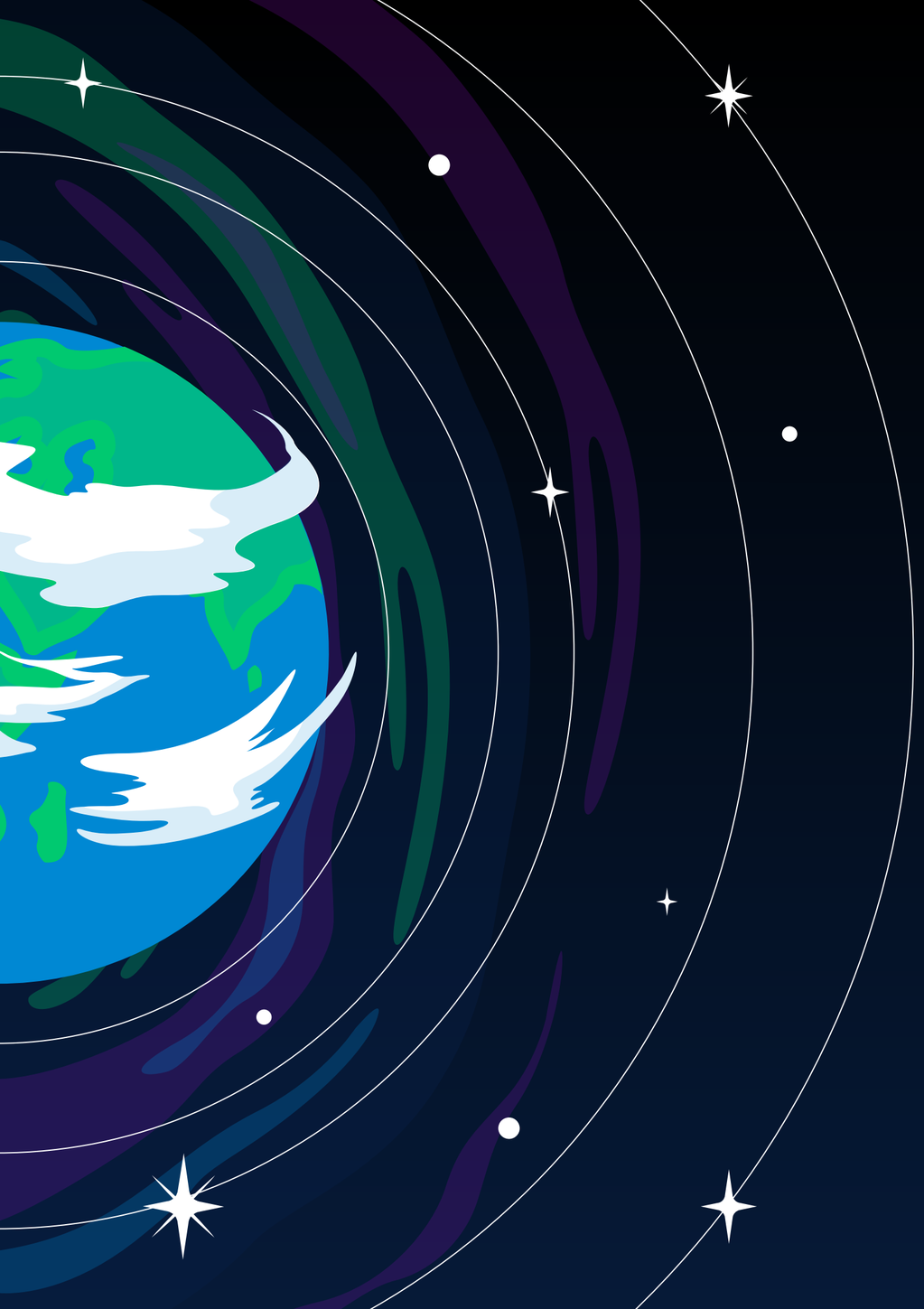


ESTIMATION OF LAND SURFACE TEMPERATURE

Introduction & Problem Definition

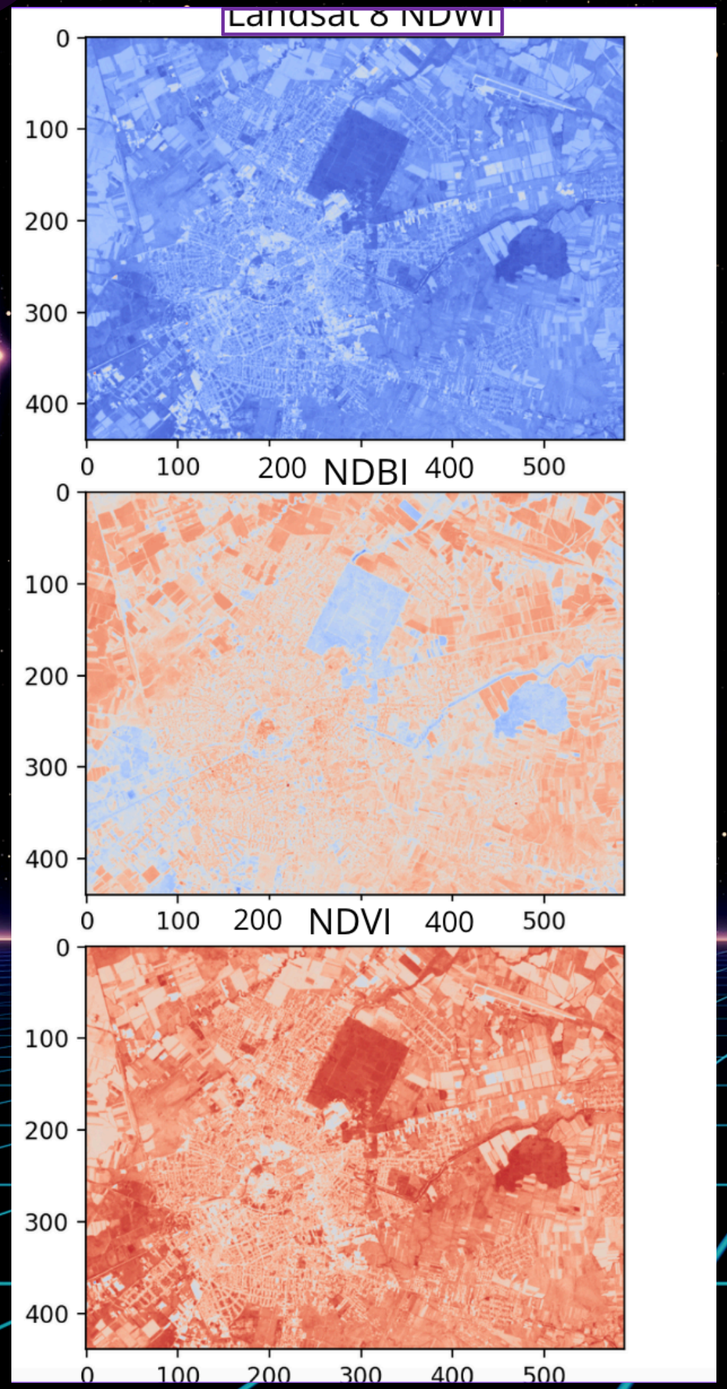
- **Urban Heat Island (UHI) Effect:**
Urban areas are significantly warmer than rural ones due to reduced vegetation and increased artificial surfaces.

