Information Visualization Redesign Project

Disclaimer: "Course project for INFOSCI 301 – Data Visualization and Information Aesthetics, instructed by Prof. Luyao Zhang at Duke Kunshan University, Spring 2025."

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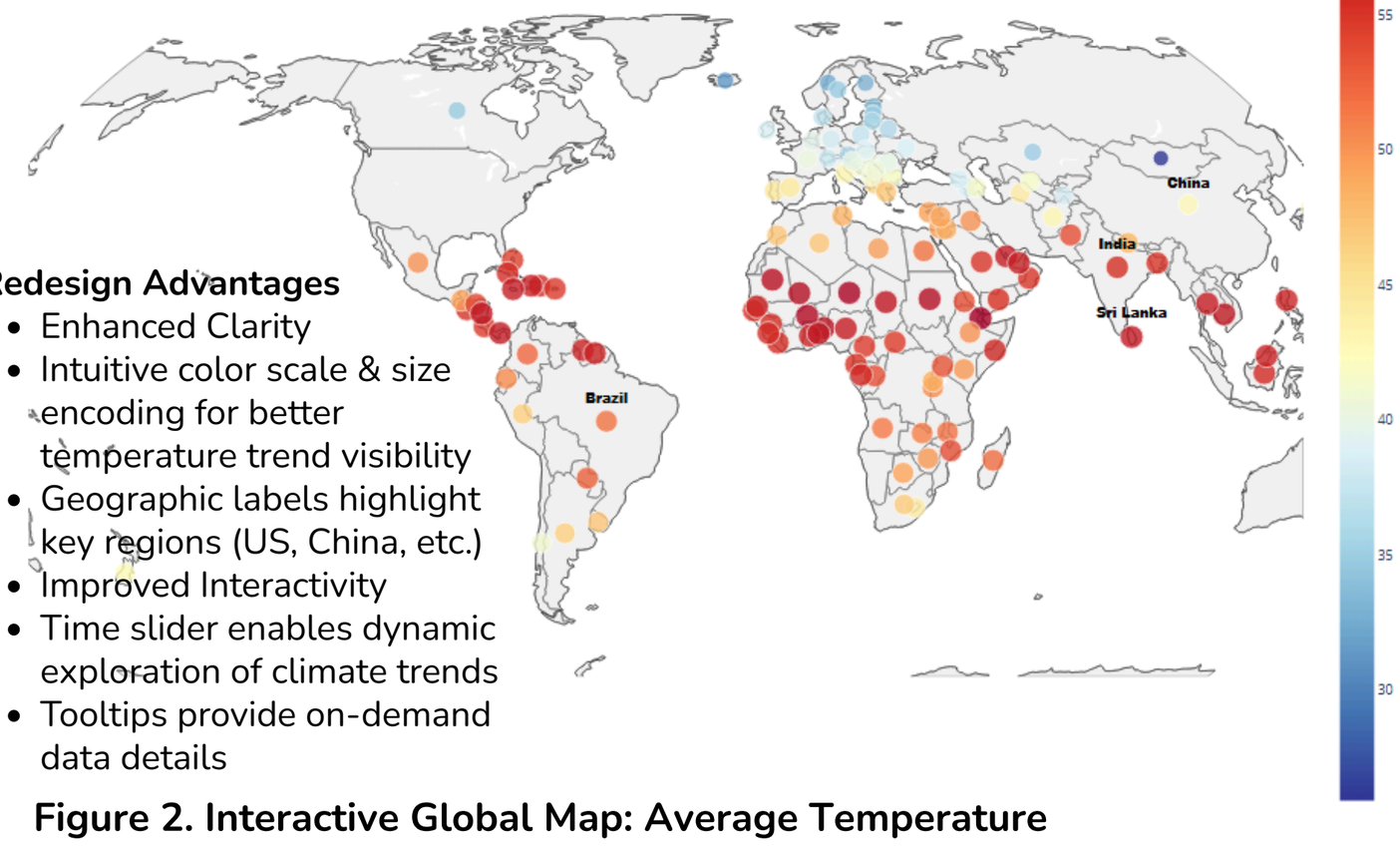
3. Final Redesign



Redesign Advantages

- Enhanced Clarity
- Intuitive color scale & size encoding for better temperature trend visibility
- Geographic labels highlight key regions (US, China, etc.)
- Improved Interactivity
- Time slider enables dynamic exploration of climate trends
- Tooltips provide on-demand data details

Figure 2. Interactive Global Map: Average Temperature Increase by Country (Source: Created by Colab)

