

François Charih

Carleton University Biomedical Informatics Collaboratory (cuBIC)

Institute of Biochemistry, Carleton University

NuvoBio

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Research interests

Computational biology

Biomedical informatics

Applied machine learning

High performance computing

Software development

Protein/peptide engineering

Education

Ph.D. in Electrical and Computer Engineering (Computational Biology)

Carleton University

Thesis: Uncovering and modulating the lysine methylome: a computational approach

Thesis advisor(s): [James R. Green](#) and [Kyle K. Biggar](#)

2019 - 2025 (expected)

📍 Ottawa, ON

M.A.Sc. in Electrical and Computer Engineering (Data Science)

Carleton University

Thesis: Machine Learning in Audiology: Applications and Implications

Thesis advisor(s): [James R. Green](#)

2016 - 2018

📍 Ottawa, ON

B.Sc.(Hons.) in Biochemistry

University of Ottawa

Thesis: Structural Insights into the DNA-Binding Activity of Metalloregulator Fur in C.

jejuni

Thesis advisor(s): [Jean-François Couture](#)

2010 - 2016

📍 Ottawa, ON

B.A.Sc. in Chemical Engineering

University of Ottawa

Thesis: Design, Simulation and Optimization of a High Production Volume Toluene

Plant

2010 - 2016

📍 Ottawa, ON

Relevant employment experience

Research Scientist

NuvoBio

2022 - present

📍 Ottawa, ON

- Leading the development of Darwin, a inhibitory peptide engineering algorithm
- Responsible for the implementation, deployment and distribution of Darwin
- Managing multiple high performance computing platforms (mid-size computer clusters)





Lead Researcher (Contractual position)

Carleton University

Summer 2020

📍 Ottawa, ON

- Collaboration initiated by the WSIB of Ontario upon reading my master's thesis
- Managed a team composed of myself, one M.Eng. student, and one undergraduate student
- Responsible for developing a semi-automated audiogram digitization/interpretation solution using machine learning and computer vision to support the claim adjudication process at WSIB

- Contract Researcher** 2018 - 2019
The Ottawa Hospital Rehabilitation Centre  Ottawa, ON
- Responsible for the implementation of a tablet-based software for the annotation of stress levels of PTSD/TBI patients undergoing VR therapy (collaboration with Rehabilitation Virtual Reality Lab at The Ottawa Hospital).
- Contract Researcher** 2017 - 2018
Natural Resources Canada  Ottawa, ON
- Co-authored a technical report detailing how deep learning strategies can be deployed for passive monitoring of critical electrical infrastructure
 - Responsible for the annotation of thousands of images for the development of deep learning-based segmentation models
- Teaching Assistant** 2017 - present
Carleton University  Ottawa, ON
- SYSC4001 - Operating Systems (Fall 2023)
 - SYSC2100 - Data Structures and Algorithms (Spring 2023)
 - SYSC4415 - Introduction to Machine Learning (Winter 2023)
 - SYSC2002 - Data Structures and Algorithms (Spring 2020)
 - SYSC2006 - Foundations of Imperative Programming (Fall 2017, Winter 2019)
- Undergraduate Research Assistant** 2014 - 2016
Ottawa Institute of Systems Biology  Ottawa, ON
- Successfully crystallized and contributed to the resolution of the crystal structure of the protein under study
 - Performed and optimized a variety of biochemistry techniques, including protein overexpression, mutational studies, structural characterization and protein-DNA interaction studies
 - Used tools including high-throughput crystallization robots, x-ray diffractometer, FPLC/HPLC, protein modelling software, isothermal titration calorimetry on a regular basis in addition to applying other common techniques

Publications

Peer-reviewed journal articles

- [J12] A. Shukri, A. C. Carroll, R. Collins, **F. Charih**, A. Wong, K. K. Biggar. Systematic in vitro optimization of antimicrobial peptides against *Escherichia coli* (2024). *JAC-Antimicrobial Resistance*. 6(4). [\[Link\]](#)
- [J11] A. H. Shukri, V. Lukinović, **F. Charih**, K. K. Biggar. Unraveling the Battle for Lysine: A Review of the Competition among Post-Translational Modifications (2023). *Biochimica et Biophysica Acta (BBA) - Gene Regulatory Mechanisms*. 1866(4). [\[Link\]](#)
- [J10] **F. Charih** and J.R. Green. Audiogram Digitization Tool for Audiological Reports (2022). *IEEE Access*. 10. [\[Link\]](#)
- [J9] K. Dick, J. B. Tanner, **F. Charih**, J.R. Green. GasBotty: Multi-Metric Extraction in the Wild (2022). *IEEE Access*. 10. [\[Link\]](#)
- [J8] **F. Charih**, K. Biggar, J.R. Green. Assessing sequence-based protein-protein interaction predictors for use in therapeutic peptide engineering (2022). *Scientific Reports*. 12(9610). [\[Link\]](#)
- [J7] G.M. Rurak, S. Simard, M. Freitas-Andrade, B. Lacoste, **F. Charih**, A. Van Geel, J. Stead, B. Woodside, J.R. Green, G. Coppola, N. Salmaso. Translatomic database of cortical astroglia across male and female mouse development reveals two distinct developmental phenotypes (2022). *Cell Reports*. 38(5). [\[Link\]](#)
- [J6] **F. Charih**, J. R. Green, K. K. Biggar. Machine Learning-Driven Identification of Novel Lysine Methylation Sites with MethylSight (2020). *Star Protocols*. [\[Link\]](#)