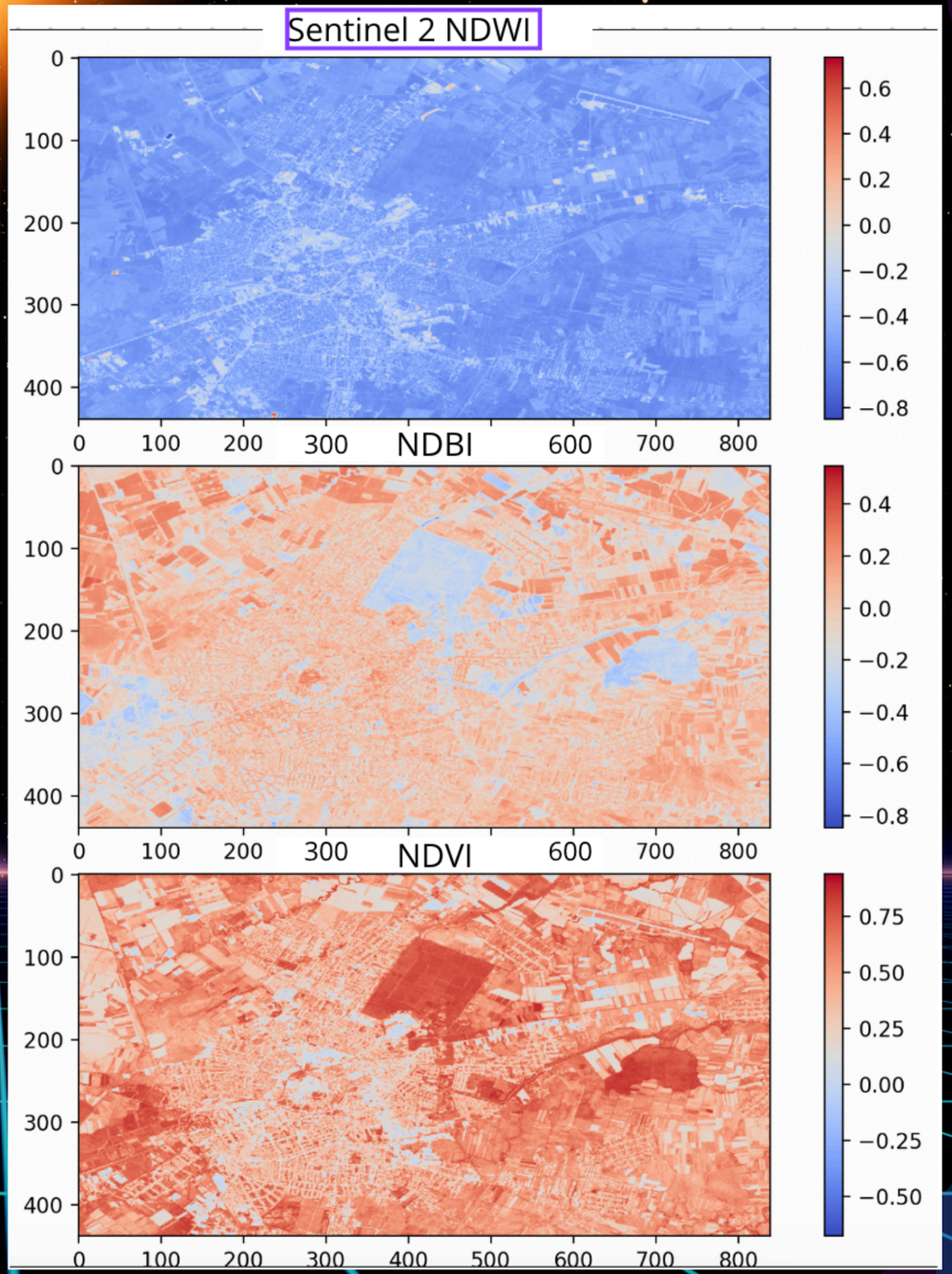
- **Problem:**
Satellite thermal infrared sensors provide low spatial resolution, limiting fine-scale urban analysis.
Higher-resolution multispectral data exist (~10m), but they lack thermal bands.
Accurate air temperature estimation at street level requires downscaling thermal data.

- **Goal:**
Downscale Landsat 8 LST data (30m) using Sentinel-2 multispectral data (10m) to generate high-resolution temperature maps.

Proposed Solution & Methodology

- **Techniques Used:**
- **Multiple Linear Regression:** Predict LST using NDVI, NDBI, and NDWI indices.
- **Residual Correction:** Improve predictions by adding regression residuals.
- **Google Earth Engine (GEE):** Cloud-based platform for efficient data processing.


Landsat 8 NDWI
NDBI
NDVI


Sentinel 2 NDWI
NDBI
NDVI

Proposed Solution & Methodology

- **Workflow:**

1. **Compute Spectral Indices:** NDVI, NDBI, NDWI from Landsat 8 (30m) and Sentinel-2 (10m).

