**IEEE CIS Newsletter, Issue 86, March 2020**

## IEEE Transactions on Artificial Intelligence

It is here, it is now, it is a great piece of news! IEEE has established the new journal our community has been waiting for to publish our work on Artificial Intelligence! Don't miss out on this opportunity and join the community of authors who started already preparing their papers for *IEEE Transactions on Artificial Intelligence* (IEEE TAI)! In one month, you will be



Image Credit: Lizete De Assis

able to submit your paper. It is time to prepare your best piece of work for IEEE TAI to increase your visibility in the international AI community and to be among the first authors to publish in IEEE TAI.
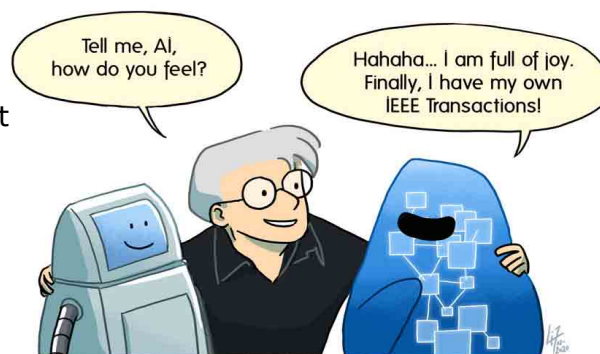
IEEE TAI is a collaboration between five IEEE Societies: Computational Intelligence Society (lead), Computer Society, Systems Man Cybernetics Society, Signal Processing Society, and Robotics and Automation Society. IEEE TAI will start receiving papers in April 2020 with the first issue scheduled for August 2020.  Below is the scope for IEEE TAI:

"The *IEEE Transactions on Artificial Intelligence (IEEE TAI)* is a

multidisciplinary journal publishing papers on theories and methodologies of Artificial Intelligence. Applications of Artificial Intelligence are also considered."

Please visit IEEE TAI webpage for more information.

Queries to the Founding Editor-in-Chief, Prof. Hussein Abbass from UNSW Canberra, Australia, at ieee.tai.eic@gmail.com.

# Research Frontier

## A Review of Evolutionary Multimodal Multiobjective Optimization

Multimodal multiobjective optimization aims to find all Pareto optimal solutions, including overlapping solutions in the objective space. Multimodal multiobjective optimization has been investigated in the evolutionary computation community since 2005. However, it is difficult to survey existing studies in this field because they have been independently conducted and do not explicitly use the term "multimodal multiobjective optimization." To address this issue, this letter reviews the existing studies of evolutionary multimodal multiobjective optimization, including studies published under names that are different from multimodal multiobjective optimization. Our review also clarifies open issues in this research area. Read More.

*IEEE Transactions on Evolutionary Computation, Feb. 2020*

## Fuzzy Support Vector Machine With Relative Density Information for Classifying Imbalanced Data

Fuzzy support vector machine (FSVM) has been combined with class imbalance learning (CIL) strategies to address the problem of classifying skewed data. However, the existing approaches hold several inherent drawbacks, causing the inaccurate prior data distribution estimation, further decreasing the quality of the classification model. To solve this problem, we present a more robust prior data distribution information extraction method named relative density, and two novel FSVM-CIL algorithms based on the relative density information in this paper. In our proposed algorithms, a K-nearest neighbors-based probability density estimation (KNN-PDE) alike strategy is utilized to calculate the relative density of each training instance. In particular, the relative density is irrelevant with the dimensionality of data distribution in feature space, but only reflects the significance of each instance within its class; hence, it is more robust than the absolute distance information. In addition, the relative density can better seize the prior data distribution information, no matter the data distribution is easy or complex. Even for the data with small injunctions or a large class overlap, the relative density information can reflect its details well. We evaluated the proposed algorithms on an amount of synthetic and real-world imbalanced datasets. The results show that our proposed algorithms obviously outperform some previous work, especially on those datasets with sophisticated distributions. Read More.

