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Comments from the Editors

Dear ACM/SIGDA members,

We are excited to present to you the July e-newsletter. We encourage you to invite your students and colleagues to be a part of the SIGDA newsletter. The newsletter covers a wide range of information from the upcoming conferences and hot research topics to technical news and activities from our community. Get involved and contact us if you want to contribute an article or announcement.

The newsletter is evolving, let us know what you think.

Happy reading!

Debjit Sinha, Keni Qiu, Editors-in-Chief, SIGDA E-News

To renew your ACM SIGDA membership, please visit http://www.acm.org/renew or call
between the hours of 8:30am to 4:30pm EST at +1-212-626-0500 (Global), or
1-800-342-6626 (US and Canada). For any questions, contact acmhelp@acm.org

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SIGDA News

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(1) "Apple Moving Macs from Intel to Arm"
[https://www.eetimes.com/apple-moving-macs-from-intel-to-arm/]

After two years of rumors, at this year's (virtual) World Wide Developer Conference (WWDC), Apple finally announced that it was going to migrate all its Mac products from Intel processors to the company's own Arm-based silicon.

(2) "Qualcomm Launches 5G and AI Robotics Platform"
[https://www.eetimes.com/qualcomm-launches-5g-and-ai-robotics-platform/]

Qualcomm Technologies launched Wednesday a premium 5G and AI-enabled robotics platform with advanced high-performance edge computing and computer vision capability. The move follows the company's launch of its entry-level robotics platform just over a year ago.

(3) "Lattice Reinvents General-Purpose FPGA Offering"
[https://www.eetimes.com/lattice-reinvents-general-purpose-fpga-offering/]

Lattice has launched a family of general-purpose FPGA devices, the second family built on its Nexus technology platform. The Certus-NX family offers high I/O density, small form factor, low power consumption, and enhanced security features for data co-processing, signal bridging, and system control.

(4) "Lattice Reinvents General-Purpose FPGA Offering"
[https://www.eetimes.com/intels-10nm-node-past-present-and-future-part-2/]

Lattice has launched a family of general-purpose FPGA devices, the second family built on its Nexus technology platform. The Certus-NX family offers high I/O density, small form factor, low power consumption, and enhanced security features for data co-processing, signal bridging, and system control.

(5) "Start-up Helps FPGAs Replace GPUs in AI Accelerators"
[https://www.eetimes.com/start-up-helps-fpgas-replace-gpus-in-ai-accelerators/]

AI software startup Mipsology is working with Xilinx to enable FPGAs to replace GPUs in AI accelerator applications using only a single additional command. Mipsology's "zero effort" software, Zebra, converts GPU code to run on Mipsology's AI compute engine on an FPGA without any code changes or retraining necessary.

(6) "Siemens Acquires UltraSoC for SoC Lifecycle Product Suite"
[https://www.eetimes.com/siemens-acquires-ultrasoc-for-soc-lifecycle-product-suit...]

Siemens is to acquire Cambridge UK-based UltraSoC with the goal of integrating their respective products. The terms of the deal were not disclosed.

(7) "Intel Doubles Down On AI Strategy With New CPU, FPGA Silicon"
[https://www.eetimes.com/intel-doubles-down-on-ai-strategy-with-new-cpu-fpga-sili...]

As part of its AI strategy for the data center, Intel announced several devices tailored specifically for this market. This includes the third generation of its Xeon Scalable CPU, a new Stratix FPGA with a dedicated AI engine, new Optane persistent memory and NAND SSDs. The company also shed a little light on its AI strategy for the data center for the first time since acquiring dedicated data center AI accelerator company Habana Labs six months ago.

(8) "Autonomous Vehicles in Covid Economy"
[https://www.eetimes.com/autonomous-vehicles-in-covid-economy/]

The Covid economy has already impacted the auto industry negatively, and more changes are on the way, along with a large dose of uncertainties. We can use what we have learned from the last few months to give perspectives on the likely future. The first table below summarizes a few things we have learned.

(9) "NXP to Jump to TSMC's 5nm for Next-Gen Auto SoC Platform"
[https://www.eetimes.com/nxp-to-jump-to-tsmcs-5nm-for-next-gen-auto-soc-platform/]

NXP Semiconductors announced Friday that it will become the first automotive chip company to jump to TSMC's 5nm process technology for the next generation "high-performance safe compute" automotive platform. NXP and TSMC expect to deliver the first sample devices to NXP's key customers toward the fall of 2021.

