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BOOK OF ABSTRACTS



4th Belgrade Bioinformatics Conference

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EDITORS

Dr. Ivana Morić

Dr. Valentina Đorđević

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FOREWORD

Dear colleagues and friends,

The 4th Belgrade Bioinformatics Conference - BelBi2023, where many high-quality scientific contributions were presented, has just ended. With great thanks to all participants, we now proudly present a book of abstracts that both reflects the scientific abundance and diversity of the conference and serves as a reminder of a memorable event.

Several research institutions, faculties, and scientific societies from Serbia joined forces in organizing this international conference, which covered numerous topics in computational biology, bioinformatics, and biomedical and health informatics. The main goal of BelBi2023 was to foster contact between scientists, both early stage career and senior researchers, allowing them to share experiences and latest advances in their fields. We sincerely hope that BelBi2023 has served as a platform for researchers from around the world to meet, initiate new collaborations, and expand professional contacts, and that all of you would become a part of the growing BelBi community.

We are grateful and proud to have welcomed more than 250 researchers from 21 countries. We have had 28 scientific sessions, consisting of more than 60 lectures (including eight Keynote talks), 47 presented posters, as well as three workshops and one satellite event – COST action. We have also organized seven industry lectures, including the NGS Challenge,

two Meet the Expert Sessions, and one Business Coffee Break where ten start-up companies took part. And finally, the future BIO4 campus was presented and first panel on Serbia's resources for storage and analyses of genetic data was organized.

We would like to thank all the members of the International Advisory Board and the International Program Committee for their efforts and help in making this event a success. We are very grateful to the Ministry of Science, Technological Development and Innovation of the Republic of Serbia, SAIGE project, and UNDP-Serbia for their support. Finally, the Local Organizing Committee is very grateful to all the sponsors of the conference - BGI, Illumina & Elta'90MS, PacBio & East Diagnostics, ThermoFisher Scientific & Vivogen, Huawei, Labena, DSP Chromatography, RNIDS, Telekom Srbija, Alfa Genetics, Kefo and Superlab, hoping that they will stay with us for many years to come.

Looking forward to seeing you again at the 5th Belgrade Bioinformatics Conference.

Belgrade, July 2023

Dr. Valentina Đorđević
& *Dr. Ivana Morić,*
On behalf of BelBi2023
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Invited lectures

A Similarity-based Normative Framework for Bio-plausible Neural Nets

Anirvan Sengupta^{1,2}

¹ Flatiron Institute, 162 5th Ave, New York, NY 10010, USA

² Department of Physics and Astronomy, Rutgers University,
136 Frelinghuysen Rd, Piscataway, NJ 08854, USA

anirvans.physics@gmail.com

In the last decade, Artificial Neural Nets (ANNs), rebranded as Deep Learning, have revolutionized the field of Artificial Intelligence. While these neural nets have their origin in analogy with the neural networks in the brain, in many ways they are trained in ways that are very different from how real neurons learn. For example, to date there is no satisfactory biologically plausible mechanism for backpropagation, the workhorse for training ANNs.

Motivated by this gap, we have looked at alternative normative approaches to neural networks that could give rise to more plausible learning rules. One such approach, which works rather well for representation learning problems, is based on similarity matching or kernel alignment. In this approach, one demands that similar sensory inputs produce similar neural activities. From this rather limited constraint, one can give rise to interesting neural networks performing many common unsupervised learning tasks. I will illustrate, in particular, the case of representing continuous manifolds like spatial information. Here, this approach produces representations very much like place cells in the hippocampus. Consequences of our theory and its relations to some experiments would be discussed. Time permitting, I would touch upon the role of similarity matching in current work in ANNs as well.

Keywords: neural network, brain representation learning

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