

Map Classification API Manual and Documentation

Seena Abed

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<https://satelliteimageclassification-production.up.railway.app/docs>

Background

The map classification API provides two endpoints which return terrain and elevation data given latitude and longitude information of a map.

Currently the API converts given coordinates into tiles of approximately .017 square miles, this is about .0026 degrees longitude and .00024 degrees latitude in North America. This value has been arbitrarily chosen and may be allowed to be variably adjusted in future renditions.

A tile at the bare minimum has the following attributes:

Field	Description
TopRight	coordinates of the top right corner of the tile's bounding box
BottomLeft	coordinates of the bottom left corner of the tile's bounding box
Center	coordinates of the center of tile

For Example:

When given a center coordinate of (Longitude: -120.6633, Latitude: 35.3006).

The API will produce a tile with Top Right bounding box coordinates of (Longitude: -120.6618,

Latitude: 35.3018) and Bottom Left bounding box coordinates of (Longitude: -120.6644,

Latitude: 35.3994)



Tiles are then used differently depending which API endpoint is being utilized.

Endpoints

Grid Generation and Classification Endpoint:

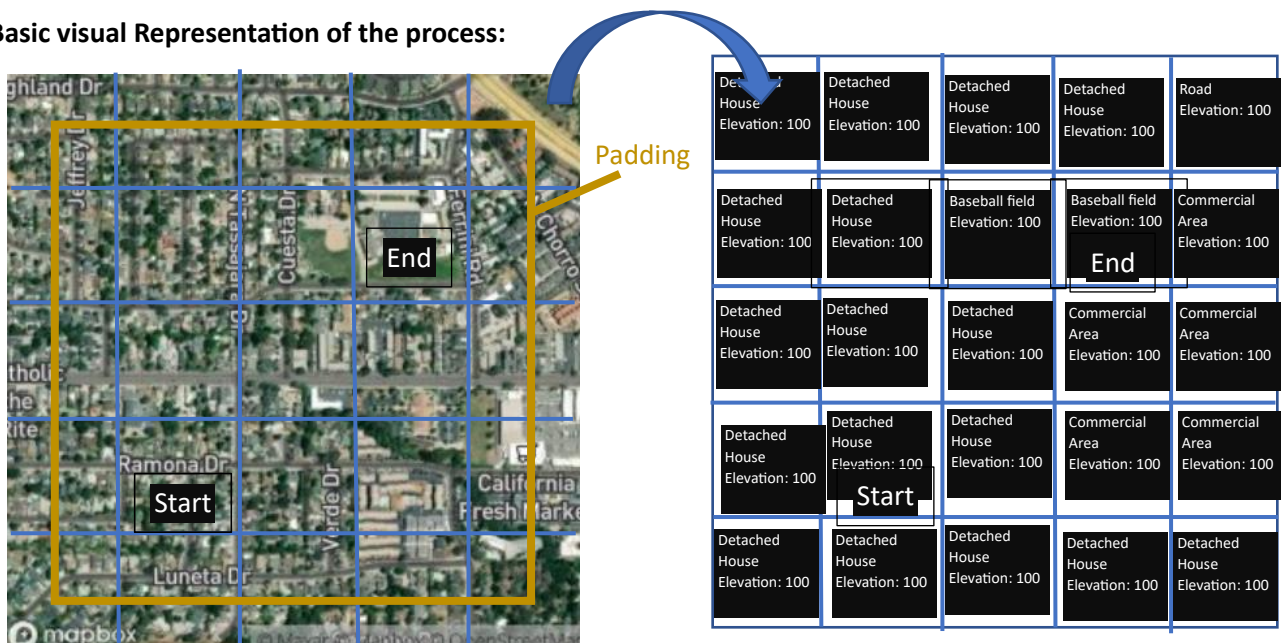
<https://satelliteimageclassification-production.up.railway.app/{startLong}/{startLat}/{endLong}/{endLat}>

This API endpoint will return a JSON structure representing a 2-dimensional grid of tiles of the area encompassing the two given coordinates. Each tile in the grid will include elevation data and will have been classified using a satellite image classification model. The grid includes padding as well as to avoid having start and end coordinates tucked into corners.

