



ICCABS 2017

**2017 IEEE 7th International Conference on
Computational Advances in Bio and Medical
Sciences (ICCABS)**

**October 19-21, 2017,
Best Western Lake Buena Vista Resort Hotel
Orlando, FL**

<http://www.iccabs.org>



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Message from the General Chairs



Welcome to the Seventh IEEE International Conference on Computational Advances in Bio and medical Sciences (ICCABS 2017)! Computational techniques are revolutionizing the way in which research is conducted in science and engineering. Unsurpassed advances have been made in myriads of application domains. This is particularly true in the areas of biology, medicine, and drug discovery. Even though a number of conferences exist today in the general area of bioinformatics, they focus on computational biology to a large extent. ICCABS has the goal of bringing together scientists in all the three areas and hence serving as a platform for bridging the research efforts in these areas. The response from these communities to the ICCABS call for papers has been indeed gratifying. We are honored to serve these international communities by bringing together researchers, scientists, and students from academia, laboratories, and industry to this premier meeting held in Orlando.

We are thankful to the steering committee members (Srinivas Aluru, Reda A. Ammar, Tao Jiang, Vipin Kumar, Ming Li, John Reif and Sartaj Sahni) who have been instrumental in getting this conference approved by IEEE.

We would like to thank Program Chairs Danny Krizanc and Shaojie Zhang for assembling an outstanding technical program. The program committee members have done a wonderful job of reviewing all the submitted papers thoroughly within a short period of time. We are thankful to them as well as all the authors who have expressed their faith in ICCABS by submitting the fruits of their hard work. ICCABS features three keynote speeches (from Mark Borodovsky, Sartaj Sahni, and Jinbo Xu) and seven invited speakers (Jaime Davila, Faraz Hach, Jingshan Huang, Sumit Kumar Jha, Pavel Skums, Liqing Zhang, and Xianglilan Zhang). We are grateful to these well-established and highly successful researchers for taking time out of their busy schedules to make ICCABS a great success.

Thanks are also due to: Financial Chair (Reda Ammar), Local Arrangements Chair (Sharma Valliyil Thankachan), Workshop Chairs (Ion Mandoiu, Pavel Skums, and Alex Zelikovsky), Proceedings Chair (Zigeng Wang), Publicity Chair (Bob Weiner), and Webmaster (Zigeng Wang) for their tireless efforts.

Selected papers from ICCABS 2017 will appear as special issues in BMC Genomics and BMC Bioinformatics. We are grateful to the editors of these journals and Omar El Bakry for their efforts in this regard. Last but not least, we would like to thank UConn and the Booth Engineering Center for Advanced Technology (BECAT) for the constant administrative support rendered to ICCABS. In particular, we offer our special thanks to Joy Billion and Karen Kuca for their incessant support.

We hope you'll continue to support ICCABS in future! Have a wonderful time in the conference!

Sanguthevar Rajasekaran, Univ. of Connecticut;

Shibu Yooseph, Univ. of Central Florida

Message from the Program Chairs



We would like to welcome you to the 7th IEEE International Conference on Computational Advances in Bio and medical Sciences (ICCABS 2017) in Orlando, Florida. The conference program covers a wide range of topics in computational biology and medicine and includes 23 extended abstracts selected by the Program Committee from all 45 submissions.

We would like to express our gratitude to the Program Committee and reviewers for their careful review and evaluation of the submissions. Special thanks to the conference General Chairs Sanguthevar Rajasekaran and Shibu Yooseph for their leadership, and the Chairs of the Workshop, Finance, Publicity, Proceedings, Local Arrangements, and the conference Webmaster for their hard work in making the conference a rich experience. Last but not least we would like to thank all the authors for presenting their latest research in this conference.

We hope that you will find the ICCABS 2017 program exciting and stimulating, and enjoy the opportunity to interact with researchers around the world. Welcome!

