Zhihao LIU

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SUMMARY

About me

I have worked with diverse geodata sources, from offshore, climate, to remote sensing, adapting my solid geophysical expertise to different domains. I am passionate about delivering geodata as a service and providing data-driven solutions for energy and climate challenges. I am looking for interesting datasets, and cutting-edge projects to apply my expertise.

WORK EXPERIENCE

Summer Intern

Department of Technology Systems, UiO [05/2023 – 07/2023]

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 weather and 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 [11/2021 – Current]

Engaged in a research project, SNOWDEPTH, focused on estimating global snow depths using spaceborne remote sensing techniques. Key achievements:

- Developed and implemented the Gradient Descent Coregistration algorithm, significantly improving the accuracy and reliability of DEMs.
- Produced a novel dataset addressing snow distribution at the hillslope scale, leveraging downscaled ERA5 climate reanalysis and satellite laser altimetry.
- Demonstrated proficiency in handling and analyzing large and diverse geospatial datasets.
- Contributed to xDEM, a reliable repository for digital elevation models.

Teaching assistant for GEO4300/9300 (Geophysical data science, 23 Fall).

Skills: Scientific programming, Geostatistics, Automating GIS.

Geomatics Professional

BGP Offshore, China National Petroleum Corporation [07/2014 – 06/2021]

As a field technician, I participated in over 12 offshore surveys (3D/4D/OBN/SideScanSonar) globally, from The Barents Sea, to West Africa, as part of a world-class seismic team, BGP Prospector. The focus is to deliver high-quality geophysical datasets and de-risking offshore operations. Key achievements:

- Conducted data processing and quality control for geophysical surveys.
- Developed a data processing pipeline using my own software (Python GUI).
- Took on technical responsibilities such as contract technical review, patents, and conferences.
- Became a Licensed Surveyor in 2018.
- Were promoted to a senior position as Assistant Manager in January 2021.

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

EDUCATION AND TRAINING

Master in Geoscience

Universitetet i Oslo [08/2021 – 06/2023]

Final grade: A (4.75/5.0)

My studies covered several keywords in the field of geophysics & Earth observation: change detection, terrain analysis, and the Cryosphere. Additionally, 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:

- **Advanced Remote Sensing and Topographic Analysis (A)**
- **Surveying, Photogrammetry and Spatial Analysis (A)**
- **Geophysical Data Science (A)**
- Glacial and Periglacial Geomorphology (B)
- Remote Sensing (B)
- Floods, Avalanches and Landslides (B)
- IPCC AR6 Climate Seminar - Physical Science Basis

Thesis (60 ECTS, A): Snow Depth Retrieval and Downscaling using Satellite Laser Altimetry, Machine Learning, and Climate Reanalysis
Poster in LATICE 2023 annual meeting: Snow Depth from Satellite Laser Altimetry: Co-registration, Bias Correction, and Statistical Downscaling

Bachelor in Geodesy and Geomatics

South West Petroleum University (China) [09/2010 – 07/2014]

With a background in Engineering, Cartography, GNSS and GIS.
A for Bachelor's thesis: A WebGIS system for urban infrastructure management.

PROJECTS

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

[05/2023 – 07/2023]

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

[01/2022 – Current]

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 is yet a challenging task because of wind redistribution, and snow-vegetation interactions.

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.
- Contributed to the scientific understanding of the role of snow depth in hydrology and climate studies.

North Sea Quad 35 Hybrid 3D seismic survey

[07/2020 – 11/2020]

Quad 35 is a well-known commercial seismic project in Norway. Historically it combined streamers and node acquisition, providing high-quality seismic data at low cost.

- 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.

CREATIVE WORKS

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 only an 11% mass loss. Is that true? What if we do it again in 2020 or 2021? I employed a surface energy balance model and coupled ERA 5 to simulate this 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.

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.

CONFERENCES AND SEMINARS

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

Presentation, IUGG 2023, Berlin.

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

Student presentation at SDG 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

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)

Offshoreorinet v1.0 Offshore seismic QC software

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

LANGUAGE SKILLS

Mother tongue(s): **Chinese**

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

HOBBIES AND INTERESTS

OSI Friluft - Volunteer

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

IMO 2022 - Volunteer

- Tour guide for International Mathematical Olympiad 2022, Oslo.

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.

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