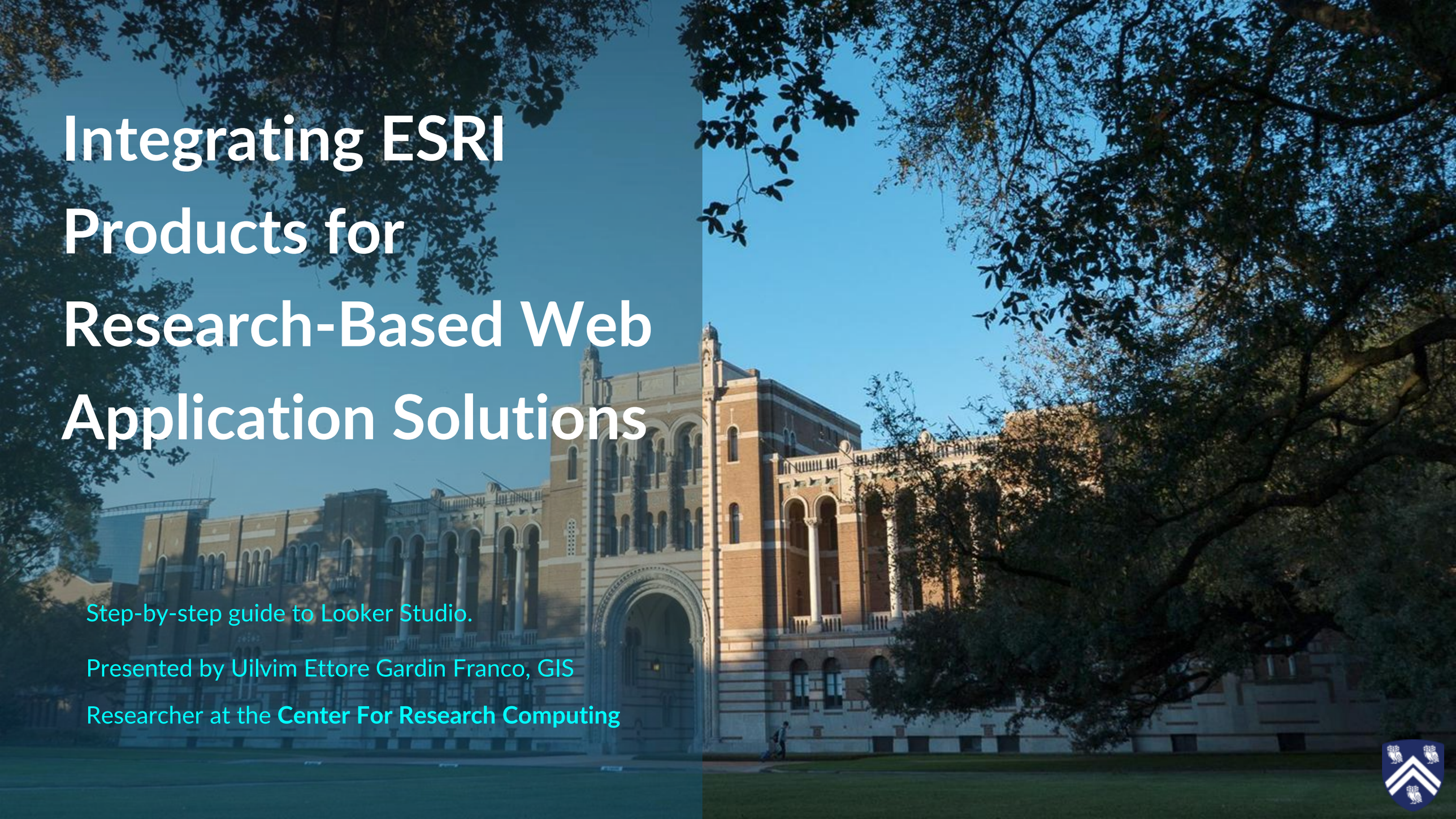
# Integrating ESRI Products for Research-Based Web Application Solutions

Step-by-step guide to Looker Studio.

