

# ICCABS 2019

**2019 9th International Conference on Computational  
Advances in Bio and medical Sciences (ICCABS)**

**November 15-17, 2019,  
Florida International University,  
Miami, Florida**

**<http://www.iccabs.org>**



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# Message from the General Chairs



Welcome to the Ninth International Conference on Computational Advances in Bio and medical Sciences (ICCABS 2019)! 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 Miami.

We are thankful to the steering committee members (Srinivas Aluru, Reda A. Ammar, Tao Jiang, Vipin Kumar, Ming Li, John Reif and Sartaj Sahni).

We would like to thank the Program Chair T.M. Murali 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 four keynote speeches (from Heng Huang, Yi Pan, Fangxiang Wu, and Shibu Yooseph). 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 Chairs (Giri Narasimhan and Arpit Mehta), Workshop Chairs (Ion Mandoiu, Pavel Skums, and Alex Zelikovsky), Proceedings Chair (Zigeng Wang), Publicity Chairs (Orlando Echevarria and Bob Weiner), and Webmaster (Zigeng Wang) for their tireless efforts.

We are grateful to Springer for publishing the proceedings of ICCABS 2019. Selected papers from ICCABS 2019 will appear as special issues in the Journal of Computational Biology, BMC Genomics, BMC Bioinformatics. We are grateful to the editors of these journals and Omar El Bakry and Sorin Istrail for their efforts in this regard. Last but not least, we would like to thank UConn for the constant administrative support rendered to ICCABS. In particular, we offer our special thanks to Joy Billion for her incessant support.

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

# Message from the Program Chair



I would like to welcome you to the 9th International Conference on Computational Advances in Bio and medical Sciences (ICCABS 2019) in Miami, Florida. The conference program includes 13 regular papers and 1 poster that cover a wide range of topics in computational biology and medicine. The Program Committee selected them from 30 submissions. I thank the members of the Program Committee and the reviewers for their careful review and evaluation of the submissions. I also thank the conference General Chairs Sanguthevar Rajasekaran and Giri Narasimhan 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. Finally, I thank all the authors for presenting their exciting research at this conference. I hope that you will find the ICCABS 2019 program to be intellectually stimulating, and that you enjoy the opportunity to interact with researchers around the world.

*T. M. Murali*, Virginia Tech, Blacksburg, VA, USA

# Message from CANGS Workshop Chairs



Welcome to the 9<sup>th</sup> Workshop on Computational Advances for Next Generation Sequencing (CANGS), held on November 15-17, 2019 at Florida International University in Miami, FL in conjunction with the 9<sup>th</sup> International Conference on Computational Advances in Bio and medical Sciences (ICCABS). 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 to dramatically accelerate 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 the workshop program includes 2 sessions comprising invited talks on a variety of current research topics including gene enrichment analysis, structural variant discovery, genome assembly, large-scale -omics data integration, RNA-Seq data summarization, inferring metabolic pathway activity from meta-transcriptomic reads, and reconstruction of intra-host viral populations. Additionally, two of the ICCABS keynote speakers will present NGS related research: Professor Yi Pan from Georgia State University will give a talk on multiple sequence alignment, and Prof. Shibu Yooseph from University of Central Florida will give a talk on microbiome data analysis.

We would like to thank ICCABS General Chairs Giri Narasimhan and Sanguthevar Rajasekaran for the opportunity to organize CANGS 2019, 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*

# Message from CASCODA Workshop Chairs



Welcome to the 2<sup>nd</sup> Workshop on Computational Advances for Single-Cell Omics Data Analysis (CASCODA), held on November 15-17, 2019 at Florida International University in Miami, FL in conjunction with the 9<sup>th</sup> International Conference on Computational Advances in Bio and medical Sciences (ICCABS). Recent technological advances have enabled high-throughput profiling of genomes, transcriptomes, epigenomes, and proteomes at single cell resolution. These revolutionary single-cell -omics technologies promise to bring unprecedented insights into tissue heterogeneity and unveil subtle regulatory processes that are undetectable by bulk sample analysis. However, fully realizing their potential requires the development of novel computational and statistical analysis methods capable of handling the massive data sizes and significant levels of technical and biological noise.

The goal of the CASCODA workshop is to bring together bioinformaticians, biologists, computer/data scientists, and statisticians to discuss the latest developments in computing infrastructure, mathematical and statistical modeling, algorithms, and visualization methods for single-cell -omics data. This year the workshop program includes 2 sessions comprising invited talks on a variety of current research topics including profiling the receptor repertoires of immune cells, inferring cancer clone mutability, single-cell genotype imputation by integrating phylogenetic priors, joint inference of evolutionary history and fitness landscapes from bulk tumor and single-cell sequencing data, and web-based tools for single cell RNA-seq analysis.

