# François Charih

Carleton University Biomedical Informatics Collaboratory (cuBIC)

Institute of Biochemistry, Carleton University

NuvoBio

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3 https://charih.ca

Research interests			
Computational biology Biomedical informatics			
	Education		
Carleton University	Engineering (Computational Biology)  ag the lysine methylome: a computation and Kyle K. Biggar	• Ottawa, ON	
M.A.Sc. in Electrical and Compute Carleton University Thesis: Machine Learning in Audio Thesis advisor(s): James R. Green	er Engineering (Data Science)  ology: Applications and Implications	2016 - 2018 ♥ Ottawa, ON	
B.Sc.(Hons.) in Biochemistry University of Ottawa Thesis: Structural Insights into the jejuni Thesis advisor(s): Jean-François Co	DNA-Binding Activity of Metalloreguouture	2010 - 2016 ♥ Ottawa, ON lator Fur in C.	
<b>B.A.Sc. in Chemical Engineering</b> University of Ottawa <b>Thesis:</b> Design, Simulation and Op Plant	rtimization of a High Production Volun	2010 - 2016 • Ottawa, ON ne Toluene	
	Relevant employment experie	nce	

- 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

**Research Scientist** 

NuvoBio

Summer 2020

2022 - present

Ottawa, ON

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 Researcher2017 - 2018Natural 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 Assistant2017 - presentCarleton 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. Standford, 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			
[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 <b>♥</b> 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] <b>Systematic Street View Sampling for Accurate Urban Population Estimation</b> Data Day 5.0	May 2018 ♥ Ottawa, ON		
[P2] Extending the SHOEBOX Audiometry mobile audiometer with an automated audio classification system Life Science Day 2.0, Carleton University	ogram 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	
American Peptide Symposium Travel Award, American Peptide Society (600 USD)	2022
<b>Douglas Millar Scholarship</b> , 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 Scholaship, Carleton University (2,000 CAD)	2018
CREATE-BEST Scholarship, NSERC (5,000 CAD)	2017
<b>Engage/VIP-I Grant</b> , NSERC, OCE and Clearwater Clinical Ltd. (50,000 CAD) Co-authored the proposal for the grant awarded to Prof. James R. Green	
M.A.Sc. Entrance Scholaship, Carleton University (2,000 CAD)	2017
Protein Modeling Contest, University of Ottawa (100 CAD)	
<b>B.Sc. Entrance Scholarship</b> , 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: Machine vision to digitize audiogram images (with WSIB Ontario)	Summer 2020
Ahmed Abdelrazik, Undergraduate Student Project: Development of an ergonomic audiogram digitization tool (with WSIB Ontario)	Summer 2020
Siddharth Chadha, Undergraduate Student Project: Digitization of audiograms with template matching	Summer 2019
Pratyush Singh, Undergraduate Student Project: Machine vision to digitize audiogram images	Summer 2018
<b>Ashlynn Steeves</b> , 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 2023

Carleton University Biology Graduate Student Association

Judge 2019, 2021, 2023, 2024

Ottawa Regional Science Fair

Communications Officer 2018-2020

Carleton University Engineering in Medicine and Biology Society

Judge 2018, 2021, 2024

Canada Wide Science Fair

# Languages

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

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