EKON 30

Max Kleiner 5 min read · Just now

EKON 30 Session: GEO Intelligence APIs and Components

This session showcases the field of geoinformation analysis (GEOINT) and its integration with AI, known as GeoAI.

I will demonstrate a practical workflow for analyzing environmental scenes using **five** specific APIs and components to extract meaningful data from images and maps.

Random Image Generator for Category Building

We set the focus on 5 APIs to extract information from maps or pictures. Geospatial Artificial Intelligence (GeoAI), as the integration of geospatial studies and AI, has become one of the fastest-developing research directions in spatial data science and geography.

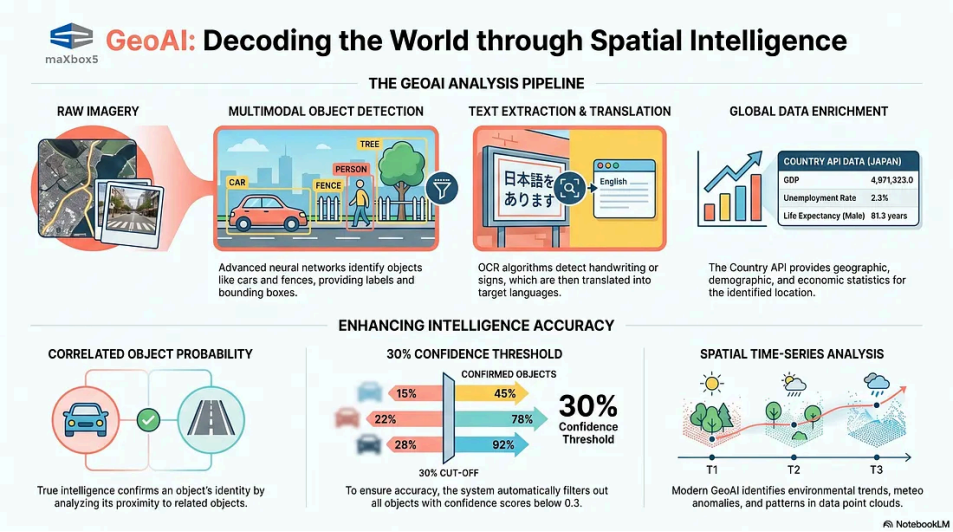
1. Object Detection API

2. Image to Text API

3. Language Translator Shell

4. Country, Capital API

5. Image Random Generator (to train/test data)



GEO Intelligence Infograph

These APIs, or components, enable object detection, similarity search, and the extraction of geographic statistics to determine location-based context. The session will demonstrate code examples in Python, maXbox and Delphi, the automated translation of text or prompts into images, and the identification of physical landmarks. Finally, I will show how spatial data science has evolved from simple pattern recognition to complex analysis pipelines used to identify global trends and anomalies.

See how the recommender, the predictor and alerter works!

```
function APIGetGeoCountry(AURL,url_name, aAPIKey: string): string;
 var encodedURL:String;  cnt: integer;
    ajt:TJson; JObj:TJSonObject2; JArr:TJSonArray2;
 begin
   encodedURL:= Format(AURL,[urlencode(url_name)]);
   with THttpRequestC.create(self) do
     try
       writ('geo_reqsend: '+encodedurl)
       headers.add('X-Api-Key:'+aAPIkey);
       if Get(encodedURL) then begin
          result:= (Response.ContentAsString)
          ajt:= TJson.create();
          ajt.parse(Response.ContentAsString);
          Jarr:= ajt.JsonArray;
          jobj:= jarr[0].asobject;
          for cnt:= 0 to Jobj.count-1 do
              writ(jobj.items[cnt].name);
          writ('surface_area: '+(jobj.values['surface_area'].asstring));
       end
          else Writeln('APIError '+inttostr(Response.StatusCode2));
     except
       writeln('HTTPS: '+ExceptiontoString(exceptiontype,exceptionparam));
     finally
```

```
          ajt.Free;
          free;
        end;
    end;
```

