# Volkan Ozcoban

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## UNIVERSITY EDUCATION

**Doctor of Philosophy – Engineering and IT (Biomedical Engineering)** **November 2023 – Current**

Thesis Title: Constructing the Bridge between Mitochondrial Dynamics and Cell Migration

Supervisors: A/Prof. Vijay Rajagopal (University of Melbourne), Dr. Senthil Arumugam (Monash University), Dr. Stanley Stylli (Royal Melbourne Hospital)

Project Description:

- Focus on **how energy production regulates cellular architecture and migration**, and **how mitochondrial dynamics and energy metabolism might influence cellular migration**.
- Aim to **build biophysical models** to explore how cellular energy influences migration and cytoskeletal architecture, integrating biophysical/microscopy experiments and deep learning-driven quantification.
- **Deep learning-based image segmentation** to **model mitochondrial interactions** using **agent-based** and **reinforcement learning-derived models** to understand disease progression.

**Bachelor of Science (Honours), University of Melbourne** **July 2021 – July 2022**

Department: Biochemistry & Pharmacology

Thesis Title: Unravelling the Mechanisms of GPCR-G Protein Promiscuity

Thesis Grade: First Class Honours (H1, 90.7%)

Project Description:

- **Developed novel biophysical assays** to investigate the GPCR-G Protein coupling environment within a cell-free environment.
- Implemented biophysical assay, protein purification, protein engineering, and cell culture techniques.

**Bachelor of Science, University of Melbourne** **March 2018 – June 2021**

Major: Biochemistry & Molecular Biology

Final Grade: First Class Honours (H1, 87.208%)

**Diploma in Mathematical Sciences, University of Melbourne** **March 2018 – June 2021**

Major: Mathematics and Statistics (Applied Mathematics)

Final Grade: First Class Honours (H1, 89.5%)

## RESEARCH EXPERIENCE

**Research Assistant** **October 2024 – Current**

**Department of Mathematics and Statistics, The University of Melbourne**

**Supervisors:** Dr. Michael Pan (Department of Mathematics and Statistics)

**Project Description:** Performed bioinformatics-based flux analysis of metabolic labelling experiments to infer *Leishmania mexicana* parasite metabolic fluxes. Applied findings to refine and validate models of parasite metabolism, providing deeper insights into parasitic regulatory mechanisms and identifying potential targets for drug discovery.

**Research Assistant** **October 2022 – April 2023**

**Alkira Bio (*previously* LASEREDD Therapeutics)**

**Supervisors:** A/Prof. Daniel Scott (CEO, Co-Founder) and Dr. Christopher Draper-Joyce (CSO, Co-Founder)

**Project Description:** Conducted research at a biotech start-up **focused on developing novel tools for GPCR-based nanobody therapeutic discovery**. Leveraged the LASEREDD® platform to enable next-generation therapeutic antibody discovery of membrane proteins. Contributed to **developing the companies' scalable frameworks and portfolio** for producing therapeutic nanobody candidates for clinical use.

**Research Assistant** **January 2021 – May 2021**

**Systems Biology Laboratory, The University of Melbourne**

**Supervisors:** Dr. Stuart Johnston (Department of Mathematics and Statistics), Dr. Matt Faria (Department of Biomedical Engineering), and Prof. Edmund Crampin (Deceased) (Department of Mathematics and Statistics)

**Project Description:** Collected experimental data to determine the effectiveness of the PDE model of nanoparticle-cell uptake developed during the Vacation Research Scholarship Program project.

**Research Project Internship (UROP)** **January 2020 – May 2021**

**The Florey Institute of Mental Health and Neuroscience**

**Supervisors:** A/Prof. Daniel Scott and Dr. Jonathan Siah (Receptor Structure and Drug Discovery Laboratory)

**Project Description:** Undertaken as part of the highly competitive Undergraduate Research Opportunities Program (UROP), this project focused on developing an innovative method to evolve G Protein-Coupled Receptors (GPCRs), specifically targeting increased expression of the RXFP1 receptor.

**Vacation Research Scholarship Program** **December 2020 – January 2021**

**Department of Mathematics and Statistics**

**Supervisor:** Dr. Stuart Johnston (The University of Melbourne)

**Project Description:** Adapted a partial differential equation model of nanoparticle-cell uptake in cells to one which incorporates phases of the cell cycle for a better understanding of nanoparticle transport and the physical processes dictating transport into cells.

**Research Project Internship** **November 2019 – February 2020**

**Computational Biology Programme, Peter MacCallum Cancer Centre**

**Supervisors:** Dr. David Goode and Dr. Anna Trigos (Computational Biology/Goode Laboratory, Peter MacCallum Cancer Centre).

**Project Description:** Developed an open-source R package (SPIAT) enabling researchers to analyse immune cell-tumour interactions in tissue microenvironments. Designed the software to be easily accessible and user-friendly, catering to scientists without programming expertise, thereby broadening utility across multidisciplinary research teams.

## PUBLICATIONS

Yuzhou Feng, Tianpei Yang, John Zhu, Mabel Li, Maria Doyle, **Volkan Ozcoban**, Greg Bass, Angela Pizzolla, Lachlan Cain, Sirui Weng, Anupama Pasam, Nikolce Kocovski, Yu-Kuan Huang, Simon Keam, Terence Speed, Paul Neeson, Richard Pearson, Shahneen Sandhu, David Goode. Spatial analysis with SPIAT and spaSim to characterize and simulate tissue microenvironments. *Nature Communications* **14**, 2697 (2023). https://doi.org/10.1038/s41467-023-37822-0

## AWARDS

- University of Melbourne Research Training Program Scholarship (Stipend and Fee Offset) (2023-2027)
- Melbourne Access Scholarship (2018-2022)
- Dean's Honours List – Bachelor of Science – Third Year (2021)
- Dean's Honours List – Bachelor of Science – Second Year (2019)
- 1st Place in the Department of Biochemistry & Pharmacology Honours Program (2021-2022)
- Undergraduate Research Opportunities Program (UROP) Scholar – CSIRO (January 2020 – May 2021)
- School of Mathematics and Statistics Vacation Research Scholarship (2020)
- Cancer Council Victoria – Summer Vacation Studentship (November 2019 – February 2020)
- Peter MacCallum Summer Scholarship (November 2019 – February 2020)
- Certificate of Merit (Second Year) – Biochemistry & Molecular Biology Major (2019)
- Science Start Up Scholarship (2018)

## TECHNICAL SKILLS

- **Computational:** Coding (Python, MATLAB, R, Git, Bash), High Performance Computing (Slurm, CPU/GPU Parallelisation), Machine/Deep Learning (Pytorch, SciPy, NumPy, Pandas, Scikit Learn, Scikit Image)
- **Wet Laboratory:** Bacterial Cell Culture, Bioluminescence/Fluorescence Resonance Energy Transfer Assays, DNA Cloning, Enzyme-Linked Immunosorbent Assays, Flow Cytometry, Mammalian Cell Culture, Protein Analysis (Fluorescence Size Exclusion Chromatography, High-Performance Liquid Chromatography, SDS-PAGE, Western Blotting), Protein Purification (Mammalian and Bacterial, particularly GPCRs and Nanobodies)
- **Mathematics:** Biophysical Models, Partial Differential Equations (Reaction-Diffusion, Elasticity, Continuum Mechanics, Biomechanics), Ordinary Differential Equations (Bond Graphs, Numerical Integration Methods), Finite Element Analysis, Spatial Statistics, Stochastic Simulations (Monte Carlo, Gillespie Algorithm)