Gang Li

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Education

Ph.D. Civil Engineering
University of Saskatchewan, Saskatoon, SK, Canada   2023

M.Sc. Civil Engineering   2014
University of Saskatchewan, Saskatoon, SK, Canada

B.Eng. Materials Science and Engineering   2008
Chongqing University, Chongqing City, China

Professional Associations

P.Eng.   Association of Professional Engineers and Geoscientists of Saskatchewan (APEGS).

Teaching Experience

Sessional Lecturer   Sep, 2019 – Dec, 2019 & Sep, 2022 – Present
Department of Chemical & Biological Engineering, U of S   Saskatoon, SK, Canada
- CHE 453 Corrosion Engineering

Department of Civil, Geological and Environmental Engineering, U of S
- CE 212 Civil Engineering Materials

Department of Computer Science, U of S
- CMPT 141 Introduction to Computer Science

St. Peter's College, U of S   Muenster, SK, Canada
- CMPT 142 Introduction to Computer Science for Engineers

Teaching Assistant   2009 –2014 (various terms)
University of Saskatchewan   Saskatoon, SK, Canada
- Material testing lab - CE 212 Civil Engineering Materials
- Problem solving lab - CE 318 Applied Engineering Mathematics
- Structural analysis software tutorial lab - CE 463 Advanced Structural Analysis

Professional Experience

Mitacs Accelerate R&D Engineer   Oct, 2022 – Present
Partnership: City of Saskatoon   Saskatoon, SK, Canada
- Project title: Effective concrete mixes for Saskatchewan sidewalks using locally available pop-out prone aggregates

I am developing cost-effective remedial strategies for reducing, and possibly eliminating, pop-out damage to concrete sidewalks, as well as other potential forms of damage caused by freeze and thaw cycles and ASR.

Mitacs Accelerate R&D Engineer   Sep, 2021 – Apr, 2022
Partnership: ZACARUK consulting Inc   Regina, SK, Canada
- Project title: A non-destructive approach for assessing the integrity and performance of waterproofing membranes in bridge decks

I developed a non-destructive method for assessing the integrity of waterproofing systems in reinforced concrete bridge decks. The proposed technique is used to assess the quality of a newly installed membrane system, or to determine whether the membrane is deteriorating during its service life.

Mitacs Accelerate R&D Engineer   Sep, 2020 – Apr, 2021
Partnership: ZACARUK consulting Inc   Regina, SK, Canada
- Project title: A rational data-driven probabilistic approach for assessing the condition and performance of RC structures
- Industrial application:

o Assessment of Moose Jaw Inland Grain Terminal
o Assessment of Petrofka Bridge

I developed a practical life-cycle deterioration model software that uses measured field data to predict the service condition of existing reinforced concrete structures and to identify novel sensor technology that can be implemented to provide critical field data. I used the software to provide probabilistic results at each deterioration stage of a reinforced concrete structure that can be used to schedule maintenance or repair strategies to extend the life of the asset.

Consultant in contract   Aug, 2019 – Dec, 2019
ZACARUK consulting Inc   Moose Jaw, SK, Canada
- Moose jaw grain station project

I designed the moisture monitoring system for concrete silos and provided personnel training for the installation and operation of the system. I assessed the corrosion condition of the grain station with the field moisture content data.

Research Engineer (full-time & part-time)   May, 2014 – Sep, 2015 & Sep,2015 - Apr, 2018
University of Saskatchewan, City of Saskatoon   Saskatoon, SK, Canada
- Bridge arch repair and life-cycle cost assessment project

I developed and installed the onsite corrosion monitoring devices for a reinforced concrete arch bridge to monitor the corrosion affecting factors such as moisture content, electrical conductivity, and oxygen content. I extracted and characterized the concrete pore solution composition for the electrochemical testing of the rebar corrosion behaviour. I developed a large-scale transport model to simulate the corrosion environment due to different exposure conditions and climate change. I assessed various rehabilitation strategies and provided recommendations for an effective rehabilitation strategy and timeline to optimize the life-cycle cost.

I led the test panel validation program, oversaw the test panel construction, facilitated the collaboration between the construction companies on multiple rehab treatments, and reported to stakeholders.

Programming experience

Python
Skilled in data science (Pandas, Matplotlib), machine learning (Scikit-Learn, TensorFlow), and advanced computational techniques (probabilistic and numerical modeling). Experienced in object-oriented programming.

COMSOL Multiphysics, MATLAB
Expertise in modeling reactive chemical transport in porous media, electrochemistry, and material mechanics. Proficient in large-scale simulations on high-performance computing clusters.

Software

Li, G., Zacaruk, J., Boulfiza, M. (2022). Rational-RC: a practical life cycle deterioration modelling framework for reinforced concrete structures. Version v0.2.3. (Documentation hosted at https://magical-sherbet-9ac2a8.netlify.app/)

Li, G., 2021 A web app for ground penetrating radar line scan data visualization and measurement
https://share.streamlit.io/ganglix/linescan_minimum_app/main/linescan_app.py

Li, G, Evitts, R, & Boulfiza, M. (2018). Homogenized-model-simplified-circuit: code for "the simplified circuit model" (v1.0.0). 2019 NACE Northern Area Western Conference (NACE NAWC 2019). Zenodo. https://doi.org/10.5281/zenodo.1406210

Li, G., Evitts, R., Boulfiza, M., & Li, A. (2018). A customized Python module for interactive curve fitting on potentiodynamic scan data (Version v1.0.2). Zenodo. https://doi.org/10.5281/zenodo.1406195

Patent
A non-destructive testing technique to assess the integrity of bridge deck membranes, in the application process as the inventor.

