

# Ali Siahkoohi

Email: [alisk@gatech.edu](mailto:alisk@gatech.edu)

Personal website: [alisiahkoohi.github.io](http://alisiahkoohi.github.io)

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## EDUCATION

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### Georgia Institute of Technology

756 W Peachtree St NW, Floor 13, Atlanta, GA 30308, USA

*Doctor of Philosophy in Computational Science and Engineering*

- Degree Advisor: [Felix J. Herrmann](#)

September 2016 – July 2022 (expected)

### University of Tehran

North Kargar St, Tehran, Tehran, Iran

*Master of Science in Geophysics*

- Degree Advisor: [Ali Gholami](#)

September 2013 – March 2016

### Sharif University of Technology

Azadi Ave., Tehran, Tehran, Iran

*Bachelor of Science in Electrical Engineering*

September 2008 – August 2013

## RESEARCH INTERESTS

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Deep Learning, Generative Models, Variational Inference, Bayesian Inverse Problems, Uncertainty Quantification, Signal Processing

## RESEARCH EXPERIENCE

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### Georgia Institute of Technology

*Graduate Research Assistant*

February 2018 – Present

### Google

*Research Intern*

August 2021 – December 2021

### The University of British Columbia

*Graduate Research Assistant*

September 2016 – January 2018

## TEACHING EXPERIENCE

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### Georgia Institute of Technology

*Graduate Teaching Assistant*

- Computational Foundations of Machine Learning
- Imaging with Data-Driven Models
- Numerical Analysis I

January 2022 – April 2022

September 2019 – December 2019

September 2018 – December 2018

### Sharif University of Technology

*Teaching Assistant*

- Signals and Systems
- Digital Signal Processing
- Linear Algebra
- Principles of Electrical Engineering Laboratory

January 2011 – May 2011

January 2011 – May 2011

September 2010 – December 2010

September 2009 – December 2009

## PROGRAMMING SKILLS

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**Languages:** Python, Julia, C, MATLAB, Bash

**Machine Learning Libraries:** TensorFlow, PyTorch, Flux.jl

**Cloud Services Platform:** Amazon Web Services (AWS)

**Message Passing Standard:** MPI

## PUBLICATIONS

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### Journal papers

**Ali Siahkoohi**, Gabrio Rizzuti, and Felix J. Herrmann. “Deep Bayesian inference for seismic imaging with tasks”. Under review by *Geophysics*. Oct. 2021. URL: <https://arxiv.org/abs/2110.04825>.

**Ali Siahkoohi**, Mathias Louboutin, and Felix J. Herrmann. “The importance of transfer learning in seismic modeling and imaging”. In: *Geophysics* 84.6 (July 2019), A47–A52. DOI: [10.1190/geo2019-0056.1](https://doi.org/10.1190/geo2019-0056.1).

### Conference papers

Mathias Louboutin, Philipp Witte, **Ali Siahkoohi**, Gabrio Rizzuti, Ziyi Yin, Rafael Orozco, and Felix J. Herrmann. “Accelerating innovation with software abstractions for scalable computational geophysics”. Mar. 2022. URL: <https://arxiv.org/abs/2203.15038>.

**Ali Siahkoohi**, Michael Chinen, Tom Denton, W. Bastiaan Kleijn, and Jan Skoglun. “Ultra-Low-Bitrate Speech Coding with Pretrained Transformers”. Mar. 2022.

**Ali Siahkoohi**, Mathias Louboutin, and Felix J. Herrmann. “Velocity continuation with Fourier neural operators for accelerated uncertainty quantification”. Mar. 2022. URL: <https://arxiv.org/abs/2203.14386>.

**Ali Siahkoohi**, Rafael Orozco, Gabrio Rizzuti, and Felix J. Herrmann. “Wave-equation based inversion with amortized variational Bayesian inference”. Apr. 2022. URL: <https://arxiv.org/abs/2203.15881>.

Ziyi Yin, **Ali Siahkoohi**, Mathias Louboutin, and Felix J. Herrmann. “Learned coupled inversion for carbon sequestration monitoring and forecasting with Fourier neural operators”. Mar. 2022. URL: <https://arxiv.org/abs/2203.14396>.

Yijun Zhang, Mathias Louboutin, **Ali Siahkoohi**, Ziyi Yin, Rajiv Kumar, and Felix J. Herrmann. “A simulation-free seismic survey design by maximizing the spectral gap”. Mar. 2022. URL: <https://arxiv.org/abs/2204.02801>.