Danny Krizanc, Wesleyan University, Middletown, Connecticut, USA

Shaojie Zhang, University of Central Florida, Orlando, Florida, USA

Message from CANGS Workshop Chairs



Welcome to the 7th Workshop on Computational Advances for Next Generation Sequencing, held on October 19-21, 2017 in Orlando, FL in conjunction with ICCABS 2017. Massively parallel DNA and RNA sequencing have become widely available, placing the capacity to generate gigabases to terabases of sequence data into the hands of individual investigators. These next-generation technologies have the potential for dramatic acceleration of biological and biomedical research by enabling the comprehensive analysis of genomes and transcriptomes to become inexpensive, routine and widespread.

The CANGS workshop aims to accelerate progress in the field by bringing together experts to discuss new directions of research and exchange ideas on the many mathematical and computational challenges presented by analysis of the exploding volume of next-generation sequencing data. This year's workshop program includes 7 sessions comprising 24 invited talks on a variety of current research topics including single cell sequencing, NGS-enabled analysis of viral infections, single nucleotide and indel variant calling, assembly and scaffolding algorithms, applications of NGS in microbiomics and immunogenomics, and phylogenetic analysis of NGS data.

We would like to thank ICCABS General Chairs Sanguthevar Rajasekaran and Shibu Yooseph for the opportunity to organize CANGS 2017, and all speakers for presenting their work at the workshop.

Ion Mandoiu, University of Connecticut
Pavel Skums, Georgia State University
Alex Zelikovsky, Georgia State University

Conference Organization

Steering Committee

Srinivas Aluru - Iowa State University
Reda A. Ammar - University of Connecticut
Tao Jiang - U.C. Riverside
Vipin Kumar - University of Minnesota
Ming Li - University of Waterloo
S. Rajasekaran (Chair) - University of Connecticut
John Reif - Duke University
Sartaj Sahni - University of Florida

General Chairs

Shibu Yooseph - University of Central Florida
S. Rajasekaran - University of Connecticut

Program Chairs

Danny Krizanc - Wesleyan University
Shaojie Zhang - University of Central Florida

Workshop Chairs

Ion Mandoiu - Univeristy of Connecticut
Pavel Skums - Georgia State University
Alex Zelikovsky - Georgia State University

Finance Chairs

Reda A. Ammar - Univeristy of Connecticut

Local Arrangements Chair

Sharma V. Thankachan - University of Central Florida

Publicity Chair

Bob Weiner - University of Connecticut

Publication Chair

Zigeng Wang - University of Connecticut

Webmaster

Zigeng Wang - University of Connecticut

Program Committee Members

Lipi Rani Acharya - Dow AgroSciences
Tatsuya Akutsu - Kyoto University, Japan
Max Alekseyev - George Washington University
Matteo Comin - University of Padova, Italy
Jaime Davila - Mayo Clinic
Dan Deblasio - Carnegie Mellon University
Jorge Duitama - Universidad de los Andes, Colombia
Richard Edwards - University of New South Wales, Australia
Scott Emrich - University of Notre Dame
Oliver Eulenstein - Iowa State University
Liliana Florea - Johns Hopkins University
Osamu Gotoh - Computational Biology Research Center (CBRC) and AIST
Faraz Hach - Simon Fraser University, Canada
Iman Hajirasouliha - Cornell University
Steffen Heber - North Carolina State University
Heng Huang - University of Texas at Arlington
Sumit Kumar Jha - University of Central Florida
Manuel Lafond - Université de Montréal, Canada
Wenxiu Ma - University of California, Riverside
Ion Mandoiu - University of Connecticut
Serghei Mangul - University of California, Los Angeles
Nadia Pisanti - Università di Pisa, Italy and Erable Team, INRIA
Maria Poptsova - Moscow State University, Russia
Subrata Saha - IBM Thomas J. Watson Research Center
Saharal Seesi - University of Connecticut
Amarda Shehu - George Mason University
Rahul Singh - San Francisco State University
Pavel Skums - Georgia State University
Yanni Sun - Michigan State University
Sing-Hoi Sze - Texas A&M University
Sharma V. Thankachan - University of Central Florida
Ugo Vaccaro - University of Salerno, Italy
Li-San Wang - University of Pennsylvania
Jianxin Wang - Central South University, China
Yufeng Wu - University of Connecticut
Fang Xiang Wu - University of Saskatchewan, Canada
Yuzhen Ye - Indiana University
Alex Zelikovsky - Georgia State University
Wei Zhang - University of Minnesota
Degui Zhi - University of Texas Health Science Center at Houston
Cuncong Zhong - University of Kansas