(10) "Applying AI Explainability To Covid-19 X-Ray Systems"
[https://www.eetimes.com/applying-ai-explainability-to-covid-19-x-ray-systems/]

You complete the patient's X-ray and wait while the AI agent diagnoses the problem. After a few minutes, the AI returns a diagnosis that is clearly wrong, with a 98% confidence level. What do you do? Take a chance on retaking the X-ray, or page the consultant?

"What is" Column

What is online hybrid system model checking of CPS?

Dr. Lei Bu

Professor

State Key Laboratory of Novel Software Technology

Department of Computer Science and Technology

Nanjing University, China

By combining communication, computation, and control (3C), Cyber-Physical Systems (CPS) [1] have comprehensive knowledge of their working environment and the other components of the system. Thus, CPS can generate accurate instructions, achieve complex targets, and gain advantages like reliability and efficiency. Among these goals, as CPS are widely used in the safety-critical area, guaranteeing the basic safety is after all the top concern.

Due to the existence of both discrete control modes transition and continuous real-time behavior in CPS, the behavior of CPS is a complex hybrid state space. Therefore, the model checking of hybrid systems [2] has been widely applied in guaranteeing the safety of CPS. Conventionally, complete hybrid automata models of CPS are built first; then, safety specifications are verified by hybrid system model checking methods. These procedures are conducted offline and before the systems run in the real world. However, existing offline hybrid system model checking methods are not capable to handle real-world CPS efficiently.

The main problem is that the behavior of CPS is highly dynamic. The runtime configurations, i.e. number of active components, values of control parameters, in CPS are generated/changed online with high nondeterminism. Thus, only a parametric model with free parameters [3] can be given for the system's state space. As a result, the classical convention of building and checking a comprehensive static hybrid system model before the CPS system is deployed (i.e. offline model checking) is difficult and often impractical.

To address this challenge, instead of the conventional offline model checking of time-unbounded future behaviors, the online hybrid system model checking of time-bounded short-run future behaviors is a promising direction [4]. Different

from the offline model checking of CPS, online model checking is performed during the runtime of CPS. The parametric model of the system can be concretized online using the runtime collected numeric values of these free parameters. The system behavior in the short run future is then predictable and describable according to the set of values. Then, we can check the safety of this online concretized model quickly. If any property is proved to be risky in the bounded future state space, the running CPS system will be stopped and switched to an application-dependent fall-back plan immediately for the concern of safety.

As the modeling and verification is conducted online, the whole procedure must be fast, so as to guarantee discovering errors before they happen, and to provide as much time as possible for the online systems to react. To this end, the following steps can be taken:

1. The designers pay special interest in checking whether any of the predefined safety-critical scenarios will happen in the systems' behavior. Typically, each scenario can be presented as a path (a.k.a., a sequence of control actions and control modes) in the model. Compared with checking the whole system, the checking of the feasibility of a given path can be handled by existing constraint solving techniques easily [3].

2. The online models for each cycle are very similar to each other. Therefore, instead of modeling and checking the system for the current cycle from scratch, it is possible to take advantage of the "incremental constraint solving" technique to reuse the problem space of the previously solved problem to increase the efficiency of the whole procedure [5].

The above methods show great applicability in handling highly dynamic CPS, and have been successfully studied in train control systems, medical surgery systems [6] and so on. In the future, how to handle complex nonlinear systems online remains an important question to solve. Meanwhile, once a potential violation is detected by online checking, instead of calling a predefined fall-back plan, like emergent braking in the train control system, how to conduct online control synthesis is also a very interesting question to study.

