

# Mahmoud Ahmed

POSTDOC · CANCER GENOMICS

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## Bio

I studied the role of autophagy in development and disease using high-throughput sequencing data. I also developed several open-source R packages and Shiny apps to work with gene expression and regulation data. Now I am building an open-source platform to discover and repurpose drugs for cancer.

## Research Interest

- Identifying task specialization and trade-offs in evolving cancer cells.
- Building causal biological networks and test their perturbation using existing knowledge and data.
- Studying the regulation of autophagy in development (adipocyte differentiation) and disease (cancer).
- Building open source tools for obtaining, analyzing and, visualizing gene expression data.

## Education

### Gyeongsang National University

*Jinju, S.Korea*

PHD IN CONVERGENCE MEDICAL SCIENCE

*Mar. 2018 - 2021*

- Thesis: Transcriptional regulation of autophagy during adipocyte differentiation

M.S IN CONVERGENCE MEDICAL SCIENCE

*Sep. 2015 - Feb. 2018*

- Thesis: Systematic characterization of autophagy-related genes during the adipocyte differentiation using public-access data

### Cairo University

*Cairo, Egypt*

BACHELOR OF MEDICINE AND SURGERY (MBBCH)

*Sep. 2007 - Nov. 2014*

- Three years of basic medical science courses, three years of clinical rotations, and one year of internship.

## Courses

<b>Genomics</b>	Data Analysis for Life Sciences, Genomic Data Science
<b>Statistics &amp; Data Analysis</b>	Data Science, Data Visualization, Machine Learning, Statistics for Medical Research
<b>Programming</b>	Mastering Software Development in R, Learn to Program: The Fundamentals
<b>Academic Writing</b>	Academic English: Writing Specialization, Writing in the Sciences

## Skills

<b>Data Processing</b>	Microarrays, RNA-Seq, ChIP-Seq, RTqPCR, Microscopy Images
<b>Data Analysis</b>	Differential Expression & Co-expression, Gene Set enrichment, Network & Image Analyses, Chromatin Segmentation
<b>Programming</b>	R, Python, Bash (*Nix), LaTeX, Git, Docker

## Awards & Scholarships

2021	<b>Recipient</b> , FAOBMB. Young Scientist Program	<i>New Zealand</i>
2020,2021	<b>Recipient</b> , KSBMB. Young Scientist Program	<i>S. Korea</i>
2018,2019	<b>Recipient</b> , Gyeongsang National University. Young Pioneer Researcher Award	<i>Jinju, S. Korea</i>
2016-2019	<b>Recipient</b> , Brain Korea 21 Plus Scholarship. Master's & PhD Courses	<i>Jinju, S. Korea</i>

## References

<b>Deok Ryong Kim</b>	PhD. Gyeongsang National University . drkim@gnu.ac.kr
<b>Byoung Kuk Na</b>	PhD. Gyeongsang National University . bkna@gnu.ac.kr
<b>Yang Jae Kang</b>	PhD. Gyeongsang National University . kangyangjae@gnu.ac.kr

## Talks & Workshops

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2022	<b>ISCB</b> , Integrating gene expression and biological knowledge for drug discovery	Virtual
2021	<b>BiocAsia</b> , LINPS: a database for cancer-cell-specific perturbations of biological networks	Virtual
2021	<b>BioC</b> , Chromatin Segmentation Analysis in R	Virtual
2021	<b>KSBMB</b> , Hierarchical Regulation of Autophagy During Adipocyte Differentiation	Busan, S. Korea
2020	<b>EuroBioc</b> , Integrating ChIP-seq and RNA-seq data in R	Virtual
2020	<b>BioC Asia</b> , target: An R package to Predict Combined Function of Transcription Factors	Virtual
2020	<b>KSBMB</b> , Integrating binding & expression data to predict transcription factors functions	Virtual

