# François Charih

Carleton University Biomedical Informatics Collaboratory (cuBIC)

Institute of Biochemistry, Carleton University

NuvoBio

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3 https://charih.ca

Research interests				
		Software development Protein/peptide engineering		
	Education			
Carleton University	Engineering (Computational Biology)  ag the lysine methylome: a computation and Kyle K. Biggar	• 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 <b>♥</b> 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	timization of a High Production Volur	2010 - 2016 ♥ Ottawa, ON ne Toluene		
	Relevant employment experie	nca		

- Responsible for the implementation, deployment and distribution of Darwin

• Leading the development of Darwin, a inhibitory peptide engineering algorithm

• 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] 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 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)		
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)	2014	
<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	
Ashlynn Steeves, Undergraduate Student Project: Using kNN to impute values in incomplete audiograms	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