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Research Frontier

Surrogate-Assisted Cooperative Swarm Optimization of High-Dimensional Expensive Problems

Surrogate models have shown to be effective in assisting metaheuristic algorithms for solving computationally expensive complex optimization problems. The effectiveness of existing surrogate-assisted metaheuristic algorithms, however, has only been verified on low-dimensional optimization problems. In this paper, a surrogate-assisted cooperative swarm optimization algorithm is proposed, in which a surrogate-assisted particle swarm optimization (PSO) algorithm and a surrogate-assisted social learning-based PSO (SL-PSO) algorithm cooperatively search for the global optimum. The cooperation between the PSO and the SL-PSO consists of two aspects. First, they share promising solutions evaluated by the real fitness function. Second, the SL-PSO focuses on exploration while the PSO concentrates on local search. Empirical studies on six 50-D and six 100-D benchmark problems demonstrate that the proposed algorithm is able to find high-quality solutions for high-dimensional problems on a limited computational budget.

IEEE Transactions on Evolutionary Computation, Aug. 2017

A Survey of Memristive Threshold Logic Circuits

In this paper, we review different memristive threshold logic (MTL) circuits that are inspired from the synaptic action of the flow of neurotransmitters in the biological brain. The brainlike generalization ability and the area minimization of these threshold logic circuits aim toward crossing Moore's law boundaries at device, circuits, and systems levels. Fast switching memory, signal processing, control systems, programmable logic, image processing, reconfigurable computing, and pattern recognition are identified as some of the potential applications of MTL systems. The physical realization of nanoscale devices with memristive behavior from materials, such as TiO2, ferroelectrics, silicon, and polymers, has accelerated research effort in these application areas, inspiring the scientific community to pursue the design of high-speed, low-cost, low-power, and high-density neuromorphic architectures.
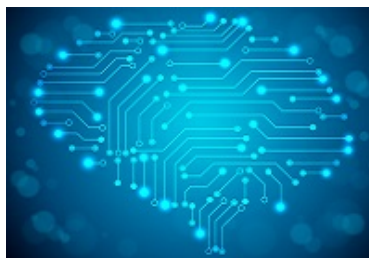
IEEE Transactions on Neural Networks and Learning Systems, Aug. 2017

Online Algorithm for Robots to Learn Object Concepts and La...

Humans form concept of objects by classifying them into categories, and ... language by simultaneously interacting with others. Thus, the meaning of a word can be learned by connecting a recognized word to its corresponding concept. We consider this ability important

Important Message

⭐ **Proposals for IEEE CIS Conferences in 2019**

Proposals for the organization of IEEE CIS financially sponsored conferences in 2019 must be submitted as soon as possible, and no later than **Dec. 31, 2017**. (Details)

⭐ **Call-for-Proposals: Activity Promotion Grants**

IEEE CIS has strategic plans to promote member activities through chapters and set up an activity promotion grant. We accept proposals until **Dec. 1, 2017** or the funding has all been used up. (Details)

⭐ **Call for Senior Member Applications**

The IEEE CIS Senior Members Subcommittee encourages you to consider applying to become a Senior Member, and we can assist you with the senior member promotion. (Details)

CIS Conferences

⭐ Conference Calendar (2017-2018)

⭐ 2017 IEEE International Conference on Data Science and Advanced

Oct. 19-21, 2017

for robots to flexibly develop knowledge of language and concepts. In this paper, we propose an online algorithm for robots to acquire knowledge of natural language and learn object concepts. A robot learns the language model from word sequences, which are obtained by the segmentation of phoneme sequences provided by a user, by using unsupervised word segmentation each time it is provided with a new object. Moreover, the robot acquires object concepts using these word sequences as well as multimodal information obtained by observing objects. The crucial aspect of our model is the interdependence of words and concepts: there is a high probability that the same words will be uttered to describe objects in the same category. By taking this relationship into account, our proposed method enables robots to acquire a more accurate language model and object concepts online. Experimental results verify this.

IEEE Transactions on Cognitive and Developmental Systems, Sep. 2017

5 Minutes with Prof. Jerry Mendel

IEEE CIS Student Activities Subcommittee invites you to get to know the pioneers and experts in the Computational Intelligence. This month "5 minutes with..." focuses on pioneer **Prof. Jerry Mendel**.

1. What is your title, full name, and place of work?
   Professor of Electrical Engineering (I will be Emeritus as of January 5, 2018), Jerry Marc Mendel, University of Southern California

2. What grade of member in CIS are you?
   Life Fellow

3. How long have you been a member of CIS?
   For as long as the CIS has existed.

4. One reason why you are a member of CIS:
   My research interests match its coverage perfectly.

5. What was your service pathway in the Computational Intelligence Society?
   My recollection is that it began with organizing sessions at FUZZ-IEEE, becoming a member and then Chair of the Fuzzy Systems TC, and then being asked to run for the AdCOM. I did and was very privileged to have served on it for 9 years. Meeting and being able to interact with AdCom members was a truly wonderful experience for me. My most fun project was being Chair of the committee that created and ran the first CIS competition to produce a short video that explained fuzzy sets and systems. We had two winners.

6. Give one interesting fact about yourself:
   I am an avid Bridge player having played now for more than 55 years. I also read a lot of Bridge books.

