SAJJAN POKHREL, Ph.D.

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https://sajjanpokhrel.github.io/

Appointments

- **Postdoctoral Research Associate**, Oak Ridge National Laboratory — Jul 2024 – Present
- **Graduate Research Assistant**, The University of British Columbia — Sep 2018 – Feb 2024
- **Transdisciplinary Research Fellow**, Organization Partner: Metro Vancouver — Sep 2022 – Aug 2023
- **Visiting Research Fellow**, IROAST, Japan — Feb 2020 – May 2020
- **MITACS Accelerate Research Intern**, Industry Partner: MANITOU — Aug 2020 – Apr 2021
- **MITACS Accelerate Research Intern**, Industry Partner: FLSmidth — Jul 2018 – Jan 2019
- **Graduate Research Assistant**, Wright State University — Jul 2015 – Dec 2017
- **Assistant Lecturer**, Purbanchal University, Kantipur City College — Dec 2013 – Jul 2015

Education

Ph.D. in Mining Engineering — May 2024
The University of British Columbia, Vancouver, Canada
Advisor: Seyed Ali Ghoreishi Madiseh

M.Sc. in Renewable and Clean Energy Engineering — Dec 2017
Wright State University, Ohio, USA
Advisor: James Menart

B.E. in Mechanical Engineering — Dec 2013
Tribhuvan University, IOE Pulchowk, Lalitpur, Nepal

Research Program

- Subsurface engineering for geothermal energy systems, integrating thermal–hydraulic modeling, field-scale experimentation, and techno-economic analysis
- Enhanced geothermal systems (EGS) and high-temperature subsurface energy extraction
- Low-temperature geothermal systems for space heating and cooling
- Coupled heat and mass transfer modeling for geothermal borehole and reservoir applications
- Subsurface thermal energy storage using engineered and legacy subsurface infrastructure
- Borehole-scale modeling of heat exchangers and wellbore thermal behavior

- Reservoir-scale thermal and hydraulic modeling for performance, sustainability, and resource management
- Application of machine learning and artificial intelligence for model acceleration, parameter estimation, and system optimization

Publications

Peer-Reviewed Journal Articles

1. **Pokhrel, Sajjan**, Leyla Amiri, Sébastien Poncet, and Seyed Ali Ghoreishi Madiseh. Reduced-order 1+3D numerical model for evaluating the performance of solar borehole thermal energy storage systems. *Journal of Energy Storage*, 66 (2023): 107503.

2. **Pokhrel, Sajjan**, Agus P. Sasmito, Atsushi Sainoki, et al. Field-scale experimental and numerical analysis of a downhole coaxial heat exchanger for geothermal energy production. *Renewable Energy*, 182 (2022): 521–535.

3. **Pokhrel, Sajjan**, Leyla Amiri, Sébastien Poncet, et al. Renewable heating solutions for buildings: a techno-economic comparative study of sewage heat recovery and solar borehole thermal energy storage systems. *Energy and Buildings*, 259 (2022): 111892.

4. **Pokhrel, Sajjan**, Leyla Amiri, Ahmad Zueter, et al. Thermal performance evaluation of integrated solar–geothermal systems: a semi-conjugate reduced-order numerical model. *Applied Energy*, 303 (2021): 117676.

5. **Pokhrel, Sajjan**, Ali Fahrettin Kuyuk, Hosein Kalantari, et al. Techno-economic trade-off between battery storage and ice thermal energy storage for renewable mine cooling applications. *Applied Sciences*, 10(17) (2020): 6022.

Manuscripts in Progress

1. Sara Sultan, ..., **Pokhrel, Sajjan**, et al. A review on phase change thermal energy storage in buildings: heat pump configurations and demand flexibility. *Energy and Buildings*, under review.

2. Ana Polgar, Jiaming Chen, **Pokhrel, Sajjan**, et al. Cultivating the soil: collaboratively shaping transdisciplinary research with stakeholders. *Journal of Integrative Environmental Sciences*, under review.

3. **Pokhrel, Sajjan**, et al. Three-dimensional numerical modeling of thermal energy extraction from an abandoned mine shaft using closed-loop geothermal technology in TOUGH3. Manuscript in preparation.

4. Chris Price, **Pokhrel, Sajjan**, et al. Life-cycle cost evaluation framework for Enhanced Geothermal Systems. Manuscript in preparation.

