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87 lines (69 loc) · 3.71 KB

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Analysis-of-the-Results-of-Image-Data-Segmentation-Methods

Specification of the requirements

Thesis goal: Develop Python application that can analyze results of image segmentation using selected metrics. Application allows visualization, comparison and export of these metrics.

Target audience: students, researchers, developers working with image segmentation models

Requirements:

- Input: two folders with images (ground truth and prediction)
- Functionalities: calculation of metrics, visualization of classification (TP, FP, TN, FN), comparison of the results, export into CSV/JSON
- Other: simple GUI, scalability, expandability

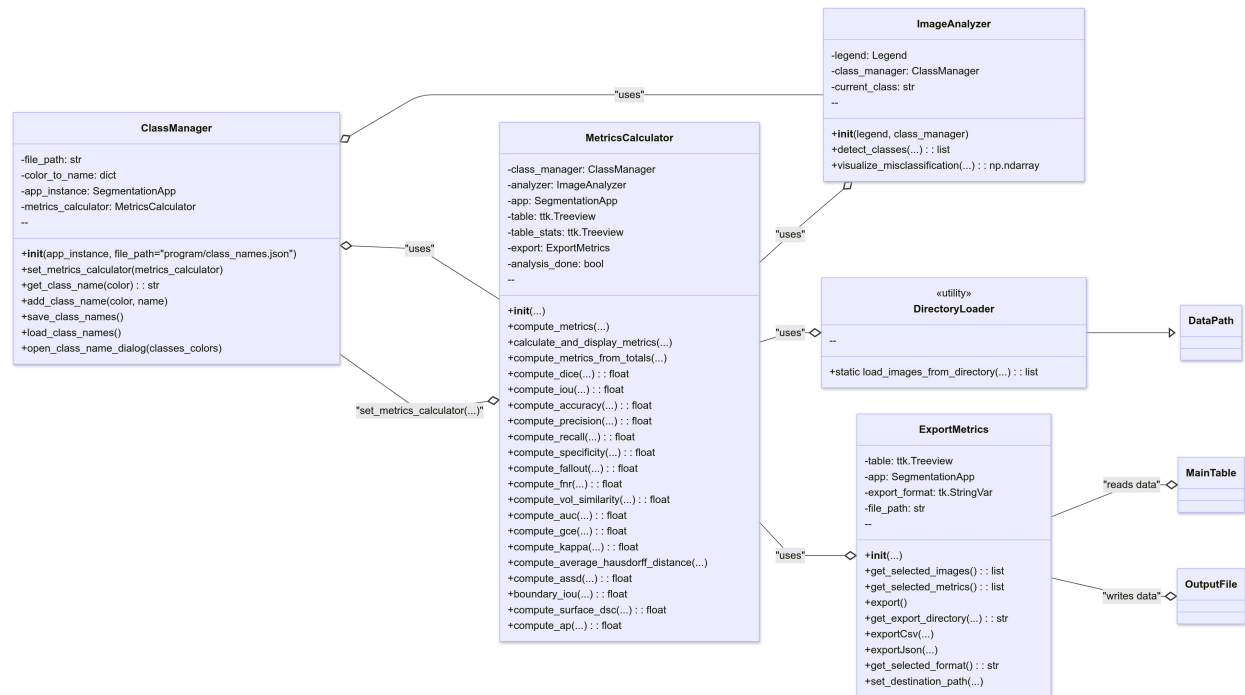
Solution proposal:

Architecture:

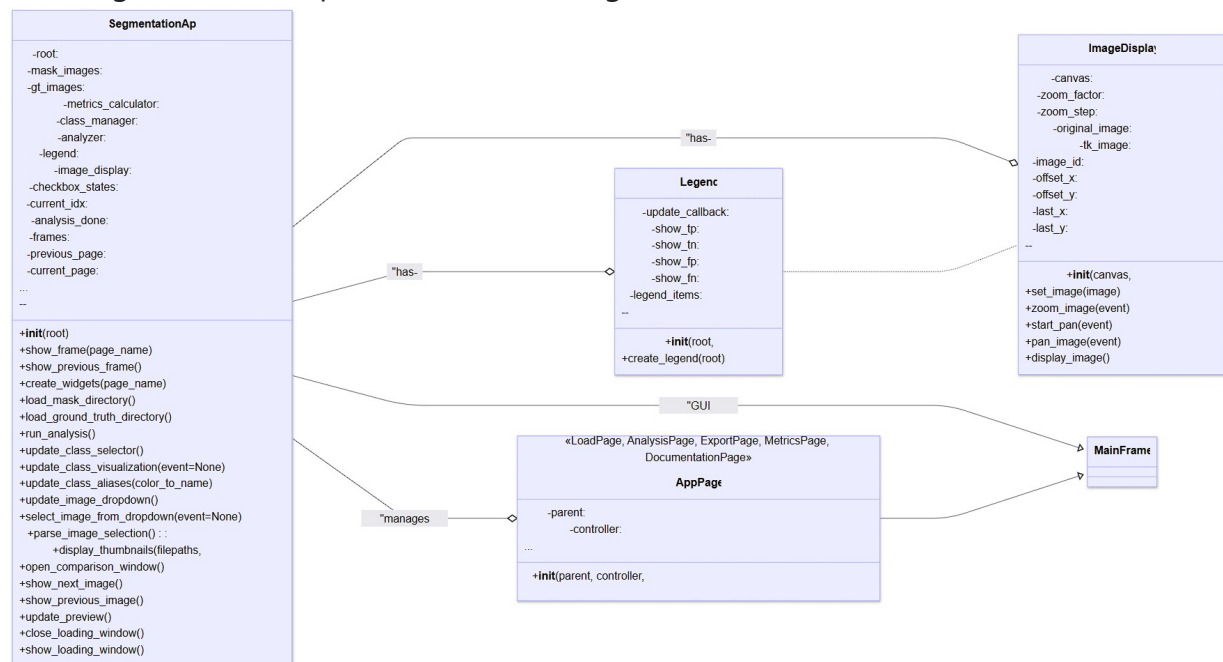
Application is split into modules:

- Data loading (DirectoryLoader)
- Class management (ClassManager)
- Metric calculation (MetricsCalculator)
- Visualization and export (ImageAnalyzer, ExportMetrics)

UML diagrams: Function diagram – classes and their relations



User diagram – UI components and their logic



GUI design:

- Navigation panel (LOAD -> ANALYSIS -> METRICS -> EXPORT)
- Sections: Loading, Analysis, Metrics, Export

Realization and implementation

Used technologies:

- Python 3.12
- OpenCV, NumPy, SciPy, Tkinter
- Git, GitHub, Figma, TkForge Implementation:
- Calculation of metrics: functions `compute_<metric_name>()`
- GUI: navigation panel, interactive controls (dropdowns, checkboxes ...)
- Export: preview and format selection (CSV/JSON)

Testing and verification of the results

Data for testing:

- Simple synthetic segmentation dataset (ChatGPT)

Comparison with reference values:

- Verification of metric values with existing libraries like sklearn and medpy
- Table of compared values: majority of metrics are equivalent, some variation explained in thesis

Limits:

- Synthetic data results don't have to apply in all real-world scenarios
- Some metrics don't have publicly accessible implementation

Installation, usage and maintenance

Installation:

- Install supported version of Python, currently 3.12 (<https://www.python.org/downloads/>)
- Run `git clone https://github.com/tazman02/Analysis-of-the-Results-of-Image-Data-Segmentation-Methods` to fetch the latest version of the project
- Optional: set up virtual environment, recommended (tutorial: <https://docs.python.org/3/library/venv.html>)
- Install libraries from requirements.txt (Run: `pip install -r requirements.txt`)
- Run the main Python file from the project directory (Run: `python`)

`segmentation_app.py`)

Usage:

- Load ground truth and prediction datasets (WARNING: Path cannot contain any diacritics, may cause error)
- Optional: Set class aliases for clarity in metrics
- Run the analysis module to compute evaluation results
- View results via the UI or console output
- Export computed metrics to desired format (e.g., CSV, JSON)

Maintenance:

- Pull the latest version from GitHub (Run: `git pull origin main` or your current working branch)
- To add new metrics: Implement a new function in the metrics module, Update the UI to include the new metric, Submit a pull request with detailed repository comments and documentation of the changes

Structure of repository

`segmentation_app.py` - main Python file, launch to start the application

`testy.ipynb` - some of the metrics used in compariston and testing

`out.json` - demo of json output

`ico.png` - icon used by application

`class_names.json` - configuration file with saved class aliases, erase whole file or specific records to delete alias

`lib` - folder, includes all other classes that are part of the functionality of the application

`img` - folder for images, contains testing and demo data

`gui` - folder, contains all classes that represent gui