Presented by Uilvim Ettore Gardin Franco, GIS Researcher at the **Center For Research Computing**



# AGENDA

- Introduction
- Center for Research Computing
- How can Web Application Solutions in a Multi-topic University Environment be easily implemented?
- Why ESRI?
- Simplified Development Using ESRI - Guide
- Case Study – Global Glacier Casualty List
- Best Practices & Recommendations

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GIS Specialist

**Geospatial Analytics & Data Visualization Specialist**

- Rice University staff since 2018
- Worked on 20 Different Projects
- Spatial Studies Lab Member
- Data Research Services Member

# Center for Research Computing

**High-Performance Computing**
Parallelization, code optimization, GPUs for machine learning, HPC application support

**Research Data Storage**
Managing, securing, and hosting research data, moving large datasets, sharing data with colleagues

**Data Analysis, Mapping, and Visualization**
Data cleaning and preparation, geospatial data collection, GIS mapping, spatial analysis, data visualization

**Research Proposal Support for Computing Resources**
Cyberinfrastructure and staffing costs, data management plans, ACCESS proposals

**Cloud for Research**
Virtual machines on demand, hybrid cloud solutions

**Research Systems Management**
Procuring, deploying, and managing research computing resources for your lab

**Facilitation and Training**
Training for Rice's shared research computing resources, consultation for computing solutions and workflows, workshops to develop core computing skills and concepts

## The Center for Research Computing can help!

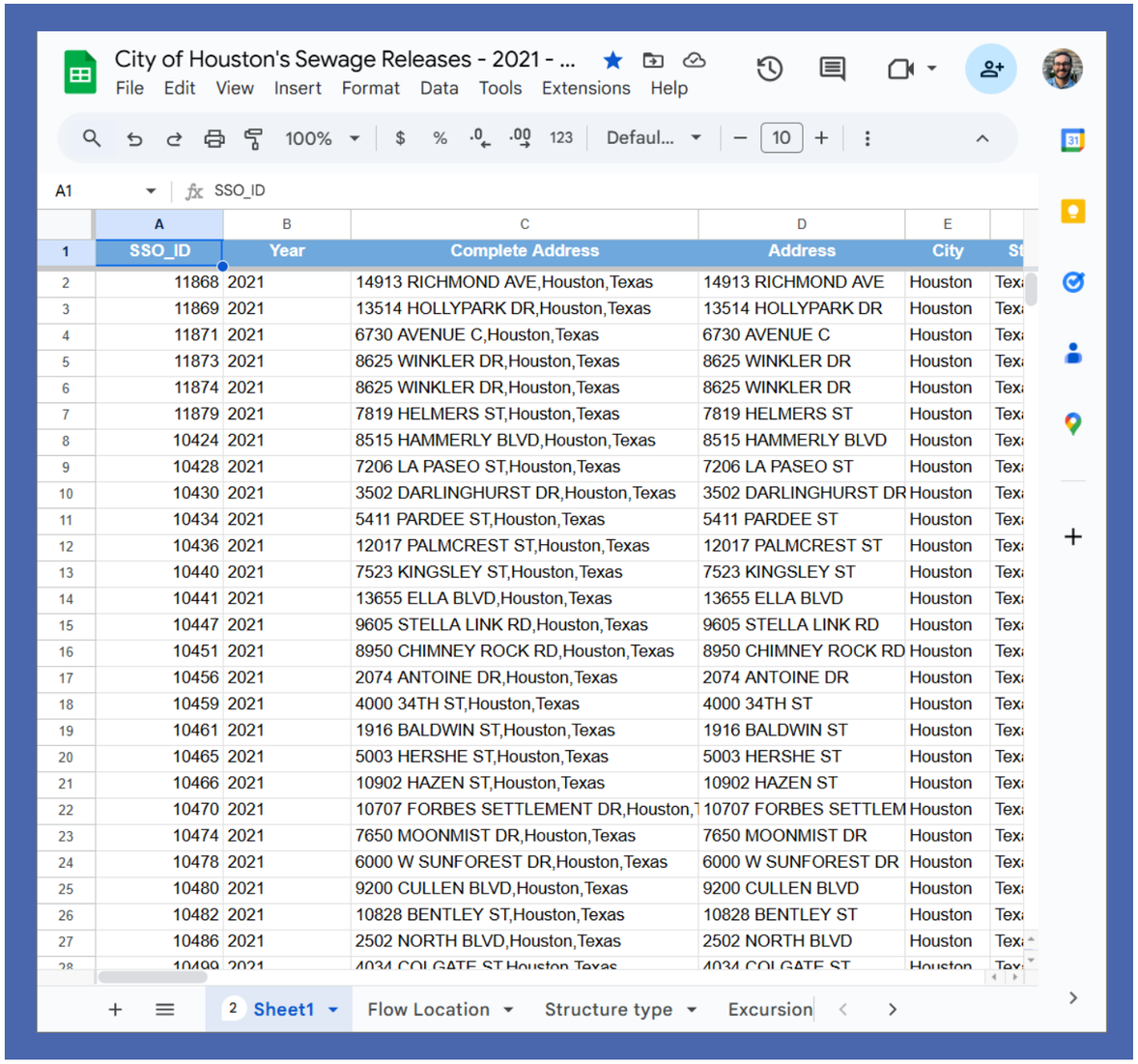
We also can visit your research group to give an overview of our services and systems, tailored to your research interests.