## Community & Outreach

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- Involved in organizing conferences
  - BioC (Virtual, 2021 - Seattle, USA, 2022)
  - BiocAsia (Virtual, 2021 - Melbourne, Australia 2022)
- Coordinating the research topic "Opportunities and Challenges in Reusing Public Genomics Data"
- Introducing data analysis tools to undergraduate and graduate students
  - Introduction to data analysis with R (Summer course for graduate students)
  - Introduction to meta-analysis in R (Tutorial for medical students)
  - Introduction to LaTeX & Overleaf (Tutorial for graduate students)

## Open Source

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- **LINPSAPP**: A database for cancer cell-specific perturbations of biological networks. (shinyapps.io)
- **ObMiTi**: A MusMus Dataset of Ob/ob and WT mice on different diets (Bioconductor)
- **target**: An R Package to Predict Combined Function of Transcription Factors (Bioconductor)
- **segmenter**: Perform Chromatin Segmentation Analysis in R by Calling ChromHMM (Bioconductor)
- **colocr**: An R package for conducting co-localization analysis. (ROpenSci/CRAN)
- **colocr\_app**: A shiny app for conducting co-localization analysis. (shinyapps.io)
- **pqr**: Quality assessing, analyzing and testing the statistical significance of qPCR data (CRAN)
- **cRegulome**: An R package to access, manage and visualize regulome (microRNA/transcription factors)-gene correlations in cancer (ROpenSci/CRAN)
- **miRCancerdb**: A database for microRNA-gene/protein expression correlation in cancer. (shinyapps.io)
- **cRegulomedb**: Build the database file for cRegulome package. (GitHub)
- **sqlome**: Build SQLite tables of microRNAs and Transcription Factors-gene Correlations (GitHub)
- **curatedAdipoArray**: A Curated Microarrays Dataset of MDI-induced Differentiated Adipocytes Under Genetic and Pharmacological Perturbations. (Bioconductor)
- **curatedAdipoRNA**: A Curated RNA-Seq Dataset of MDI-induced Differentiated Adipocytes. (Bioconductor)
- **curatedAdipoChIP**: A Curated ChIP-Seq Dataset of MDI-induced Differentiated Adipocytes. (Bioconductor)
- **apihelpers**: Helper Functions for Making an R Client for an API (GitHub)
- **biogridapi**: An R client for BIOGRID API (GitHub)
- **stringapi**: An R client for STRING API (GitHub)
- **biowareapi**: An R client for bioware API (GitHub)
- **stitchapi**: An R client for STITCH API (STRING v10) (GitHub)

## Publications

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- Mahmoud Ahmed et al. "Tissue-specific gene expression in obese hyperglycemic mice". In: *All Life* 15.1 (Dec. 2022), pp. 555–561. ISSN: 2689-5293
- Mahmoud Ahmed et al. "Hierarchical regulation of autophagy during adipocyte differentiation." In: *PLoS one* 17.1 (2022), e0250865. ISSN: 1932-6203
- Mahmoud Ahmed et al. "A Functional Network Model of the Metastasis Suppressor PEBP1/RKIP and Its Regulators in Breast Cancer Cells." In: *Cancers* 13.23 (Dec. 2021). ISSN: 2072-6694

