Anran Xu

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NATIONALITY

People's Republic of China (China).

EDUCATION

The University of British Columbia Vancouver, Canada
Master of Science in Geophysics 2022.09-present

- Outstanding Student Presentation Award (AGU 2023)

University of Toronto Toronto, Canada
Honours Bachelor of Science 2018.09-2022.06
Mathematics & Its Applications Specialist (Physical Science); Physics Major

- GPA: **3.91/4.0**
- Dean's List Scholar (Fall/Winter 2019-2020 & 2020-2021)
- The Don Salt Memorial Scholarship (Canadian Exploration Geophysical Society (KEGS))
- New College Council In-Course Scholarship
- Summer Undergraduate Research Program (SURP) in astronomy & astrophysics

SELECTED RESEARCH EXPERIENCE

Neural Fields for Imaging Inverse Problems in Fluorescence Microscopy (CNRS internship) Sophia-Antibus, France 2024.05-2024.10
Advisor: Luca Calatroni and Laure Blanc-Féraud, CNRS

- Developed an NF-based approach to represent continuous positions of fluorescent molecules, enhancing fluorescence microscopy by addressing challenges such as blur, noise, and undersampling

Leveraging Convolutional Neural Networks for implicit regularization Vancouver, Canada
Advisor: Lindsey Heagy, University of British Columbia 2023.05-2023.12

- Design a novel pipeline for the Direct Current (DC) resistivity inversion using the PyTorch and SimPEG
- Analyze the mechanism of the implicit regularization effect observed in the proposed pipeline
- Test the proposed pipeline with the synthetic and field data, the results are more accurate than the conventional pipleine

Development of ML Methods for Power Spectrum Emulators (SURP internship) Toronto, Canada
Advisor: Dr. Keir Rogers, University of Toronto 2022.05-2022.08
Poster: http://www.astro.utoronto.ca/wp-content/uploads/2022/12/AnranXu_SURP2022.pdf

- Reviewed the literature about Cosmopower and axion dark matter cosmology
- Studied the background material on cosmology including cosmic microwave background, LSS matter density, etc.
- Used the axionCAMB package to generate a dataset with different LCDM parameters' space
- Grasped the Cosmopower packages to train a DNN that maps the input cosmological parameters to CMB and matter power spectra in an axion dark matter cosmology model, achieving error less than 0.06σ for 99% of the CMB spectra

Visual Sentiment Analysis using Deep Learning Models Toronto, Canada
AI4Good Lab (Amii) 2022.05-2022.07

- Reviewed the existing research literature on image sentiment analysis
- Collaborated with team members to write a project proposal
- Pre-processed the collected data to create a labeled dataset
- Built and optimized a convolutional neural network (CNN) model using transfer learning from ResNet50v2, achieving accuracy of 72% for the training set and 75% for the validation set

Development of AI Methods for Finding Hidden Dimensions Toronto, Canada

Advisor：Dr. Hazem Daoud, *University of Toronto* 2021.05-2021.08

- Reviewed the literature about diffraction pattern analysis using machine learning methods, and explored how A.I. can aid in matching changes in diffraction pattern to structural changes of bismuth
- Gained essential knowledge and skills by taking two courses: *Deep Learning Specialization* and *TensorFlow Developer Professional Certificate* on Coursera
- Exported the synthetic profiles of the electron diffraction patterns and converted them into the ring-like electron diffraction images using Python
- Built and optimized a convolutional neural network (CNN) model, achieving accuracy of 93.2% for the training set and 91.15% for the validation set
- Used the CNN model to predict the Uiso values of real diffraction patterns, and the prediction has the right trend

Moment Tensor Inversion for the Mw=6.5 Earthquake in Nevada Toronto, Canada

Advisor: Prof. Qinya Liu, University of Toronto 2021.05-2021.07

- Studied background material on seismic wave equation, seismic wave propagation, and earthquake source representations (focal ball, moment tensor)
- Grasped software packages (gCAP & FK package) on seismic data processing and source mechanism inversions
- Used FK package to calculate the required Green's functions in multi-layered media
- Performed moment-tensor inversion about the Mw=6.5 earthquake in Nevada in 2020 using gCAP package, the result shows that most of segments have correlation coefficients greater than 90 (100 is the maximum)

Selected Conferences and Publications

Xu, Anran, and Lindsey J. Heagy. "A Test-Time Learning Approach to Reparameterize the Geophysical Inverse Problem with a Convolutional Neural Network." ***IEEE Transactions on Geoscience and Remote Sensing*** (2024).

Advancing Earth and Space Science (AGU23) San Francisco, US

"Leveraging Convolutional Neural Networks for implicit regularization" 2023.12.13

Anran Xu, Lindsey Justine Heagy and John Weis, University of British Columbia

SLAM Conference on mathematics of Data Science (MDS24) Atlanta, US

"Leverage Neural fields to the geophysical inverse problems" 2024.10.25

Anran Xu, and Lindsey Justine Heagy, University of British Columbia

WORK EXPERIENCE

Teaching Assistant Vancouver, Canada

Instructor: Lindsey Heagy

EOSC 350: Environmrntal, Geotechnical, and Exploration Geophysics at University of British Columbia

New Oriental Education & Technology Group Inc. Beijing, China

High School Physics Tutor 2020.07-2020.08

- Prepared, assigned and corrected tests
- Evaluated students' progress and discussed the results with students and their parents
- Analyzed student's performance by collecting data about their quizzes' marks and the quality of homework

SKILLS

Language: Chinese Mandarin (Native), English (Fluent)

Computer Skills: Python, Julia, LaTeX, BASH shell, Linux