Topics covered

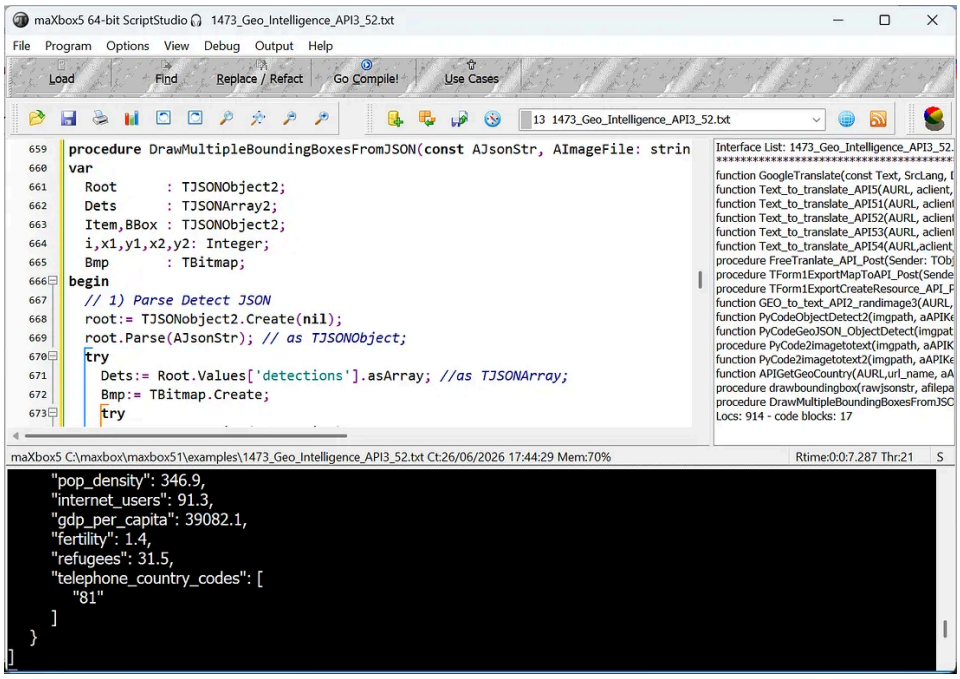
- Geospatial Intelligence (GEOINT)
- Object Detection APIs
- Image to Text (OCR) Algorithms
- Geospatial Artificial Intelligence (GeoAI)
- Integration of Delphi and Python for GIS
- Script Handling in maXbox
- Correlated Object Recognition

Video about the topic:

EKON30 GEO Intelligence Decoding GeoAI video

https://youtu.be/E97ORQtEkGg

Podcast about the topic:



Live Coding during Session

Slide Show EKON 30

https://de.slideshare.net/slideshow/advanced-geo-intelligence-integrating-maps-apis-and-ai-for-enhanced-geospatial-analysis/288228122

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GEO Intelligence: Geospatial AI and Information Extraction

Executive Summary

Geospatial Intelligence (GEOINT) and its subset, Geospatial Artificial Intelligence (GeoAI), represent a rapidly evolving intersection of spatial data science, geography, and machine learning. By synthesizing geospatial data with advanced neural networks, these fields provide critical insights into objects and events as they relate to space and time.

> *This briefing document examines a specific methodological framework centered on the integration of five key APIs designed to extract, translate, and analyze information from maps and imagery. The analysis highlights a shift from basic object recognition to "true intelligence" — the ability to confirm object probabilities through correlation. The field is moving beyond simple computer vision toward comprehensive environmental analysis, including trend identification and anomaly detection in environmental time series.*

Defining the Geospatial Landscape

The provided documentation defines the core disciplines driving spatial data science:

- **Geospatial Intelligence (GEOINT):** The analysis of geospatial data used to gain insights about objects and events in relation to both space and time.
- **Geospatial Artificial Intelligence (GeoAI):** The integration of geospatial studies and AI. It is currently recognized as one of the fastest-developing research directions in geography.

The 5-API Information Extraction Framework

The analysis focuses on a specific pipeline of four to five APIs used to process and synthesize data from maps or pictures.

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API Categories and Functions

API Category	Primary Function
Object Detection API	Provides fast image recognition using advanced neural networks. Returns labels, confidence scores, and bounding box coordinates.
Image to Text API	Utilizes Optical Character Recognition (OCR) algorithms to extract text from images, including varying sizes, fonts, and handwriting.
Language Translator	Translates extracted text (e.g., from an image sign) into different languages, such as Japanese.
Country, Capital API	Provides geographic, demographic, and economic statistics about countries and cities based on detected locations.
Image Random Generator	Generates images for training data, placeholders, and design needs, supporting custom categories and sizes.

GEO Int API Framework

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Provides fast image recognition using advanced neural networks. Returns labels, confidence scores, and bounding box coordinates.

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Object Detection and Probabilistic Intelligence

Methodology

The Object Detection API filters results based on a confidence threshold; objects with a confidence score of less than 0.3 (30%) are excluded. A typical output provides a JSON array containing:

- **Label:** The identified object type (e.g., “car”, “fence”).
- **Confidence Score:** The probability of accuracy (e.g., 0.78).
- **Bounding Box:** Coordinates (x1, y1, x2, y2) defining the object’s location in the frame.

