François Charih

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Research interests

Peptide therapeutic design	Applied machine learning	Clinical decision support
Computational biochemistry	Health informatics	AI in education

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Education

Ph.D. in Electrical and Computer Engineering   Jan 2019 - Sep 2025
Carleton University   📍 Ottawa, ON
Thesis: Sequence-based peptide binder design to modulate the lysine methylome and beyond
Thesis advisor(s): James R. Green and Kyle K. Biggar

M.A.Sc. in Electrical and Computer Engineering   Sep 2016 - Dec 2018
Carleton University   📍 Ottawa, ON
Thesis: Machine Learning in Audiology: Applications and Implications
Thesis advisor(s): James R. Green

B.A.Sc. in Chemical Engineering   Sep 2010 - Apr 2016
University of Ottawa   📍 Ottawa, ON
Thesis: Design, Simulation and Optimization of a High Production Volume Toluene Plant

B.Sc.(Hons.) in Biochemistry   Sep 2010 - Apr 2016
University of Ottawa   📍 Ottawa, ON
Thesis: Structural Insights into the DNA-Binding Activity of Metalloregulator Fur in C. jejuni
Thesis advisor(s): Jean-François Couture

Relevant employment experience

Research scientist & co-founder   Sep 2023 - present
NuvoBio   📍 Ottawa, ON

- Design, implementation, deployment, and continuous development of DarwinAI, NuvoBio's AI-based peptide therapeutic discovery platform
- Execution of a research program and dissemination of results in peer-reviewed journals and conferences
- Fulfillment of peptide binder design contracts for academic and industrial clients
- Management of high performance computing platforms (computer clusters, cloud infrastructures, on-site hardware)
- Scientific popularization and communication

Lead researcher (contractual position)   May 2020 - Aug 2020
Carleton University   📍 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   Sep 2018 - Mar 2019
The Ottawa Hospital Rehabilitation Centre   📍 Ottawa, ON

- Developed data collection software (iOS) for the annotation of stress levels of post-traumatic stress disorder/traumatic brain injury patients undergoing VR therapy (collaboration with Rehabilitation VR Lab at The Ottawa Hospital)

Contract researcher   Sep 2017 - Apr 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   Sep 2017 - Dec 2023
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   May 2014 - Aug 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

[J16] N. Ridgeway, A. Chopra, V. Lukinović, M. Feldman, **F. Charih**, D. Levy, J. R. Green, K. K. Biggar. Machine learning-driven prediction of substrates for enzymes introducing or removing protein post-translational modifications (2025). *Communications Chemistry*, 8. [Link]

[J15] G. M. Rurak, C. Groulx, A. McFee, A. Aguilar-Valles, **F. Charih**, J. R. Green, B. Woodside, G. Coppola, N. Salmaso. Translatome plasticity of neocortical astroglia throughout the estrous cycle (2025). *Glial Health Research* (Submitted).

[J14] **F. Charih**, J. R. Green, K. K. Biggar. Sequence-based protein-protein interaction prediction and its applications in drug discovery (2025). *Cells*, 14(18). [Link]

[J13] V. Lukinović, H. Adhikary, M. Hoekstra, A. Shukri, **F. Charih**, A. Chopra, K. K. Biggar. Design of a selective peptide inhibitor targeting KDM5C demethylase activity (2025). *Structure*, 33. [Link]

[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**, J. R. Green. Audiogram Digitization Tool for Audiological Reports (2022). *IEEE Access*, 10. [Link]

[J9] **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]

[J8] K. Dick, J. B. Tanner, **F. Charih**, J. R. Green. GasBotty: Multi-Metric Extraction in the Wild (2022). *IEEE Access*, 10. [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*, 1(3). [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, S. S-C. Li. Proteome-wide Prediction of Lysine Methylation Reveals Novel Histone Marks and Outlines the Methyllysine Proteome (2020). *Cell Reports*, 32(107896). [Link]

