

# Gang Li

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## Education

### Ph.D. Civil Engineering (Grade 90%)

University of Saskatchewan, Saskatoon, SK, Canada

2023

- Dissertation: "Modelling of Crack Reinforced Concrete Corrosion in Service Environments"

### M.Sc. Civil Engineering (Grade 87%)

University of Saskatchewan, Saskatoon, SK, Canada

2014

- Thesis: "Effect of Cracks on the Transport Characteristics of Cracked Concrete"

### B.Eng. Materials Science and Engineering (Grade 89%)

Chongqing University, Chongqing, China

2008

- Specialized in civil engineering materials
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## Professional Associations

Registered Professional Engineer (P.Eng.)

- Association of Professional Engineers and Geoscientists of Saskatchewan (APEGS)
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## Certificates and Awards

2024 Certificate in University Teaching and Learning

The Gwenna Moss Centre, University of Saskatchewan

2024 Nomination for PhD Thesis Awards

University of Saskatchewan

2021 Certificate of Project Management

Mitacs

2020 Certificate of Applied Machine Learning in Python

University of Michigan (via Coursera)

2020 Certificate of Contribution

NACE Calgary Sector

2016 Saskatchewan Innovation and Opportunity Scholarship

Government of Saskatchewan

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## 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

- Redesigned and delivered the course to integrate theoretical concepts with real-world applications, incorporating diverse instructional methods, including traditional lectures, interactive case studies, and innovative tools like a web application for visualization. Developed authentic assessment tasks that reflect professional engineering challenges, enabling students to apply theoretical knowledge in practical scenarios.

Department of Civil, Geological and Environmental Engineering, U of S

#### ▪ CE 212 Civil Engineering Materials

- Delivered content on the properties, testing, and sustainable use of materials in civil engineering. Emphasized practical applications through lab sessions, case studies on significant projects, and multiple assessment choices to cater to diverse student needs and learning styles.

Department of Computer Science, U of S

#### ▪ CMPT 141 Introduction to Computer Science

- Focused on building foundational programming skills through extensive coding exercises, adaptive grading systems, and interactive learning tools. Implemented comprehensive feedback mechanisms to enhance student learning and reduce exam anxiety.

### Faculty member

Sep, 2022 – Present

St. Peter's College, U of S first-year engineering program

Muenster, SK, Canada

#### ▪ CMPT 142 Introduction to Computer Science for Engineers

- Adapted course content to enhance the immersive learning experience of a small-sized class. Utilized formative assessments to provide immediate feedback and foster deep understanding of programming concepts. Adjusted instructional methods to accommodate diverse skill levels, ensuring both accessible and challenging learning environments for all students.
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**Teaching Assistant**

University of Saskatchewan

2009 –2014 (various terms)

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
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**Research and Professional Experience****Research Engineer**

Corrosion and Electrochemical Engineering, University of Saskatchewan,

Jan, 2024 – Present

Saskatoon, SK, Canada

- Project: Electrochemical evaluation of iron-based alloys corrosion and protection for potash mining environments
- Partnership: Nutrien
  - Led an electrochemical study on the corrosion processes of metals within potash mining settings, focusing on the intricacies of anodic and cathodic behaviours of iron-based alloys in saturated potash solutions.
  - My research significantly enhanced quantitative corrosion prediction, facilitating strategic material selection and contributing to the sustainability of potash mining assets.

**Mitacs Accelerate R&D Engineer**

University of Saskatchewan and various partnerships

Sep, 2020 – Dec, 2023

Saskatoon, SK, Canada

- Project: Effective concrete mixes for Saskatchewan sidewalks using locally available pop-out prone aggregates
- Partnership: City of Saskatoon
  - Developed 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.
- Project: A non-destructive approach for assessing the integrity and performance of waterproofing membranes in bridge decks
- Partnership: ZACARUK consulting Inc
  - 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.
- Project: A rational data-driven probabilistic approach for assessing the condition and performance of RC structures
- Partnership: ZACARUK consulting Inc
  - Developed and implemented a life-cycle deterioration model software designed to predict the service condition of reinforced concrete structures using field data.
  - This software employs probabilistic analysis to support decision-making for maintenance and repair strategies, significantly extending the lifespan of the assets.
  - Key applications include the Moose Jaw Inland Grain Terminal and Petrofka Bridge, where the model has greatly enhanced maintenance scheduling and structural health monitoring.