The Concept of Correlated Objects

True intelligence in the GEOINT context is defined as the ability to confirm the probability of one object by identifying a second, correlated object.

- **Example:** In a scene containing a fence, the presence of cars in front of that fence increases the statistical probability that the first object is, in fact, a fence.
- **Scene Analysis:** In a “standard normalized scene,” systems identify houses, cars, fences, humans, clouds, trees, and unidentified objects like train barriers or white-and-red torches.

Technical Implementation and Integration

The processing pipeline is executed using **maXbox** (maXbox5 and maXbox6), an environment for managing code blocks. The implementation involves a multi-language approach:

- **Primary Languages:** Delphi, maXbox5, Python (specifically version 3.14.3), and Python4Delphi.
- **Key Libraries:** `requests` for API calls with api-keys and `geojson` for spatial data formatting.
- **Architecture:** The system utilizes `TPythonEngine` to execute Python strings within a Delphi environment and `THttpRequestC` for handling REST API requests.

API Request Configuration

Successful data extraction requires specific header configurations, particularly for authentication:

- **Header Format:** `headers.add('X-Api-Key:' + aAPIKey);`

- **Error Handling:** Failure to locate requested headers or syntax errors in file paths (such as unexpected characters after line continuation) are common debug points. For instance, file paths in `ExecStr` must be properly escaped to avoid `SyntaxError`.

Evolution of the Field

GEOINT has transitioned significantly over the last several years:

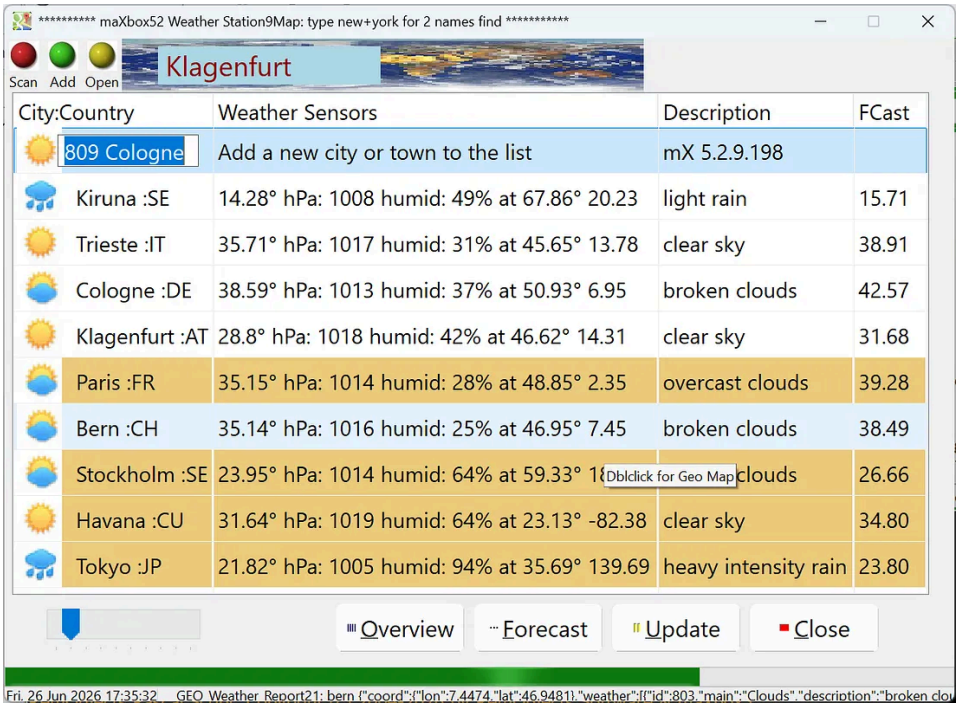
1. **Past Applications:** Specialized computer vision focused on pattern recognition in aerial or railway imagery and classifying data point clouds.
2. **Current and Future Applications:** The range has expanded to include:

- Evaluating environmental time series.
- Identifying geographic trends.
- Meteorological analysis (meteo).
- Climate analysis and population sentiments
- Anomaly detection.

Conclusion

The integration of AI into Geographic Information Systems (GIS) has moved from specialized niche applications to a broad suite of innovative technologies. By leveraging a pipeline of specialized APIs — from OCR to economic demographic data — GEOINT systems can now transform raw imagery into actionable spatial intelligence. The future of the field lies in its ability to process complex time-series data and identify global anomalies with increasing precision.

GEO Intelligence MindMap



GEO Int based on context information

Geospatial + Geoinformatics + GIS + Maxbox5 + Geography +

Written by Max Kleiner

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Edit profile

Max Kleiner's professional environment is in the areas of OOP, UML and coding - among other things as a trainer, developer and consultant.