[1] Edward A. Lee. Cyber-Physical Systems - Are Computing Foundations Adequate? Position paper for National Science Foundation workshop on Cyber-Physical Systems: Research Motivation, Techniques and Roadmap, 2006.
[2] Thomas A Henzinger. The theory of hybrid automata. In Verification of digital and hybrid systems, pages 265–292. Springer, 2000.
[3] Lei Bu, Qixin Wang, Xinyue Ren, Shaopeng Xing, Xuandong Li, Scenario-based Online Reachability Validation For CPS Fault Prediction, in IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems, doi: 10.1109/TCAD.2019.2935062.
[4] Lei Bu, Qixin Wang, Xin Chen, Linzhang Wang, Tian Zhang, Jianhua Zhao, Xuandong Li. Toward Online Hybrid Systems Model Checking of Cyber-Physical Systems' Time-bounded Short-run Behavior. SIGBED Review, 8(2): 7-10, 2011.
[5] Lei Bu, Shaopeng Xing, Xinyue Ren, Yang Yang, Qixin Wang, Xuandong Li. Incremental Online Verification of Dynamic Cyber-Physical Systems. in Proceedings of DATE 2019: 782-787
[6] Tao Li, Feng Tan, Qixin Wang, Lei Bu, Jiannong Cao, Xue Liu. From Offline Toward Real Time: A Hybrid Systems Model Checking and CPS Codesign Approach for Medical Device Plug-and-Play Collaborations. IEEE Transactions on Parallel and Distributed Systems, 25(3): 642-652, 2014.

Paper Submission Deadlines

HiPC'20 – IEEE Int'l Conference on High Performance Computing, Data, And Analytics
Pune, India
Deadline: July 8, 2020 (Abstracts due: July 1, 2020)
Dec 16-19, 2020
http://www.hipc.org

iSES'20 – IEEE Int'l Symposium on Smart Electronic Systems
Chennai, India
Deadline: July 31, 2020
Dec 14-16, 2020
http://www.ieee-ises.org

SLIP^2 - System-Level Interconnect Problems and Pathfinding (co-located with ICCAD 2020)
San Diego, CA
Deadline: Aug 21, 2020 (Abstracts due: Aug 14, 2020)
Nov 5, 2020
http://sliponline.org

WOSET'20 - Workshop on Open-Source EDA Technology (co-located with ICCAD 2020)
San Diego, CA
Deadline: Sept 6, 2020
Nov 5, 2020
https://woset-workshop.github.io

Upcoming Conferences and Symposia

ISVLSI'20 – IEEE Computer Society Annual Symposium on VLSI
Limassol, Cyprus
Jul 6-8, 2020
http://www.isvlsi.org

ICDCS'20 – IEEE Int'l Conference on Distributed Computing Systems
Singapore
Jul 8-10, 2019
https://icdcs2020.sg

DAC'20 – Design Automation Conference
Virtual
Jul 19-23, 2020
http://www.dac.com/

IWBDA'20 - Int'l Workshop on Bio-Design Automation
Online
Aug 3-5, 2020
http://www.iwbdaconf.org/2020

ISLPED'20 – ACM/IEEE Int'l Symposium on Low Power Electronics and Design
Boston, MA
Aug 10-12, 2020
http://www.islped.org

ESWEEK'20 - Embedded Systems Week (CASES, CODES+ISSS, and EMSOFT)
Hamburg, Germany
Deadline: Apr 17, 2020 (Abstracts due: Apr 3, 2020)
Sept 20-25, 2020
http://www.esweek.org

NOCS'20 – IEEE/ACM Int'l Symposium on Networks-on-Chip (co-located with ESWEEK'20)
Virtual Conference
Sept 24-25, 2020
http://nocs2020.engr.uky.edu/

GLSVLSI'20 – ACM Great Lakes Symposium on VLSI
Beijing, China
Sept 7-9, 2020
http://www.glsvlsi.org

PACT'20 - Int'l Conference on Parallel Architectures and Compilation
Techniques
Atlanta, GA
Oct 3-7, 2020
http://www.pactconf.org

VLSI-SoC'20 – IFIP/IEEE Int'l Conference on Very Large Scale Integration
Salt Lake City, UT
Oct 5-7, 2020
http://www.vlsi-soc.com

ISCAS'20 – IEEE Int'l Symposium on Circuits and Systems
Seville, Spain
Oct 11-14, 2020
http://iscas2020.org

MICRO'20 – IEEE/ACM Int'l Symposium on Microarchitecture
Athens, Greece
Oct 17-21, 2020
http://www.microarch.org/micro53

BodyNets'20 – Int'l Conference on Body Area Networks
Cyberspace
Oct 21-22, 2020
http://www.bodynets.org

