Rupeng Li

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Google Scholar Profile

Current Position

2022-Present **Lecturer**, ***C**hina **U**niversity of **P**etroleum (**B**eijing), China.*

Education

2017–2022 **PhD, Petroleum Engineering**, *The **U**niversity of **N**ew **S**outh **W**ales, Australia*,
- Supervisor: Christoph Arns, Igor Shikhov
- Research focus: inverse problems, digital core analysis, porous media.

2013–2017 **BEng, Petroleum Engineering**, ***C**hina **U**niversity of **P**etroleum (**E**ast China)*,
- Overall GPA – 3.92/4.00 by WES, Ranking **1**/432
- Exchange student at UNSW, Spring 2017.

Research Interests

I am interested in building efficient and scalable probabilistic models for inverse problems arising from (Bayesian) parameter estimation and uncertainty quantification in NMR petrophysics, core analysis, hydrological modeling, etc. Currently, I focus on developing practical multi-objective Bayesian optimization approaches to the estimation of key physical parameters under various physical constraints.

Publications

Journal Articles

2022 **Bayesian optimization with transfer learning: A study on spatial variability of rock properties using NMR relaxometry**
Rupeng Li, Igor Shikhov, and Christoph Arns
Water Resources Research, top journal in hydrology [AGU]

2022 **A Bayesian optimization approach to the simultaneous extraction of intrinsic physical parameters from T_1 and T_2 relaxation responses**
Rupeng Li, Igor Shikhov, and Christoph Arns
SPE Journal, #1 in petroleum engineering [OnePetro]

2022 **Tuning the intentional corona of cerium oxide nanoparticles to promote angiogenesis via fibroblast growth factor 2 signalling**
Lu Fu, **Rupeng Li**, Whitelock John, and Megan Lord
Regenerative Biomaterials [OUP]

2021 **Solving multiphysics, multiparameter, multi-modal inverse problems: an application to NMR relaxation in porous media**
Rupeng Li, Igor Shikhov, and Christoph Arns
Physical Review Applied, top journal in physics [APS]

2021 **Mechanisms of confining pressure dependence of resistivity index for tight sandstones by digital core analysis**
Hongyi Dai, Igor Shikhov, **Rupeng Li**, and Christoph Arns
SPE Journal [OnePetro]

2021 **A numerical study of field strength and clay morphology impact on NMR transverse relaxation in sandstones**
Yingzhi Cui, Igor Shikhov, **Rupeng Li**, Shitao Liu, and Christoph Arns
Journal of Petroleum Science and Engineering [Elsevier]

2020 **A topology-based single-pool decomposition framework for large-scale global optimization**
Xiaoming Xue, Kai Zhang, **Rupeng Li**, Liming Zhang, Chuanjin Yao, Jian Wang, and Jun Yao
Applied Soft Computing [Elsevier]

2018 **Relaxation and relaxation exchange NMR to characterise asphaltene adsorption and wettability dynamics in siliceous systems**
Igor Shikhov, **Rupeng Li**, and Christoph Arns
Fuel [Elsevier]

Conference Proceedings

2023 **A Bayesian optimization approach to the extraction of intrinsic physical parameters from T2 relaxation response**
Rupeng Li, Igor Shikhov, and Christoph Arns
International Symposium of the Society of Core Analysts, Austin, Texas [E3S]

2017 **T_2-store-T_2 Relaxation Exchange NMR to Characterize Effect of Asphaltenes on Wettability Dynamics in Siliceous Systems**
Igor Shikhov, **Rupeng Li**, and Christoph Arns
International Symposium of the Society of Core Analysts, Vienna, Austria [jgmaas]

Talks

2024 **An approach to eliminating additional dephasing due to internal magnetic field gradients in NMR measurements using multi-objective Bayesian optimization**
Rupeng Li, Igor Shikhov, and Christoph Arns
Poster presentation at the 16th International Bologna Conference on Magnetic Resonance in Porous Media (MRPM), Tromsø, Norway

2022 **A Bayesian optimization approach to the extraction of intrinsic physical parameters from T_2 relaxation responses**
Rupeng Li, Igor Shikhov, and Christoph Arns
Oral presentation at the 35th International Symposium of the Society of Core Analysts (SCA), Austin, Texas

2022 **Determination of intrinsic physical properties of porous media by solving inverse problems in Laplace NMR relaxometry using Bayesian optimization**
Rupeng Li, Igor Shikhov, and Christoph Arns
Poster presentation at the 15th International Bologna Conference on Magnetic Resonance in Porous Media (MRPM), Hangzhou, China

2020 **Effective parameter identification via NMR experiment and simulation using multi-task inverse solution workflow**
Rupeng Li, Igor Shikhov, and Christoph Arns
Oral presentation at the 12nd Annual Meeting of Interpore, Qingdao, China

2019 **Identification of surface relaxivities and effective diffusion coefficients governing relaxation processes in porous media by matching T_2 distributions through Bayesian optimization**
Rupeng Li, Igor Shikhov, and Christoph Arns
Oral presentation at the 12nd Australia and New Zealand society for Magnetic Resonance conference (ANZMAG), Perth, Australia

2019 **Identification of physical properties governing relaxation process in saturated rocks by matching experimental T_2 distributions and CT-image based NMR simulation through SL-particle swarm optimization**
Rupeng Li, Igor Shikhov, and Christoph Arns
Poster presentation at the 15th International Conference on Magnetic Resonance Microscopy (ICMRM), Paris, France

2018 **Accelerated simulation of NMR T_1 relaxation in digitized porous media using first-passage equations**
Rupeng Li, Igor Shikhov, and Christoph Arns
Poster presentation at the 8th Biennial Western Sydney University Symposium on NMR, MRI and Diffusion, Sydney, Australia

Teaching

2023-Present Lecturer, Undergraduate Physics (II)
- Prepared and delivered physics to a large class of **124** students.
- Course evaluation: ranking 127 out of a total of 1012 courses university-wide **(top 12.5%).**
- Provided 1-on-30 tutoring to students who were initially struggling, scoring below 30 on their mid-term assessments. After several tutoring sessions, they achieved on average a score of 75 on the final exam, with the highest achieved score of 92 **(ranking 8/124).**

2023-Present Lecturer, Physics Experiments (I) & (II)
- Created and delivered physical experiments: principle and application of oscilloscope; determination of wavelength of light using Newton's rings or a grating, etc.

2022 Teaching Assistant, Undergraduate Physics (II)

2022 Teaching Assistant, Physics Experiments (II)

2018-2020 Teaching Assistant, PTRL3030 & PTRL5021, Reservoir Characterization
- Created and delivered simple and ordinary Kriging interpolation, stochastic simulation, up-scaling and their applications in geological modeling.

Grants and Awards

2022-2024 Distinguished Early-Career Researcher Fellowship ($120k)
- *Geological parameter estimation using Bayesian optimization*
- 500 researchers per year for oversea doctorate degree recipients, top 3%

2022 Poster Presentation Award at the 15th International Bologna Conference on Magnetic Resonance in Porous Media

2018 Poster Presentation Award at the 8th NMR, MRI & Diffusion Symposium

2017-2022 UNSW Doctorate Scholarship

2016 4th place in SPE Asia Pacific Oil & Gas Conference and Exhibition Paper Contest

2016 Exchange Student Scholarship, UNSW & Chinese Scholarship Council

2014-2016 National Scholarship - **1/432**, awarded 3 years in a row, CUPE

Programming skills

Intermediate Bash, C, Fortran

Experienced MATLAB, Python