**https://kb.rice.edu/crc-can-help**

# How can Web Application Solutions in a Multi-topic University Environment be easily implemented?

- Funding
- Hosting & Management
- Long-Term Maintenance
- Coding Knowledge
- Data Complexity & Visualization Tools

# From Data to a Web Application Solution

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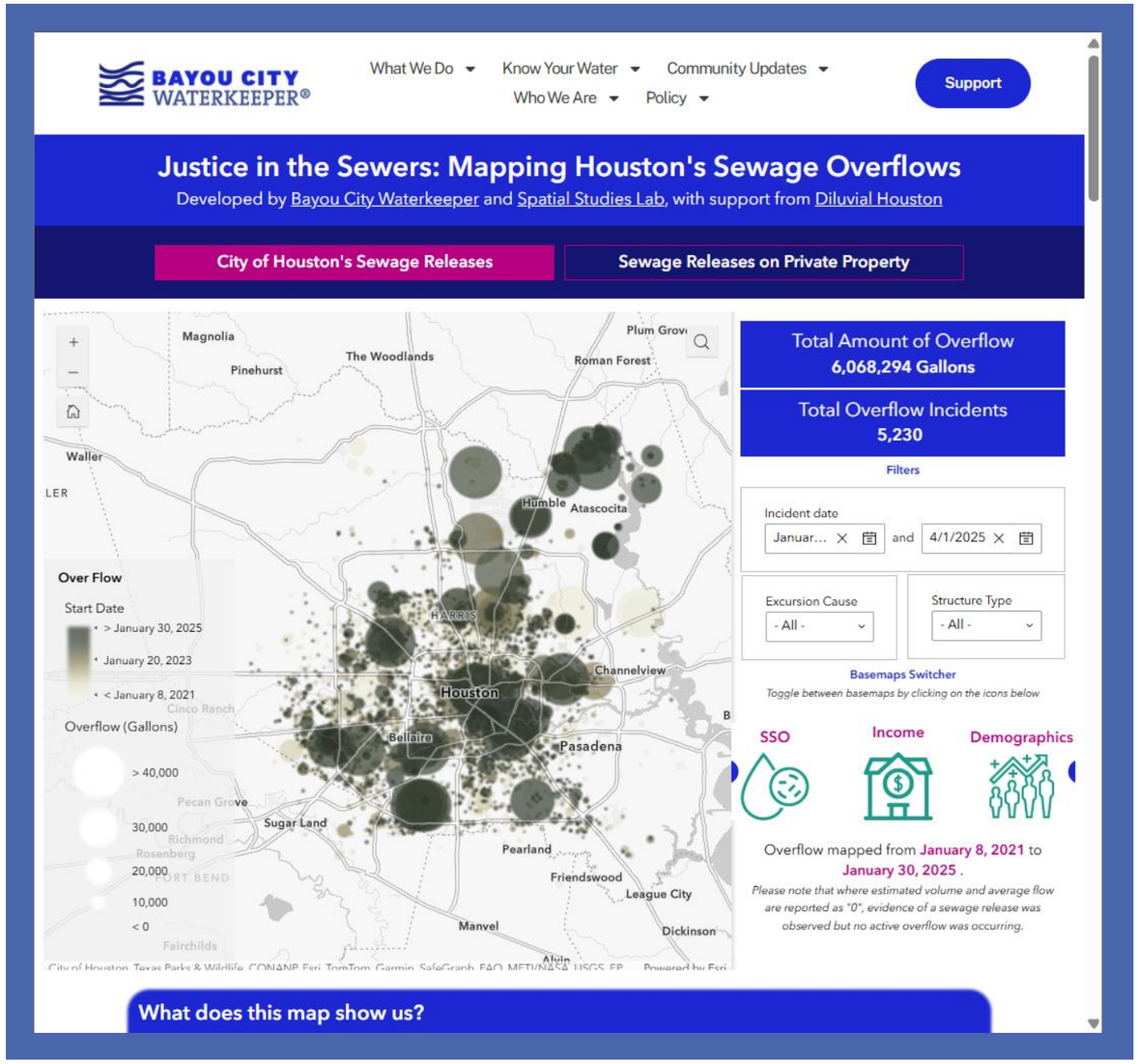