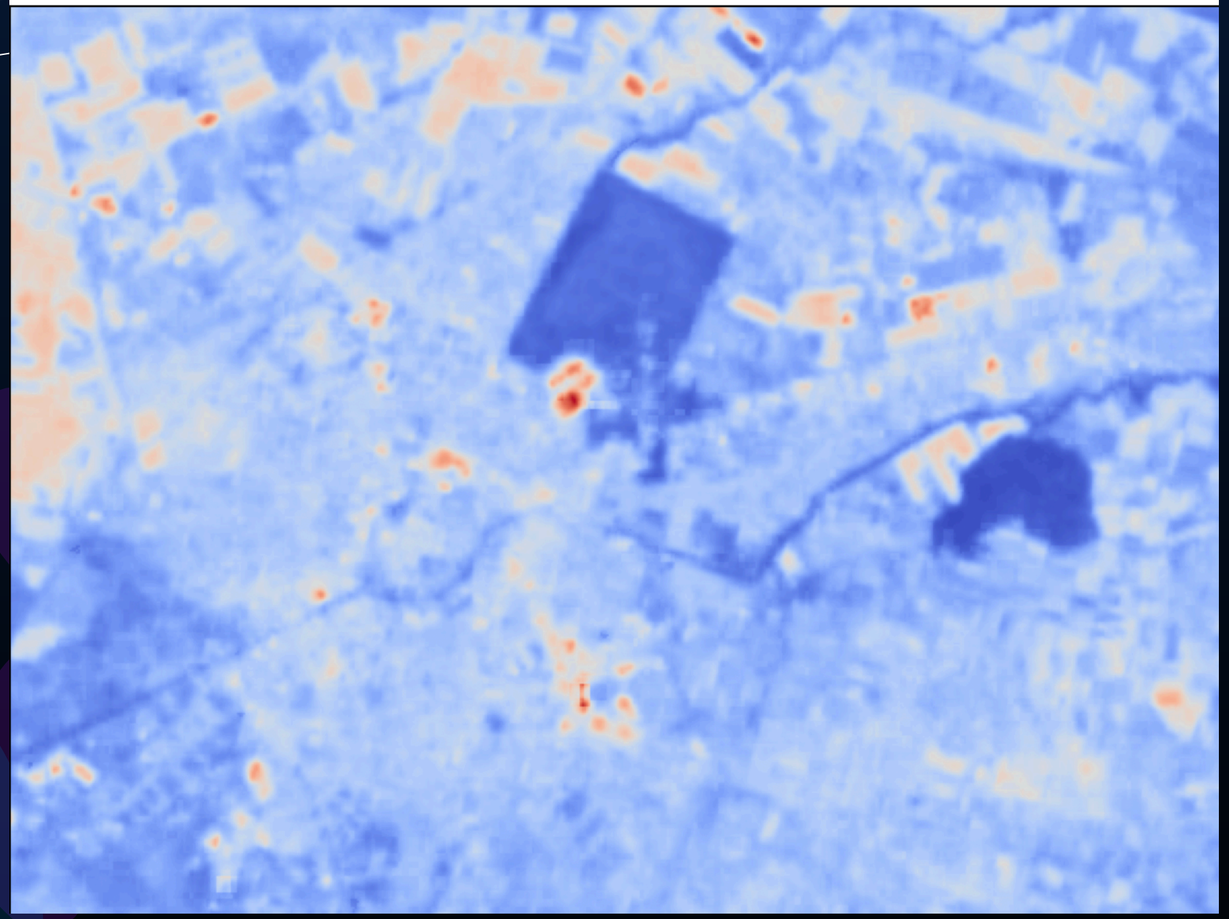
2. **Train Regression Model:** Use Landsat 8 indices and LST to build a prediction model.

3. **Apply Model to Sentinel-2 Data:** Predict LST at 10m resolution.