ICCAD'20 – IEEE/ACM Int'l Conference on Computer-Aided Design
San Diego, CA
Nov 2-5, 2020
http://www.iccad.com

HOST'20 – IEEE Int'l Symposium on Hardware-Oriented Security and Trust
San Jose, CA
Dec 6-9, 2020
http://www.hostsymposium.org

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Best Paper Awards

Best Paper Awards at ISPD 2020: The International Symposium on Physical Design, http://www.ispd.cc

"TEMPO: Fast Mask Topography Effect Modeling with Deep Learning", by Wei Ye (UT Austin), Mohamed Baker Alawieh (UT Austin), Yuki Watanabe (Kioxia Corp.), Shigeki Nojima (Kioxia Corp.), Yibo Lin (Peking Univ.) and David Z. Pan (UT Austin).

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Activity Spotlight - ACM/IEEE Design Automation WebiNar (DAWN) Event 2

Fireside Chat: Career Development for Scholars in EDA Research

Hosts:

Yiran Chen, Duke University

Tsung-Yi Ho, National Tsing Hua University

Time: June 23 (Tuesday), 2020, 10-11:30AM EDT

Zoom Meeting Link: https://zoom.us/j/99382928700?pwd=TXl1cUhRN1JjK1ZCTkQvQmtjVXJ3dz09

Password: DAWN2020

Invited Guests:

Diana Marchulescu, Department Chair of ECE, UT Austin

Kwang-Ting Tim Cheng, Dean of Engineering, HKUST

Giovanni De Micheli, Former Director of Electrical Engineering Institute at EPFL

Ayse Kivilcim Coskun, Boston University

Phillip Stanley-Marbell, University of Cambridge

Jeyavijayan Rajendran, TAMU

Sponsors: ACM SIGDA, IEEE CEDA

Call for Submissions

1. IEEE D&T Special Issue on Near-Memory and In-Memory Processing

In this context, this special issue on Near-Memory and In-Memory Processing will introduce, explore, and investigate challenges and opportunities in developing innovative NMP/IMP computer architectures based on conventional and emerging technologies for a wide variety of modern applications. The aim of this special issue is to offer the readers a clear perspective of the rich landscape of both academic and industrial endeavors in architecting, designing and testing NMP/IMP architectures and systems. The special issue will not only showcase the state-of-the-art but also articulate the innovations and advances required for widespread adoption of such systems in existing and emerging application domains. In particular, the special issue will cover both hardware-, software- and algorithm-level techniques that enable and advance near-memory and in-memory processing systems (see topics of interest). It will include innovative design of circuit components, processor micro-architecture, heterogeneous systems, memory interface, software support, workloads analysis, and communications. It will delve into the design automation methodologies and optimizations, programming model, compilers to support NMP/IMP, verification & testing approaches, and concerns for the system robustness and security. The special issue will also incorporate various application domains that will benefit from the NMP or IMP. The submission details refer https://ieee-ceda.org/special-issue-near-memory-and-memory-processing/.

2. 2nd ACM/IEEE Workshop on Machine Learning for CAD (MLCAD)

The Virtual MLCAD workshop focuses on Machine Learning (ML) methods for all aspects of CAD and electronic system design. The predecessor of this workshop series was held at the Design, Automation and Test in Europe (DATE) Conference in March 2019, followed by the inaugural regular workshop in Banff, Canada, in September 2019. The workshop is sponsored by both IEEE Council on Electronic Design Automation (CEDA) and ACM Special Interest Group on Design Automation (SIGDA). More details on paper submission refer to http://mlcad.itec.kit.edu/.

Call for Participation - ROAD4NN 2020 Workshop

ROAD4NN 2020: International Workshop on Research Open Automatic Design for Neural Networks 2020

DAC 2020 Full Day Workshop, Jul 19, 2020, 9am - 4pm Pacific Time

To be held virtually

Overview

In the past decade, machine learning, especially neural network based deep learning, has achieved an amazing success. Various neural networks (NNs), such as CNNs, RNNs, LSTMs and SNNs, have been deployed for various industrial applications like image classification, speech recognition, and automated control. On one hand, there is a very fast algorithm evolvement of neural network models, almost every week there is a new model from a major academic and/or industry institute. On the other hand, all major industry giants have been developing and/or deploying specialized hardware platforms to accelerate the performance and energy-efficiency of neural networks across the cloud and edge devices. This include Nvidia GPU, ARM Embedded CPUs, Qualcomm Adreno Embedded GPUs, Intel Nervana/Habana/Loihi ASICs, Intel and Xilinx FPGAs, Google TPU, Microsoft Brainwave, Amazon Inferentia, Huawei Da Vinci architecture, and Cambricon NPU, to name just a few. However, there is a significant gap between the fast algorithm evolvement and staggering hardware development.

