Alexandru Popa

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Current Position:
- Full Professor - University of Bucharest (since February 2020)
- Senior Researcher - National Research Institute for Research and Development in Informatics, Bucharest (since February 2017)

Education
- University of Bucharest - BSc (2008)
- University of Bristol - PhD (2011)

Short bio

Research interests: Alexandru Popa is an internationally recognized expert in the field of discrete optimization algorithms. He has a broad research experience both in theory and in practice. On the theoretical side he is an expert in approximation algorithms. On the practical side, he studied meta-heuristics for providing (sub-optimal but efficient) solutions for NP-hard problems. Also, Dr. Popa is an expert in using integer programming for modelling various NP-hard problems with practical applications.

Publication record: Although he is only 34 years old, Prof. Popa has published over 65 papers in prestigious journals (e.g., Mathematics of Computation, Algorithmica, Central European Journal
of Operations Research, Algorithmic Finance, Distributed Computing) and conferences (e.g. SODA, MFCS). For more details, please refer to his Google Scholar profile. It is worth noting his recent publication that has a very important practical application: *A novel algorithm for clearing financial obligations between companies - an application within the Romanian Ministry of Economy.*

International experience: Alexandru Popa has broad international experience and was affiliated with 5 universities in 5 different countries: Romania, Great Britain, Finland, Czech Republic and Kazakhstan. Moreover, he carried out many research visits to over 18 universities and research institutes all over the world (Israel, China, Austria, Germany, UK, Slovakia, France, India, Sweden, Denmark, Iceland). Moreover, he is the national coordinator of the European Research project COST CA 15210, ``European Network for Collaboration on Kidney Exchange Programmes'', which aims to solve algorithmic problems related to kidney transplants in Europe. The project has over 40 members (in over 20 countries) from various areas: medicine, law, computer science. Alexandru won several awards, the most recent being the third place at Rada Mihalcea prize for Young Researchers in Science and Technology. He was also awarded two DAAD fellowships to visit MPII Saarbrücken and University of Augsburg.

Community service: Alexandru Popa was a PC member of several conferences as IEEE SSCI, SOFSEM, IWOCA, SYNASC and a reviewer for project proposals for Netherlands Organisation for Scientific Research and National Research, Development and Innovation Office of Hungary and was a member of Board of Examiners for adjudicating the Ph.D. thesis of R.Senthil Amutha, Bharathiar University India, 2018

Student supervision: Alexandru Popa supervised 2 PhD students that graduated: Ashik Matthew (Aalto University, co-supervised with Prof. Patric Östergård) and Radu Mincu (University of Bucharest). He currently supervises 7 PhD students in various stages of their PhD (4 students in the first year, one student in the second year, one student in the third year and another student currently

Description of the research group

The research group of the prospective advisor, Prof. Dr. Alexandru Popa consists of 7 PhD students, three Assistant Professors (one former PhD student of Alexandru and two other colleagues) and several master and undergraduate students. Moreove, Prof. Popa has many collaborators at other universities.

To state it in one short sentence, the **main goal** of Alexandru's research is to understand and to provide algorithms for various NP-hard problems. Of course, this is a long term (possibly life long) goal and the methods for investigating this topic span both theory and practice: heuristics, integer programming, approximation algorithms, fixed parameter algorithms.

Next, we will briefly describe the research area of each of the 7 PhD students currently under the supervision of Prof. Popa.

Camelia Obreja is in the final stages of her PhD. Her focus was on various types of colorings for graphs, such as harmonious and graceful colorings. Finding such colorings is an extremely difficult computational task, even on particular classes of graphs.

Ahmed AlSahlani is a second year student carring out his PhD in the field of computer security, more precisely he is concerned with authentication mechanisms for Internet of Things.

Maria Constantin is studying the algorithmic aspects of several problems with applications in computational biology. Currently she studies the evolutionary distance between two genomes of different organisms by determining the minimum number of genome rearrangements needed to obtain one from the other.