Procedure:

- Given start and end coordinates. The API generates a 2-dimensional list of tiles with the start and end tiles placed relative to one another as well as a layer of tiles which serve as padding around the edges.
- The API then procedurally fills in the bounding box and coordinate information of every empty tile in the grid. (Any element that isn't the start or end tile)
- For each tile in the grid, the API obtains a static satellite image using MapBox API and classifies the image using a classification model, at the same time, it also obtains the elevation data of the tile using google maps API
- The resulting grid with the classification and elevation data is returned as a server response.

Basic visual Representation of the process:



Field	Type	Description
TopRight	Object: {longitude: float, latitude: float }	coordinates of the top right corner of the tile's bounding box
BottomLeft	Object: { longitude: float, latitude: float }	coordinates of the bottom left corner of the tile's bounding box
Center	Object: { longitude: float, latitude: float }	coordinates of the center of tile
arrCoord	List: [int,int]	The tile's x and y coordinates in the 2-dimensional structure. Indexed starting at 0.
type	String	Indicator of the tile's type. "Start", "End" or NULL if the tile does not contain the start or end coordinate
terrain	String	Indicator of the tile's terrain. (Ex. "Detached Home", "Commercial Area", "Paddy field" etc...) A list of the 51 possible classifications can be found here
Elevation	Float	Float value representing elevation in feet of the tile's center coordinate.

Each tile returned in the 2-dimensional JSON structure will contain the following fields:

Usage Example:

An API request to /0/0/0.0026/0.0024

Given:

Starting Coordinate: {Longitude: 0 , latitude: 0}

Ending Coordinate: {Longitude: 0.0026, latitude: 0.0024}

Resulting JSON structure format:

```
[
  [
    {
      "TopRight": {
        "longitude": -0.0013,
        "latitude": -0.0012
      },
      "BottomLeft": {
        "longitude": -0.0039,
        "latitude": -0.0036
      },
      "center": {
        "longitude": -0.0026,
        "latitude": -0.0024
      },
      "arrCoord": [
        0,
        0
      ],
      "type": null,
      "terrain": "paddy field",
      "elevation": -3408.3642578125
    },
    ...
  ],
  ...
]
```

Tile at (0,0)

```
{
  "TopRight": {
    "longitude": 0.0013,
    "latitude": -0.0012
  },
  "BottomLeft": {
    "longitude": -0.0013,
    "latitude": -0.0036
  },
  "center": {
    "longitude": 0,
    "latitude": -0.0024
  },
  "arrCoord": [
    0,
    1
  ],
  "type": null,
  "terrain": "paddy field",
  "elevation": -3524.3310546875
},
...
]
```

Tile at (0,1)

Visual Representation of Resulting Grid:

<p>TopRight: {longitude": -0.0013, "latitude": 0.006}, BottomLeft: {"longitude": -0.0039, "latitude": 0.0036}, Center: {"longitude": -0.0026, "latitude": 0.0048 }, arrCoord: [3,0], type: null, terrain: "paddy field", elevation: -3299.668701171875</p>	<p>TopRight: {longitude": 0.0013, "latitude": 0.006}, BottomLeft: {"longitude": -0.0013, "latitude": 0.0036}, Center: {"longitude": 0, "latitude": 0.0048 }, arrCoord: [3,1], type: null, terrain: "paddy field", elevation: -3438.31884765625</p>	<p>TopRight: {longitude": 0.0039, "latitude": 0.006}, BottomLeft: {"longitude": 0.0013, "latitude": 0.0036}, Center: {"longitude": .0026, "latitude": 0.0048 }, arrCoord: [3,2], type: null, terrain: "paddy field", elevation: -3574.12890625</p>	<p>TopRight: {longitude": 0.0065, "latitude": 0.006}, BottomLeft: {"longitude": 0.0039, "latitude": 0.0036}, Center: {"longitude": .0052, "latitude": 0.0048 }, arrCoord: [3,3], type: null, terrain: "paddy field", elevation: -3703.91162109375</p>
<p>TopRight: {longitude": -0.0013, "latitude": 0.0036}, BottomLeft: {"longitude": -0.0039, "latitude": 0.0012}, Center: {"longitude": -0.0026, "latitude": 0.0024 }, arrCoord: [2,0], type: null, terrain: "paddy field", elevation: - 3336.49072265625</p>	<p>TopRight: {longitude": 0.0013, "latitude": 0.0036}, BottomLeft: {"longitude": -0.0013, "latitude": 0.0012}, Center: {"longitude": 0, "latitude": 0.0024 }, arrCoord: [2,1], type: null, terrain: "paddy field", elevation: -3464.0380859375</p>	<p>TopRight: {longitude": 0.0039, "latitude": 0.0036}, BottomLeft: {"longitude": 0.0013, "latitude": 0.0012}, Center: {"longitude": 0.0026, "latitude": 0.0024 }, arrCoord: [2,2], type: "End", terrain: "paddy field", elevation: -3588.745361328125</p>	<p>TopRight: {longitude": 0.0065, "latitude": 0.0036}, BottomLeft: {"longitude": 0.0039, "latitude": 0.0012}, Center: {"longitude": 0.0052, "latitude": 0.0024 }, arrCoord: [2,3], type: NULL, terrain: "paddy field", elevation: -3707.98046875</p>
<p>TopRight: {longitude": -0.0013, "latitude": 0.0012}, BottomLeft: {"longitude": -0.0039, "latitude": -0.0012}, Center: {"longitude": -0.0026, "latitude": 0 }, arrCoord: [1,0], type: null, terrain: "paddy field", elevation: - 3372.724365234375</p>	<p>TopRight: {longitude": 0.0013, "latitude": 0.0012}, BottomLeft: {"longitude": -0.0013, "latitude": -0.0012}, Center: {"longitude": 0, "latitude": 0 }, arrCoord: [1,1], type: "Start", terrain: "paddy field", elevation: - 3492</p>	<p>TopRight: {longitude": 0.0039, "latitude": 0.0012}, BottomLeft: {"longitude": 0.0013, "latitude": -0.0012}, Center: {"longitude": .0026, "latitude": 0 }, arrCoord: [1,2], type: null, terrain: "paddy field", elevation: -3608.435546875</p>	<p>TopRight: {longitude": 0.0065, "latitude": 0.0012}, BottomLeft: {"longitude": 0.0039, "latitude": -0.0012}, Center: {"longitude": .52, "latitude": 0 }, arrCoord: [1,3], type: "Start", terrain: "paddy field", elevation: - -3718.618408203125</p>
<p>TopRight: {longitude": -0.0013, "latitude": -0.0012}, BottomLeft: {"longitude": -0.0039, "latitude": -0.0036}, Center: {"longitude": -0.0026, "latitude": -0.0024 }, arrCoord: [0,0], type: null, terrain: "paddy field", elevation: -3408.3642578125},</p>	<p>TopRight: {longitude": 0.0013, "latitude": -0.0012}, BottomLeft: {"longitude": -0.0013, "latitude": -0.0036}, Center: {"longitude": 0, "latitude": -0.0024 }, arrCoord: [0,1], type: null, terrain: "paddy field", elevation: -3524.3310546875</p>	<p>TopRight: {longitude": 0.0039, "latitude": -0.0012}, BottomLeft: {"longitude": 0.0013, "latitude": -0.0036}, Center: {"longitude": 0.0026, "latitude": -0.0024 }, arrCoord: [0,2], type: null, terrain: "paddy field", elevation: -3636.630859375</p>	<p>TopRight: {longitude": 0.0065, "latitude": -0.0012}, BottomLeft: {"longitude": 0.0039, "latitude": -0.0036}, Center: {"longitude": 0.0052, "latitude": -0.0024 }, arrCoord: [0,3], type: null, terrain: "paddy field", elevation: -3743.458251953125</p>

Single Coordinate Classification Endpoint

`https://satelliteimageclassification-production.up.railway.app/{longitude}/{latitude}`

Given a single coordinate consisting of longitude and latitude, the API will return the terrain classification and elevation data of that coordinate.

Procedure:

- The given coordinate is turned into a tile.
- The tile classified by obtaining its corresponding image from Mapbox API and running the image through a classification model.
- The elevation data is obtained at the same time from Google Maps API
- The classification and elevation data are then returned as server response.

Usage example:

API request to `/-120.677/35.2944`

Given:

Coordinate: {longitude: -120.677, latitude: 35.2944}

Resulting JSON structure:

```
{
  "coordinates": {
    "longitude": -120.677,
    "latitude": 35.2944
  },
  "terrain": "detached house",
  "elevation": 76.75740814208984
}
```