Solar Panel Detection using Orthoimagery and Deep Learning

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Independent statistics for evidence-based decision making

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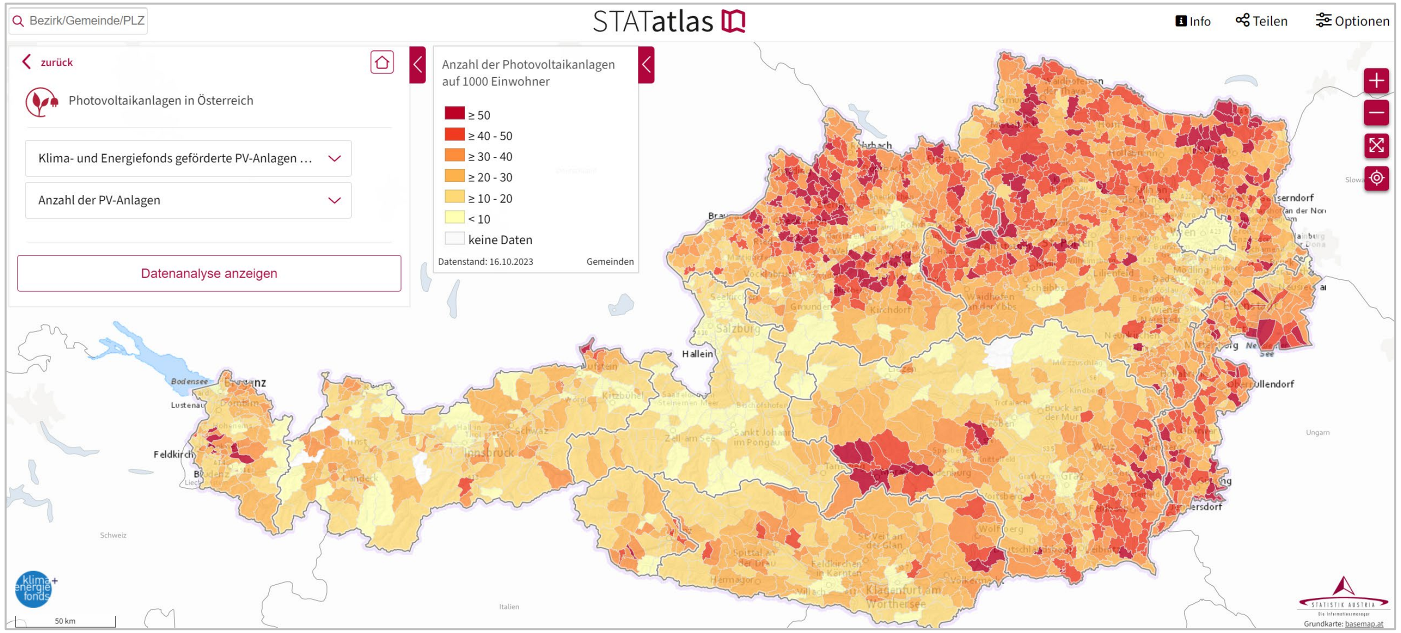
Topics

- Relevance
- Orthoimagery
- Deep Learning Model
- Methodology and Technology
- Next steps