# WHY ESRI?

## ▸Advantages

### ▸ ✅ No-Code & Low-Code Solutions

▸Tools like **Experience Builder**, **StoryMaps**, and **Dashboards** allow users to create interactive web applications without advanced coding skills.

### ▸ ✅ Seamless GIS Integration

▸Directly integrates with **ArcGIS Online**, **ArcGIS Enterprise**, and **ArcGIS Pro**, ensuring compatibility with spatial data and existing GIS workflows.

### ▸ ✅ Scalability & Institutional Support

▸Many universities already have ESRI licenses, reducing software costs.

▸ESRI provides **technical support** and extensive documentation.

### ▸ ✅ Security & Data Management

▸Offers **cloud-based hosting (ArcGIS Online)** and **on-premise solutions (ArcGIS Enterprise)** with role-based access control.

### ▸ ✅ Customizability & API Access

▸For advanced users, ESRI provides **ArcGIS API for JavaScript**, **Python (ArcPy)**, and integration with **external databases** and **third-party apps**.

## Disadvantages & Limitations

### ❌ Cost for Advanced Features

•Some **premium capabilities** (e.g., ArcGIS Enterprise, geocoding, and high-volume feature services) require additional licensing costs.

### ❌ Hosting Restrictions

•ArcGIS Online has **storage and processing limits** while self-hosting with ArcGIS Enterprise requires **dedicated IT support**.

### ❌ Limited Open-Source Interoperability

•ESRI's ecosystem is proprietary, meaning integration with **QGIS, PostGIS, and other open-source tools** can be complex.

### ❌ Learning Curve for Customization

•While basic apps are easy to configure, deeper customization (e.g., **JavaScript API, Arcade expressions, ArcPy automation**) requires GIS and programming knowledge.

**Opportunity for on-premises Solutions**

# Scenarios

ESRI Native Solutions

Hybrid – ESRI + On-Premises Solution

On-premises Solutions + ESRI API Java Script

Which one is the best?

**No-Code / Low-Code Solutions (Easy to use, minimal coding required)**

▸**ArcGIS Online** – Cloud-based GIS platform for creating, sharing, and managing spatial data.

▸**ArcGIS Experience Builder** – Custom web app builder with drag-and-drop widgets, responsive design, and flexible layouts.

▸**ArcGIS StoryMaps** – Interactive storytelling tool for combining maps, images, videos, and text.

▸**ArcGIS Dashboards** – Real-time, interactive data visualization tool for monitoring and decision-making.

▸**ArcGIS Web AppBuilder** *(Deprecated in 2025, replaced by Experience Builder)* – Widget-based tool for building web applications.

**Advanced Web & App Development (Requires coding skills)**

▸**ArcGIS API for JavaScript** – Framework for building custom interactive web applications with GIS capabilities.

