François Charih

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Research Interests

Computational biology ■ Applied machine learning ■ Protein biochemistry ■ Cancer

Education

Ph.D. in Electrical and Computer Engineering 2019 -
Carleton University Ottawa, ON
Advisors: James R. Green and Kyle K. Biggar
Thesis: *Combining experimental and computer-aided methods to uncover and modulate the methyllysine proteome*

M.A.Sc. Electrical and Computer Engineering (Data Science) 2016 - 2018
Carleton University Ottawa, ON
Advisor: James R. Green
Thesis: *Machine Learning in Audiology: Applications and Implications*

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

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

Recent Employment

Contract Researcher 2018 - 2019
The Ottawa Hospital Rehabilitation Centre Ottawa, ON

- Responsible for the implementation of a tablet-based software for the annotation of temporal events by clinicians

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 -
Carleton University Ottawa, ON

- Ran tutorials for the course "Foundations of Imperative Programming" (SYSC2006)

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

[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). *Submitted to Cell Reports*. (*Co-first authors)

[J4] **F. Charih**, M. Bromwich, A. E. Mark, R. Lefrancois, and J. R. Green. Data-Driven Audiogram Classification for Mobile Audiometry (2020). *Scientific Reports* 10(3962). doi: https://doi.org/10.1038/s41598-020-60898-3

[J3] S. Sarvan, A. Yeung, **F. Charih**, A. Stintzi, and J.-F. Couture. Crystal structure of Campylobacter jejuni peroxide regulator (2018). *BioMetals* 32(3) 491-500. doi: https://doi.org/10.1007/s10534-019-00177-5

[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) 2351-2360. doi: https://doi.org/10.1002/1873-3468.13120

[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) 1-14. doi: https://doi.org/10.1038/s41598-018-25157-6

Conference Proceedings

[C5] K. Dick, **F. Charih**, J. Woo, J. R. Green. Gas Prices of America: The Machine-Augmented Crowd-Sourcing Era. *Accepted at the 17th Conference on Computer and Robot Vision*, Ottawa, Canada, May 2020.

[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. *Submitted for the Proceedings of the 2020 IEEE International Symposium on Medical Measurements and Applications (MeMeA)*, Bari, Italy, June 2020.

[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. doi: https://doi.org/10.1109/LSC.2018.8572268r

[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. doi: https://doi.org/10.1109/MeMeA.2018.8438746

[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. doi: https://doi.org/10.1109/CRV.2018.00028

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

[O2] **F. Charih**. Machine Learning in Audiology: Applications and Implications. *Master's thesis*, Carleton University, Ottawa, ON, December 2018, (170 pages). https://curve.carleton.ca/873548bb-f077-49d4-a5a6-9a69fddf1284 (Defended without revisions, and was awarded the Carleton University Senate medal)

[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, (88 pages).

Presentations and Workshops

[PW6] **AI in biology and biomedical engineering (guest lecture)** — December 2nd, 2019
ECOR1055 — Ottawa, ON

[PW5] **X-ray crystallography and computational biochemistry (guest lecture)** — November 22nd, 2019
BIOC3202 — Ottawa, ON

[PW4] **Introductory Data Analysis with Pandas** — October 16th, 2019
Lecture Series (IEEE EMBS Carleton) — Ottawa, ON

[PW3] **Building interactive visualizations in the browser with D3.js** — February 6th, 2019
Lecture Series (IEEE EMBS Carleton) — Ottawa, ON

[PW2] **Machine learning in Audiology (guest lecture)** — November 2018, 2019
HLTH2001 and HLTH4102 (Carleton University) — Ottawa, ON

[PW1] **MethylSight: A Computational Approach to the Elucidation of the Methyllysine Proteome** — November 9th, 2018
21st Chemistry and Biochemistry Graduate Research Conference — Montreal, QC

Selected Posters

[P2] **Machine Learning in Audiology: Applications and Implications** — October 19th, 2018
Ottawa-AI Alliance Workshop — Ottawa, ON

[P1] **Extending the SHŒBOX Audiometry mobile audiometer with an automated audiogram classification system** — May 30th, 2018
Life Science Day 2.0, Carleton University — Ottawa, ON

Awards and Honours

Douglas Millar Scholarship, Dean of the FGPA (Carleton) (3,200 CAD) — 2020
Awarded yearly to an outstanding graduate student in engineering

Postgraduate Scholarship-Doctoral (PGS-D), NSERC (63,000 CAD) — 2019
Awarded to high potential researchers to pursue doctoral studies

Ontario Graduate Scholarship, Carleton University (15,000 CAD) — 2019
Declined in favour of NSERC PGS-D award

Carleton University Senate Medal, Carleton University — 2019
Awarded for outstanding academic achievement at the graduate level

Ph.D. Entrance Scholaship, 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) — 2017
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.Sc. Entrance Scholarship, University of Ottawa (2,000 CAD) — 2011

Research Mentoring

I have had the great pleasure to act as a mentor to the following students:

Pratyush Singh, Undergraduate Student — Summer 2018
Machine vision to digitize audiogram images

Ashlynn Steeves, Undergraduate Student — Winter 2018
Using kNN to impute values in incomplete audiograms

Other

Judge, Ottawa Regional Science Fair — 2019

Communications Officer, Carleton University Engineering in Medicine and Biology Society — 2018-2019

Judge, Canada Wide Science Fair — 2018

Software Skills

Programming languages: Python, Javascript, Rust, C/C++, Bash, Java
Software libraries: PyTorch, Tensorflow, Keras, Scikit-Learn, Pandas, Numpy/SciPy, DEAP
Markup languages: LaTeX, Markdown
Web development: React, Amazon Web Services, Google Cloud, RESTful APIs, HTML5, CSS3