In this workshop, we focus on the open research problems of automatic design for neural networks, where we discuss full stack open source infrastructure support to develop and deploy novel neural networks, including novel algorithms and applications, hardware architectures and emerging devices, hardware-software co-design, as well as programming, compiler, system, and tool support. We will bring together academic and industry experts to share their experience, discuss challenges they face as well as potential focus areas for the community.

There will be a keynote given by Prof. Deming Chen, UIUC, who also co-founded Inspirit IoT, Inc.; the keynote title is "Elegant and Effective Co-design of Machine-Learning Algorithms and Hardware Accelerators". We have also invited 12 renowned researchers from academic and industry to give invited talks, who come from MIT, TAMU, UCSB, UC Berkeley, Cornell, Notre Dame, Rice, NCSU, W&M, Microsoft, and Xilinx. For free registration and more information on the workshop schedule, please visit: https://sites.google.com/view/road4nn

Welcome to register and attend (it's free)! We will send out the Zoom invitation to the registered attendees before the workshop event.

Technical Activities

1. "New UK Huawei £1 billion Optoelectronics R&D HQ Approved"

Huawei gets approval to build new £1 billion optoelectronics R&D facility in Cambridge, UK.
[https://www.eetimes.eu/new-uk-huawei-1-billion-optoelectronics-rd-hq-approved/]

2."Global Silicon Wafer Area Shipments Edge Up in 1Q 2020 Despite COVID-19 Headwinds"

Global silicon wafer area shipments rose 2.7% to 2,920 million square inches in Q1 2020, compared with Q4 2019 shipments of 2,844 million square inches, but dropped 4.3% YoY...
[https://www.eetasia.com/global-silicon-wafer-area-shipments-edge-up-in-1q-2020-d...]

3. "Investment in Digital Twins technology to grow in 2021"

According to a study from Juniper Research, the global market for Digital Twins technology has not been severely affected by the current pandemic. Researchers expect only a slight drop in revenue during 2020 — less than 1% — and an increase of 17% in 2021 reaching $12.7 billion.
[https://iot.eetimes.com/investment-in-digital-twins-technology-to-grow-in-2021/]

4. "Synopsys and Arm Extend Strategic Partnership to Deliver Superior Full-Flow Quality-of-Results and Time-to-Results"

Synopsys, Inc. (Nasdaq: SNPS) today announced it has signed a multi-year agreement with Arm for the purpose of accelerating design and verification of Arm®-based system-on-chips (SoCs) for mutual customers. With this agreement, Synopsys and Arm will jointly develop and distribute optimized Synopsys product reference methodologies to Arm customers and deliver training on the use of Synopsys products and flows with Arm IP. Synopsys' early access to Arm pre-production IP ensures that early licensees of the latest Arm cores have optimized products and methodology in place before they begin their design projects.
[https://www.edacafe.com/nbc/articles/1/1763079/Synopsys-Arm-Extend-Strategic-Par...]

Job Openings:
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1. Southern University of Science and Technology in Shenzhen China

Job Title: Professor / Associate Professor / Assistant Professor of Microelectronics

Description: School of Microelectronics (SME), National Exemplary School of Microelectronics, Southern University of Science and Technology (SUSTech) invites highly qualified candidates to fill multiple tenure-track/tenured faculty positions in the areas of (but not limited) Emerging Microelectronic Devices (Wide-bandgap, Nonvolatile memory, MEMS Sensor), and IC-Chip Designs (Future Computing/Communication/Biomedical SoC). Junior applicants should have (i) a PhD degree in related fields; and (ii) outstanding potential in teaching and research. Candidates for senior post are expected to have demonstrated exceptional academic leadership and strong commitment to be excellent in teaching, research, and services.
Submit (in English, PDF version) a cover letter, a statement in research and teaching, a CV plus copies of 3 most significant publications, and contacts of three referees to: sme-hr@sme.sustech.edu.cn entitled with "Apply for Faculty Position". Applicants are required to specify the rank of the position in their letter of application. The positions will be open until they are filled by appropriate candidates. For more information, please visit:
http://ohr.sustc.edu.cn/sustczp/product/recruit/a.do?action=toZPGWList2&entityId...