*IEEE Transactions on Fuzzy Systems, Dec. 2019*

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## Selection and Optimization of Temporal Spike Encoding Methods for Spiking Neural Networks

Spiking neural networks (SNNs) receive trains of spiking events as inputs. In order to design efficient SNN systems, real-valued signals must be optimally encoded into spike trains so that the task-relevant

information is retained. This paper provides a systematic quantitative and qualitative analysis and guidelines for optimal temporal encoding. It proposes a methodology of a three-step encoding workflow: method selection by signal characteristics, parameter optimization by error metrics between original and reconstructed signals, and validation by comparison of the original signal and the encoded spike train. Four encoding methods are analyzed: one stimulus estimation [Ben's Spiker algorithm (BSA)] and three temporal contrast [threshold-based, step-forward (SW), and moving-window (MW)] encodings. A short theoretical analysis is provided, and the extended quantitative analysis is carried out applying four types of test signals: step-wise signal, smooth (sinusoid) signal with added noise, trended smooth signal, and event-like smooth signal. Various time-domain and frequency spectrum properties are explored, and a comparison is provided. BSA, the only method providing unipolar spikes, was shown to be ineffective for step-wise signals, but it can follow smoothly changing signals if filter coefficients are scaled appropriately. Producing bipolar (positive and negative) spike trains, SW encoding was most effective for all types of signals as it proved to be robust and easy to optimize. Signal-to-noise ratio (SNR) can be recommended as the error metric for parameter optimization. Currently, only a visual check is available for final validation. Read More.

*IEEE Transactions on Neural Networks and Learning Systems, Feb. 2020*

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# 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.

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**Call for Project Proposals for IEEE CIS Chapters**

The IEEE Computational Intelligence Society (CIS) invites CIS Chapters to submit projects that focus on any of the following topics:

- Interactions with local industry (e.g., promoting membership within people working at a local company).

- Promoting diversity and inclusion (e.g., increasing the participation of women and indigenous groups).

- Mentorship and outreach programs.

- Organization of regional forums focused on topics related to Computational Intelligence.

- Ethical and social implications of computational intelligence.

Who is eligible?

- Any CIS Chapter which is currently active and had organized a minimum of two events in 2019. Such events must have been properly reported to the IEEE (using Vtools) AND to the CIS Chapters Chair (Marde Helbig <m.helbig@griffith.edu.au>) by **15 March 2020**.
- CIS Chapters which were inactive during 2019 or are in the process of being dissolved (or have been dissolved) by the IEEE are not eligible to participate.

For more information please visit the IEEE CIS Chapters webpage.

# Educational Activities

**Call for Applications: 2020 Graduate Student Research Grants**

The IEEE Computational Intelligence Society (CIS) funds scholarships for undergraduate, graduate and PhD students who need financial support to carry out their research during an academic break period. The primary intent of these scholarships is to cover the expenses related to a visit to another university, institute or research agency for collaboration with an identified researcher in the field of interest of the applicant. Funds can be used to cover travel expenses as well as certain living expenses (such as housing). The field of interest of applicants is open but should be connected with an identifiable component of the CIS (neural networks, fuzzy systems, or evolutionary computation).

The call for the next round of applications has a deadline for submission of **15 March 2020**. Submissions should be made via EasyChair.

More information on the scheme, including past projects, can be found on the CIS Graduate Student Research Grants webpage.

# CIS Conferences



2020 Joint IEEE 10th International Conference on Development and Learning and Epigenetic Robotics (ICDL-EpiRob)
Valparaíso, Chile
7-10 Sep. 2020
**(Submission: 15 Mar. 2020)**

2020 IEEE Conference on Games (CoG)
Higashiosaka, Japan
24-27 Aug. 2020
**(Submission: 23 Mar. 2020)**

5th South-East Europe Design Automation, Computer Engineering, Computer Networks and Social Media Conference (SEEDA CECNSM 2020)
**Corfu, Greece**
**Sep 25-27, 2020**
**(Submission:  24 April 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 7th International Conference on Data Science and Advanced Analytics (DSAA 2020)
Sydney, Australia

6-9 Oct. 2020
**(Submission: 24 May 2020)**

2020 IEEE Symposium Series on Computational Intelligence (IEEE SSCI 2020)
Canberra, Australia
1-4 Dec. 2020
**(Submission: 7 Aug. 2020 -- strict deadline)**

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)

- 2020 IEEE / ITU International Conference on Artificial Intelligence for Good (AI4G) (9 Mar)

- 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)

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