- Mahmoud Ahmed and Deok Ryong Kim. "LINPS: a database for cancer-cell-specific perturbations of biological networks". In: *Database* 2021 (Aug. 2021). ISSN: 1758-0463
- Mahmoud Ahmed, Trang Huyen Lai, and Deok Ryong Kim. "A Small Fraction of Progenitors Differentiate Into Mature Adipocytes by Escaping the Constraints on the Cell Structure". In: *Frontiers in Cell and Developmental Biology* 9 (Oct. 2021), p. 2736. ISSN: 2296-634X
- Sahib Zada et al. "Cross talk between autophagy and oncogenic signaling pathways and implications for cancer therapy". In: *Biochimica et Biophysica Acta - Reviews on Cancer* 1876.1 (2021), p. 188565. ISSN: 18792561
- Trang Huyen Lai et al. "Transcriptional Repression of Raf Kinase Inhibitory Protein Gene by Metadherin during Cancer Progression". In: *International Journal of Molecular Sciences* 22.6 (Mar. 2021), p. 3052. ISSN: 1422-0067
- M. Ahmed and D.R. Kim. "Anti-cancer effect of RKIP via modulating autophagy during metastasis". In: *Prognostic and Therapeutic Applications of RKIP in Cancer*. 2020. Chap. 15. ISBN: 9780128196120
- Mahmoud Ahmed, Do Sik Min, and Deok Ryong Kim. "Curated gene expression dataset of differentiating 3T3-L1 adipocytes under pharmacological and genetic perturbations". In: *Adipocyte* 9.1 (Jan. 2020), pp. 600–608. ISSN: 2162-3945
- Mahmoud Ahmed, Do Sik Min, and Deok Ryong Kim. "Integrating binding and expression data to predict transcription factors combined function". In: *BMC Genomics* 21.1 (Dec. 2020), p. 610. ISSN: 1471-2164
- Mahmoud Ahmed, Trang Huyen Lai, and Deok Ryong Kim. "colocr: an R package for conducting colocalization analysis on fluorescence microscopy images". In: *PeerJ* 7 (July 2019), e7255. ISSN: 2167-8359
- Mahmoud Ahmed and Deok Ryong Kim. "Modelling the gene expression and the DNA-binding in the 3T3-L1 differentiating adipocytes." In: *Adipocyte* 8.1 (2019), pp. 401–411. ISSN: 2162-397X
- Mahmoud Ahmed et al. "Transcriptional Regulation of Autophagy Genes via Stage-Specific Activation of CEBPB and PPAR $\gamma$  during Adipogenesis: A Systematic Study Using Public Gene Expression and Transcription Factor Binding Datasets". In: *Cells* 8.11 (Oct. 2019), p. 1321. ISSN: 2073-4409
- Mahmoud Ahmed and Deok Ryong Kim. "cRegulome: an R package for accessing microRNA and transcription factor-gene expression correlations in cancer." In: *PeerJ* 7 (2019), e6509. ISSN: 2167-8359
- Sahib Zada et al. "Protein kinase A activation by  $\beta$ -lapachone is associated with apoptotic cell death in NQO1-overexpressing breast cancer cells." In: *Oncology reports* 42.4 (Oct. 2019), pp. 1621–1630. ISSN: 1791-2431
- Huynh Quoc Nguyen et al. "Calpain-dependent Beclin1 cleavage stimulates senescence-associated cell death in HT22 hippocampal cells under the oxidative stress conditions." In: *Neuroscience letters* 701 (2019), pp. 106–111. ISSN: 1872-7972
- Mahmoud Ahmed and Deok Ryong Kim. "qPCR: an R package for quality assessment, analysis and testing of qPCR data." In: *PeerJ* 6.3 (Mar. 2018), e4473. ISSN: 2167-8359
- Mahmoud Ahmed et al. "Co-Expression network analysis of AMPK and autophagy gene products during adipocyte differentiation". In: *International Journal of Molecular Sciences* 19.6 (June 2018), p. 1808. ISSN: 14220067
- Mahmoud Ahmed et al. "Systematic characterization of autophagy-related genes during the adipocyte differentiation using public-access data". In: *Oncotarget* 9.February (2018). ISSN: 1949-2553
- Mahmoud Ahmed et al. "Functional Linkage of RKIP to the Epithelial to Mesenchymal Transition and Autophagy during the Development of Prostate Cancer". In: *Cancers* 10.8 (Aug. 2018), p. 273. ISSN: 2072-6694
- M. Ahmed et al. "MiRCancerdb: A database for correlation analysis between microRNA and gene expression in cancer". In: *BMC Research Notes* 11.1 (2018). ISSN: 17560500
- Jong Ryeal Hahm, Mahmoud Ahmed, and Deok Ryong Kim. "RKIP phosphorylation-dependent ERK1 activation stimulates adipogenic lipid accumulation in 3T3-L1 preadipocytes overexpressing LC3." In: *Biochemical and biophysical research communications* 478.1 (Sept. 2016), pp. 12–17. ISSN: 1090-2104