2. The University of Texas at Dallas

Job Title: Assistant Professor in Electrical and Computer Engineering

Description: The Electrical and Computer Engineering Department at UT Dallas has over 50 faculty members, approximately 600 EE and 550 CE undergraduate students, 425 EE and 90 CE graduate students, and offers BS, MS, and PhD degrees in Electrical Engineering and Computer Engineering, as well as MS and PhD degrees in Telecommunications Engineering. Areas of research expertise include microelectronics, photonics, communications and networks, signal processing, machine learning, embedded systems, analog electronics, power and energy systems, and control. Particular emphasis will be placed upon candidates having research expertise in either computer engineering, or

power and energy systems, or both. Examples include: Security, Electronic Design Automation, Machine Learning (and Embedded ML), Hardware Accelerators, Hybrid Computing, Human-Computer Interactions (Auditory), Data Center Architectures; Data Center Power Systems and Renewable Energy.

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3. The North Atlantic Qatar

Title: Assistant Professor of Electrical Engineering

Description: The beautiful and culturally progressive State of Qatar is home to the world-class post-secondary institution, College of the North Atlantic – Qatar (CNA-Q). Internationally recognized as a comprehensive technical college, CNA-Q is committed to high quality, student-centered education. This commitment is reflected through state-of-the-art facilities, accessible and responsive technology programs and strong partnerships with industry. The School of Engineering Technology and Industrial Trades invites applications for positions at the level of Assistant Professor in Electrical Engineering.

Applications should be submitted via our online application portal: https://careers.cna-qatar.com/en/qatar/jobs/assistant-professor-electrical-engin...

4. Technical University of Munich Department of Electrical and Computer Engineering

Title: Associate Professor / Full Professor in High-Power Converter Systems

Description: The Technical University of Munich (TUM) invites applications for the position of Associate Professor or Full Professor in » High-Power Converter Systems« to begin in summer semester 2021. The position is a tenured W3 position.

For Associate Professor Level: We are looking for a candidate with advanced scientific experience, proven by achievements in research and teaching at the highest international standards. A university degree and an outstanding doctoral degree or equivalent scientific qualification as well as pedagogical aptitude are also prerequisites. Substantial research experience abroad is expected. For Full Professor Level: We are looking for a candidate with high international reputation who has demonstrated an outstanding academic record and an internationally recognized research program. A university degree and an outstanding doctoral degree or equivalent scientific qualification as well as pedagogical aptitude are also prerequisites. Substantial research experience abroad is expected.

Please send your application no later than 31.07.2020 to the Dean of Electrical and Computer Engineering, Prof. Wolfgang Utschick, Email address for applications: dekanat@ei.tum.de. Kontakt: dekanat@ei.tum.de

5. University of Copenhagen

Title: Assistant Professor of Machine Learning

Description: The Department of Computer Science at the University of Copenhagen is seeking candidates for a tenure track assistant professorship in Machine Learning. The tenure track assistant professor's duties will primarily include research, including obligations with regard to publication/scientific communication and research-based teaching with associated examination obligations within Machine Learning. To a limited extend the position may also include other duties. imitri Van Landuyt, tel.: +32 16 32 76 50, mail: dimitri.vanlanduyt@kuleuven.be.

The position is open from 1 February 2021 or as soon as possible thereafter. Further information on the Department is linked at http://www.science.ku.dk/english/about-the-faculty/organisation/. Inquiries about the position can be made to Head of Section, Professor Christina Lioma (c.lioma@di.ku.dk; cell phone +45 2155 4731) and Head of Department, Professor Mads Nielsen (madsn@di.ku.dk; cell phone +45 2460 0599)

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Notice to Authors

Notice to Authors

This newsletter is a free service for current SIGDA members and is added automatically with a new SIGDA membership. Circulation: 2,700