- [J5] K. K. Biggar*, **F. Charih***, H. Liu, Y. B. Ruiz-Blanco, L. Stalker, A. Chopra, J. Connolly, K. Frensemier, M. Galka, Q. Fang, C. Wynder, W. L. Stanford, J. R. Green, and S. S.-C. Li. Proteome-wide Prediction of Lysine Methylation Reveals Novel Histone Marks and Outlines the Methyllysine Proteome (2020). *Cell Reports*. 32(107896). (*Co-first authors) [[Link](#)]
- [J4] **F. Charih**, M. Bromwich, A. E. Mark, R. Lefrançois, and J. R. Green. Data-Driven Audiogram Classification for Mobile Audiometry (2020). *Scientific Reports*. 10(3962). [[Link](#)]
- [J3] S. Sarvan, A. Yeung, **F. Charih**, A. Stintzi, and J.-F. Couture. Purification and characterization of *Campylobacter jejuni* ferric uptake regulator (2018). *BioMetals*. 32(3). [[Link](#)]
- [J2] S. Sarvan, **F. Charih**, J. Butcher, J. S. Brunzelle, A. Stintzi, and J.-F. Couture. Crystal structure of *Campylobacter jejuni* peroxide regulator (2018). *FEBS Letters*. 592(13). [[Link](#)]
- [J1] S. Sarvan, **F. Charih**, M. Askoura, J. Butcher, J. S. Brunzelle, A. Stintzi, and J.-F. Couture. Functional insights into the interplay between DNA interaction and metal coordination in ferric uptake regulators (2018). *Scientific Reports*. 8(1). [[Link](#)]

Conference proceedings

- [C5] K. Dick, **F. Charih**, J. Woo, J. R. Green. Gas Prices of America: The Machine-Augmented Crowd-Sourcing Era. *17th Conference on Computer and Robot Vision*, Ottawa, Canada, May 2020. [[Link](#)]
- [C4] R. Selzler, A. Smith, **F. Charih**, A. Boyle, J. Holly, C. Bridgewater, M. Besemann, D. Curran, A. D. C. Chan, and J. R. Green. Exploratory Analysis of Ultra-Short-Term Heart Rate Variability Features in Virtual Rehabilitation Sessions. *2020 IEEE International Symposium on Medical Measurements and Applications (MeMeA)*, Bari, Italy, June 2020. [[Link](#)]
- [C3] **F. Charih**, A. Steeves, M. Bromwich, A. E. Mark, R. Lefrançois, and J. R. Green. Applications of Machine Learning Methods in Retrospective Studies on Hearing. *Proceedings of the 2018 IEEE Life Sciences Conference*, Montréal, Canada, October 2018. [[Link](#)]
- [C2] **F. Charih**, M. Bromwich, R. Lefrançois, A. E. Mark, and J. R. Green. Mining Audiograms to Improve the Interpretability of Automated Audiometry Measurements. *Proceedings of the 2018 IEEE International Symposium on Medical Measurements and Applications (MeMeA)*, Rome, Italy, June 2018. [[Link](#)]
- [C1] K. Dick, **F. Charih**, Y. Souley Dosso, L. Russell, and J. R. Green. Systematic Street View Sampling: High Quality Annotation of Power Infrastructure in Rural Ontario. *Proceedings of the 2018 15th Conference on Computer and Robot Vision (CRV)*, Toronto, Canada, May 2018. [[Link](#)]

Other manuscripts (e.g. pre-prints, theses, etc.)

- [O3] K. K. Biggar, N. Ridgeway, A. Chopra, V. Lukinović, **F. Charih**, D. Levy, J. R. Green. Machine learning-based exploration of enzyme-substrate networks: SET8-mediated methyllysine and its changing impact within cancer proteomes. *preprint*, Nature Communications (under review), , 2024. [[Link](#)]
- [O2] **F. Charih**. Machine Learning in Audiology: Applications and Implications. *Master's thesis*, Carleton University, Ottawa, ON, December 2018. (Defended without revisions, and was awarded the Carleton University Senate medal) [[Link](#)]
- [O1] K. Dick, **F. Charih**, Y. Souley Dosso, L. Russell, and J. R. Green. Towards Energy Infrastructure Image Segmentation Using Deep Learning. *Technical Report prepared for Natural Resources Canada*, Carleton University, Ottawa, ON, April 2018.