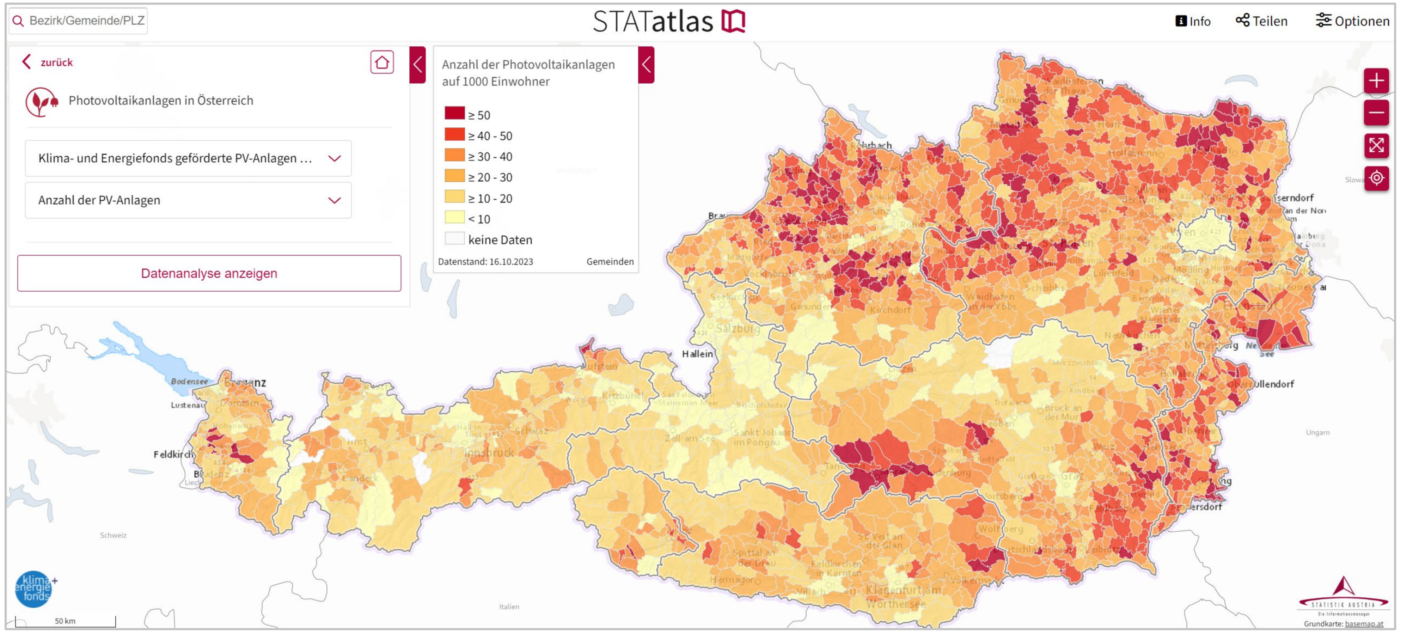
Relevance

- Growing requirements on energy statistics
  ⟶ georeferenced data and cartographic display of solar panels
- Current data source are two funding agencies:



Relevance

- Growing requirements on energy statistics
  → georeferenced data and cartographic display of PV plants
- Current data source are two funding agencies:



→ Only data from funded PV plants / solar panels

→ Only data on regional level (LAU)

Relevance

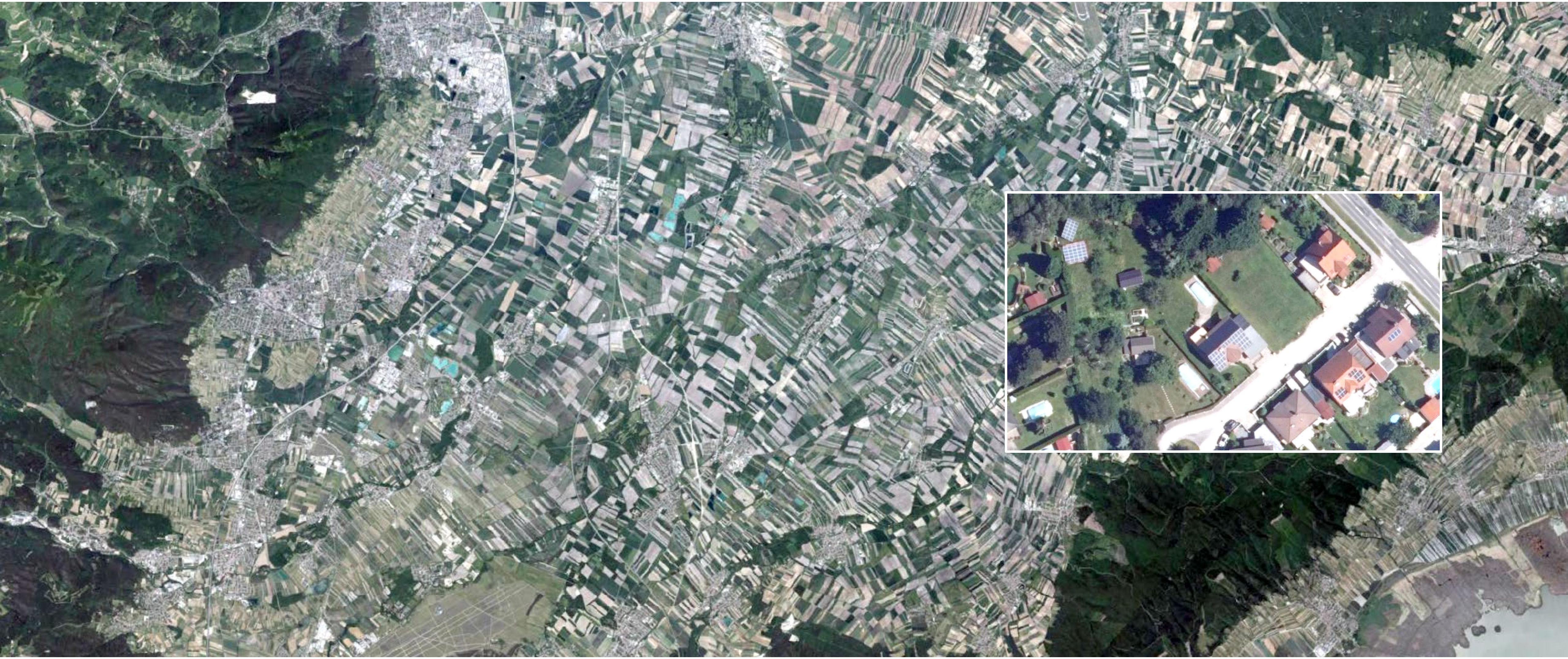
- Increasing popularity of solar panels and possibility to buy small plants in hardware stores