▸**ArcGIS Runtime SDKs** – Develop custom GIS applications for mobile and desktop (iOS, Android, .NET, Qt, Java).

▸**ArcGIS Hub** – Community engagement and data-sharing platform for collaboration.

**Desktop & Data Processing (Supports web app development & analysis)**

▸**ArcGIS Pro** – Desktop GIS software with advanced spatial analysis, 3D visualization, and data processing.

▸**ArcMap** *(Legacy, replaced by ArcGIS Pro)* – Traditional desktop GIS software for map creation and spatial analysis.

▸**ArcGIS Insights** – Data analytics and visualization tool for spatial and statistical analysis.

**Enterprise & Cloud Solutions (Scalable, self-hosted, or cloud-based)**

▸**ArcGIS Enterprise** – Self-hosted GIS platform for managing data, services, and applications.

▸**ArcGIS Server** – Core component of ArcGIS Enterprise for hosting GIS services.

▸**ArcGIS Online Hosted Feature Services** – Cloud-based hosting for GIS data with editing capabilities.

▸**ArcGIS Image Server** – Manages and processes large-scale raster datasets and imagery.

**Automation & Data Science (Advanced scripting & AI integration)**

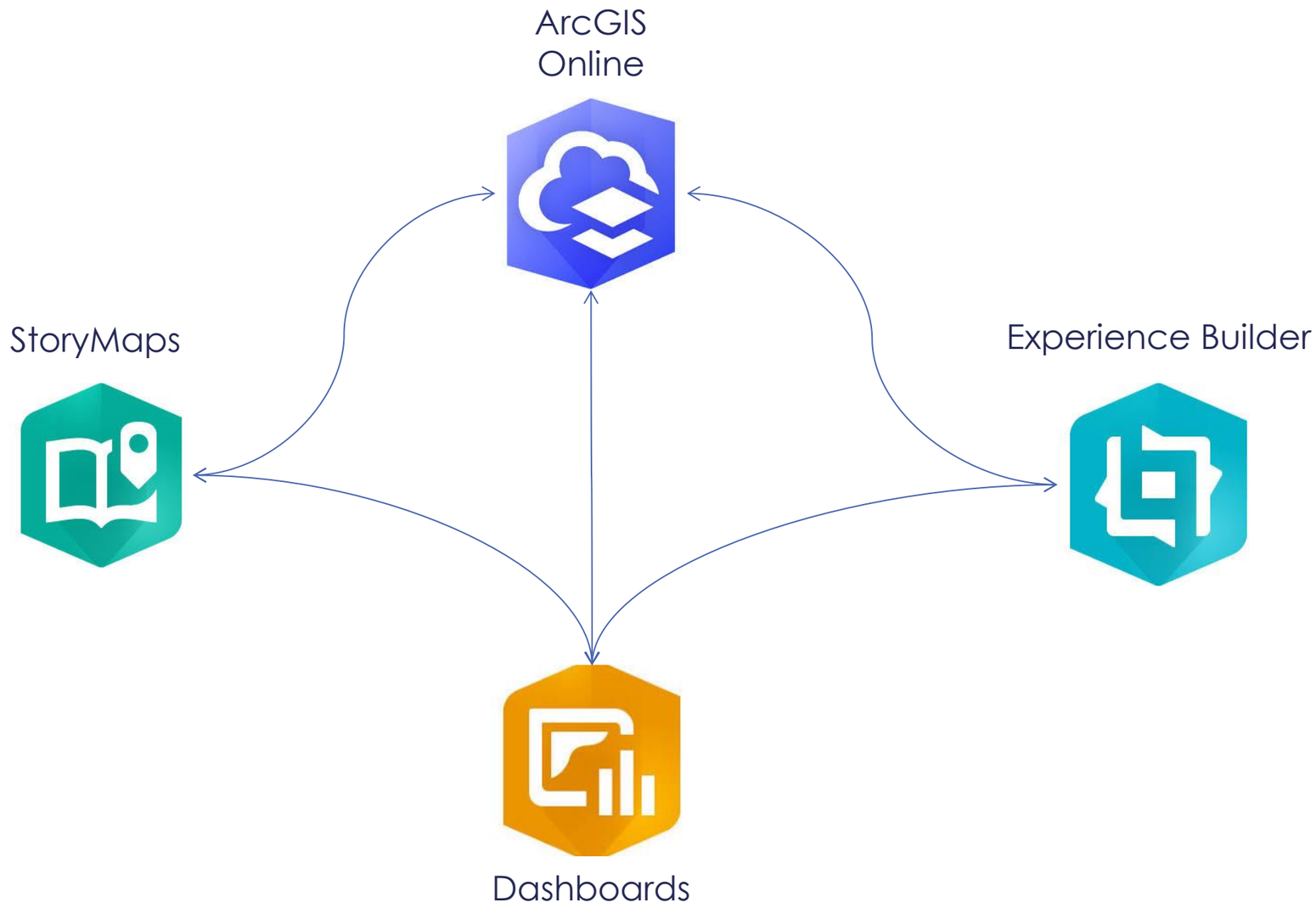
▸**ArcPy (Python Library)** – Automates GIS tasks, spatial analysis, and geoprocessing workflows.

