NSF Spatiotemporal Innovation Center

January 2023 Monthly Newsletter

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OSTP/ White House Event

The National Space Council hosted an event for students during Computer Science Education Week (Dec 5-11) on December 9th at 2 pm ET. The intended invitees include students who use computational skills to create models, analyze data, and develop innovative technology to combat the climate crisis. The datasets of focus are on USGS, NASA, and NOAA. Seven students from STC (including high school fellow, 2-year START intern, graduate students, and postdoc fellow) were invited to participate. They represented our projects on air quality, arctic sea ice, and urban heat island funded by NASA AIST, NASA CISTO/NCCS, NSF ACI and EarthCube, and I/UCRC programs. Students listened to national leaders from the white house, congress, and agencies, as well as asked questions and had discussion with national leaders such as the 2nd Gentlemen and the previous NGA director.

Challenges and opportunities of the spatiotemporal responses to the global pandemic of COVID-19

STC leaders including Chaowei Yang, Wendy Guan and Shuming Bao published their latest paper, "Challenges and opportunities of the spatiotemporal responses to the global pandemic of COVID-19", in the Annals of GIS. This paper summarizes new developments, challenges and findings with a focus on the spatiotemporal analysis of the impact of COVID-19. This is an editorial for the special issue on COVID-19 for annals of GIS and summarization of the spatiotemporal rapid response to COVID-19 project.

For further information and/or inquiries, please email Dr. Chaowei Phil Yang at cyang3@gmu.edu

The Special Issue

STC is collaboratively organizing the Special Issue of big earth data for climate studies for the international journal Remote Sensing. Dr. Chaowei Yang, Dr. Daniel Q. Duffy, and Mr. Sudhir Shrestha guest-edit the issue and welcome manuscripts addressing Big Earth data, data processing and simulations based on big data, and new computing methods and information technologies. The webpage of the Special Issue "Big Earth Data for Climate Studies" is now online.

Check it out at the following link:
https://www.mdpi.com/journal/remotesensing/special_issues/K5OCX36907

January 2023, Applications & Developments with KNIME

Discover the latest in spatiotemporal innovation! This month, we had the opportunity to collaborate with KNIME on a series of events and webinars. The highlight of the month was the Spatiotemporal Innovation event, where we jointly introduced the most recent release with Harvard site and KNIME.

The Development of Python-based KNIME Extension and KNIME Web Portal for Geospatial Analysis and Simulation Online

Sponsored by the Spatial Data Lab (SDL) project, this training webinar will cover the following topics: (1) How to develop python-based extensions for KNIME; (2) How to convert a desktop based KNIME workflow to KNIME Web Portal for online geospatial analysis and simulation; (3) Applications of Geospatial extension for KNIME and online geospatial analysis and simulation with KNIME Web Portal; and (4) How to collaborate with the SDL team on geospatial development and applications. The webinar is a part of the Spatiotemporal Innovation Workshop series. Date: 9:00 PM - 10:00 PM, Jan 13, 2023 (US Eastern Time).

Registration: https://www.eventbrite.com/e/505780341617.

Data Connect : North America - Geolocation applications with KNIME

Jointed organized by CGA and KNIME, this event will introduce the new Geospatial Analysis Extension in KNIME's most recent release. For more information and to attend in person, please visit https://www.meetup.com/boston-knime-users/events/290102421/.

For virtual participation, please visit https://www.meetup.com/de-DE/boston-knime-users/events/290173362/.

Date: January 25, 2023, 6:00pm to 9:00pm (US Eastern Tim).
Location: CGIS South Building, Room S050, 1730 Cambridge St, Cambridge MA 02138

# Deep Geometric Neural Network for Spatial Interpolation

Emory undergraduate student, Minxing Zhang, recently published a paper entitled, "Deep Geometric Neural Network for Spatial Interpolation", in ACM SIGSPATIAL 2022, advised by Dr. Liang Zhao who serves as CO-PI of the Spatiotemporal Innovation Center and cooperated with Dr. Yun Li who graduated from our center and work as a postdoctoral researcher at Emory University. This work won the Best Poster Runner-up Award in ACM SIGSPATIAL 2022. The article proposed a novel Deep Geometric Spatial Interpolation framework that considers distance and orientation information. It can support spatial interpolation by automatically interpolating the value of the targeted variable at unknown locations based on existing observations.