  → subsidy data may not include all relevant information
- Most complete data source expected to be the ‚Certificate of Origin Database (CoO-DB)‘:

  → Investigation and desired cooperation didn‘t lead to sufficient results
- Meanwhile Obect Detection models and new data sources are gaining popularity in many disciplines – including Statistics

  & no national dataset on geolocated solar panels is available
- Now evaluating the use of Orthoimagery and automated Object Detection models to detect solar panels on building rooftops

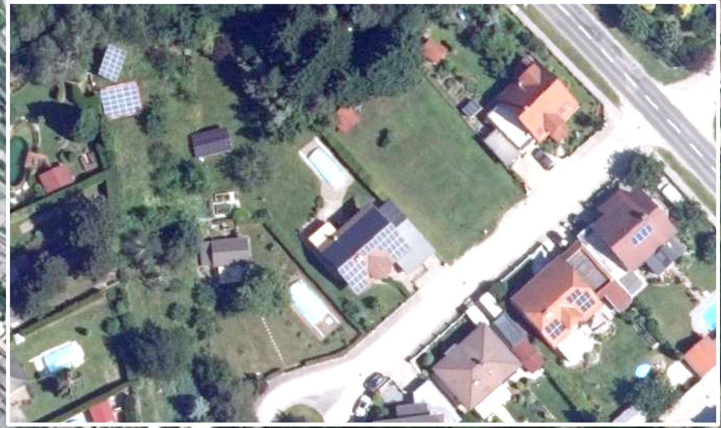
Orthoimagery



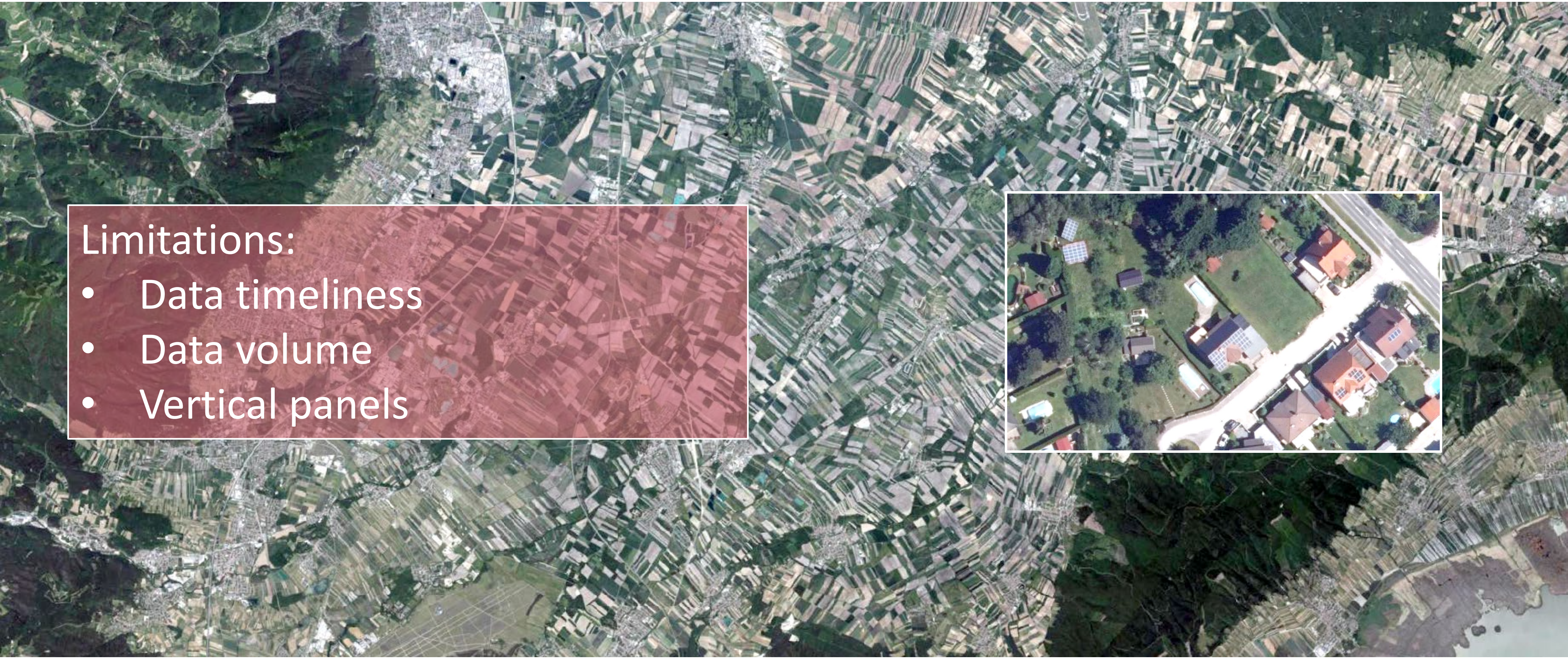
Orthoimagery

Benefits:

- New data sources -> new statistics
- Data objectivity
- Data consistency
- Spatial explicitness
- Quantifiable data
- Transparent analysis
- Availability



Orthoimagery

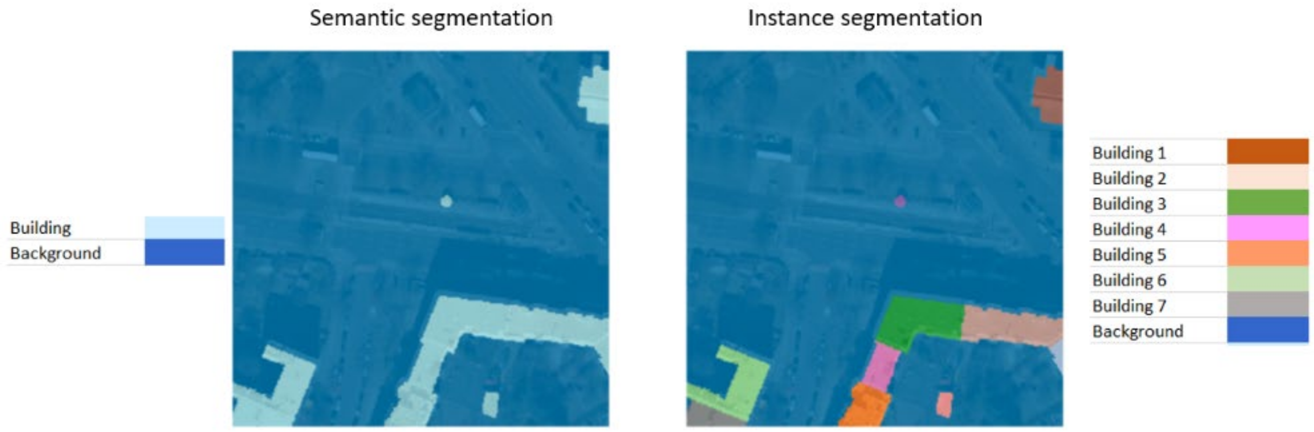


Limitations:

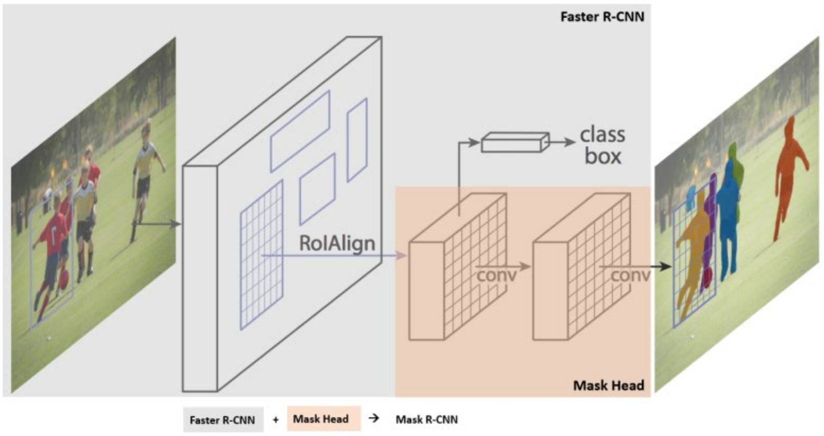
- Data timeliness
- Data volume
- Vertical panels

Deep Learning Model

- First attemps using ESRI's Object Detection algorithms
- Pre-trained model availabe (trained in the U.S.) usable with high-res. Aerial imagery
- Model uses the **MaskRCNN** model architecture



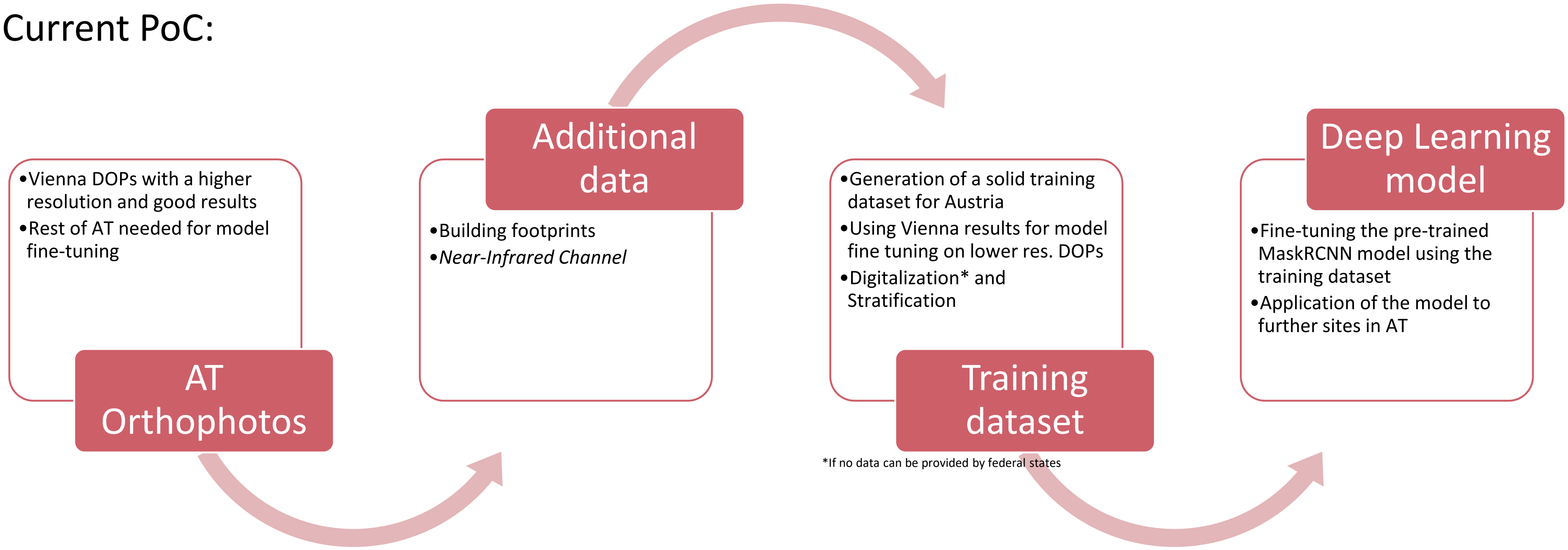
Source: ESRI ©



Source: ESRI ©

Methodology and Technology

- First results using the ‚plain' pre-trained model with available Orthoimagery are not satisfying (low detection rate, confusion with cars and roof lights), thus further **methodological improvements are required**
- Current PoC:



Next Steps

Implementing the described workflow and further evaluating results

Establish further contact to **federal states and other stakeholders** to assess possible data sources

Literature research -> Several similar studies in Europe -> **Evaluating other solutions and models**

After successful PoC: **Large-Scale processing** (Infrastructure and funding necessary)

Enriching Energy Statistics and the building register

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