



Zhihao LIU

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SUMMARY

I build tools

Passionate geodata professional with a strong focus on geophysical data science, climate reanalysis, and remote sensing. Experienced in handling large, diverse datasets and proficient in scientific programming and geostatistics. Seeking to contribute to academia through innovative ideas and good programming skills.

RESEARCH EXPERIENCE

Teaching Assistant - Department of Geosciences, UiO

[Aug 2023 – Nov 2023]

Teaching Assistant for GEO4300/9300 (Geophysical Data Science), Fall 2023. Main responsibility:

- Assisted in the preparation and delivery of course materials, focusing on the application of data science in geophysics.
- Conducted 35-hour lab sessions and provided hands-on training in scientific programming, data analysis, and the use of tools.
- Engaged in one-on-one mentoring and support for students, helping with all technique issues related to data science.
- Graded the exercises and course reports.

Summer Intern - Department of Technology System, UiO

[May 2023 – Jul 2023]

How does climate change impact wind and solar production? This is a summer research project funded by UiO: Energy and Environmental.

- Focusing on exploring machine learning algorithms for bias correction and spatial downscaling.
- Collaborating with a multidisciplinary team to apply bias correction and spatial downscaling to climate datasets, aiming to improve energy system modeling.

Skills: Downscaling, Bias correction, Climate reanalysis, Energy system modeling, Wind power.

Research Assistant - Department of Geosciences, UiO

[Nov 2021 – Jun 2023]

Engaged in a research project, [SNOWDEPTH](#), focused on estimating global snow depths using spaceborne remote sensing techniques. This project is funded by the Research Council of Norway. Key achievements:

- Developed and implemented the Gradient Descent Coregistration algorithm, significantly improving the accuracy and reliability of DEMs in change detection.
- Participated in field trips with experience on Drone and Lidar.
- Produced a novel dataset addressing snow distribution at the hillslope scale, leveraging downscaled ERA5 climate reanalysis and satellite laser altimetry (DOI 10.5281/zenodo.10048875).
- Demonstrated proficiency in handling and analyzing large and diverse geospatial datasets.
- Contributed to [xDEM](#), a reliable repository for digital elevation models.

Skills: Scientific programming, Geostatistics, Automating GIS.

Geomatics Professional - BGP Offshore, CNPC

[Jul 2014 – Jun 2021]

I participated in over 12 offshore surveys (3D/4D/OBN/SideScanSonar) globally as part of a world-class seismic team, BGP Prospector. The focus is to deliver high-quality geophysical datasets and de-risking offshore operations.

- Developed and optimized [a data processing pipeline](#) using Python, enhancing the efficiency and accuracy of data interpretation.
- Collaborated with cross-functional teams and performed rigorous data quality control, contributing to critical decision-making in offshore exploration.
- HSE culture and cross-culture environment.
- Took on technical responsibilities such as contract technical review, patents, and conference participation.

Skills: Data processing, Quality control, Python, HSEQ.

EDUCATION AND TRAINING

Master in Geoscience

Universitetet i Oslo [Aug 2021 – Jun 2023]

My studies covered several keywords in the field of geophysics & Earth Observation: change detection, terrain analysis, and cold processes. I presented my master's thesis in IUGG 2023 Berlin (International Union of Geodesy and Geophysics) with a traveling grant and was awarded a sponsorship from the Industrial Liaison program.

Courses (GPA 4.75/5.0):

1. **Advanced Remote Sensing and Topographic Analysis (A)**
2. **Surveying, Photogrammetry and Spatial Analysis (A)**
3. **Geophysical Data Science (A)**
4. Glacial and Periglacial Geomorphology (B)
5. Remote Sensing (B)
6. Floods, Avalanches and Landslides (B)
7. IPCC AR6 Climate Seminar - Physical Science Basis

Thesis (A): [Snow Depth Retrieval and Downscaling using Satellite Laser Altimetry, Machine Learning, and Climate Reanalysis](#)

Poster: [Snow Depth from Satellite Laser Altimetry: Co-registration, Bias Correction, and Statistical Downscaling](#)

Bachelor in Geodesy and Geomatics

South West Petroleum University [Sep 2010 – Jul 2014]

With a background in Engineering, Cartography, GNSS, and GIS.

Thesis (A): A WebGIS system for urban infrastructure management.

PROJECTS

Bias-correction and spatial downscaling of weather data for energy system modelling

[May 2023 – Jul 2023]

Understanding the resource availability and variability of solar and wind energy generation is essential to designing and planning optimal energy systems. This becomes more important when climate change has changed the weather conditions of different regions of the world, increasing the intrinsic uncertainties associated with these types of renewable sources. Key deliverables:

- A review of machine learning-based downscaling techniques for climate variables.
- The downscaled, debiased wind speed for energy system modeling by QDM (Quantile Delta Mapping).

SNOWDEPTH - Global snow depths from spaceborne remote sensing for permafrost, high-elevation precipitation, and climate reanalysis

[Jan 2022 – Nov 2023]

Seasonal snow depth is a key component of surface energy balance and the water cycle, which is related to scientific topics e.g. permafrost thawing, ice/snow albedo feedback, high-mountain precipitation, hydropower...Estimating snow depth by a satellite in 500 km away is a challenging task, and requires dedicated, careful signal processing. Key deliverables:

- Developed a comprehensive workflow for retrieving snow depth from satellite laser altimetry, offering applicability to global-scale snow depth studies.
- [Produced downscaled snow depth products](#) at hillslope scales that are expected to improve hydrologic models, permafrost modeling, and avalanche assessments.
- [Wrote a paper](#) that contributed to the scientific understanding of snow subgrid processes.