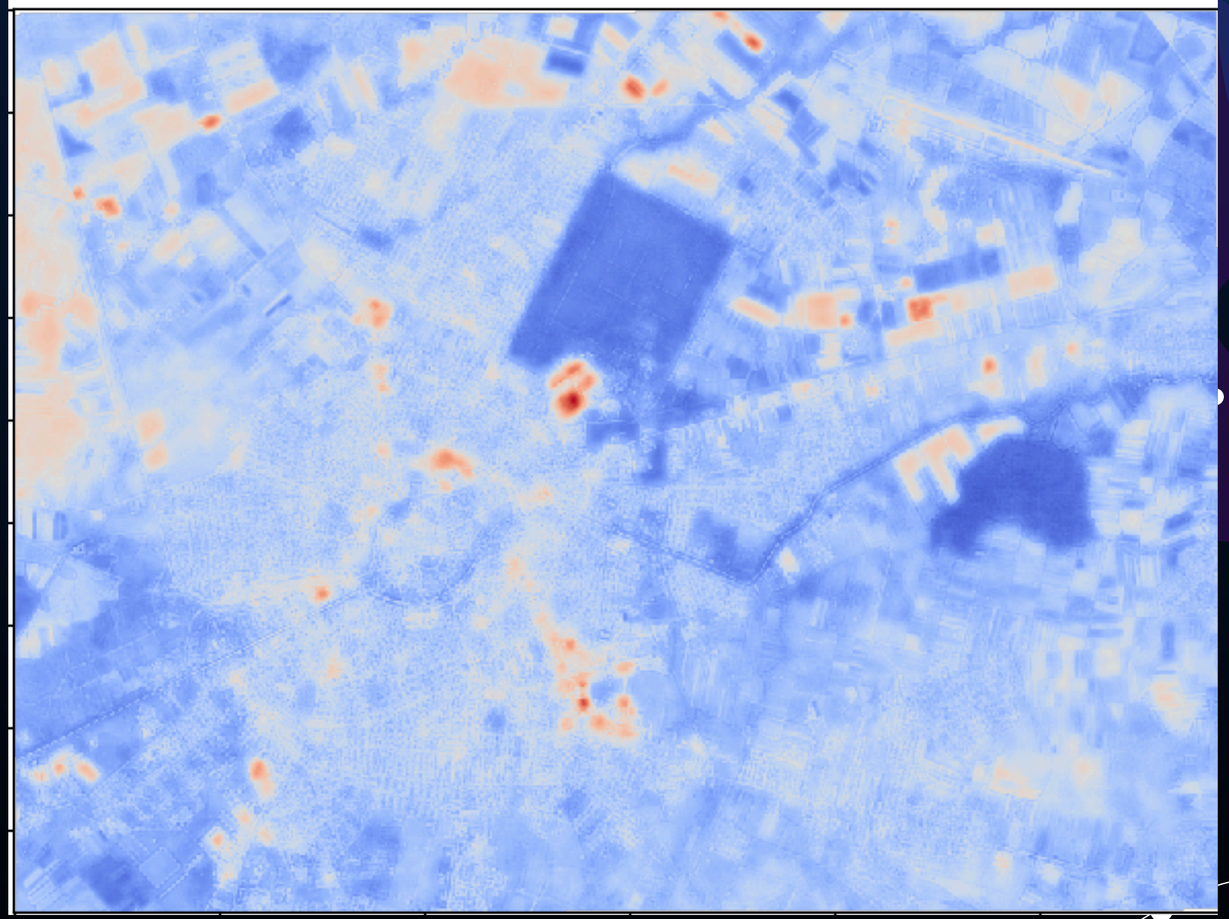
4. **Residual Correction:** Add residuals to improve accuracy.