Read more

Technical Activities

Computational Intelligence in Bioinformatics and Computational Biology

⌄ Editor

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The IEEE CIBCB 2017 conference sponsored by the CIS Bioinformatics and Bioengineering Technical Committee was held August 23-25 in Manchester, UK. The conference brought together students and researchers from 23 countries. We heard talks on diverse topics in bioinformatics and bioengineering, including special sessions on machine learning in medical diagnosis and prognosis, computational intelligence in biological feature induction, multi-objective optimization in computational biology and bioinformatics, parallel and distributed high performance computing solutions for computational intelligence methods, and digital signal processing for genomic and metagenomic sequence analysis. You can visit the conference website to see slides from the tutorials and some of the presentations.

Educational Activities

Coming soon to IEEE.tv – plenary talks from CEC 2017

Videos of two plenary talks from IEEE 2017 Congress on Evolutionary Computation (CEC 2017) are soon to appear on IEEE.tv. The videos were recorded by Borja Calvo of the CIS Education Multimedia subcommittee and submitted by Paul Kaufmann of Educational Materials subcommittee. Details as follows:

- **Title: When Do We Resort to Evolutionary Computation in the Communications Industry – And What is Needed in the Future?**
  Speaker: Rainer Storn

- **Title: How Symmetry Constrains Evolutionary Optimizers: Black Box Differential Evolution – A Case Study**
  Speaker: Kenneth V. Price

University Curricula Subcommittee

The CIS University Curricula Subcommittee intends to build up a collection of links to good quality courses on "everything CI". Are you teaching a CI course, and either some or all material can be accessed by interested learners free-of-charge? If this is the case, you are cordially invited to submit your course to the newly created subreddit. Or do you know of a great course? If so, then tell the teaching staff about this opportunity to (1) get some exposure and (2) contribute to the education of the general public!

Over time, this subreddit will contain educational material that can be used by everybody, for example, to learn about some cool CI technology from scratch, or to keep up-to-date with new trends. The dynamic nature of subreddits allows us to easily share details about courses, as well as to ask and answer questions. The subreddit will be lightly moderated by the Subcommittee, lead by Markus Wagner.

Summer School

2017 IEEE CIS Summer School on Computational and Artificial Intelligence
July 8-11 & 23-26, 2017, Beijing, China
Institute of Automation, Chinese Academy of Sciences

We were happy to organize the 2017 IEEE CIS Summer School on Computational and Artificial Intelligence. Due to the tremendous applications over 2000 undergraduates who rank within top 5 in their majors from top universities in China, we had to divide it into two schools. The first was from July 8th to 11th to host 100 students and the second was from July 23rd to 26th to host the 120 students. The main target of the summer school was to provide senior undergraduate students and other potential audience with hands-on knowledge on sophisticated CI (Computational Intelligence) based AI (Artificial Intelligence) algorithms and methods, most recent advances and developments in CI and AI research.

Call for Papers (Journal)

- IEEE CIM Special Issue on Computational Intelligence Techniques in Bioinformatics and Bioengineering (Nov 15)
- IEEE CIM Special Issue on Computational Intelligence in Finance and Economics (Dec 31)
- IEEE TCDS Special Issue on Neuro-Robotics Systems: Sensing, Cognition, Learning and Control (Nov 30)
- IEEE TETCI Special Issue on Human-Machine Symbiosis (Oct 2)
- IEEE TETCI Special Issue on Large-scale Memristive Systems and Neurochips for Computational Intelligence (Oct 30)
- IEEE TETCI Special Issue on Computational Intelligence in Data-Driven Optimization (Jan 31, 2018)

Call for Papers (Conference)

- Call for Special Sessions / Tutorials / Competitions / Workshops: IEEE World Congress on Computational Intelligence (WCCI 2018) (Dec 15)
- IEEE Conference on Evolving and Adaptive Intelligent Systems (EAIS 2018) (Jan 20, 2018)
- European Conference on Genetic Programming (EuroGP 2018) (Nov 1)
- International Conference on Advanced Computational Intelligence (ICACI 2018) (Nov 15)
- International Symposium on Neural Networks (ISNN 2018) (Jan 15, 2018)
- International Conference on Information Science and Technology (ICIST 2018) (Feb 1, 2018)

Call for Participation

- IEEE CIS 2017 Competition: "Telling a Story: How your Computational Intelligence Research benefits Society and Humanity" (Oct 1)
- IEEE Computer Society 2017 Call for Major Award Nominations (Oct 1)
- IEEE SMC Workshop on Brain-Machine Interface Systems (SM Canada (Oct 5-8)
- International Conference on Behavioral, Economic, and Socio-Cultural Computing (BESC 2017), Krakow, Poland (Oct 16-18)

- IEEE International Conference on Data Science and Advanced Analytics (DSAA 2017), Tokyo, Japan (Oct 19-21)
- International Conference on Simulated Evolution and Learning (SEAL 2017), Shenzhen, China (Nov 10-13)

Career Opportunities

- PhD Scholarship on Machine Learning for Software Engineering, University of Leicester, UK (Open until Filled)
- PhD Scholarship in EECS, South Dakota State University, USA (Feb, 2018)