Arvin Zaker

azake040@uottawa.ca | github.com/ArvinZaker

1 Educational Background

Honours Bachelor of Science - Translational and Molecular Medicine | (September 2019 - April 2023)

University of Ottawa, Ottawa, ON

- Major Research Project Supervisor: Dr. Arvind Mer
- Major Research Project Title: Comparative analysis of drug response metrics in patient-derived xenografts

2 Honours, Scholarships and Awards

NSERC - Undergraduate Student Research Awards (USRA) | (May 2023)

University of Ottawa, Ottawa, ON

- Competitive merit-based award. Selection based on academic performance, quality of the research proposal, and the research's potential impact.
- One of 88 awards available at the University of Ottawa.
- Valued at $7500 for 3 months

Work in Biomedical Research Scholarship | (May 2022)

University of Ottawa, Ottawa, ON

- Competitive merit-based award. Selection based on academic performance and the quality of the research proposal.
- Under 50% success rate.
- Valued at $3500 for 3 months

TMM Summer Training program | (May 2022)

University of Ottawa, Ottawa, ON

- Competitive merit-based award. Selection based on based on academic performance and the quality of the research proposal.
- Valued at $8900 for 3 months.

Undergraduate Research Opportunities (UROP) | (December 2020)

University of Ottawa, Ottawa, ON

- Competitive merit-based award. Selection based on academic performance and the quality of the research proposal.
- Valued at $1000 for 4 months.

Dean's Honour List & Merit Scholarship | (September 2019 - April 2023)

University of Ottawa, Ottawa, ON

- Merit-based award. Selection based on grade point average (GPA) in post-secondary studies.
- Valued at $1000 per term (awarded every term).

3 Research Experience

Research Assistant | (June 2024 - Present)

Supervisor: Dr. Arvind Mer (Primary Supervisor) and Dr. Gilda Stefanelli

Title: Analyzing the genome-wide distribution of H2AZ histone binding

Contribution:

- Created and optimized a epigenomic analysis pipeline for Cut&Run high throughput studies.
- Analyzed the functional impacts of H2AZ histone binding pattern in DNA through pathway analysis.

Research Assistant | (March 2024 - June 2024)

Supervisor: Dr. Arvind Mer (Primary Supervisor) and Dr. Jean-Francois Couture

Title: Structural insights into an atypical histone binding mechanism by a PHD finger

Contribution:

- Obtained and aggregated CXXC1 mutational data from 44 studies and databases.
- Visualized the mutation frequency across the whole genome and PHD domain region.

Research Assistant | (September 2023 - February 2024)

Supervisor: Dr. Arvind Mer

Title: Text-mining-based feature selection for anticancer drug response prediction

Contribution:

- Devised multiple feature selection methods for drug-response prediction machine-learning models.
- Trained machine-learning models with varying feature selection methods and compared their predictive performance on validation datasets.
- Visualized the performance differential between machine learning methods trained using literature-derived genes and other techniques.

Research Assistant | (September 2023 - December 2023)

Supervisor: Dr. Arvind Mer (Primary Supervisor) and Dr. Ryan C. Russell

Title: Transcriptomic analysis of RB and VHL knockout in Renal cell carcinoma.

Contribution:

- Evaluated the transcriptomic impact of RB and VHL gene knockouts on the progression of renal cell carcinoma.
- Utilized RNASeq data to contract the effectors and targets associated with RB and VHL gene knockout, identifying areas of convergent molecular perturbation.

Research Assistant | (July 2023 - February 2024)

Supervisor: Dr. Arvind Mer (Primary Supervisor) and Dr. Vanessa M D'Costa

Title: Characterization of the diversity of type IV secretion system-encoding plasmids in *Acinetobacter*

Contribution:

- Created and optimized a genomic analysis and annotation pipeline of the bacterial genome and plasmid using Prokka, Roary and PEPPAN tools.
- Identified major clusters of Type IV secretion systems across 118 bacterial and plasmid strains.

Summer Research Assistant | (May 2023 - August 2023)

Supervisor: Dr. Arvind Mer

Title: Machine learning methods for drug response prediction in Patient-Derived Xenograft

Contribution:

- Developed machine-learning based drug response metrics to predict the probability of response to anti-cancer medication.
- Successfully applied the machine learning model to predict drug response to Paclitaxel in human clinical trial data with 95% accuracy.
- Successfully applied the machine learning model to predict the overall survival of breast cancer patients in the Cancer Genome Atlas Program (TCGA).

Research Assistant | (September 2022 - June 2023)

Supervisor: Dr. Arvind Mer (Primary Supervisor) and Dr. Ryan C. Russell

Title: Analysis of Protein-Protein Interactions to Discover Components and Regulators of a Novel Autophagy Regulator Complex

Contribution:

- Designed and co-developed the BiogridMiner package for analyzing and curating protein-protein interaction networks for the discovery of pathways and complex proteins.
- Contributed to the discovery of novel autophagy proteins involved in the ATG12/5/16 autophagy complex.

Undergraduate Thesis | (September 2022 - April 2023)

Supervisor: Dr. Arvind Mer

Title: Comparative Analysis of Drug Response Metrics for Patient-Derived Xenograft

Contribution:

- Performed literature review to identify common methods of quantifying drug reseponse in patient-derived xenografts (PDX)
- Developed xeMetron package to calculate 250 existing and novel drug response metrics for measuring the drug response in xenografts.
- Performed biomarker discovery to identify transcriptional markers of drug sensitivity in anti-cancer medications.