We would like to thank General Chairs Giri Narasimhan and Sanguthevar Rajasekaran for the opportunity to organize CASCODA as part of ICCABS 2019, 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 - Georgia Institute of Technology*  
*Reda A. Ammar - University of Connecticut*  
*Tao Jiang - University of California, Riverside*  
*Vipin Kumar - University of Minnesota*  
*Ming Li - University of Waterloo*  
*Sanguthevar Rajasekaran - University of Connecticut (Chair)*  
*John Reif - Duke University*  
*Sartaj Sahni - University of Florida*

## General Chairs

*Giri Narasimhan - Florida International University*  
*Sanguthevar Rajasekaran - University of Connecticut*

## Program Chair

*T. M. Murali - Virginia Polytechnic Institute and State University*

## Workshop Chairs

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

## Finance Chair

*Reda A. Ammar - University of Connecticut*

## Local Arrangements Chairs

*Giri Narasimhan - Florida International University*  
*Arpit Mehta - Florida International University*

## Publicity Chairs

*Orlando Echevarria - University of Connecticut*  
*Bob Weiner - University of Connecticut*

## Publication Chair

*Zigeng Wang - University of Connecticut*

## Webmaster

*Zigeng Wang - University of Connecticut*

# Program Committee Members

Tatsuya Akutsu - Kyoto University, Japan  
Max Alekseyev - George Washington University  
Jaime Davila - Mayo Clinic  
Jorge Duitama - Universidad de los Andes, Colombia  
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  
Sumit Kumar Jha - University of Central Florida  
Yoo-Ah Kim - National Institutes of Health  
Danny Krizanc - Wesleyan University  
M. Oğuzhan Külekci - Istanbul Technical University, Turkey  
Manuel Lafond - Université de Montréal, Canada  
Yuk Yee (Fanny) Leung - University of Pennsylvania  
Ion Mandoiu - University of Connecticut  
Serghei Mangul - University of California, Los Angeles  
Maria Poptsova - Moscow State University, Russia  
Subrata Saha - IBM Thomas J. Watson Research Center  
Pavel Skums - Georgia State University  
Yanni Sun - Michigan State University  
Sing-Hoi Sze - Texas A&M University  
Sharma V. Thankachan - University of Central Florida  
Mahmut Uludag - King Abdullah University of Science and Technology, SAU  
Ugo Vaccaro - University of Salerno, Italy  
Balaji Venkatachalam - Google  
Li-San Wang - University of Pennsylvania  
Jianxin Wang - Central South University, China  
Fang Xiang Wu - University of Saskatchewan, Canada  
Shibu Yooseph - University of Central Florida  
Alex Zelikovsky - Georgia State University  
Shaojie Zhang - University of Central Florida  
Wei Zhang - University of Central Florida  
Cuncong Zhong - University of Kansas



# ICCABS 2019 Program

Friday, November 15, 2019

8:50am - Opening Remarks  
9:00am

9:00am - Keynote Talk  
10:00am Chair: *Ion Mandoiu*

*Yi Pan - Georgia State University*

[Title: Biological Multiple Sequence Alignment: Scoring Functions, Algorithms, and Evaluations](#)

10:00am - Coffee Break  
10:30am

10:30am - Keynote Talk and ICCABS Session 1  
12:00am Chair: *Giri Narasimhan*

*Fangxiang Wu - University of Saskatchewan*

[Title: Artificial Intelligence for Medical Image Analytics](#)

**Session 1A: ICCABS 1**

- Abdullah Baihan, Reda Ammar, Robert Aseltine, Mohammed Baihan and Sanguthevar Rajasekaran. [Efficient Sequential and Parallel Algorithms for Incremental Record Linkage](#)

12:00pm - Lunch  
1:30pm

1:30pm - Keynote Talk  
2:30pm Chair: *Sanguthevar Rajasekaran*

*Heng Huang - University of Pittsburgh*

[Title: Large-Scale Machine Learning for Biomedical Data Science: AI Meets Health](#)

2:30pm - Coffee Break  
3:00pm

3:00pm -  
5:00pm

## Parallel Sessions

### Session 2A: ICCABS 2

Chair: *Zigeng Wang*

- Sakib Mostafa, Wutao Yin and Fang-Xiang Wu. [Autoencoder Based Methods for Diagnosis of Autism Spectrum Disorder](#)
- Qasem Abu Al-Haija and Kamal Al Nasr. [Parametric Prediction Model for Annual Growth of Electron Microscopy Data](#) (Poster)

### Session 2B: CANGS 1

Chair: *Ion Mandoiu*

- R Krishna Murthy Karuturi. Gene Enrichment Analysis: Biases and Methods and Biases
- Matthew Hayes, Derrick Mullins and Angela Nguyen. Complex Germline Structural Variant Discovery via Cluster Normalization
- Fahad Alqahtani and Ion Mandoiu. SMART2: Multi-Sample Statistical Mitogenome Assembly with Repeats