Figure 3. Global Surface Temperature Trends Over Time (Source: Created by Colab)

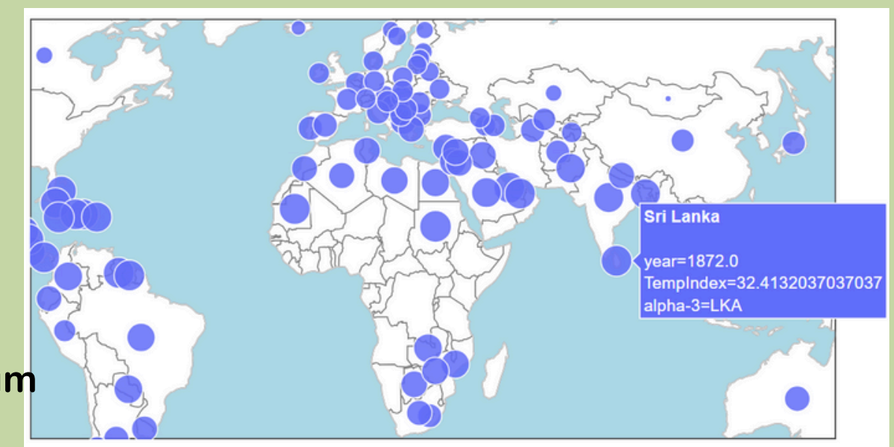
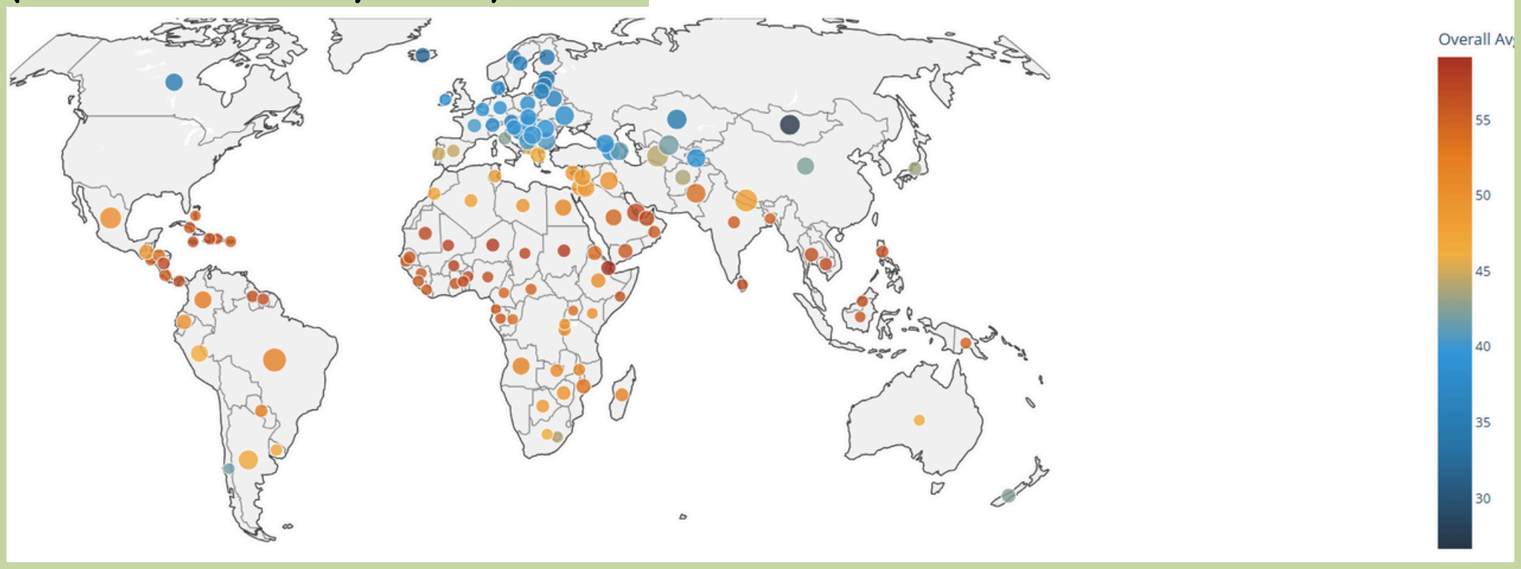
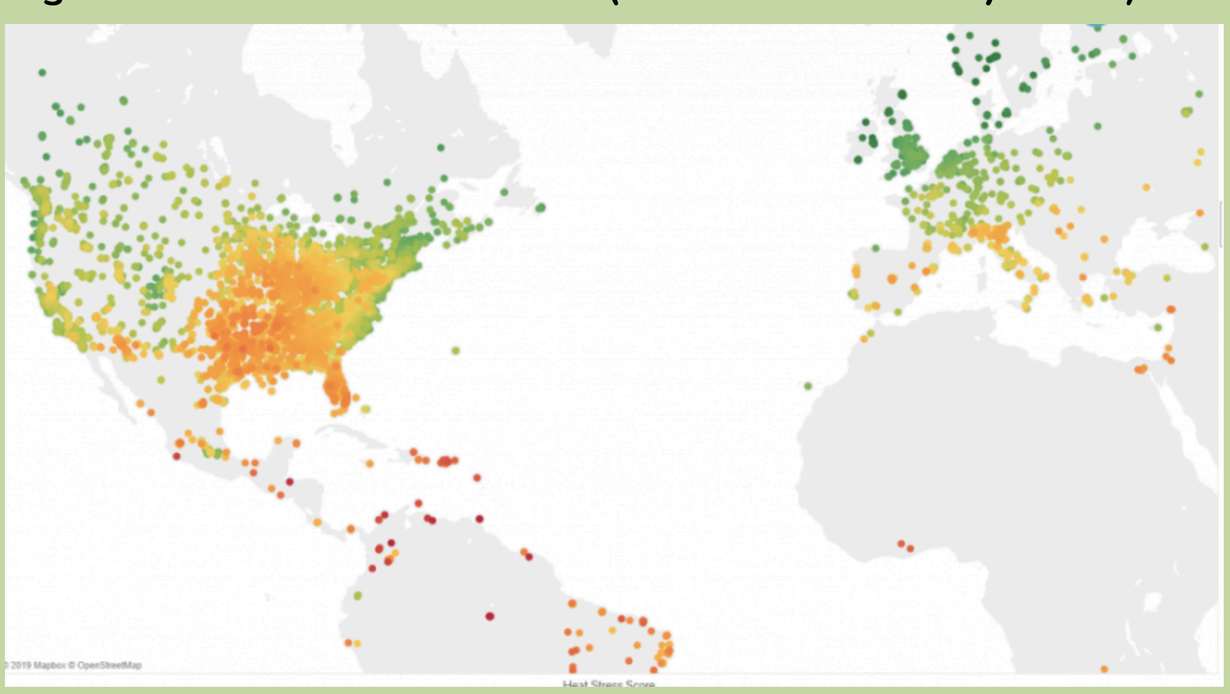