ICCABS 2017 Program

Thursday, October 19, 2017

8:20am - **Opening Remarks**
8:30am

8:30am - **Keynote Talk**
9:30am **Chair:** *Shibu Yooseph*

Jinbo Xu - Toyota Technological Institute at Chicago
Title: [Protein Contact Prediction and Folding by Deep Learning](#)

9:30am - **ICCABS0**
10:20am **Chair:** *S. Rajasekaran*

- *Thamer Alsulaiman, Beth Osia, Anna Malkova and Suely Oliveira.* [Concurrent MMBIRFinder](#)
- *Elizabeth Brooks, Graham Roberts, Alison Scoville and Filip Jagodzinski.* [ModEDI: An Extendable Software Architecture for Examining the Effects of Nonlinear Developmental Interactions on Evolutionary Trajectories](#)

10:20am - **Coffee Break**
10:40am

10:40am - **Invited Talks**
12:20pm **Chair:** *Sharma Thankachan*

Pavel Skums - Georgia State University
Title: [Investigation of viral outbreaks using the synthesis of sequencing and social network data](#)

Jingshan Huang - University of South Alabama
Title: [Semantics-oriented Data Science and Computational Life Sciences: innovative application of semantic technologies in microRNA and lncRNA research](#)

Sumit Kumar Jha - University of Central Florida
Title: [Calibration of Stochastic Biochemical Models against Behavioral Temporal Logic Specifications](#)

12:20pm - **Lunch**
1:40pm

1:40pm - Invited Talks
3:20pm Chair: *Shaojie Zhang*

Liqing Zhang - Virginia Polytechnic Institute and State University
Title: [Analysis of Whole Genome Sequence and Genome-wide SNPs in Highly Inbred Pigs](#)

Jaime Davila - Mayo Clinic
Title: [Challenges of using RNA-seq in the clinical setting](#)

Xianglilan Zhang – University of Waterloo, Canada
Title: [De Novo Peptide Sequencing by Deep Learning](#)

3:20pm - Coffee Break
3:40pm

3:40pm - Parallel Sessions
5:20pm

Session 1A: ICCABS1
Chair: *Iman Hajirasouliha*

- *Tomohiro Ban, Masahito Ohue and Yutaka Akiyama.* [Efficient Hyperparameter Optimization by Using Bayesian Optimization for Drug-Target Interaction Prediction](#)
- *Amal Alzu'Bi, Leming Zhou and Valerie Watzlaf.* [Are Physicians Ready to Utilize Genomics to Achieve Personalized Practice and What Do They Desire to Have in a Patient Genomic Information System?](#)
- *Mojtaba Nouri Bygi and Ileana Streinu.* [Efficient pebble game algorithms engineered for protein rigidity applications](#)

Session 1B: CANGS -- NGS APPLICATIONS
Chair: *Pavel Skums*

- *Karuturi.* [Genomics of Patient Derived Xenografts \(PDX\): Challenges and Approaches](#)
- *Abrams, Kumar, Karuturi, George.* [A computational method to aid in the design and analysis of single cell RNA-seq experiments](#)
- *Skums.* [Tumor phylogeny inference from single cell sequencing data using discrete optimization](#)
- *Perkins, Heber.* [RiboStreamR: A Web Application for Quality Control, Analysis, and Visualization of Ribo-Seq Data](#)