**Consultant**

ZACARUK consulting Inc

Aug, 2019 – Dec, 2019

Moose Jaw, SK, Canada

- Designed a moisture monitoring system for concrete silos, provided personnel training for the installation and operation of the system.
- Assessed the carbonation-induced corrosion conditions using collected field moisture content data.

**Research Engineer (full-time & part-time)**

University of Saskatchewan, City of Saskatoon

May, 2014 – Sep, 2015 &amp; Sep, 2015 - Apr, 2018

Saskatoon, SK, Canada

- Project: Bridge arch repair and life-cycle cost assessment

- Developed and implemented advanced onsite corrosion monitoring systems for a reinforced concrete arch bridge, focusing on critical factors such as moisture, conductivity, and oxygen levels.
- Performed detailed analysis of concrete pore solutions to evaluate rebar corrosion behaviors under various environmental conditions.
- Designed and utilized a comprehensive transport model to project corrosion scenarios influenced by diverse conditions and climate change effects.
- Assessed and optimized rehabilitation strategies to enhance the lifecycle cost-efficiency of the infrastructure.
- Led the validation of test panels, managed construction projects, and facilitated multi-party collaborations to ensure cohesive rehabilitation treatments and stakeholder alignment.

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## Programming and Software Development

### Programming Skills:

**Python:** Advanced expertise in data science (Pandas, Matplotlib), machine learning (Scikit-Learn, TensorFlow), and advanced computational techniques including probabilistic and numerical modeling. Proficient in object-oriented programming.

**COMSOL Multiphysics & MATLAB:** Specialized in modeling reactive chemical transport in porous media, electrochemistry, and material mechanics. Highly skilled in conducting large-scale simulations on high-performance computing clusters.

### Developed Software:

Li, G. (2024). Reference Electrode Potential Converter (v0.0). Zenodo. <https://doi.org/10.5281/zenodo.10937502>. [Web app](#).

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](#))

Li, G. (2021) Ground Penetrating Radar Line Scan Data Visualization and Measurement [Web app](#).

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>

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## Patent

A non-destructive testing technique to assess the integrity of bridge deck membranes. Under patent application process as the inventor.

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## Publication

- 14 Li, G., Boulfiza, M., & Evitts, R. (2024). Unraveling the paradoxical rebar corrosion behaviour in cracked concrete: a novel numerical investigation. (manuscript prepared for *Cement and Concrete Composites*)
- 13 Li, G. (2024). Reference Electrode Potential Converter (v0.0). Zenodo. <https://doi.org/10.5281/zenodo.10937502>.
- 12 Li, G., Evitts, R., & Boulfiza, M. (2024). Interactive effect of moisture, chloride and carbonation on rebar corrosion in mortar. (under review in *Construction and Building materials*). Preprint available: <https://dx.doi.org/10.2139/ssrn.4543416>

- 11 Li, G., Boulfiza, M., & Evitts, R. (2024). A 3-D transport model for assessing the impact of microclimate change on the corrosion performance of a bridge subjected to carbonation and chloride attack. *Case Studies in Construction Materials*, e02880. <https://doi.org/10.1016/j.cscm.2024.e02880>
- 10 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>
- 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 5<sup>th</sup> 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 24<sup>th</sup> Canadian Congress of Applied Mechanics*. Saskatoon, SK, Canada.

## Professional Engagements and Presentations

### Presentations:

Ministry of Highways and Infrastructure Web Conference “Deterioration of structures: testing and rehabilitation”	Jul 30, 2020
NACE Northern Area Western Conference (Regina Canada) “Homogenized corrosion parameters of rebars in concrete”	Feb 6, 2020
NACE Northern Area Western Conference (Calgary Canada) “Corrosion Prediction with 3D Model Utilizing Meteorological Data and Properties of Site-extracted Rebar and Concrete”	Feb 7, 2019

### Invited Talks:

Saskatoon Engineering Society (Saskatoon Canada) “Corrosion Arch Rehab for the University Bridge —provide healthcare to infrastructures”	Nov 29, 2019
NACE Calgary Luncheon Technical Session “Computer-aided Assessment of Arch Rehabilitation Strategies for the University Bridge”	Jan 25, 2019

**Media Engagements:**

Interview on Global News Topic: "Calcium chloride and its corrosive effects on concrete and asphalt"	Jan 8, 2019
Live Interview on 630CHED Radio "Ryan Jespersen Show" Podcast: "Corrosion & the maintenance needs of civic structures" (Duration 20:40)	Aug 22, 2018

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