

CURRICULUM VITAE

Mahdi Moeini, Professor (Associate)

I. Personal information

First Name: Mahdi

Surname: Moeini

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II. Diplomas and current position

👉 PhD and Habilitation in Computer Science (Optimization and Operations Research)

👉 **Since September 2022:** Associate Professor in Computer Science at the *École Nationale Supérieure d'Informatique pour l'Industrie et l'Entreprise* (ENSIIE) and the research lab. SAMOVAR of the *Télécom SudParis*.

👉 **For more details:** please refer to <https://sites.google.com/view/mahdi-moeini>

III. Research interests

My principal research interests are:

- combinatorial optimization,
- design of exact and heuristic/metaheuristic algorithms,
- applications of optimization and operations research in different domains of science and engineering, e.g., in logistics and transportation, etc.

My research experiences in the above areas cover a wide range of topics at different levels:

- Modeling complex problems as mathematical optimization models,
- Design of efficient algorithms and proposing new techniques of operational research and optimization for solving the optimization models,
- Implementing algorithms and conducting computational experiments.

I publish my research results in top-ranked journals and conferences.

IV. Statistics on major publications

The results of my research activities have been published in several journals and conferences:

👉 **35** published (*peer reviewed*) articles:

14 articles in different international journals

21 full papers and book chapters in the proceedings of the international conferences

For the detailed list of my publications, please refer to:

<https://sites.google.com/view/mahdi-moeini/publications>

Google Scholar:

<https://scholar.google.com/citations?user=zwR5s84AAAAJ&hl=en>

Host institution: Laboratory SAMOVAR of the Télécom SudParis and ENSIIE

Supervisor: Mahdi Moeini, Professor (Associate)

I. The research team "SOP (Statistics, Optimization and Probability)"

The SOP is one of the seven research teams at the research lab. SAMOVAR of the *Télécom SudParis* (TSP).

At the SOP team, we conduct research in operations research, optimization, statistical learning, and computational statistics. Through fundamental or methodological contributions, we address problems related to:

- Convex or non-convex optimization,
- Combinatorial optimization,
- Applications of operations research and optimization,
- Bayesian statistics,
- Inference in hidden data models,
- Analytical combinatorics (applied to stochastic processes).

We formulate problems as mathematical models, design and develop algorithms, and analyze them considering their efficiency and solution quality. Depending on the research theme/project, we may analyze the ability of algorithms in incorporating data on-the-fly and exploring high-dimensional spaces while controlling costs.

For further information about the research team SOP and its members, please refer to:

<https://samovar.telecom-sudparis.eu/index.php/en/sop/>

For further details about the research lab SAMOVAR, please refer to:

<https://samovar.telecom-sudparis.eu/index.php/en/accueil-2/>

II. ENSIIE (<https://www.ensiie.fr>)

In addition to SOP/SAMOVAR, I am associated to the ENSIIE (*École Nationale Supérieure d'Informatique pour l'Industrie et l'Entreprise*) that is a top engineering school in France with a focus on *computer science* and *applied mathematics*.

In addition to our activities at the research lab. SAMOVAR, we pursue some further activities (e.g., research seminars, research internships, etc.) at the ENSIIE, and we have some complementary fund at the ENSIIE to support our research, e.g., for inviting researchers, to cover conferences costs, etc.

Project Description

Mahdi Moeini, Professor (Associate)

Keywords: vehicle routing problem, robots, drones, heuristics, evolutionary algorithms

Requirements: strong background and interest in algorithm design, mathematical modeling, operations research and its applications in logistics, and implementing algorithms (in preference in Python or Julia, or in any other major programming language).

I. Context

Civil drones have been used for many years in different sectors, e.g., agriculture and surveillance. In addition, in recent years, many logistics companies, such as Amazon and DHL, conducted experiments with the aim of using drones to deliver parcels to customers [1-5]. In fact, usually trucks are used for delivering parcels. However, due to the increasing popularity of e-commerce, the importance of fast and cheap delivery, customer satisfaction, and reducing pollution in urban zones, autonomous drones and robots have attracted attention as an alternative and innovative delivery mode [1-5].



Figure: Autonomous robots and drones for parcel delivery [4,5].

II. Topic and Objectives

In this project, we are interested in formulating and solving mathematical models that take into consideration not only traditional delivery modes, but also new delivery vehicles, i.e., drones and robots. Specifically, we are interested in a variant of the vehicle routing problem, where in addition to trucks, a set of drones and robots also have the objective of serving customers through operations that are called "sorties" [1-3]. In each sortie, a drone/robot starts its mission from a drone/robot station, and after serving a customer, the drone/robot returns to its departure point [1]. This operation can be repeated, if necessary. In this context, the *drone/robot stations* are used as the service and host bases for the drones/robots and a stock of parcels provided by the trucks. The goal is to serve all customers in the shortest possible time using the combination of trucks (initially parked at a depot), drones, and robots. This problem can be formulated as a *mixed integer linear program* (MILP) [1].

Different extensions to the problem presented in [1] can be investigated. Depending on the interest and background of the scholarship holder, this project aims at selecting an extension (of the problem presented in [1]) to perform the following tasks:

- providing a mathematical formulation,
- designing as well as implementing efficient solution methods,
- and conducting computational experiments (on benchmark instances).

The results should be reported in a paper that we will submit to an *EvoStar conference*.

Some references:

- [1] Kloster, K., **Moeini, M.**, Vigo, D., Wendt, O.: *The multiple traveling salesman problem in presence of drone-and robot-supported packet stations*. European Journal of Operational Research, 305 (2), 630-643, 2023.
- [2] Schermer, D., **Moeini, M.**, Wendt, O.: *A hybrid VNS/Tabu search algorithm for solving the vehicle routing problem with drones and en route operations*. Computers & Operations Research, Vol. 109: 134-158, 2019.
- [3] Schermer, D., **Moeini, M.**, Wendt, O.: *A matheuristic for the vehicle routing problem with drones and its variants*. Transportation Research Part C: Emerging Technologies, Vol. 106: 166-204, 2019.
- [4] <https://www.bbc.com/news/uk-england-cambridgeshire-61471989>
- [5] <http://www.thepostalhub.com/blog/mercedes-benz-vans-matternet-drones-siroop>

Some other relevant information (e.g., additional funding, accommodation arrangements, location information)

- The scholarship holder will work at an office located in Evry (from which you can reach Paris by metro/RER). The office will be either at the campus of Télécom SudParis or at the ENSIIE.

I. The Campus of Télécom SudParis in “Evry”, France

Please visit the following page to find some information about the location, access plan, etc. of the campus of the *Télécom SudParis* in Evry:

<https://www.telecom-sudparis.eu/nous-situer/>

II. ENSIIE (in “Evry”, France)

Please visit the following page to find some information about the location, access plan, etc. of the *ENSIIE*:

<https://www.ensiie.fr/comment-venir/>