

Mohamed Khaled Gunady

Research Interests

- Bioinformatics, Data Science, Machine Learning, Statistical Learning
- Artificial Intelligence, Multi-Agent Systems, Robotics
- Parallel Programming, Data Structures, Algorithms

Education

Ph.D. Computer Science

Sept. 2013 – Present

University of Maryland – College Park, MD, USA

Concentration: Bioinformatics, Machine Learning, Data Science

Advisor: [Hector Corrada Bravo](#)

GPA: 3.88 / 4.0

Relevant Coursework:

- CMSC701 Computational Genomics (Mihai Pop)
- CMSC702 Computational Systems Biology and Functional Genomics (Hector Bravo)
- CMSC724 Database Management Systems (Amol Deshpande)
- CMSC723 Computational Linguistics (Marine Carput)
- CMSC726 Machine Learning (Hal Daume III)
- CMSC828C Statistical Pattern Recognition (Rama Chellappa)

M.Sc. Computer Science

Sept. 2010 – Sept. 2012

Egypt-Japan University (E-JUST), Egypt

Thesis: Agents Learning to Play Hide-and-Seek Games

Concentration: Machine Learning, Multi-agent Systems

Advisors: [Walid Gomaa](#), [Ikuo Takeuchi](#), Amin Shoukry

GPA: 3.66 / 4.0

B.Sc. Computer Engineering

Sept. 2004 – June 2009

Faculty of Engineering, University of Alexandria, Egypt

Thesis: General Purpose computing on Graphics Processing Units

Concentration: Parallel Programming, Multi-core and Many-core

Advisors: Ayman Khalafallah, and Amin Shoukry

GPA: 3.79 / 4.0. Ranking in batch: 10 out of 80

Research Experience

University of Maryland – College Park, MD, USA

June 2015 – Present

Research on Bioinformatics and data analysis at UMD's [CBCB](#).

Including work on transcripts-level and alternative splicing differential expression analysis from RNA-seq data. Our graph-based approach implemented in [yanagi](#) uses high throughput lightweight kmer-based alignment to provide count statistics on the local splicing level. This work empowers ultrafast and lightweight alignment approaches to provide segment-based counts for more accurate omnibus analysis of differential splicing, transcript, gene levels. (Python, R, C++)

We also adapted our graph approach in Yanagi to build Whole Genome Population Reference which is significantly important for genotyping highly polymorphic regions of the genome like HLA genes.

Moreover, other work on single-cell RNA-seq data imputation. Using modern generative adversarial models (GANs) into imputing single cell datasets that are typically sparse and noisy. (Tensorflow, Python)

Egypt-Japan University (E-JUST), Egypt

Sept. 2010 – Sept. 2012

Research on Machine Learning and Multi-Agent Systems for robots locomotion. In particular, how robots learn to play Hide-and-Seek. A novel learning model for multi-seekers to cooperate and divide the seeking territories, in a hierarchical learning model using Reinforcement Learning. The model is enhanced by means of state aggregation for space and time reduction (Curse of Dimensionality).

Faculty of Engineering, University of Alexandria, Egypt

Sept. 2004 – June 2009

Research on Parallel Programming using multi-core and many-core frameworks using GPUs for general purpose computing (GPGPU) rather than graphics processing only. Data-parallelizable case-studies like Genetic Programming, Image Processing, large-scaled Sorting algorithms & Data Clustering algorithms were studied, modeled, and implemented on GPUs.

Work Experience

illumina, San Diego, California

May 2017 – July 2017

Bioinformatics Intern

- Genomic Variants Team: I extended my work in RNA-Seq to apply my graph-based approach (Yanagi) in the area of WGS to efficiently use population reference graphs in linear k-mer based aligners. Experiments on highly polymorphic genomic regions, e.g. HLA genes, showed promising results compared to graph-based aligners.

SAP America Inc., Newtown Square, Pennsylvania

May 2014 – July 2014

Support Engineer intern, Global Active Support

- Center of Expertise (CoE): center for solving performance problems and availability analysis of complex SAP solutions at premium customer base.