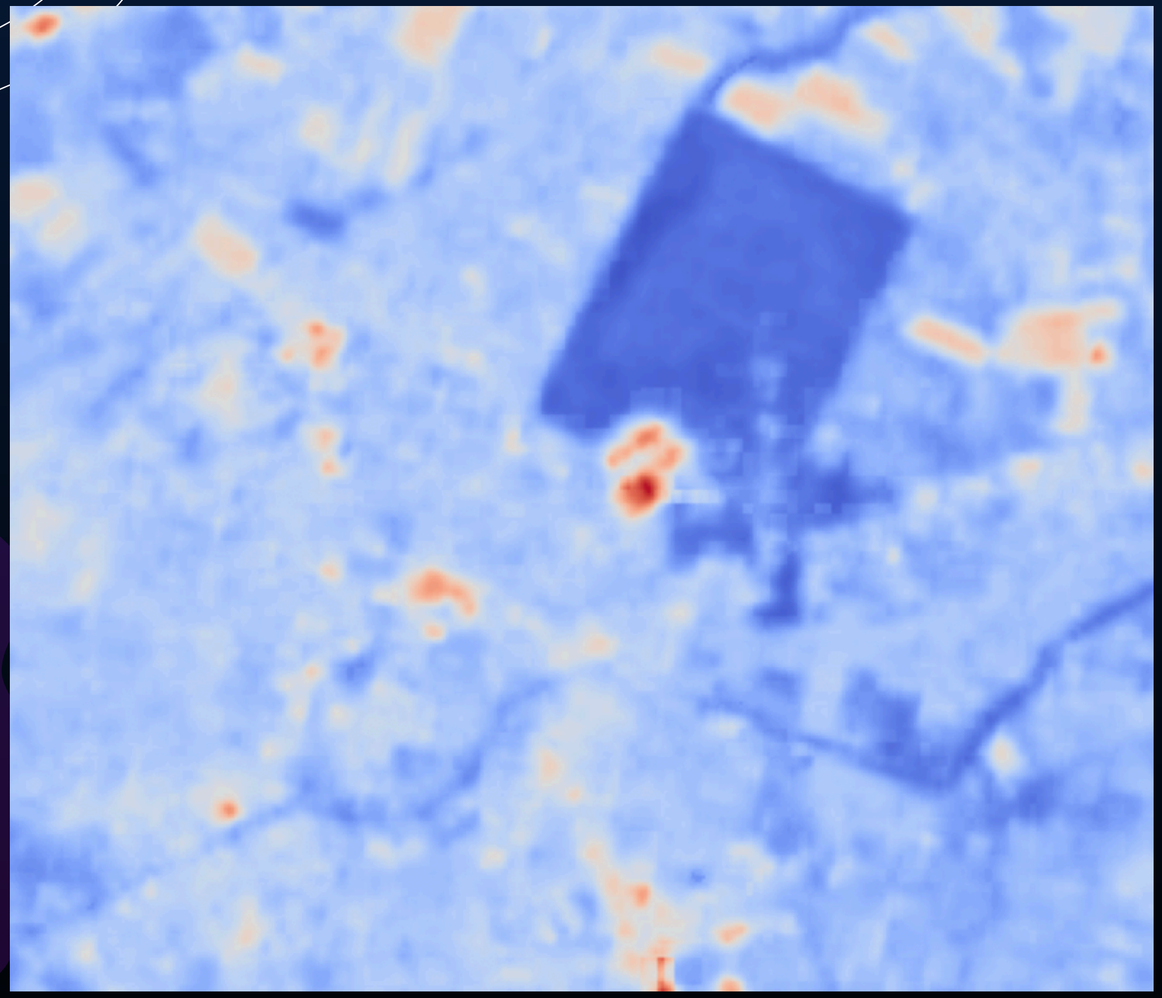
5. **Validation:** Compare results with in situ measurements and visual analysis.