5. **Pokhrel, Sajjan**, et al. Performance evaluation of a shallow underground thermal battery as a peak-load replacement for deep borehole heat exchangers in geothermal heat pump systems. Manuscript in preparation.

Conference Proceedings

1. Anees, Fady, Xiaobing Liu, Bo Shen, and **Pokhrel, Sajjan**. An analysis of potential benefits of adding diurnal thermal storage in geothermal heat pump systems. *Geothermal Rising Conference*, Reno, Nevada, 2025.

2. **Pokhrel, Sajjan**, Xiaobing Liu, et al. Field test of a novel underground thermal battery for ground source heat pump applications. *Stanford Geothermal Workshop*, Stanford, California, 2025.

3. **Pokhrel, Sajjan**, Xiaobing Liu, et al. Opportunities and challenges for heat extraction from abandoned mines using ground source heat pumps for space conditioning applications. *IGSHPA Annual Conference*, Champaign, Illinois, 2025.

4. **Pokhrel, Sajjan**, Leyla Amiri, Sébastien Poncet, et al. A sustainable heating solution for multifamily residential buildings in cold climates. *9th International Renewable and Sustainable Energy Conference (IRSEC)*, 2021.

5. **Pokhrel, Sajjan**, Agus P. Sasmito, Atsushi Sainoki, et al. Field-scale experimental and numerical analysis of a downhole coaxial heat exchanger. *15th International Conference on Heat Transfer, Fluid Mechanics and Thermodynamics (HEFAT)*, 2021.

6. **Pokhrel, Sajjan**, Leyla Amiri, Ahmad Zueter, et al. Evaluation of a solar borehole thermal energy storage system for residential heating applications. *International Conference on Applied Energy (ICAE)*, 2020.

7. Kalantari, Hosein, **Pokhrel, Sajjan**, Amin Shadi, et al. Numerical study of mine water heat recovery systems using coupled heat exchanger units. *International Conference on Applied Energy (ICAE)*, 2019.

8. **Pokhrel, Sajjan**, Srijan Rajbamshi, Saroj Bhattarai, et al. Prospects of bagasse cogeneration in sugar industries of Nepal. *Rentech Symposium Compendium*, 2014.

Conference Presentations

1. Field test of a novel underground thermal battery for ground source heat pump applications. *Stanford Geothermal Workshop*, Stanford, California, 2025. (Oral)

2. Thermal Performance Comparison of a Novel Underground Thermal Battery with a Single U-tube Borehole Heat Exchanger *IGSHPA Annual Conference*, Champaign, Illinois, 2025. (Poster)

3. Opportunities and challenges for heat extraction from abandoned mines using ground source heat pumps for space conditioning applications. *IGSHPA Annual Conference*, Champaign, Illinois, 2025. (Oral)

4. A sustainable heating solution for multifamily residential buildings in cold climates. *9th International Renewable and Sustainable Energy Conference (IRSEC)*, 2021. (Oral)

5. Field-scale experimental and numerical analysis of a downhole coaxial heat exchanger. *15th International Conference on Heat Transfer, Fluid Mechanics and Thermodynamics (HEFAT)*, 2021. (Oral)

6. Prospects of bagasse cogeneration in sugar industries of Nepal. *Rentech Symposium Compendium*, 2014. (Oral)

Invited Talks

1. Renewable heating solutions for buildings: thermal energy storage technologies. Clean Energy Research Group (CERG) Fall Seminar Series, Simon Fraser University, November 15, 2024.

2. Analysis of coaxial borehole heat exchangers for geothermal energy extraction and storage. National Renewable Energy Laboratory (Geothermal Group), March 6, 2024.

3. Analysis of coaxial borehole heat exchangers for geothermal heat and power. University of Calgary (Geo-Energy Group), January 4, 2024.

4. Analysis of coaxial borehole heat exchangers for geothermal heat and power. Testor Group, Cornell University, June 7, 2023.

5. Analysis of coaxial borehole heat exchangers for geothermal heat and power. Argonne National Laboratory (Electrification and Infrastructure Group), January 25, 2023.

Teaching Experience

Lecturer (Full-time) Dec 2013 – Jul 2015
Kantipur City College, Purbanchal University, Kathmandu, Nepal

- Undergraduate courses taught:
  - Thermodynamics I
  - Applied Mechanics
  - Fluid Mechanics
- Responsibilities included course design, lecture delivery, laboratory instruction, assignment and exam preparation, and student evaluation.