Rajiv Kumar, Maria Kotsi, **Ali Siahkoohi**, and Alison Malcolm. “Enabling uncertainty quantification for seismic data preprocessing using normalizing flows (NF)—An interpolation example”. In: *First International Meeting for Applied Geoscience & Energy*. Society of Exploration Geophysicists. 2021, pp. 1515–1519. DOI: [10.1190/segam2021-3583705.1](https://doi.org/10.1190/segam2021-3583705.1). URL: <https://slim.gatech.edu/Publications/Public/Conferences/SEG/2021/kumar2021SEGeuq/kumar2021SEGeuq.pdf>.

Rafael Orozco, **Ali Siahkoohi**, Gabrio Rizzuti, Tristan van Leeuwen, and Felix J. Herrmann. “Photoacoustic imaging with conditional priors from normalizing flows”. In: *NeurIPS 2021 Workshop on Deep Learning and Inverse Problems*. 2021. URL: <https://openreview.net/forum?id=woi1OTvROO1>.

Yuxiao Ren, Philipp A. Witte, **Ali Siahkoohi**, Mathias Louboutin, and Felix J. Herrmann. “Seismic Velocity Inversion and Uncertainty Quantification Using Conditional Normalizing Flows”. In: *American Geophysical Union (AGU) Fall Meeting*. Dec. 2021. URL: <https://agu.confex.com/agu/fm21/meetingapp.cgi/Paper/815883>.

**Ali Siahkoohi** and Felix J. Herrmann. “Learning by example: fast reliability-aware seismic imaging with normalizing flows”. In: *First International Meeting for Applied Geoscience & Energy*. Society of Exploration Geophysicists. 2021, pp. 1580–1585. DOI: [10.1190/segam2021-3581836.1](https://doi.org/10.1190/segam2021-3581836.1). URL: <https://arxiv.org/abs/2104.06255>.

**Ali Siahkoohi**, Gabrio Rizzuti, Mathias Louboutin, Philipp Witte, and Felix J. Herrmann. “Preconditioned training of normalizing flows for variational inference in inverse problems”. In: *3rd Symposium on Advances in Approximate Bayesian Inference*. Jan. 2021. URL: <https://openreview.net/pdf?id=P9m1sMaNQ8T>.

Gabrio Rizzuti, **Ali Siahkoohi**, Philipp A. Witte, and Felix J. Herrmann. “Parameterizing uncertainty by deep invertible networks, an application to reservoir characterization”. In: *SEG Technical Program Expanded Abstracts*. Sept. 2020, pp. 1541–1545. DOI: [10.1190/segam2020-3428150.1](https://doi.org/10.1190/segam2020-3428150.1). URL: <https://arxiv.org/abs/2004.07871>.

**Ali Siahkoohi**, Gabrio Rizzuti, and Felix J. Herrmann. “A deep-learning based Bayesian approach to seismic imaging and uncertainty quantification”. In: *82nd EAGE Conference and Exhibition 2020*. Jan. 2020. URL: <https://arxiv.org/abs/2001.04567>.

**Ali Siahkoohi**, Gabrio Rizzuti, and Felix J. Herrmann. “Uncertainty quantification in imaging and automatic horizon tracking—a Bayesian deep-prior based approach”. In: *SEG Technical Program Expanded Abstracts*. Sept. 2020, pp. 1636–1640. DOI: [10.1190/segam2020-3417560.1](https://doi.org/10.1190/segam2020-3417560.1). URL: <https://arxiv.org/abs/2004.00227>.

**Ali Siahkoohi**, Gabrio Rizzuti, and Felix J. Herrmann. “Weak deep priors for seismic imaging”. In: *SEG Technical Program Expanded Abstracts*. Sept. 2020, pp. 2998–3002. DOI: [10.1190/segam2020-3417568.1](https://doi.org/10.1190/segam2020-3417568.1). URL: <https://arxiv.org/abs/2004.06835>.