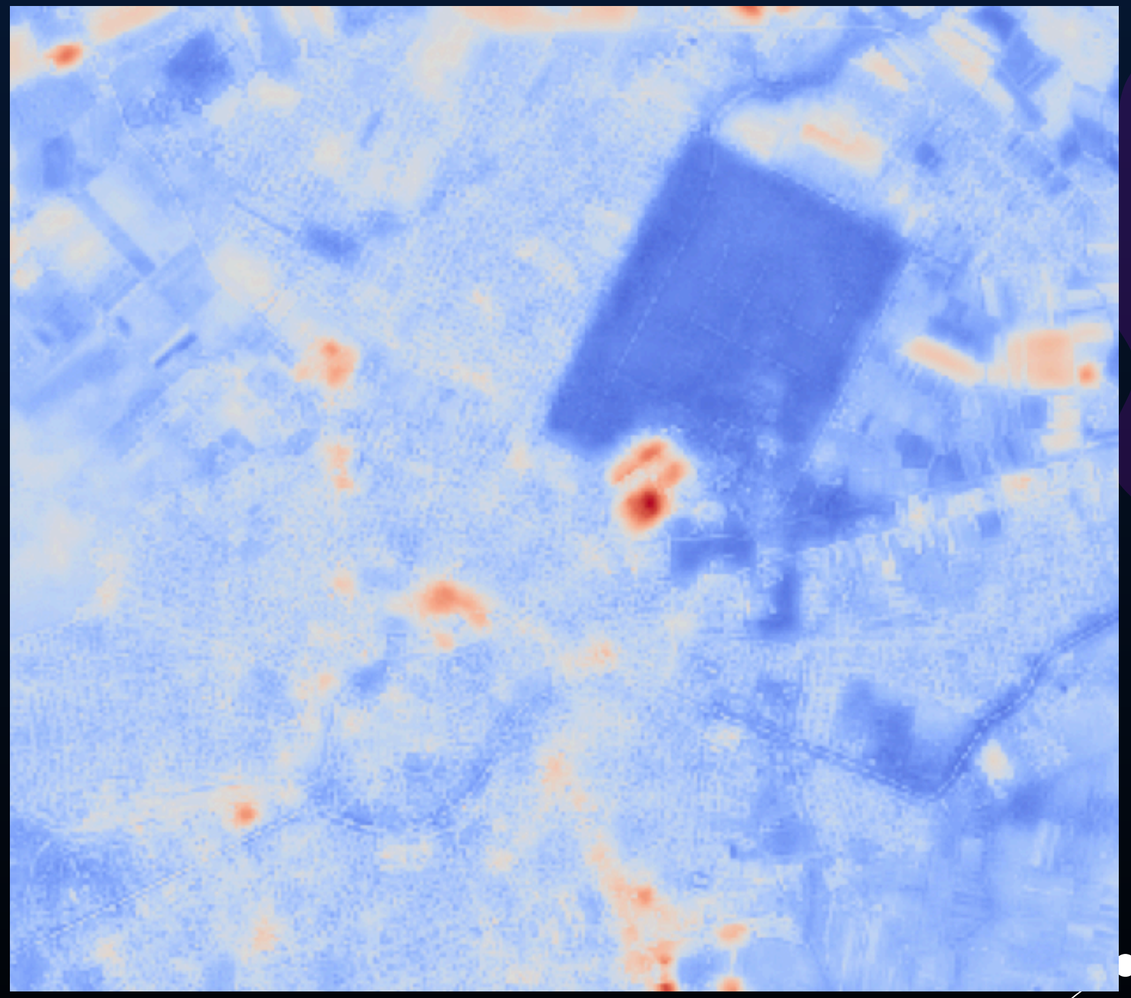
Landsat 8 LST



Sentinel 2 LST







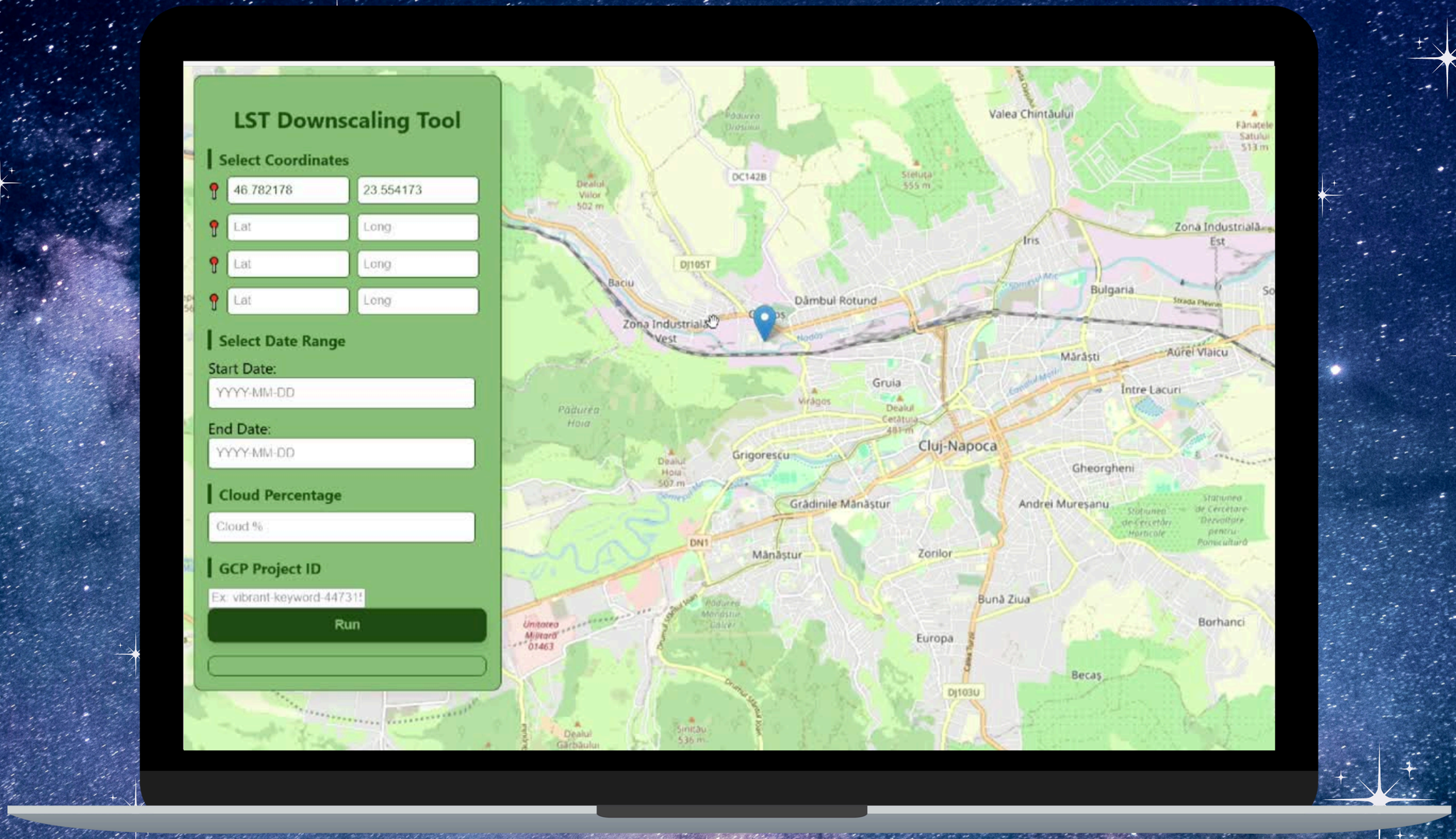
Inovative solution

This project addresses the growing demand for higher-resolution Land Surface Temperature (LST) data, which is crucial for urban planning, environmental monitoring, and climate change studies.