InovaEg., Alexandria, Egypt

Feb. 2013 – Aug. 2013

Game Developer/Team Leader

- Developing puzzle game for iOS using Cocos2D+Box2D
- Responsibilities: game design, puzzle levels design, code team lead

BadrIT co., Alexandria, Egypt

July 2009 – Sept. 2010

Software Developer

- In Ruby on Rails (RoR) team:
 - Developed an internal HR system for BadrIT
 - Developed an internal Order Food system for employees in BadrIT
- In iPhone team:
 - Humail: an emotional 3D-like mail client for iPhone
 - iMeasure: a research-oriented application to use the accelerometer in iPhone to measure distances, handling noisy sensory readings

Publications

- **Mohamed Gunady**, Stephen Mount, Hector Bravo, "*Yanagi: Fast and interpretable segment-based alternative splicing and gene expression analysis*" (**BMC Bioinformatics**)
- **Aya Ismail**, **Mohamed Gunady**, Luiz Pessoa, Hector Bravo, **Soheil Feizi**, "*Cell-Attention Reduces Vanishing Saliency of Recurrent Neural Networks*" (**NeurIPS 2019**)
- **Mohamed Gunady**, Hector Bravo, **Soheil Feizi**, "*scGAIN: Single-Cell Data Imputation using Generative Adversarial Networks*" (**Submitted to RECOMB 2020**)
- **Mohamed Gunady**, Hector Bravo, Sangtae Kim, "*Bridging Linear to Graph-based Alignment with Whole Genome Population Reference Graphs*", Presentation and Poster (**ISMB 2018**)
- **Mohamed Gunady**, Steffen Cornwell, Stephen Mount, Hector Bravo, "*Yanagi: Transcript Segment Library Construction for RNA-Seq Quantification*", 17th International Workshop on Algorithms in Bioinformatics (**WABI 2017**)

- **Mohamed Gunady**, Walid Gomaa, Ikuo Takeuchi, "Aggregate Reinforcement Learning for multi-agent territory division: The Hide-and-Seek game", Engineering Applications of Artificial Intelligence, Volume 34, pp 122-136 (2014)
- **Mohamed Gunady**, Walid Gomaa, Ikuo Takeuchi, "Multi-Agent Task Division Learning in Hide-and-Seek Games", 15th AIMS. Springer-Verlag LNCS, Volume 7557, pp 256-265 (2012)
- **Mohamed Gunady**, Walid Gomaa. "Reinforcement learning generalization using state aggregation with a maze-solving problem", Proceedings of Japan-Egypt Conference on Electronics, Communications and Computers (JEC-ECC), IEEE Xplore, pp. 157–162 (2012)

Teaching Experience

TA, Computer Science Department, University of Maryland – College Park, MD, USA

- CMSC131 Object Oriented Programming I, Java Programming (Fall 2013, Spring 2014)
- CMSC132 Object Oriented Programming II, Data Structures (Fall 2014)
- CMSC423 Bioinformatic Algorithms, Databases, and Tools (Spring 2015)

IT Skills

Data Analysis frameworks:

R/Bioconductor

Mobile development:

Symbian C++, J2ME, Apple iOS

Programming languages:

C/C++, JAVA, Python, Ruby, Objective-C

SQL, OpenGL, CUDA for GPUs

Web development & frameworks:

HTML, XML, CSS, JavaScript, JSON, Ajax

MySQL / SQLite

JSP / Servlets, EJB, PHP, Ruby on Rails (RoR)

Honors and Awards

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| - Dean's Fellowship Award, University of Maryland | 2013-2015 |
| - Fellowship for M.Sc. degree from Mitsubishi International Corporation, E-JUST | 2010-2012 |
| - Degree of Honor, University of Alexandria, Egypt | 2009 |
| - Bronze Medal in the programming contest of Egyptian Olympiad in Informatics | EOI 2006 |

Languages

Arabic: Native Language

English: Excellent

French & Japanese: Fair

Personal Interests

Drawing, Table Tennis, Watching Anime

Free readings in Psychology, History. Enjoy travelling, open landscapes

* References available upon request.