



IEEE CIS Newsletter, Issue 86, April 2020

COVID-19 Notice

Dear IEEE Computational Intelligence Society Members,

The IEEE Computational Intelligence Society is closely monitoring developments related to the COVID-19 outbreak. The health and safety of our members is the number one priority of our Society. The Computational Intelligence Society is working diligently to ensure that the hard work of our conference organizers and authors is not minimized by the impact of this crisis, while also considering the health and safety of our participants. Several IEEE sponsored conferences and workshops have already made the decision to move to web-hosted events, while other conferences have decided to either change venues, reschedule the event, or proceed as planned. You can find the most recent announcements and updates from all of our Society's conferences and events at <https://cis.ieee.org/volunteer-resources/covid-19-notice> as our organizers make decisions.

We want to keep all of you informed as best as possible, so please continue to check this page for updates about upcoming conferences and events.

Publications

Covid-19 Related Research and Technologies Free to Access in IEEE Xplore®

IEEE realizes that many are directly or indirectly engaged in the fight against COVID-19 and its effects on global health and safety, research, infrastructure, communications, and more. IEEE has identified articles and standards from the IEEE *Xplore* digital library that may help researchers understand and manage different aspects of the COVID-19 pandemic and technologies that can be leveraged to combat it.

All content in this collection is now free to access, with additional rights for all types of reuse, including full text and data mining, and analysis.

We are continually monitoring the developments and will update the **IEEE Xplore** content periodically.

Thank you for your support of our shared mission to advance technology for humanity.

Research Frontier

Tackling Large-Scale and Combinatorial Bi-Level Problems With a Genetic Programming Hyper-Heuristic

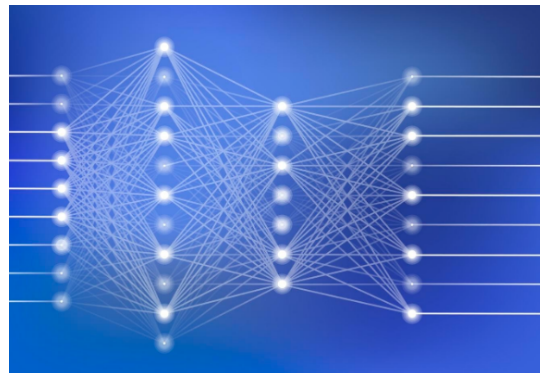
Combinatorial bi-level optimization remains a challenging topic, especially when the lower-level is an NP-hard problem. In this paper, we tackle large-scale and combinatorial bi-level problems using GP hyper-heuristics, i.e., an approach that permits to train heuristics like a machine learning model. Our contribution aims at targeting the intensive and complex lower-level optimizations that occur when solving a large-scale and combinatorial bi-level problem. For this purpose, we consider hyper-heuristics through heuristic



generation. Using a GP hyper-heuristic approach, we train greedy heuristics in order to make them more reliable when encountering unseen lower-level instances that could be generated during bi-level optimization. To validate our approach referred to as GA+AGH, we tackle instances from the bi-level cloud pricing optimization problem (BCPOP) that model the trading interactions between a cloud service provider and cloud service customers. Numerical results demonstrate the abilities of the trained heuristics to cope with the inherent nested structure that makes bi-level optimization problems so hard. Furthermore, it has been shown that training heuristics for lower-level optimization permits to outperform human-based heuristics and metaheuristics which constitute an excellent outcome for bi-level optimization. [Read More](#).