North Sea Quad 35 Hybrid 3D seismic survey

[Jul 2020 – Nov 2020]

[Quad 35](#) is a well-known commercial seismic project in Norway. Historically It combined streamers and node acquisition.

- Worked as a technician for contract technical review, onboard acquisition, data QC & reprocessing, and follow-up work.
- Got [the best commendation](#) from the client for modeling this novel acquisition to make it more efficient and understandable.

Skills: Offshore data acquisition, Quality control, Technical support, Follow-up

Essaouira side-scan sonar survey, Offshore Morocco

[Apr 2017 – Apr 2017]

The main point of the pre-survey was identifying the possible shallow hazards for seismic equipment: reefs, shipwrecks, and pipelines.

- Designed and conducted a side-scan sonar pre-survey for seismic projects.
- I am also familiar with offshore magnetic and gravity surveys that we do simultaneously during seismic acquisition.

Skills: Side-scan sonar, HSEQ, Teamwork

CREATIVE WORKS

Using 5.8 million to buy a unit in Oslo, which one is worth?

The goal of this project was to determine which [unit to buy in Oslo](#) using multiple-criteria decision analysis (MCDA). The median price for a unit in the city is 5.8 million. The project involved scraping property data from Finn, cleaning the data, and gathering spatial information from open-access databases, OpenStreetMap, and satellite images. An MCDA model was then created to make the final decision.

Skills: Spatial Analysis, MCDA Modeling.

What if the ice block expedition 1959 happens in 2021?

In 1959, a three-ton block of ice from Mo i Rana by the Arctic Circle was trucked to Libreville by the Equator with an 11% mass loss. Is that true? What if we do it again in 2020 or 2021? [I applied an energy balance model](#) and coupled ERA 5 with a historical event (the Ice Block Expedition of 1959).

Skills: Numerical Modeling, Climate Reanalysis, Time-series Analysis.

How to bury Longyearbyen by an avalanche?

Avalanches are rapid snow mass movements over snow-covered slopes, which could be dangerous for people living in mountainous terrain due to long-time exposure. So, [how to bury a town with a designed avalanche?](#) I used Software RAMMS::Avalanche® to simulate slab avalanche movement by the Voellmy-fluid friction model. I found NVE's new report may overestimate the size of the avalanche in some scenarios.

Skills: Mass Movement Modeling, GIS.

Agriculture change detection: The expansion of west Nile delta

Over the past three decades, Egypt has faced a significant challenge in ensuring food security due to its rapidly growing population. As a result, the Nile Delta region has become increasingly crowded. To tackle this issue, a study was conducted in the western Nile region using spectral analysis, NDVI, classification, and change detection techniques. The purpose of this study was to identify changes in agriculture practices and land use patterns over time.

Skills: Change detection, Remote sensing.

CONFERENCES AND SEMINARS

Assessing Subgrid Snow Depth Variability with Satellite Laser Altimetry

Zhihao Liu, Désirée Treichler. Paper submitted.

Snow Depth Retrieval and Downscaling Using Satellite Laser Altimetry, Machine Learning and Climate Reanalysis

Oral Presentation, JC01, IUGG 2023, Berlin.

Unlocking the Secrets of Snow Depth - A Study of Satellite Altimetry and High-Precision Digital Elevation Models

Oral presentation at Sustainability Conference 2023, UiO

An identification system for underwater seismic devices

Patent, PRC 201911154941X · Issued May 13, 2022.

Wide-towed sources in streamer seismic: a case study from Norway Q35

Zhihao Liu, Bo Wen, Yuanjie Liu, Xuebin Qin, Qian Zhao, [Conference paper](#) from Society of Petroleum Geophysicists 2021, Chengdu, China

Offshoreorinet v1.0 seismic QC software

Software Copyright, 2020SR0194691 · Issued Mar 2, 2020.

A hybrid seismic acquisition: from wide-towed sources, sparse node to FWI

Zhihao Liu, Yuanjie Liu, Bo Wen, BGP geophysical technology overseas workshop 2021, Beijing, China (not open access)

HOBBIES AND INTERESTS

Marathon

- Not bad runner with 130 (half-marathon) and 330 (marathon) of the personal best.
- Have organized medium size marathon (15K) and was in charge of supply and volunteers.

OSI Friluft - Volunteer

- Board member - Media & Facebook
- Tour leader of outdoor

IMO 2022 - Volunteer

- Tour guide for International Mathematical Olympiad 2022, Oslo.

LANGUAGE SKILLS

Mother tongue(s): **Chinese**

Other language(s): **English (professional working proficiency)** | **Norsk (beginner)**

REFERENCES

2021 - Present

Professor and Supervisor, Andreas Max Kääb, Email: a.m.kaab@geo.uio.no, Mobile: +47 22855812

Project Leader and Co-supervisor, Désirée Treichler, Email: desiree.treichler@geo.uio.no, Mobile: +47 22857869

Summer supervisor, Guillermo Andrés Valenzuela Venegas, Email: g.a.v.venegas@its.uio.no, Mobile: +47 97382720

2016 - 2021

Chief geophysicist of BGP Prospector, Bo Wen, Email: wenbo01@cnpc.com.cn, Mobile: +86 18622259275