

## Foreword

IOI, the International Olympiad in Informatics, organized by Singapore from September 13th to 19th, 2020, is held online for the first time in the IOI history, due to the worldwide spread of COVID-19. This is a big challenge for host organizers, as well as IOI committees. A traditional one-day scientific conference is replaced by only virtual presentations of the papers by the authors, and publishing papers in this volume in printed and online version at IOI website. The authors are welcome to make short onsite presentations at next year IOI, which will be hosted by Singapore onsite, 20–27 of June, 2021.

The IOI journal is focused on the research and practice of computing professionals who work in the field of teaching informatics to talented secondary and high school students. The journal is closely connected to the scientific conference annually organized during the IOI. Unfortunately, the conference this year will be held as virtual event with online presentations from the authors. The 14th volume has two tracks: the first section of the journal focuses on research, and the second section includes reports for sharing national experiences and other news important for the community.

In their paper, A. Alnahhas and N. Mourtada study the possibility of using machine learning techniques in order to build a system that will be able to predict the future performance of contestants in competitive programming contests, based on historical rating lists. They describe an experiment in which they use public data from the Codeforces website and show that machine learning techniques achieve acceptable results for the problem.

P.T. Do, B.T. Pham and V.C. Than summarize the latest algorithms for solving some classical NP-hard optimization problems on the particular graph classes. Furthermore, they discuss the application of the  $\alpha$ -redundant method in order to obtain linear-time algorithms for finding a Maximum Induced Matching on interval and circular-arc graphs.

M. Dolinsky and M. Dolinskaya describe a system for teaching text-based programming in elementary schools, built on the basis of the website [dl.gsu.by](http://dl.gsu.by), and explain the main advantages of using this technology.

The paper of D.I. Estevez introduces theory of blockchain technology, implementation, and applications while focusing on its types of consensus algorithms. The methodology is linguistic and consists of a comparative analysis of the most popular algorithms. The problems related to blockchain architecture and algorithms could serve as an inspiration and a training resource for olympiads because of their potential to be intellectually stimulating and to contribute to our knowledge.

In their paper „Recommending Tasks in Online Judges using Autoencoder Neural Networks”, P. Fantozzi, and L. Laura propose the design of a recommender system for tasks in Online Judges. The authors think that their system is a first step to the development of recommender systems.

In his paper “Operator Utilization and Abstract Conceptions”, D. Ginat deals with abstraction. The abstract perspectives of ignoring details and relating to particular properties of recognizable parts are fundamental in problem solving. The task solutions presented in the paper encapsulated them in computations with repeated utilizations of operators. Two operators are used for sorting and one is used for transforming binary matrix colors.

In the paper “Introduction of Honorable Mention award at International Olympiad in Informatics”, M. Jovanov and E. Stankov present analysis of the results at IOI and other Scientific Olympiads in previous years, and present a final solution for the introduction of the fourth level award at IOI.

A. Laaksonen and T. Talvitie present the current state and future plans for the CSES (Code Submission Evaluation System) online judge system, which has been used for organization of several online programming courses as well as contests in Finland since 2013. The CSES problem set is an ongoing project whose purpose is to create a high-quality collection of educational algorithm programming problems. At the time of publishing the problem set consists of 200 problems, and the final goal is to reach 1,000 problems.

M. Lodi analyses the concept of computational thinking by providing a review of its many definitions and finding that they share a lot of common elements, classified in mental processes, methods, practices, and transversal skills. He concludes that elements of computational thinking should be intended inside Informatics as a discipline, being its “disciplinary way or thinking” – Informatical thinking.

A group of authors (M. Mirzayanov, O. Pavlova, P. Mavrin, R. Melnikov, A. Plotnikov, V. Parfenov, and A. Stankevich) discuss Codeforces as an educational platform for learning programming. They argue that the infrastructure of Codeforces provides a solid open ecosystem for building a programming learning process, and describe all the aspects and relationships of this ecosystem, as well as examples of successful integration into educational processes in the age of digitalization.

A paper of P.S. Pankov and A.A. Kenzhaliev deals with tasks on recognition and on restoration of data from a unified viewpoint.

M.S. Tsvetkova and V.M. Kiryukhin elaborate top 10 key skills which they have concluded to be most valuable for the success of students at IOI, based on their 30 years long experience on preparation of IOI gold medallist in Russia, as well as on preparation of curriculum of school informatics.

Finally, in the second part of the volume, two reports are presented focusing on team selection and training in Hungary, and in Argentine Olympiad in informatics. S. Halim presents the latest edition of his book aimed at all potential IOI contestants around the world, for their preparation for the contest. B. Kostadinov gives report of a new IOI activity aimed at the period in between two actual IOIs, that will keep the interest and spirit of the involved people from IOI community.

Many thanks to all of those who have assisted with the volume – especially authors and reviewers. A lot of work goes, not only to the writing of the papers, but to an extended period of review and correction.