Ionut Chirvase is a first year PhD student concerned with investigating distributed algorithms for the maximal independent set problem

Hamid Valizedeghan is a first year PhD student and his focus falls in the area of artificial intelligence. He aims to apply machine learning methods to tackle NP-hard problems. He is currently applying Q-learning to solve the sokoban game.

Tiberiu Sirbu is a first year PhD student. He aims to use his previous experience in optimization and control to study vehicle routing problems and platoons.

Razvan Vasile is a first year PhD student whose focus are theoretical aspects of NP-hard problems. He currently studies a computational problem that arises from brachytherapy.

Next, I will briefly present the work of 2 of my undergraduate students who achieved significant results. First, Cristian Pop, developed an application related to social networks which helps detecting news influence in a country (see the recent publication in SoftwareX). Very recently, Andrei Popa, introduced new, more efficient, algorithms for counting the number of gapped palindromes in a string. Last but not least, a 2021 paper together with Ionut Gavrila has strong practical impact and is currently implemented by the Romanian Ministry of Economy.

Description of the work carried out by the student

I am, in general, flexible with the topic that the visiting student chooses to investigate. The most important aspect is that the student choses a subject that he/she finds motivating and that is in line with the guidance of his/her PhD advisor. Thus, I see the following options:

1. The visiting PhD student proposes his own research topic.

2. The visiting student decides to work with one of my PhD students on a research project. The research group of the advisor consists of a large number of students that investigate different research projects, and, therefore there are many available options. For example, the visiting student may work with Maria Constantin to design some heuristic algorithms for finding the evolutionary distance between two genomes of different organisms by determining the minimum number of genome rearrangements needed to obtain one from the other. Maria Constantin returned recently from maternity leave and a collaboration with a visiting student will be mutually beneficial for boths students.

3. Another option for the visiting student is to choose a project to work on independently. In the past I have studied several NP-hard problems from the theoretical perspective (approximation algorithms and fixed parameter algorithms) and the visiting student can develop metaheuristics for some of these problems. For example, some better algorithms can be designed for payment networks which are systems that allow the transfer of monetary value between any two participants in the network, often by using intermediary nodes.

Short presentation of University of Bucharest

The **University of Bucharest** is a public university founded on 4 July 1864 (156 years ago) by a decree of Prince Alexandru Ioan Cuza to convert the former Princely Academy into the current University of Bucharest, making it the second oldest modern Romanian university. It is one of the five members of the *Universitaria Consortium* (the group of elite Romanian universities).

See the International Office webpage of the University of Bucharest for more details: https://unibuc.ro/international/?lang=en

Information about Bucharest

Known for its wide, tree-lined boulevards, glorious Belle Époque buildings and a reputation for high life (which in the 1900s earned its nickname of "Little Paris"), Bucharest, Romania's largest city and capital, is today a bustling metropolis. Population of 1,944,367 inhabitants is that Bucharest is the sixth city in population in the European Union. In fact, however, Bucharest gathers over three million people, and experts predict that over the next five years, the total will exceed four million. Add to this the fact that the settlements around the city, which will be part of the future metropolitan area population totals about 430,000 inhabitants.

Bucharest has reasonable connections with most European capitals and with the largest cities in Romania. The city is also reached by a large number of low-costs flights, mainly from destinations in Italy and Spain as well as from some major cities in Germany, France, the UK, Ireland, Belgium, Hungary, Turkey, Austria, Israel etc.

Bucharest has plenty of attractions and is in general a fun place to live in. Prices usually go anywhere from €5-7 to €30-40 for high-end dining for a single person menu consisting of a meal (most places offer €5-7 Euros menus that include an Entree, Main Dish and Dessert or a Drink) and a soft drink.

For more details about the city, do not hesitate to ask me, or visit:

https://wikitravel.org/en/Bucharest

writing up the thesis). His research group also consists of several other master and undergraduate students.