Publication

14 Li, G., Boulfiza, M., & Evitts, R. A Pore-scale corrosion model for rebar corrosion in concrete: the effect of water and chloride distribution at pore level. (unpublished manuscript)

13 Li, G., Boulfiza, M., & Evitts, R. Comprehensive corrosion model of cracked reinforced concrete. (unpublished manuscript)

12 Li, G., Boulfiza, M., & Evitts, R. (2023). Effect of accurate microclimate representation on the corrosion performance of a bridge subjected to carbonation and chloride attack. (*Case studies in Construction Materials, accepted*).

11 Li, G., Evitts, R., & Boulfiza, M. (2023). On the corrosion parameters acquired through potentiodynamic scans of carbon steel rebar in simulated pore solution and mortar. *Construction and Building Materials*, *409*, 134160. https://doi.org/10.1016/J.CONBUILDMAT.2023.134160

10 Li, G., Evitts, R., & Boulfiza, M. (2023). On the interactive effect of moisture, chloride and carbonation on rebar corrosion in mortar. (Submitted to *Construction and Building materials*). Preprint available: https://dx.doi.org/10.2139/ssrn.4543416

9   Li, G., Evitts, R., & Boulfiza, M. (2023). Dataset of corrosion parameters for rebar in simulated pore solution and mortar (v1.0.1) [Data set]. Zenodo. https://doi.org/10.5281/zenodo.10150202

8   Li, G. (2023). Modelling of crack reinforced concrete corrosion in service environment, PhD Dissertation, University of Saskatchewan, Saskatoon, Canada.

7   Li, G., Evitts, R., & Boulfiza, M. (2023). The impact of non-uniformity and resistivity on the homogenised corrosion parameters of rebars in concrete–a circuit model analysis. *Corrosion Engineering, Science and Technology*, *58*(4), 399-409.

6   Li, G., Boulfiza, M., & Evitts, R. (2019, February) Corrosion Prediction with 3D Model Utilizing Meteorological Data and Properties of Site-extracted Rebar and Concrete. *Proceedings of NACE Northern Area Western Conference*. Calgary, AB, Canada.

5   Li, G., Evitts, R., Boulfiza, M., & Li, A. (2018). A customized Python module for interactive curve fitting on potentiodynamic scan data (Version v1.0.2). Zenodo. https://doi.org/10.5281/zenodo.1406195

4   Kennell, G., Zacaruk, J., Li, G., & Boulfiza, M. (2015). The University Bridge Arch Assessment-A New Approach. In *TAC 2015: Getting You There Safely-2015 Conference and Exhibition of the Transportation Association of Canada.*

3   Li, G., Boulfiza, M., & Si, B. (2015). Effect of artificial and natural cracks on water flow in concrete. *Proceedings of the 5th International Conference on Construction Materials*. Whistler, Canada.

2   Li, G. (2014). *Effect of Cracks on the Transport Characteristics of Cracked Concrete*, Master's thesis, University of Saskatchewan, Saskatoon, Canada.

1   Li, G., & Boulfiza, M. (2013). *Effects of cracking on the transport characteristics of reinforced concrete*. *Proceedings of the 24th Canadian Congress of Applied Mechanics*. Saskatoon, SK, Canada.

Certificate and Awards

Certificate in University Teaching and Learning (anticipated in 2024)	University of Saskatchewan
Nomination to PhD Thesis Awards/Governor General's Gold Medal	University of Saskatchewan
Certificate of Project Management	Mitacs
Certificate of Applied Machine Learning in Python	University of Michigan (via Coursera)
Certificate of Contribution to the NACE Calgary Sector	National Association of Corrosion Engineers
Saskatchewan Innovation and Opportunity Scholarship	Government of Saskatchewan

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Presentations

Presentation to Ministry of Highways and Infrastructure (Web conference)	Jul 30, 2020
Deterioration of structures: testing and rehabilitation	

Presentation, NACE Northern Area Western Conference (Regina Canada)   Feb 6, 2020
Homogenized corrosion parameters of rebars in concrete

Open Lecture, Saskatoon Engineering Society (Saskatoon Canada)   Nov 29, 2019
Corrosion Arch Rehab for the Univ Bridge —"provide healthcare to infrastructures"

Presentation, NACE Northern Area Western Conference (Calgary Canada)   Feb 7, 2019
Corrosion Prediction with 3D Model Utilizing Meteorological Data and Properties of Site-extracted Rebar and Concrete

Guest Speaker, NACE Calgary luncheon technical session   Jan 25, 2019
Topic: Computer-aided Assessment of Arch Rehabilitation Strategies for the University Bridge (30 mins)

Interview, Global News   Jan 8, 2019
Topic: "Calcium chloride and its corrosive effects on concrete and asphalt"

Live Interview, Ryan Jespersen Show, 630CHED radio   Aug 22, 2018
Podcast: Jespersen - 11 - Corrosion & the maintenance needs of civic structures (Duration 20:40)