

# AI for Climate Change

## Laboratory 5

### Description of Technologies Used

- **Google Earth Engine (GEE):** The core processing and analysis are performed within the GEE environment. This platform provides access to the necessary satellite imagery (LANDSAT 8) and both the *Random Forest* and *SVM classifiers*. The primary advantage of using GEE is its ability to handle large geospatial datasets and perform complex computations efficiently.
- **GEE Application Interface:** The application was directly deployed using GEE's built-in app deployment features. This allows users to access and interact with the results through a web interface hosted by GEE.

The application uses the following GEE components:

- **Asset IDs:** Landsat NSI and RGB image assets are stored and accessed using unique IDs.
- **Visualization Parameters:** Specific visualization settings are defined for RGB imagery (color bands, min/max values, gamma) and ice melt (color palette, opacity).
- **Custom Module:** A custom GEE module (*melting\_heatmap*) is used to calculate and display ice loss using color red on a new map visualisation.
- **Map Object:** The GEE Map object is used to display the satellite imagery and analysis results. The map is initially centered on the bounds of the 2015 NSI image.
- **UI Elements:**
  - *ui.Select*: Dropdown menus for selecting the year and the view (NSI, RGB, Ice Loss)
  - *ui.Label*: Labels for the title, instructions, legends, and loading status.
  - *ui.Panel*: Organizes the UI elements, including the control panel and legends.
- **Legends:** Visual legends are provided for the NSI heatmap and the ice loss layers, explaining the color scales.

### Description of Integration Steps

The integration process involved the following steps:

#### 1. GEE Script Development:

- The existing GEE code was adapted to create an interactive application. This includes:
  - Defining asset IDs for NSI and RGB images for different years.
  - Setting up visualization parameters for RGB and ice loss data.
  - Loading a custom module for melting heat map calculation.
  - Initializing the map view and centering it on the initial image.
  - Creating dropdown menus for year and view selection.
  - Adding a loading indicator to improve user experience.
  - Implementing legends for NSI and ice loss visualizations.
  - Defining the *updateMap* function to handle changes in user selections and update the map display accordingly.
  - Calling *updateMap* to display the default state of the application.
  - Adding the control panel to the UI root.

#### 2. GEE App Deployment:

- The GEE script was deployed as a web application using the GEE platform. This process makes the application accessible via a URL.

**Link to App:** <https://ee-icemonitor.projects.earthengine.app/view/glacier-guardian>