▸**ArcGIS API for Python** – Manages, analyzes, and automates GIS workflows in ArcGIS Online and Enterprise.

▸**ESRI GeoAI** – AI-driven spatial analysis with deep learning models.

# SIMPLIFIED DEVELOPMENT USING ESRI - GUIDE

# ESRI Easy to go solutions



# Global Glacier Casualty List Requirements

**Research Question**

A dynamic platform to visualize data about recently disappeared and soon-to-disappear glaciers.

**Data**

Dataset containing the latitude and longitude of glaciers, structured for ongoing edits and improvements.

**Visualization Requirements**

Must include an interactive 3D globe map showing glacier locations. Each glacier should have an associated article included in the application.

**Hosting & Domain**

Budget sources are limited, and minimal code maintenance is needed.

# Global Glacier Casualty List Solution Structure

Data Analysis

ArcGIS Pro

Data Hosting

ArcGIS Online

ESRI StoryMaps

Application Development

Experience B. Developer

Orion VM

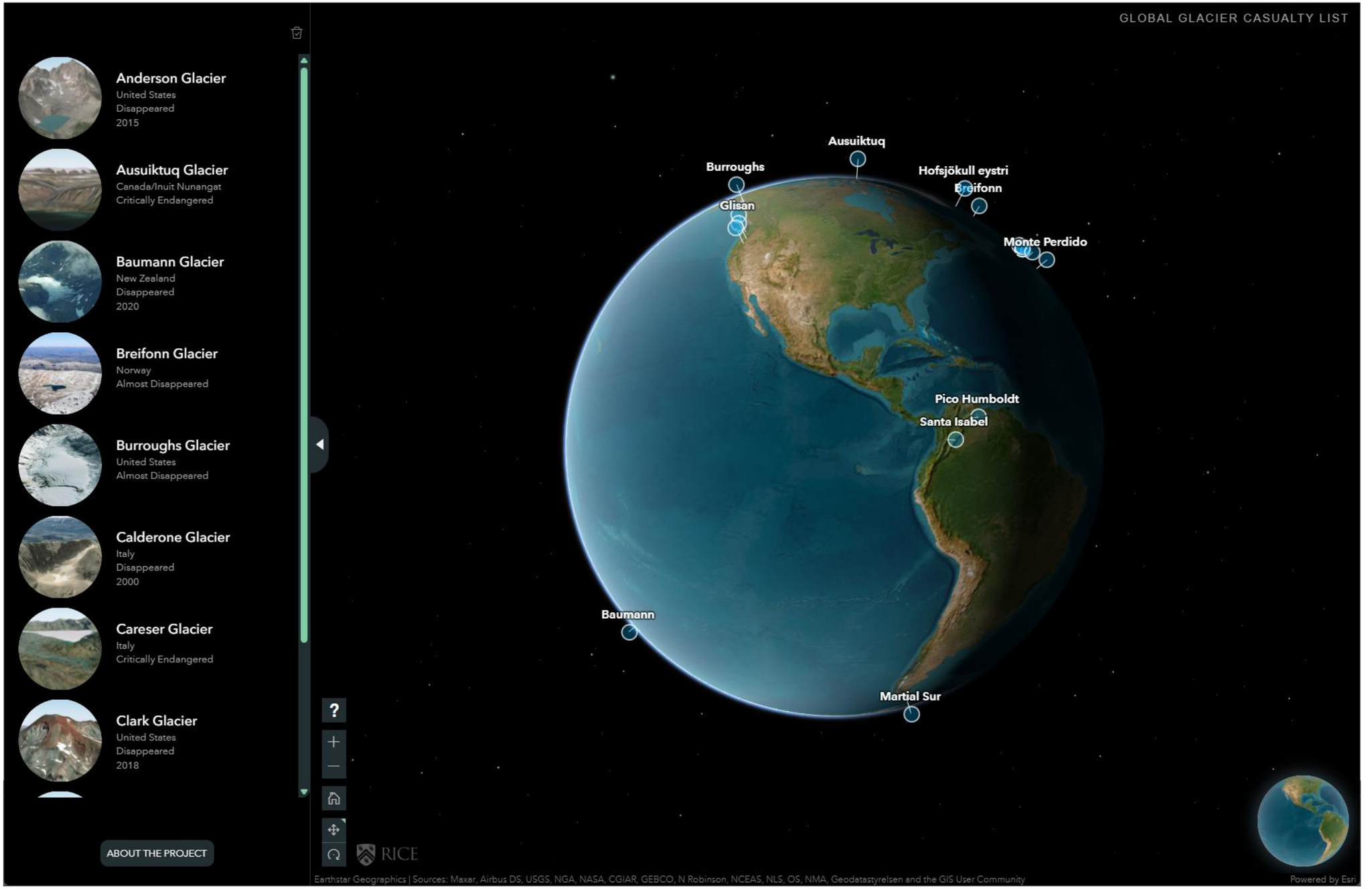
Java Script Libraries

ESRI SDK JS

App. Hosting

Bucket

Rice Domain




# GGCL Project

The Global Glacier Casualty List (GGCL) is a dynamic platform to visualize data about recently disappeared and soon-to-disappear glaciers. We want to tell these glaciers' stories and how their losses have or will impact human communities in terms of cultural meaning, natural beauty, water availability, economic opportunity and world heritage.