Friday, October 20, 2017

8:30am - **Keynote Talk**

9:30am **Chair:** *Giri Narasimhan*

Mark Borodovsky - Georgia Institute of Technology

[Title: New Automatic and Effective Tools for Genome Annotation](#)

9:30am -
10:20am

Parallel Sessions

Session 2A: ICCABS2

Chair: *Trevor Cickovski*

- *Cuncong Zhong, Youngik Yang and Shibu Yooseph.* [GRASP2: Fast and Memory-efficient Gene-centric Assembly and Homolog Search](#)
- *Sy-Miin Chow, Akhil Kumar, Ann Ouyang, Bu Zhong, Jungmin Lee and Nicholas Inverso.* [What can Physicians learn from Social Forums: Insights from an on-line Self Help and Support Group](#)

Session 2B: CANGS -- VIRUSES

Chair: *Igor Mandric*

- *Icer, Artyomenko, Ramachandran, Zelikovsky, Khudyakov, Skums.* [Assessment of HCV infection stage as recent or chronic using multi-parameter analysis and machine learning](#)
- *Basodi, Burcak Icer, Skums, Khudyakov, Zelikovsky, Pan.* [Detection of Acute and Chronic HCV Infections using Sequence Image Normalization](#)

10:20am -
10:40am

Coffee Break

10:40am -
12:20pm

Parallel Sessions

Session 3A: ICCABS3

Chair: *Zigeng Wang*

- *Trevor Cickovski, Vanessa Aguiar-Pulido and Giri Narasimhan.* [MATria: A Unified Centrality Algorithm](#)
- *Negin Fraidouni and Gergely Zaruba.* [A Correlation Based Matrix Completion Approach to Gene Expression Prediction](#)
- *Jing Hu and Bryan Andrews.* [Distinguishing Long Non-coding RNAs From mRNAs Using a Two-layer Structured Classifier](#)

Session 3B: CANGS -- VARIATION

Chair: *Jorge Duitama*

- *Huo, Wu, Zhang, Zeng.* [Analysis of complete genome sequence and genome-wide SNPs in highly inbred pigs](#)
- *Duitama, Tello, De la hoz, Loaiza, Riascos.* [NGSEP3: Accurate, efficient and user friendly production and analysis of genomic variation datasets through STR-aware integrated realignment](#)
- *Mancuso, Yang, Pasaniuc.* [Improved Spatial Localization using Gaussian Distributions for](#)

- *Chunchun Zhao and Sartaj Sahni.* [Efficient Computation of the Damerau-Levenshtein Distance Between Biological Sequences](#)
- *Nabavi.* [Alleles Copy Number Variation Detection for Next Generation Sequencing Data](#)

12:20pm -
1:40pm **Lunch**

1:40pm -
3:20pm **Parallel Sessions**

Session 4A: ICCABS4
Chair: *Jing Hu*

- *Jens Lichtenberg and David Boline.* [Evaluation of peak calling approaches for genome-wide MBD2-based Methyl-Seq profiling](#)
- *David Morris, Tatiana Maximova, Erion Plaku and Amarda Shehu.* [Out of One, Many: Exploiting Intrinsic Motions to Explore Protein Structure Spaces](#)
- *Jacob Porter and Liqing Zhang.* [InfoTrim: A DNA Read Quality Trimmer Using Entropy](#) (Poster)
- **Invited Talk:** *Faraz Hach - Simon Fraser University, Canada*
Title: Compression of High Throughput Sequencing Data

Session 4B: CANGS-- ALGORITHMS
Chair: *Mukul Bansal*

- *Rajasekaran.* [The closest pair problem: Algorithms and applications](#)
- *Daddio, Mandoiu.* [Identifying alpha-beta T cell clones via pooling and b-matching](#)
- *Li, Bansal.* [Integrated Analysis of Domain, Gene, and Species Level Evolution](#)
- *Tsyvina, Campo, Sims, Zelikovsky, Khudyakov, Skums.* [Efficient signature-based algorithm for detection of genetic relatedness between heterogeneous populations](#)