While Sentinel-2 does not provide LST at a 10m resolution, our approach leverages its higher spatial resolution to downscale the coarser LST data from Landsat 8.

By combining satellite data, advanced regression techniques, and residual correction, we achieve a breakthrough in generating LST maps at an unprecedented 10m resolution, making this solution both innovative and impactful in geospatial analysis.

DEMO


LST Downscaling Tool
Select Coordinates
46.782178
23.554173
Lat
Long
Lat
Long
Lat
Long
Select Date Range
Start Date:
YYYY-MM-DD
End Date:
YYYY-MM-DD
Cloud Percentage
Cloud %
GCP Project ID
Ex: vibrant-keyword-447311
Run
Valea Chintăului
Fânațele Satului 513 m
DC142B
Dealul Viilor 502 m
Stejuța 555 m
Zona Industrială Est
Iris
DJ105T
Baciu
Dâmbul Rotund
Bulgaria
Zona Industrială Vest
Mărăști
Aurel Vlaicu
Gruia
Între Lacuri
Pădurea Hoia
Dealul Cetățuia 481 m
Cluj-Napoca
Grigorescu
Dealul Hoia 507 m
Gheorgheni
Grădinile Mănăștur
Andrei Mureșanu
DN1
Mănăștur
Zorilor
Bună Ziua
Borhanci
Europa
Becaș
DJ103U
Dealul Gărbăului
Sinitău 536 m

MARKET OPPORTUNITIES

Market Potential for High-Resolution LST

- Growing demand for high-resolution LST data in urban planning and climate monitoring.
- Remote sensing market projected to exceed $20 billion by 2030 (CAGR 8%).
- Current gap: no 10m resolution LST data available.

ADDRESSED NEEDS

Addressing Key Challenges

- High-resolution LST maps for urban heat and climate studies.
- Accurate and accessible data for decision-making.

CUSTOMER PROFILE

Who Benefits from Our Solution?

Governments (B2G)

Urban planners, environmental agencies.

Businesses (B2B)

Environmental consulting firms, GIS platform developers.

Individuals (B2C)

Researchers, academics, and students.

VALUE PROPOSITION

What Makes Us Stand Out

- **First-of-its-kind 10m resolution LST maps.**
- **Rapid results with exportable, user-friendly formats.**

- **Seamless integration with GIS and other data systems.**
- **Affordable and adaptable for diverse applications: urban planning, education, climate studies.**

BUSSINES MODEL

Sustainable and Scalable Monetization

Revenue Streams:

- Subscription-based access (B2G, B2B).
- One-time custom data purchases.

Scalability:

- Expandable to other analyses and regions.

Focus: Offering accessible, cost-effective, and premium LST data.

OUR AI TEAM

CHIPER
ROBERTO-MARIAN

COJAN
ALEXIA ILARIA

DIACONESCU
ANDREI-MIHAI

OUR PPI TEAM

CHERAN ANDREI

COJAN
ALEXIA ILARIA

CIGHI VASILE

BIBLIOGRPHY

The following resources were essential in the development of our application:

1. **Google Earth Engine API (ee)**
The Google Earth Engine API provided a powerful platform for accessing and processing large-scale satellite data. Its cloud-based infrastructure allowed us to efficiently handle multispectral and thermal imagery from Landsat 8 and Sentinel-2 missions.
Link: Google Earth Engine Documentation
2. **Python Programming Language**
Python was used as the primary programming language for implementing our workflow.
3. **Copernicus Open Access Hub**
Sentinel-2 data were obtained from the Copernicus Open Access Hub, which provides free access to high-resolution multispectral imagery for environmental monitoring.
Link: Copernicus Open Access Hub
4. **Landsat 8 Data (USGS EarthExplorer)**
The Landsat 8 data used for retrieving land surface temperature were sourced from the USGS EarthExplorer platform.
Link: USGS EarthExplorer
5. **Research Article**
The methodology and approach for downscaling land surface temperature were inspired by research on integrating Landsat and Sentinel data for high-resolution LST mapping:
Link: Research Article DOI


THANK
YOU