Google Summer of Code 2025 Proposal

Personal Information

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Degree Program: B.Tech in Artificial Intelligence and Machine Learning

Year of Study: 2nd Year

Location & Timezone: Hyderabad, India (IST)

Synopsis

Title: Support Pixel Resolution Metadata in ilastik

The project aims to enhance ilastik's support for biological imaging by enabling it to read and write pixel resolution metadata embedded in image formats such as TIFF. This functionality is crucial when analyzing biological images, where spatial calibration is essential for accurate interpretation of results. The primary goals of this project include:

- Read pixel resolution metadata from TIFF files (especially those exported from FIJI).

- Preserve and write the metadata during TIFF exports from ilastik.

- Provide GUI options for viewing and manually editing pixel resolution data.

- Extend the capability for future real-world scale-aware analyses and visualization.

By completing this project, ilastik will become more interoperable with tools like FIJI and better suited for use cases in biomedical imaging that depend on physical measurements.

Benefits to the Community

Currently, ilastik ignores pixel resolution metadata, which limits its effectiveness when dealing with datasets requiring real-world measurement accuracy. Researchers frequently work with images representing vastly different scales—from nanometers to centimeters—and having resolution information is key to comparing datasets or deriving quantitative insights.

This feature will:

- Improve interoperability with FIJI and other tools in the bioimaging ecosystem.

- Enable future enhancements like scale-aware feature extraction, measurements, and display.

- Improve reproducibility and transparency in research workflows.

- Provide a more complete metadata pipeline, aligning ilastik with FAIR data principles.

Deliverables

Phase 1

- Understand ilastik's IO and image-loading architecture.

- Research existing TIFF metadata standards and how FIJI encodes resolution data.

- Load and parse pixel resolution metadata from TIFF files.

- Display resolution info in ilastik's GUI.

Phase 2

- Enable editing of pixel resolution via GUI.

- Ensure correct handling when saving/exporting TIFFs from ilastik.

- Implement tests for read/write of resolution metadata.

Phase 3

- Extend internal data representation to carry resolution info across modules.

- Collaborate with community on useful UI/UX enhancements.

- Ensure backward compatibility.

- Finalize documentation, tutorials, and blog post.

Timeline

Period	Milestone
May 20 – June 16	Community Bonding: Understand ilastik's codebase, explore TIFF resolution metadata, join Zulip discussions, reproduce related issues.
June 17 – July 14	Phase 1: Metadata reading + GUI display. Begin testing.
July 15 – July 22	Phase 1 Evaluation.
July 23 – August 18	Phase 2: Writing/exporting TIFFs with resolution metadata, GUI editing. Add automated tests.
August 19 – August 23	Phase 2 Evaluation.
August 24 – September 13	Phase 3: Extend internal representation, refine UX, document. Create usage tutorials. Submit final blog and PR.
September 14 – Final Evaluation	Submit final code, evaluations, blog post, and documentation.

Technical Approach

- **Image Metadata Handling**: Use the tifffile Python package to read/write TIFF resolution tags (XResolution, YResolution).

- **ilastik Integration**: Modify the data import/export pipeline to propagate resolution metadata.

- **PyQt Enhancements**: Add GUI widgets for resolution info within ilastik's data properties view.

- **Validation and Testing**: Use pytest to write functional and regression tests around IO operations and metadata integrity.

About Me

I am Addapu Praharika, a second-year B.Tech student majoring in Artificial Intelligence and Machine Learning at Malla Reddy Engineering College for Women. I am a highly motivated and curious developer with a strong passion for using AI to solve real-world problems.

Though I am early in my open-source journey, I have developed several impactful projects:

- **AI-Based Panic Gesture Detection System** – Developed an emergency hand gesture recognition system using TensorFlow, OpenCV, and MediaPipe, aimed at enhancing safety for deaf and mute women. Presented in the Women's Day IPD Competition with a unique 3D web interface.

- **Audio Transcription App (GenAI Hackathon)** – Participated in Smart Bride's GenAI Hackathon and built an AI-powered transcription app using OpenAI's Whisper for multilingual transcription and translation.

- **Academic & Technical Knowledge** – Strong foundation in Python, PyQt, OpenCV, machine learning, and version control. Currently building my GitHub profile with meaningful contributions.

I am excited to work on this project because it aligns perfectly with my interests in biomedical imaging, machine learning, and impactful software development. This opportunity will serve as a solid foundation to launch my open-source journey and contribute to tools that matter.

Why Me?

- I'm deeply passionate about building ethical, inclusive, and accessible AI systems.

- I bring a unique perspective as a student in a women's engineering college, actively solving problems that empower underrepresented groups.

- I love collaborating and learning — and I'm quick to pick up new frameworks and workflows.

- I'm committed to making this project a long-term contribution, beyond the GSoC timeline.

Contributions to ilastik

- Studied and tested ilastik's installation, GUI, and workflows.

- Explored the issue tracker and familiarized myself with developer documentation.

- Reviewed related issues: #2870, #967.

- Discussed project scope and expectations with mentors via Zulip and GitHub.

Future Vision

Post-GSoC, I hope to:

- Improve other aspects of metadata and inter-tool compatibility.

- Contribute to enhanced visualization of pixel-scale-aware features.

- Continue building educational content for ilastik.

- Help new contributors onboard by writing beginner-friendly guides.

References

- ilastik Project Website: https://www.ilastik.org/

- GitHub Repo: https://github.com/ilastik/ilastik

- Related Issues: [#2870](), [#967]()

- PSF GSoC Contributor Guide: https://python-gsoc.org/contributors.html

Thank you for considering my proposal. I am excited about the opportunity to contribute meaningfully to the ilastik project and grow as an open-source contributor.