IEEE Transactions on Evolutionary Computation, Feb. 2020

Heterogeneous Multilayer Generalized Operational Perceptron



The traditional multilayer perceptron (MLP) using a McCulloch–Pitts neuron model is inherently limited to a set of neuronal activities, i.e., linear weighted sum followed by nonlinear thresholding step. Previously, generalized operational perceptron (GOP) was

proposed to extend the conventional perceptron model by defining a diverse set of neuronal activities to imitate a generalized model of biological neurons. Together with GOP, a progressive operational perceptron (POP) algorithm was proposed to optimize a predefined template of multiple homogeneous layers in a layerwise manner. In this paper, we propose an efficient algorithm to learn a compact, fully heterogeneous multilayer network that allows each individual neuron, regardless of the layer, to have distinct characteristics. Based on the

complexity of the problem, the proposed algorithm operates in a progressive manner on a neuronal level, searching for a compact topology, not only in terms of depth but also width, i.e., the number of neurons in each layer. The proposed algorithm is shown to outperform other related learning methods in extensive experiments on several classification problems. [Read More](#).

IEEE Transactions on Neural Networks and Learning Systems, Mar. 2020

Fuzzified Image Enhancement for Deep Learning in Iris Recognition

Deep learning techniques such as convolutional neural network and capsule network have attained good results in iris recognition. However, due to the influence of eyelashes, skin, and background noises, the model often needs many iterations to retrieve



informative iris patterns. Also because of some nonideal situations, such as reflection of glasses and facula on the eyeball, it is hard to detect the boundary of pupil and iris perfectly. Under such a circumstance, discarding the rest parts beyond the boundary may cause losing useful information. Hence, we use Gaussian, triangular fuzzy average, and triangular fuzzy median smoothing filters to preprocess the image by fuzzifying the region beyond the boundary to improve the signal-to-noise ratios. We applied the enhanced images through fuzzy operations to train deep learning methods, which speeds up the process of convergence and also increases the recognition accuracy rate. The saliency maps show that fuzzified image filters make the images more informative for deep learning. The proposed fuzzy operation of images may be a robust technique in

many other deep-learning applications of image processing, analysis, and prediction. [Read More.](#)

IEEE Transactions on Fuzzy Systems, Jan. 2020

DeepFeat: A Bottom-Up and Top-Down Saliency Model Based on Deep Features of Convolutional Neural Networks

A deep feature-based saliency model (DeepFeat) is developed to leverage understanding of the prediction of human fixations. Conventional saliency models often predict the human visual attention relying on few image cues. Although such models predict fixations on



a variety of image complexities, their approaches are limited to the incorporated features. In this paper, we aim to utilize the deep features of convolutional neural networks by combining bottom-up (BU) and top-down (TD) saliency maps. The proposed framework is applied on deep features of three popular deep convolutional neural networks (DCNNs). We exploit four evaluation metrics to evaluate the correspondence between the proposed saliency model and the ground-truth fixations over two datasets. The results demonstrate that the deep features of pre-trained DCNNs over the ImageNet dataset are strong predictors of the human fixations. The incorporation of BU and TD saliency maps outperforms the individual BU or TD implementations. Moreover, in comparison to nine saliency models, including four state-of-the-art and five conventional saliency models, our proposed DeepFeat model outperforms the conventional saliency models over all four evaluation metrics. [Read More.](#)

Member Activities

2020 Call for CIS Award Nominations

The IEEE Computational Intelligence Society annually recognizes significant contributions and meritorious service in the field of computational intelligence. Recognizing volunteers and eminent colleagues is a key element to keep our Society alive and to promote research excellence in computational intelligence.

Please consider nominating well-deserving colleagues for one of the following awards:

- Neural Networks Pioneer Award
- Fuzzy Systems Pioneer Award
- Evolutionary Computation Pioneer Award
- Meritorious Service Award
- IEEE Transactions on Neural Networks and Learning Systems Outstanding Paper Award
- Outstanding Chapter Award
- Outstanding PhD Dissertation Award
- Outstanding Organization Award
- Outstanding Early Career Award

The completed nomination must be submitted by email to the Awards Soliciting Nominations Subcommittee Chair, Prof. Sanaz Mostaghim (Sanaz.mostaghim@ovgu.de) and a copy to cis-info@ieee.org by **30 April 2020** in a single, **standalone** PDF file. **Self-nominations are not allowed.** The nomination can be considered submitted only after acknowledgement of the Awards Soliciting Nominations Subcommittee Chair.

