majesty the Queen, who is the Duke of Lancaster. As well as being a fortification, its courtrooms have witnessed many famous trials over the centuries, including those of the Lancashire Witches who were convicted and sentenced to death in 1612. Lancaster Castle is open to the public, offering visitors a chance to walk the halls of one of the best-preserved castles in Great Britain.

## **Outdoors**

The City centre boasts lots of open green spaces, from canal-side walks, the River Lune footpath and several parks. Williamson Park and the impressive Ashton Memorial look over the city across to Morecambe Bay and the distant hills of the Lake District – the perfect place for a summer picnic or a study break and home to the Dukes Theatre's "Play in the Park", the UK's biggest outdoor walkabout theatre event.

## **Shopping**

The city has a great shopping scene, with many independent shops and boutiques nestled alongside stores from many major retailers. Our traditional high street is also home to the bi-weekly Charter Market – a selection of 40 stalls offering everything from fresh produce and delicious dishes from around the world to books and gifts. With **Preston, Manchester, Liverpool and Blackpool** just a train ride away, you'll never be short of places to shop!