Summer Research Assistant | (May 2022 - August 2022)

Supervisor: Dr. Arvind Mer (Primary Supervisor) and Dr. Damien D'Amours

Title: Large-scale phenogenomic analysis of human cancers uncovers frequent alterations affecting SMC5/6 complex components in breast cancer

Contribution:

- Aggregated and combined data from 199 cancer studies to analyze the mutational effects of SMC5/6 DNA repair complex in a pan-cancer cohort.
- Utilized R programming language to analyze the functional impact of SMC5/6 mutation using transcriptomic data.
- Performed cancer phenotype and survival analysis to study the clinical implication of SMC5/6 alterations.

Student Research Assistant | (March 2022 - Present)

Supervisor: Dr. Arvind Mer (Primary Supervisor) and Dr. Greg Silasi

Title: Enhancing motor cortex excitability in mice through optogenetic intermittent theta burst (iTBS) stimulation

Contribution:

- Co-developing computational algorithms for quantification of cortical neural activity and hemodynamics with partner neurology lab.
- Assessing phenomic alterations associated with optogenetic iTBS interventions in mouse models.

Student Research Assistant | (January 2022 - April 2022)

Supervisor: Dr. Arvind Mer

Title: Analysis of Drug Response in Patient-Derived Xenografts

Contribution:

- Created an open-source computational tool (xeMetron) for analyzing *in vivo* cancer drug response.
- Conducted correlational study between cancer gene biomarkers and drug response in patient derived xenograft models.

Student Research Assistant | (September 2021 - April 2022)

Supervisor: Dr. Adam Rudner

Title: Discovery and Characterization of Phage Arzan and Khorshid

Contribution:

- Performed environmental sampling, phage extraction, and phage amplification assays
- Conducted DNA extraction and restriction digest analysis via gel electrophoresis.
- Discovered and annotated the genome of two novel phages, Arzan and Khorshid

UROP Research Assistant | (November 2020 - July 2022)

Supervisor: Dr. Jean-Marc Renaud

Title: Role of Adenosine Receptors on Mice Skeletal Muscle Fatigue Kinetics.

Contribution:

- Designed experiments and set up research equipment for data collection
- Performed experiments on mouse muscles using electrophysiological equipment
- Performed antibody staining, fluorescent imaging, and analysis of muscle tissue in the Imiris program

4 Publications, Presentations and Abstracts

Articles (Peer Reviewed)

Couture, JF., Gregoire, S., Gregoire, J., Yidai, Y., Monika, J., Sarvan, S., **Zaker, A.**, Ulrich, K., Brunzelle, J., Mer, A. (2024). Structural insights into an atypical histone binding mechanism by a PHD finger. Structure 0, (2024). doi:10.1016/j.str.2024.06.017

Wu, G., **Zaker, A.**, Ebrahimi, A., Tripathi, S. & Mer, A. S. Text-mining-based feature selection for anticancer drug response prediction. Bioinformatics Advances 4, vbae047 (2024). doi:10.1093/bioadv/vbae047

Nasser, F., Gaudreau, A., Lubega, S., **Zaker, A.**, D'Costa, VM., Mer, A. (2024). Characterization of the Diversity of Type IV Secretion System-encoding Plasmids in *Acinetobacter*. Emerg Microbes Infect 13, 2320929 (2024). doi:10.1080/22221751.2024.2320929

Roy S., **Zaker, A.**, Mer, A., D'Amours, D. (2023). Large-scale phenogenomic analysis of human cancers uncovers frequent alterations affecting SMC5/6 complex components in breast cancer, NAR Cancer, 5(3). doi:10.1093/narcan/zcad047.

Posters and presentations at scientific meetings (peer-reviewed)

Roy, S., **Zaker, A.**, Mer, A., D'Amours, D. (2023). Large-scale phenogenomic analysis of human cancers uncovers frequent alterations affecting SMC5/6 complex components in breast cancer. *Canadian Society for Molecular Biosciences (CSMB) International Conference*. Ottawa, ON. (poster and presentation)

Zaker, A., Mer, A. (2022). Comparative analysis of drug response metrics in patient-derived xenografts. *4th Annual Faculty of Medicine Research Day.* Ottawa, ON. (oral presentation)

Friesen, R., Algharbi S., **Zaker, A.**, Mahdi, O., Gao, R., Ferri, O., Li, J., Wang, SY., HeffernanC., Featherstone, A., Radar, A., Gandelman, M., Chander N., Bancud, SE., Rege, I., Shriraam, R., Jung, D., Karunakaran, G., Sarakbi, R., Znamenski, E., Ristovski, M., Freitas, JD., McCarthy, L., Williams, EC., D'Ambrosio, L., Chan, K., Wheaton, K., Rudner, AD. (2022). Investigating Nucleotide-binding Proteins in Bacteriophage JohnDoe. *SEA Symposium.* University of Pittsburgh, Pittsburgh, PA. (abstract and presentation).

Featherstone, A., Radar, A., Salama, A., Tiukuvaara, S., Ferri, O., **Zaker, A.**, Algharbi, S., Mahdi, O., Setia, G., Friesen, R., Wang, GY., Li, J., Gao, R., Jung, D., Karunakaran, G., Znamenski, E., Ristovski, M., Sarakbi, R., Freitas, JD., McCarthy, L., Williams, EC., D'Ambrosio, L., Wheaton, K., Rudner AD. (2022). Give Us a Millet of Your Time: Dehusking the Singleton Bacteriophage Arzan. *SEA Symposium.* University of Pittsburgh, Pittsburgh, PA. (abstract and presentation)

Zaker, A., McCarthy, L., Jung, D., Karunakaran, G., Rudner, A. (2022). Discovery and characterization of bacteriophage Arzan. *University of Ottawa, Ottawa, ON.* (poster and presentation)

Zaker, A., McRae, C., Renaud, J.M. (2021). Role of Adenosine Receptors on mice skeletal muscle fatigue kinetics. *UROP symposium.* University of Ottawa, Ottawa, ON. (abstract and poster).