Presentations and workshops

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| [PW9] Machine learning in Biomedical Informatics and Bioinformatics (Guest lecture)
ECOR1055 | November 6th, 2024
📍 Ottawa, ON |
| [PW8] Machine learning in Biomedical Informatics and Bioinformatics
ECOR1055 | November 1st, 2022
📍 Ottawa, ON |

[PW7] Evolution-Inspired Peptide Drug Design GRADflix Challenge [Link]	April 2022 📍 Ottawa, ON
[PW6] AI in biology and biomedical engineering (guest lecture) ECOR1055	December 2nd, 2019 📍 Ottawa, ON
[PW5] X-ray crystallography and computational biochemistry (guest lecture) BIOC3202 [Link]	November 22nd, 2019 📍 Ottawa, ON
[PW4] Introductory Data Analysis with Pandas Lecture Series (IEEE EMBS Carleton) [Link]	October 16th, 2019 📍 Ottawa, ON
[PW3] Building interactive visualizations in the browser with D3.js Lecture Series (IEEE EMBS Carleton) [Link]	February 6th, 2019 📍 Ottawa, ON
[PW2] Machine learning in Audiology (guest lecture) HLTH2001 and HLTH4102 (Carleton University) [Link]	November 2018, 2019 📍 Ottawa, ON
[PW1] MethylSight: A Computational Approach to the Elucidation of the Methyllysine Proteome 21st Chemistry and Biochemistry Graduate Research Conference [Link]	November 9th, 2018 📍 Montreal, QC

Selected posters

[P6] In silico design of a novel SMYD3 inhibitor with Darwin Life Science Day 6.0, Carleton University	May 2023 📍 Ottawa, ON
[P5] Darwin: an evolution-inspired algorithm for target-specific peptide inhibitor engineering American Peptide Society Symposium	June 2022 📍 Whistler, BC
[P4] Machine Learning in Audiology: Applications and Implications Ottawa-AI Alliance Workshop	October 2018 📍 Ottawa, ON
[P3] Systematic Street View Sampling for Accurate Urban Population Estimation Data Day 5.0	May 2018 📍 Ottawa, ON
[P2] Extending the SHOEBOX Audiometry mobile audiometer with an automated audiogram classification system Life Science Day 2.0, Carleton University	May 2018 📍 Ottawa, ON
[P1] Structural insights into the DNA Binding Activity of the Ferric Uptake Regulator in Campylobacter jejuni Honours Project Poster Day	April, 2015 📍 Ottawa, ON

Awards and honours

Gabriel Warshaw Scholarship , Carleton University (1,700 CAD) Merit-based award	2023
Queen Elizabeth II Scholarship in Science and Technology , Government of Ontario (15,000 CAD) Merit-based award	2022

American Peptide Symposium Travel Award , American Peptide Society (600 USD)	2022
Douglas Millar Scholarship , Dean of the FGPA (Carleton) (3,200 CAD) Awarded yearly to an outstanding graduate student in engineering	2020
Postgraduate Scholarship-Doctoral (PGS-D) , NSERC (63,000 CAD) Awarded to high potential researchers to pursue doctoral studies	2019
Ontario Graduate Scholarship , Carleton University (15,000 CAD) Declined in favour of NSERC PGS-D award	2019
Carleton University Senate Medal , Carleton University Awarded for outstanding academic achievement at the graduate level (1 medal/faculty awarded)	2019
Ph.D. Entrance Scholarship , Carleton University (2,000 CAD)	2018
CREATE-BEST Scholarship , NSERC (5,000 CAD)	2017
Engage/VIP-I Grant , NSERC, OCE and Clearwater Clinical Ltd. (50,000 CAD) Co-authored the proposal for the grant awarded to Prof. James R. Green	2017
M.A.Sc. Entrance Scholarship , Carleton University (2,000 CAD)	2017
Protein Modeling Contest , University of Ottawa (100 CAD)	2014
B.Sc. Entrance Scholarship , University of Ottawa (2,000 CAD)	2011

Research mentoring

I have had the great pleasure to mentor the following students:

Abhinav Yalamanchili , M.Eng. Student Project: <i>Machine vision to digitize audiogram images (with WSIB Ontario)</i>	Summer 2020
Ahmed Abdelrazik , Undergraduate Student Project: <i>Development of an ergonomic audiogram digitization tool (with WSIB Ontario)</i>	Summer 2020
Siddharth Chadha , Undergraduate Student Project: <i>Digitization of audiograms with template matching</i>	Summer 2019
Pratyush Singh , Undergraduate Student Project: <i>Machine vision to digitize audiogram images</i>	Summer 2018
Ashlynn Steeves , Undergraduate Student Project: <i>Using kNN to impute values in incomplete audiograms</i>	Winter 2018

Peer reviews

I have reviewed submissions for the following peer-reviewed journals or conferences:

- Scientific Reports (5 reviews)
- Oxford Bioinformatics (1 review)
- PLoS One (1 review)
- Cell Star Protocols (1 review)
- IEEE International Symposium on Medical Measurements and Applications (1 review)

Other relevant roles

Executive Member Carleton University Biology Graduate Student Association	2023
Judge Ottawa Regional Science Fair	2019, 2021, 2023, 2024
Communications Officer Carleton University Engineering in Medicine and Biology Society	2018-2020
Judge Canada Wide Science Fair	2018, 2021, 2024

Languages

Natural languages: French (native), English (full professional proficiency), Moroccan Arabic (elementary proficiency)

Programming languages: Python, Rust, C/C++, JavaScript, Java, HTML/CSS