[J4] **F. Charih**, M. Bromwich, A. E. Mark, R. Lefrançois, 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, 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, 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, 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] R. Selzler, A. Smith, **F. Charih**, A. Boyle, J. Holly, C. Bridgewater, M. Besemann, D. Curran, A. D. C. Chan, J. R. Green. Exploratory Analysis of Ultra-Short-Term Heart Rate Variability Features in Virtual Rehabilitation Sessions. *IEEE International Symposium on Medical Measurements and Applications (MeMeA)*, Bari, Italy, June 1-July 1, 2020. [Link]

[C4] K. Dick, **F. Charih**, J. Woo, J. R. Green. Gas Prices of America: The Machine-Augmented Crowd-Sourcing Era. *Conference on Computer and Robot Vision (CRV)*, Ottawa, ON, May 13-15, 2020. [Link]

[C3] **F. Charih**, A. Steeves, M. Bromwich, A. E. Mark, R. Lefrançois, J. R. Green. Applications of Machine Learning Methods in Retrospective Studies on Hearing. *IEEE Life Sciences Conference*, Montréal, Canada, October 28-30, 2018. [Link]

[C2] **F. Charih**, M. Bromwich, R. Lefrançois, A. E. Mark, J. R. Green. Mining Audiograms to Improve the Interpretability of Automated Audiometry Measurements. *IEEE International Symposium on Medical Measurements and Applications (MeMeA)*, Rome, Italy, June 11-13, 2018. [Link]

[C1] K. Dick, **F. Charih**, Y. Souley Dosso, L. Russell, J. R. Green. Systematic Street View Sampling: High Quality Annotation of Power Infrastructure in Rural Ontario. *15th Conference on Computer and Robot Vision (CRV)*, Toronto, Canada, May 8-10, 2018. [Link]

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

[O1] **F. Charih**, M. Boulter, K. K. Biggar, J. R. Green. Leveraging learned representations and multitask learning for lysine methylation site discovery. *Preprint*, bioRxiv, 2025. (Submitted to Scientific Reports) [Link]

Patents

[P1] **F. Charih**, K. K. Biggar, J. R. Green. Method for in silico sequence-based design of a peptide which binds to a target. *Patent*, United States Patent and Trademark Office (USPTO), 2025. (Provisional patent application no: 63/747,936)

Presentations and workshops

[PW9] Machine learning in biomedical informatics and bioinformatics (guest lecture) ECOR1055	Nov 2024 ⦿ Ottawa, ON
[PW8] Machine learning in biomedical informatics and bioinformatics (guest lecture) ECOR1055	Nov 2022 ⦿ Ottawa, ON
[PW7] Evolution-inspired peptide drug design GRADflix Challenge [Link]	Apr 2021 ⦿ Ottawa, ON
[PW6] AI in biology and biomedical engineering (guest lecture) ECOR1055	Dec 2019 ⦿ Ottawa, ON
[PW5] X-ray crystallography and computational biochemistry (guest lecture) BIOC3202	Nov 2019 ⦿ Ottawa, ON
[PW4] Machine learning in audiology (guest lecture) HLTH2001 and HLTH4102 (Carleton University)	Nov 2019 ⦿ Ottawa, ON
[PW3] Introductory data analysis with Pandas (workshop) Lecture Series (IEEE EMBS Carleton)	Oct 2019 ⦿ Ottawa, ON
[PW2] Building interactive visualizations in the browser with D3.js (workshop) Lecture Series (IEEE EMBS Carleton) [Link]	Feb 2019 ⦿ Ottawa, ON
[PW1] MethylSight: a computational approach to the elucidation of the methyllysine proteome 21st Chemistry and Biochemistry Graduate Research Conference	Nov 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

Jun 2022
📍 Whistler, BC

[P4] Machine Learning in Audiology: Applications and Implications
Ottawa-AI Alliance Workshop