- Mi Zhang, **Ali Siahkoohi**, and Felix J. Herrmann. “Transfer learning in large-scale ocean bottom seismic wavefield reconstruction”. In: *SEG Technical Program Expanded Abstracts*. Sept. 2020, pp. 1666–1670. DOI: [10.1190/segam2020-3427882.1](https://arxiv.org/abs/2004.07388). URL: <https://arxiv.org/abs/2004.07388>.
- Felix J. Herrmann, **Ali Siahkoohi**, and Gabrio Rizzuti. “Learned imaging with constraints and uncertainty quantification”. In: *NeurIPS 2019 Deep Inverse Workshop*. Dec. 2019. URL: <https://arxiv.org/abs/1909.06473>.
- Gabrio Rizzuti, **Ali Siahkoohi**, and Felix J. Herrmann. “Learned iterative solvers for the Helmholtz equation”. In: *81st EAGE Conference and Exhibition 2019*. June 2019. DOI: [10.3997/2214-4609.201901542](https://doi.org/10.3997/2214-4609.201901542).
- Ali Siahkoohi**, Rajiv Kumar, and Felix J. Herrmann. “Deep-learning based ocean bottom seismic wavefield recovery”. In: *SEG Technical Program Expanded Abstracts*. Aug. 2019, pp. 2232–2237. DOI: [10.1190/segam2019-3216632.1](https://doi.org/10.1190/segam2019-3216632.1).
- Ali Siahkoohi**, Dirk J. Verschuur, and Felix J. Herrmann. “Surface-related multiple elimination with deep learning”. In: *SEG Technical Program Expanded Abstracts*. Aug. 2019, pp. 4629–4634. DOI: [10.1190/segam2019-3216723.1](https://doi.org/10.1190/segam2019-3216723.1).
- Ali Siahkoohi**, Rajiv Kumar, and Felix J. Herrmann. “Seismic Data Reconstruction with Generative Adversarial Networks”. In: *80th EAGE Conference and Exhibition 2018*. June 2018. DOI: [10.3997/2214-4609.201801393](https://doi.org/10.3997/2214-4609.201801393).
- Ali Siahkoohi**, Mathias Louboutin, Rajiv Kumar, and Felix J. Herrmann. “Deep-convolutional neural networks in prestack seismic—two exploratory examples”. In: *SEG Technical Program Expanded Abstracts*. Oct. 2018, pp. 2196–2200. DOI: [10.1190/segam2018-2998599.1](https://doi.org/10.1190/segam2018-2998599.1).
- Ali Siahkoohi** and Ali Gholami. “Sparsity Promoting Least Squares Migration for Laterally Inhomogeneous Media”. In: *7th EAGE Saint Petersburg International Conference and Exhibition*. Apr. 2016. DOI: [10.3997/2214-4609.201600223](https://doi.org/10.3997/2214-4609.201600223).
- Mohammad Sadegh Ebrahimi, Mohammad Hossein Daraei, Jamshid Rezaei, and **Ali Siahkoohi**. “A Novel Utilization of Wireless Sensor Networks as Data Acquisition System in Smart Grids”. In: *Materials Science and Information Technology*. Vol. 433. Advanced Materials Research. Trans Tech Publications, Jan. 2012, pp. 6725–6730. DOI: [10.4028/www.scientific.net/AMR.433-440.6725](https://doi.org/10.4028/www.scientific.net/AMR.433-440.6725).
- Amir Najafi, **Ali Siahkoohi**, and Mohammad B. Shamsollahi. “A content-based digital image watermarking algorithm robust against JPEG compression”. In: *2011 IEEE International Symposium on Signal Processing and Information Technology (ISSPIT)*. IEEE. Feb. 2011, pp. 432–437. DOI: [10.1109/ISSPIT.2011.6151601](https://doi.org/10.1109/ISSPIT.2011.6151601).

## Technical reports

- Mathias Louboutin, **Ali Siahkoohi**, Rongrong Wang, and Felix J. Herrmann. “Low-memory stochastic backpropagation with multi-channel randomized trace estimation”. June 2021. URL: <https://arxiv.org/abs/2106.06998>.
- Ali Siahkoohi**, Gabrio Rizzuti, Philipp A. Witte, and Felix J. Herrmann. “Faster Uncertainty Quantification for Inverse Problems with Conditional Normalizing Flows”. In: *Tech. rep. TR-CSE-2020-2, Georgia Institute of Technology*. July 2020. URL: <https://arxiv.org/abs/2007.07985>.
- Ali Siahkoohi**, Mathias Louboutin, and Felix J. Herrmann. “Neural network augmented wave-equation simulation”. In: *Tech. rep. TR-CSE-2019-1, Georgia Institute of Technology*. Sept. 2019. URL: <https://arxiv.org/abs/1910.00925>.