For further information and/or inquiries, please email Minxing Zhang at minxing.zhang@emory.edu.
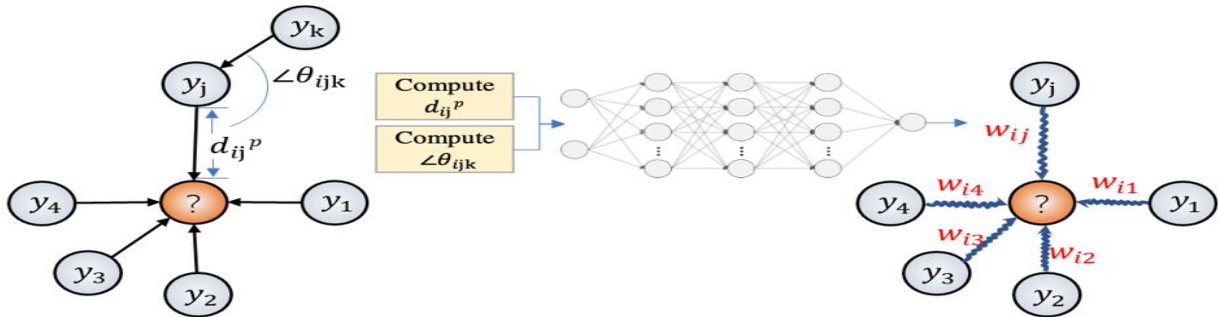
Developing and examining the transit-based accessibility to hospitals of Ulaanbaatar, Mongolia

In a recent study, researchers looked at how easy it is for people in Ulaanbaatar, Mongolia to access hospitals via public transportation. This is an important issue in low- and middle-income countries like Mongolia, where limited accessibility to healthcare can have negative effects on people's health.
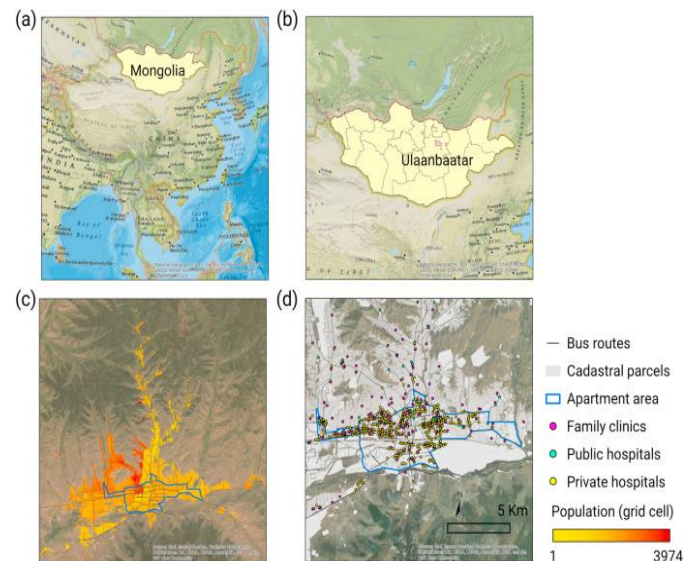
In collaboration with our partner organization ESIP and NASA, the STC center organized two ESIP Virtual sessions about the latest on Utilizing GPU for AI/ML of Earth Science and the Past, present and future of Digital Twins in Earth Systems.

Accelerating Earth Science Research with GPUs in Machine Learning

Earth science researchers face a major computational challenge when using AI/DL applications, but the use of GPUs in these applications has shown the potential to speed up the process. This session provided valuable insights into how researchers can optimize their AI/ML applications and improve performance through the adoption of GPU computing. The speakers for this event are Stan Posey, who provided an overview of NVIDIA support to Earth Sciences, Daniel Q. Duffy from NASA, also our IAB chair, who discussed the Hybrid Cloud Capabilities in Support of AI/ML, Jordan Alexis Caraballo-Vega from NASA Goddard, who presented an overview of AI/ML usage at Goddard, and Phil Yang, our center director, reported the GPU support to Earth Sciences Computing Testbed center IAB project. Attendees are advised to have a general understanding of AI/ML and big data in earth sciences. During the session, the various Earth science AI applications are highlighted and the maturity level of GPU-supported computing platforms such as supermicro, DGX clusters, and cloud computing are evaluated. The session concluded with a discussion on a potential hackathon at the summer ESIP meeting, aimed at further promoting the integration of GPUs in Earth science research for open science.

For more information visit, https://2023januaryesipmeeting.sched.com/event/1EwXH/utilizing-gpus-in-machine-learning-for-earth-sciences

Plenary: Digital Twins for Earth Systems – Past, Present, and Future

Leaders from NASA, CNES, EU, and Academia come together to introduce the concept, cutting-edge, and future research of digital twins for Earth Systems. The plenary session delved into the basics of digital twins, the role of earth data and sciences, use cases and examples. Technology foundations required to build a digital twin as well as opportunities and challenges were discussed. Speakers include Benjamin D. Smith from NASA AIST program who funded 14 digital twins project in its 2021 solicitation, Jean-Marc Delvit from CNES talked about Digital Twin Factory, Peter Bauer talked about Destination Earth, and Michael Goodchild, our center advisory board chair talked about privacy and ethical and uncertainties of Digital Twins. Follow up is agreed by everyone to further advance our research and development of digital twins.

For more information visit, https://2023januaryesipmeeting.sched.com/event/1EwX8/plenary-digital-twins-for-earth-systems-past-present-and-future