**See the website**

# Best Practices & Recommendations

**Choosing the Right ESRI Tool for Your Needs**

- StoryMaps & Dashboards → Best for **visual storytelling & real-time monitoring**.
- Experience Builder & Web AppBuilder → Ideal for **interactive applications with custom layouts**.
- ArcGIS Online & Enterprise → Use **cloud-based hosting for accessibility** or **on-premise for control & security**.

🔄 **Ensuring Long-Term Sustainability**

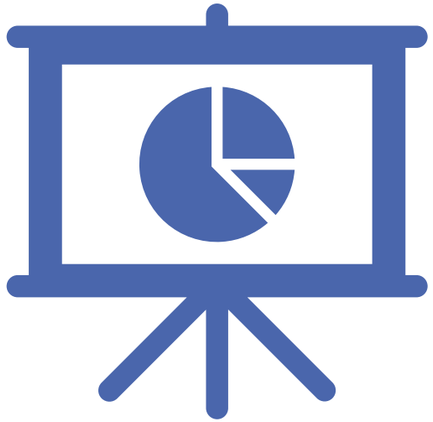
- Plan for **data updates & maintenance** (use hosted feature layers or automate updates with Python).
- Document workflows and **use version control** for major changes.
- Train collaborators and **define user roles** to manage data and permissions effectively.

💡 **Optimizing Performance & Scalability**

- Use **cached tiles** for faster map rendering in high-traffic applications.
- Limit unnecessary data layers to **improve loading speeds**.
- Configure proper **attribute indexing** in hosted feature services to speed up queries.

📌 **Final Tips**

✓ **Start with low-code tools** before diving into custom development.
✓ **Plan for long-term maintenance** to avoid project obsolescence.
✓ **Leverage ESRI training resources & university support** for skill-building.



# Thank You!

We appreciate your participation in today's workshop. **Integrating ESRI Products for Research-Based Web Application Solutions**

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