Figure 4. Global Temperature Variability Map: Mean vs. Maximum (Source: Created by Colab)



1. Critical Engagement with Original Visualization

Figure 1. Global heat stress risk (Source: Four Twenty Seven)



Goal

- To improve the clarity and effectiveness of a map visualizing global heat stress risk among corporate facilities.

Method

- Redesigned the visualization using **Colab** and the **open-source Plotly library**, informed by **visualization theory**, **design research**, and **data governance principles** to enhance visual encoding, interactivity, and layout for better insight.

Key Weaknesses of the original visualization

- Unclear Encoding: Missing legend and non-intuitive color scheme hinder interpretation.
- Data Gaps: Lacks transparency in risk calculation and ethical considerations for vulnerable regions.
- Validation Issues: No user testing or verification of algorithmic accuracy.
- Overplotting: Dense areas obscure data, needing better grouping.

Redesign

2. Theoretical Inspirations

Tamara Munzner's Visualization Theory

- Encode Principle: Visual variables like color and size should represent data meaningfully.
- Task Abstraction: Visualizations should support user goals such as "discover" and "present".
- Idiom Validation: Visualizations must be evaluated for correctness and usability.
- Dynamic Data Representation: Static maps fail to show temporal trends. The redesign integrates time-based interaction to reflect evolving climate risk more accurately.

Data Principles

- FAIR: Source transparency + reusable design (cited dataset)
- OECD: Clear annotations ensure traceability
- DMBOK: Standardized values avoid misleading visuals

Acknowledgments

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Contribution to Sustainable Development Goals (SDGs)

SDG 3: Good Health and Well-Being: enhances public awareness of environmental health risks like heat stress.

SDG 11: Sustainable Cities and Communities: By making climate data more accessible and actionable, we empower communities to build resilience and promote sustainable urban development.

Future Research Direction on Digital Humanities

Inspired by our visit to the Zhouzhuang Mystery of Life Museum, future directions include: 3D modeling of biological specimens to enhance public engagement; Storytelling of scientific teamwork behind exhibits to humanize data; Community-driven biodiversity visualization using digital tools.