Oct 2018
📍 Ottawa, ON

[P3] Extending the SHOEBOX Audiometry mobile audiometer with an automated audiogram classification system
Life Science Day 2.0 (Carleton University)

May 2018
📍 Ottawa, ON

[P2] Systematic Street View Sampling for Accurate Urban Population Estimation
Data Day 5.0 (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 (University of Ottawa)

Apr 2015
📍 Ottawa, ON

Awards and honours

Carleton University Medal nomination, Carleton University
Nominated by my Ph.D. examination committee for the University Medal awarded to graduate students for outstanding academic achievement

Sep 2025

Gabriel Warshaw Scholarship, Carleton University (1,700 CAD)
Awarded to a graduate engineering students aspiring to a career based on the peaceful and environmentally respectful applications of engineering

Sep 2023

Queen Elizabeth II Scholarship in Science and Technology, Government of Ontario (15,000 CAD)

Sep 2022

American Peptide Symposium Travel Award, American Peptide Society (600 USD)

Jun 2022

Douglas Millar Scholarship, Dean of the FGPA (Carleton) (3,200 CAD)
Awarded yearly to an outstanding graduate student in engineering

Jun 2020

Carleton University Senate Medal, Carleton University
Awarded for outstanding academic achievement at the graduate level (1 medal/faculty awarded)

Aug 2019

Ontario Graduate Scholarship, Carleton University/Government of Ontario (15,000 CAD)
Declined in favour of NSERC PGS-D award

May 2019

Postgraduate Scholarship-Doctoral (PGS-D), NSERC (63,000 CAD, over 3 years)
Awarded to high potential researchers to pursue doctoral studies

May 2019

Ph.D entrance scholarship, Carleton University (2,000 CAD)

Jan 2019

Engage/VIP-I Grant, NSERC/OCE (50,000 CAD)
Co-authored the proposal for the grant awarded to Prof. James R. Green

Sep 2017

CREATE-BEST Scholarship, NSERC (5,000 CAD)

Sep 2017

M.A.Sc. entrance scholarship, Carleton University (2,000 CAD)

May 2017

B.Sc. Entrance Scholarship, University of Ottawa (2,000 CAD)

Sep 2011

Research mentoring

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

Tadesse Gessese, B.Sc.
Project: *Prediction of cell-penetrating peptides*
Jan 2024 - Apr 2024

Abhinav Yalamanchili, M.Eng.
Project: *Machine vision to digitize audiogram images (with WSIB Ontario)*
May 2020 - Aug 2020

Ahmed Abdelrazik, B.A.Sc.
Project: *Development of an ergonomic audiogram digitization tool (with WSIB Ontario)*
May 2020 - Aug 2020

Siddharth Chadha, B.A.Sc.
Project: *Digitization of audiograms with template matching*
May 2019 - Aug 2019

Pratyush Singh, M.Eng.
Project: *Machine vision to digitize audiogram images*
May 2018 - Aug 2018

Ashlynn Steeves, B.A.Sc.
Project: *Using kNN to impute values in incomplete audiograms*
Jan 2018 - Apr 2018

Peer reviews

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

- International Conference on Learning Representations (ICLR) (1)
- Conference on Neural Information Processing Systems (NeurIPS) (1)
- IEEE International Symposium on Medical Measurements and Applications (MeMeA) (2)
- IEEE International Conference on Collaborative Advances in Software and Computing (CASCON) (1)
- The Laryngoscope (1)
- Drug Discovery Today (1)
- Genomics, Proteomics & Bioinformatics (1)
- Scientific Reports (5)
- STAR Protocols (1)
- Bioinformatics (1)
- PLOS ONE (1)

Other relevant roles

Executive Member
Carleton University Biology Graduate Student Association
Sep 2023 - Apr 2024

Judge
Ottawa Regional Science Fair
Apr 2019 - present

Communications Officer
Carleton University Engineering in Medicine and Biology Society
Sep 2018 - May 2020

Judge
Canada-Wide Science Fair
May 2018 - present

Languages

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

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