3:20pm -
3:40pm **Coffee Break**

3:40pm -
5:20pm **Parallel Sessions**

Session 5A: ICCABS5
Chair: *Cuncong Zhong*

- *Ardalan Naseri, Degui Zhi and Shaojie Zhang.* [Multi-allelic Positional Burrows-Wheeler Transform](#)
- *Wen-Chyi Lin, Ching-Chung Li, Jonathan I. Epstein and Robert W. Veltri.*

Session 5B: CANGS -- ASSEMBLY AND SCAFFOLDING
Chair: *Max Alekseyev*

- *Fu, Chang, Friesen, Teakle, Tarone, Sze.* [Identifying similar transcripts in a related organism from de Bruijn graphs of RNA-Seq data, with applications to the study of salt and waterlogging tolerance in *Melilotus*](#)

[Advance on Curvelet Application to Prostate Cancer Tissue Image Classification](#)

- *Hosein Toosi, Ali Moeini and Iman Hajirasouliha.* [BAMSE: Bayesian model selection for tumor phylogeny inference among multiple tumor samples](#)
- *Aganezov, Alekseyev.* [On Problem of Orienting Ordered Scaffolds](#)
- *Mandric, Knyazev, Zelikovsky.* [Repeat aware scaffolding evaluation pipeline](#)
- *Chu, Li, Wu.* [GAPPadder: A Sensitive Approach for Closing Gaps on Draft Genomes with Short Sequence Reads](#)

6:00pm - Banquet

9:00pm Dinner at 6:00pm

Saturday, October 21, 2017

8:30am - **Keynote Talk**

9:30am **Chair:** *S. Rajasekaran*

Sartaj Sahni - University of Florida
Title: [Time and Energy Efficient Computing](#)

9:30am -
10:20am

Parallel Sessions

Session 6A: ICCABS6

Chair: *Negin Fraidouni*

- *Jun Wang and Liangjiang Wang.* [Prediction of Back-Splicing Sites Reveals Sequence Compositional Features of Human Circular RNAs](#)
- *Peng Xiao and Sanguthevar Rajasekaran.* [Efficient Exact Algorithms for LDD Motif Search](#)

Session 6B: CANGS -- VIRUSES

Chair: *Alex Zelikovsky*

- *Knyazev, Tsyvina, Artyomenko, Skums, Zelikovsky.* [Accurate Reconstruction of Viral Population Using Correlation between SNVs.](#)
- *Pawar, Freas, Weber, Harrison.* [Analysis of Drug Resistance in HIV PR](#)

10:20am -
10:40am

Coffee Break

10:40am -
12:20pm

Parallel Sessions

Session 7A: ICCABS7

Chair: *Jens Lichtenberg*

- *Sudipta Pathak and Xingyu Cai.* [Ensemble Learning Algorithm for Drug-Target Interaction Prediction](#)
- *Chunchun Zhao and Sartaj Sahni.* [Efficient RNA Folding Using Zuker's Method](#)
- *Jacob Porter.* [A Pharmacophore Hypothesis and Computationally Optimized Lead Compounds for VKORC1](#)
- *Dina Abdelhafiz, Sheida Nabavi, Reda Ammar and Clifford Yang.* [Survey on Deep Convolutional Neural Networks in Mammography](#) (Extended Abstract)

Session 7B: CANGS -- MICROBIOMICS & IMMUNOGENOMICS

Chair: *Alex Zelikovsky*

- *Narasimhan.* [Advances in Microbiome Analysis](#)
- *Zelikovsky.* [Inference of metabolic pathway activity from meta-transcriptomic reads](#)
- *Mangul, Lapierre, Alser, Mandric, Martin, Eskin, Koslicki.* [Ultra-sensitive profiling of eukaryotic and viral communities of 1736 built environments across the US metropolitan areas](#)
- *Al Seesi.* [Genomics Guided Neo-epitope Prediction for Tumor Vaccine Design](#)