1 Applicant Information

Last Name: Zaker

First Name: Arvin

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2 University Educational Background

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

University of Ottawa, Ottawa, ON

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

3 Research–specific 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, the quality of the research proposal, and the research's potential contribution to the STEM field.
- One of the 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 $3500 for 3 Months

TMM Summer Training (TST) 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.

4 Other Honours, Scholarships and Awards

Merit Scholarship | (September 2020 - 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).

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

University of Ottawa, Ottawa, ON

- Merit-based award.
- Selection based on Grade point average (GPA).
- Awarded every academic term at the University of Ottawa.

Admission Scholarship | (September 2019)

University of Ottawa, Ottawa, ON

- Merit-based award.
- Selection based on Grade point average (GPA) in Secondary education.
- Valued at $3000.

Academic Excellence Scholarship | (September 2018)

Cardiff Sixth Form College, Cardiff, UK

- Competitive merit-based award.
- Selection based on past academic performance and results of an extensive multi-subject test.
- Selected 5 out of approximately 80 applicants.
- Valued at $14000 for 8 months.

5 Research Experience

Research Assistant

Supervisor: Dr. Arvind Mer and Dr. Ryan C. Russell

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

Date range: September 2023 - Present

Time Commitment: Part-time (10 hours per week)

Contribution:

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

Summer Research Assistant

Supervisor: Dr. Arvind Mer

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

Date range of involvement: May 2023 - August 2023

Time Commitment: Full-time (40 hours per week)

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 97.5% 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

Supervisor: Dr. Arvind Mer and Dr. Ryan C. Russell

Title: BiogridMiner: BIOGRID-based Analysis Toolkit for Protein-Protein Interaction Networks

Date range of involvement: September 2022 - June 2023

Time Commitment: Part-time (2 hour per week)

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 ATG16L1/ATG5 protein complex.

Undergraduate Thesis

Supervisor: Dr. Arvind Mer

Title: Comparative analysis of drug response metrics in patient-derived xenografts.

Date range of involvement: September 2022 - April 2023

Time Commitment: Part-time (20 hours per week)

Contribution:

- Developed over 250 novel drug response metrics for measuring the drug response in patient derived xenografts.
- Created the xeMetron package to facilitate the quantification of drug response metrics.
- Performed biomarker discovery for prediction of transcriptional markers of drug sensitivity in anti-cancer medications.

Summer Research Assistant

Supervisor: Dr. Arvind Mer and Dr. Damien D'Amours

Title: Large-scale analysis of SMC5/6 complex alteration effects in human cancers

Date range of involvement: May 2022 - August 2022

Time Commitment: Full-time (40 hours per week)

Contribution:

- Analyzed the mutational effects of SMC5/6 DNA repair complex in pan-cancer cohort.
- Utilized the R programming language in genomic and transcriptomic data analysis
- Cancer phenotype and survival analysis of novel DNA repair complexes
- Utilized multiple machine mining algorithms for biomarker discovery

Student Research Assistant

Supervisor: Dr. Arvind Mer and Dr. Greg Silasi

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

Date range of involvement: March 2022 - Present

Time Commitment: Part-time (1 hour per week)

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 mice stroke models.

Student Research Assistant

Supervisor: Dr. Arvind Mer

Title: Analysis of drug response in patient-derived xenografts

Date range of involvement: January 2022 to April 2022

Time Commitment: Part-time (10 hours per week)

Contribution:

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

Student Research Assistant

Supervisor: Dr. Adam Rudner

Title: Discovery and Characterization of Phage Arzan

Date range of involvement: September 2021 - April 2022

Time Commitment: Part-time (10 hours per week)

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

Supervisor: Dr. Jean-Marc Renaud

Title: Role of Adenosine Receptors on mice skeletal muscle fatigue kinetics.

Date range of involvement: December 2020 - July 2022

Time Commitment: Part-time (5 hours per week)

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

6 Publications, Presentations and Abstracts

Articles (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, NAR Cancer, 5(3). doi:10.1093/narcan/zcad047.

Wu, G., **Zaker, A.**, Tripathi, S., Mer, A. (2023). Text-Mining Based Feature Selection for Anticancer Drug Response Prediction. (under review)

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).

- Located and Annotated the potential novel nucleotide-binding protein sequence in phage JohnDoe.
- Compared the potential sequence against known nucleotide-binding lsm and Hfq-RNA binding proteins using the R programming language.
- Helped in the creation and sharing of the online presentation (link).

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).