Graduate Teaching Assistant 2020 – 2022
The University of British Columbia, Vancouver, Canada

- Modeling and Simulation (Fall 2020, Fall 2021)
- Mine Water Management (Winter 2020, Winter 2022)
- Responsibilities included laboratory instruction, grading of assignments and exams, and support for term projects.

Funded Grants

1. Commercial Buildings Integration (CBI) Inter-Lab Market-Readiness Program for Advancing Commercial Technologies (IMPACT) FY 2025–2026
   Co-Principal Investigator. Total award: USD 100,000.

2. Strategic Partnership Project (SPP), Oak Ridge National Laboratory USD 400,000
   Contributing team member.

3. MITACS Accelerate Research Grant CAD 30,000
   Contributing team member; assisted with proposal development and industry coordination.

Grant Writing and Proposal Development

- GTO Laboratory Call Proposals (multiple submissions) — >USD 3M requested
  Role: Proposal development and technical contribution.
- ORNL LDRD proposal: Thermal Energy Storage for data center cooling — USD 1M requested
  Role: Principal Investigator.
- Connected Communities 2.0, U.S. Department of Energy — USD 6.5M requested
  Role: Proposal development and technical contribution.
- High-Temperature Heat Pump – Reservoir Thermal Energy Storage (HTHP–RTES) — USD 1.5M requested
  Role: Proposal development and technical contribution.
- Qatar National Research Fund — USD 1.5M requested
  Role: Proposal development and technical contribution.

Professional Service

- **Peer Reviewer:** *Applied Energy*; *Energy and Buildings*; *Processes*; *Transactions of the Canadian Society for Mechanical Engineering*; *Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Journal*
- **Guest Editor:** *Energies*, Special Issue on Geothermal Energy Advancements (2025–2026)
- **Grant Reviewer:** U.S. Department of Energy (DOE), Office of Science (SC), Small Business Innovation Research (SBIR) / Small Business Technology Transfer (STTR)
- **Scientific Committee Member:** eSim Conference, 2026
- **Vice President (Elected):** Oak Ridge Postdoctoral Association Executive Committee (ORPEX-25)

Event Organization and Leadership

- Organizer, Oak Ridge Postdoctoral Association (ORPA) Research Symposium — 2025
- Organizer, Postdoctoral Appreciation Week — 2025
- Organizer, ESTD Crosscut Forum on Geothermal Energy, Oak Ridge National Laboratory — 2025

Professional Affiliations

- American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
- Geothermal Resources Council (GRC)
- Canadian Institute of Mining, Metallurgy and Petroleum (CIM)

Software and Computational Tools

Programming Languages: Python, MATLAB, R, C
Simulation and Modeling: TOUGH3, ANSYS Fluent, OpenFOAM, ICEM CFD, RETScreen, eQuest
Design and Visualization: SolidWorks

Awards, Scholarships, and Fellowships

1. Commercialization Catalyst Cohort, Oak Ridge National Laboratory 2025
   Selected through a competitive application process.

2. Collaborative Ph.D. Fellowship 2022 – 2023
   CAD 25,000.

3. Graduate Student Publication Awards, University of British Columbia 2020 – 2023
   Five awards (CAD 1,800 each).

4. MITACS Accelerate Research Award 2021 – 2022
   CAD 30,000.

5. Visiting Research Fellowship, International Research Organization for Advanced Science and Technology (IROAST), Japan 2021
   ¥450,000.

6. MITACS Accelerate Research Award 2018 – 2019
   CAD 18,000.

7. Graduate Research Fellowship, Wright State University 2015 – 2017
   Full tuition waiver and stipend (USD 10,000 per year).

8. Merit-Based Undergraduate Scholarship, Government of Nepal 2009 – 2013
   Full tuition waiver.

9. Mahatma Gandhi Scholarship, Government of India 2006 – 2007
   Two-year scholarship.

Students Mentored

- Saloha Aboud, Undergraduate Student (Class of 2023)
- Mankanwar Singh, Undergraduate Student (Class of 2023)

Media Exposure

- CBC Radio, *What on Earth*: Revolutionizing climate education in universities, 2023.

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