# Saturday, November 16, 2019

9:00am - **Keynote Talk**

10:00am **Chair:** *Sharma Thankachan*

*Shibu Yooseph - University of Central Florida*

Title: Identification of biomarkers and interactions from microbiome data

10:00am - **Coffee Break**  
10:30am

10:30am - **Parallel Sessions**  
12:00pm

## **Session 3A: ICCABS 3**

**Chair:** *Shibu Yooseph*

- Shuzhen Kuang and Liangjiang Wang. [Deep learning of CTCF-mediated chromatin loops in 3D genome organization](#)
- Trevor Cickovski, Astrid Manuel, Kalai Mathee, Michael Campos and Giri Narasimhan. [Effects of Various Alpha-1 Antitrypsin Supplement Dosages on the Lung Microbiome and Metabolome](#)
- Ishwor Thapa and Hesham Ali. [A new graph database system for multi-omics data integration and mining complex biological information](#)

## **Session 3B: CASCODA 1**

**Chair:** *Pavel Skums*

- Serghei Mangul. Profiling T and B cell receptor repertoires from scRNA-Seq data
- Pavel Skums. Inferring Cancer Clone Mutability using Single Cell Sequencing Data
- Igor Mandric, Ion Mandoiu, Alex Zelikovsky and Pavel Skums. Genotype imputation from single cell sequencing data by integrating phylogenetic priors

12:00pm - **Lunch**  
1:30pm

1:30pm - **Parallel Sessions**  
2:30pm

## **Session 4A: ICCABS 4**

**Chair:** *Trevor Cickovski*

- Steffen Heber, Anna Stepanova, Jose Alonso and Patrick Perkins. [RiboSimR: a tool for simulation and power analysis of Ribo-seq](#)

## **Session 4B: CASCODA 2**

**Chair:** *Ion Mandoiu*

- Viachaslau Tsyvina and Pavel Skums. Joint inference of evolutionary inference and fitness landscape of a

- [experiments](#)
  - Jiefu Li, Jung-Youn Lee and Li Liao. [Detecting de novo Plasmodesmata targeting signals and identifying PD targeting proteins](#)
- tumor from bulk and single-cell sequencing data
- Marmar Moussa and Ion Mandoiu. Extensions to the SC1 pipeline for web-based single cell RNA-seq analysis

**2:30pm -  
3:00pm**      **Coffee Break**

**3:00pm -  
5:00pm**      **Parallel Sessions**

**Session 4A: ICCABS 5**  
**Chair: Camilo Valdes**

- Md. Khaledur Rahman. [FastFeatGen: Faster parallel feature extraction from genome sequences and efficient prediction of DNA  \$N^6\$ -methyladenine sites](#)
- Chu-Yu Cheng and Chung-Chin Lu. [The Agility of a Neuron: Phase Shift between Sinusoidal Current Input and Firing Rate Curve](#)
- Mohammad Mohebbi, Liang Ding, Russell L. Malmberg and Liming Cai. [A Multi-Hypothesis Learning Algorithm for Human and Mouse miRNA Target Prediction](#)
- Georg Hahn, Sharon Marie Lutz and Christoph Lange. [locStra: Fast analysis of local/global stratification in whole genome sequencing \(WGS\) studies](#)

**Session 4B: CANGS 2**  
**Chair: Alex Zelikovsky**

- Kerui Peng and Serghei Mangul. Reuse of publicly available omics data across a million research publications
- Steffen Heber. Natural Language Generation for RNA-seq Data Summarization
- Fillip Rondel, Roya Hosseini, Igor Mandric, Ion Mandoiu and Alex Zelikovsky. Inferring relative enzyme participation in metabolic pathway activity from metatranscriptomic reads
- Sergey Knyazev and Alex Zelikovsky. Reconstruction of Intra-Host Viral Populations Using Next Generation Sequencing

**6:00pm -  
8:00pm**      **Banquet**

## Sunday, November 17, 2019

9:00am -  
10:00am **ICCABS Session**

### **Session 5A: ICCABS 6**

**Chair:** *Musfiqur Rahman Sazal*

- Hsin-Hao Chen and Chung-Chin Lu. [Optimized multiple fluorescence based detection in a single molecule synthesis process under high noise level environment](#)
- Khajamoinuddin Syed, William Sleeman Iv, Joseph Nalluri, Payal Soni, Michael Hagan, Jatinder Palta, Rishabh Kapoor and Preetam Ghosh. [Treatment Practice Analysis of Intermediate or High Risk Localized Prostate Cancer: A Multi-Center Study with Veterans Health Administration Data](#)

10:00am -  
10:30am **Coffee Farewell Break**