For more information, details and procedural aspects, please visit the [awards webpage](#) or contact the CIS Awards Committee Chair, Prof. Cesare Alippi alippi@elet.polimi.it.

CIS Conferences

Due to the outbreak of the COVID-19 pandemic, dates and details of CIS sponsored conferences should be monitored closely.

The situation is changing very quickly. Please consult the conference web pages frequently to obtain the latest information.



18th International Conference on Information Processing and Management of Uncertainty in Knowledge-Based Systems (IPMU)

Lisbon, Portugal
25-27 Jun 2020

2020 Joint IEEE 10th International Conference on Development and Learning and Epigenetic Robotics (ICDL-EpiRob)

Valparaíso, Chile
7-10 Sep 2020

2020 IEEE Conference on Games (CoG)

Higashiosaka, Japan
24-27 Aug 2020

5th South-East Europe Design Automation, Computer Engineering, Computer Networks and Social Media Conference (SEEDA CECNSM)

Corfu, Greece
25-27 Sep 2020
(Submission: 24 April 2020)

2020 International Conference on Process Mining (ICPM)

Padua, Italy
5-8 Oct 2020
(Submission: 24 June 2020)

2020 IEEE International Conference on Computational Intelligence in
Bioinformatics and Computational Biology (CIBCB)

Viña del Mar, Chile

27-29 Oct 2020

(Submission: 1 May 2020)

2020 IEEE Latin American Conference on Computational Intelligence
(LA-CCI)

Temuco, Chile

4-6 Nov 2020

(Submission: 29 May 2020)

2020 IEEE 7th International Conference on Data Science and
Advanced Analytics (DSAA)

Sydney, Australia

6-9 Oct 2020

(Submission: 24 May 2020)

2020 IEEE Symposium Series on Computational Intelligence (IEEE
SSCI)

Canberra, Australia

1-4 Dec 2020

(Submission: 7 Aug 2020 -- strict deadline)

2021 Smart World Village

Atlanta, Georgia

18-21 Oct 2020

CIS sponsors and co-sponsors a
number of conferences across
the globe.

[View Full Schedule](#)

Announcements

Call for Papers (Journal)

- [IEEE TNNLS Special Issue on Adaptive Learning and Control for Autonomous Vehicles \(30 Jul\)](#)
- [IEEE TEVC Special Issue on Evolutionary Computation Meets Deep Learning \(1 Sept\)](#)
- [IEEE TNNLS Special Issue on New Frontiers in Extremely Efficient Reservoir Computing \(15 Sept\)](#)
- [IEEE TNNLS Special Issue on Biologically Learned/Inspired Methods for Sensing, Control and Decision Making \(31 Oct\)](#)
- [IEEE TFS Special Issue on Fuzzy Systems Toward Human-Explainable Artificial Intelligence and Their Applications \(31 Oct\)](#)
- [IEEE TEVC Special Issue on Multi-task Evolutionary Computation \(1 Nov\)](#)

Call for Papers (Conference)

- [International Conference on Applied Artificial Intelligence \(ICAPAI 2020\) \(19 Apr\)](#)
- [The 16th International Conference on Predictive Models and Data Analytics in Software Engineering \(PROMISE 2020\) \(30 Jun\)](#)

Career Opportunities

- [Assistant professor, Associate Professor, or professor-level positions in the Department of Computer Science at CINVESTAV-IPN of Mexico \(26 June\)](#). We give Higher priority to candidates in Data Science or Machine Learning field, although applicants from all areas of Computer Science are welcome.
- [7 Postdoctoral Fellow in Artificial Intelligence at Victoria University of Wellington \(Job Ref 2000024\) \(31 July\)](#)

This global health crisis is a unique challenge that has impacted many members of the IEEE family. These are difficult times, but we will get

through them by working together. Thank you for your support of our shared mission to advance technology for humanity.



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