

LabelUp: Rapid Image Labeling

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Abstract

MetroStar introduces "LabelUp," a transformative auto-labeling AI solution, custom-built for US government applications. Utilizing advanced transformer technology, LabelUp revolutionizes data labeling, significantly enhancing operational AI models' efficiency for critical defense mechanisms. This innovative system promises over 800% workload reduction, facilitating rapid, precise labeling with its intuitive low-code interface, featuring sophisticated in-context-learning models. Compared to traditional methods, LabelUp demonstrates staggering time and cost savings, redefining industry benchmarks. The paper further elucidates risk mitigation strategies, ensuring robust security and accuracy. In its prototype stage, LabelUp has shown significant potential, forecasting a breakthrough in image/video labeling processes. The white paper culminates with an invitation for a detailed government review and discussion.

Solution

MetroStar's LabelUp: The US-government-native auto-labeling AI, powered by cutting-edge transformer technology. Ready to deploy, built for scale, and delivered with a US-WDS-compliant interface. Your one-stop app for both government and commercial labeling challenges.

LabelUp addresses the need for faster, more accurate, and consistent labeling for rapid utilization of operational AI Models that enhance capabilities of warfighters and the systems they rely on. Our fully integrated solution contains everything needed to load and quickly label the whole data set in an easy no-code/low-code UI. It includes state-of-the-art in-context-learning models Segment Anything (Kirillov et al. 2023) and SegGPT (Wang et al. 2023) for one-click labeling of a few prompts followed by automated labeling of the remaining dataset. The result? Reduction in operator workload by over 800% and delivery of a seamless workflow for image/video labeling that offers scalability, consistency, and accuracy.

Value Proposition of LabelUp

Beyond the advantage of time-saving and simplified user adoption as a low-code/no-code tool, LabelUp ensures transparency in data labeling that is consistently and accurately applied. This drastically reduces human error, which is common in manual labeling processes. Furthermore, LabelUp's approach provides rapid feedback loops, allowing for iterations toward the highest quality data. It will also evaluate existing/external dataset labels, further enhancing utility.

We compared traditional manual labeling with our prototype LabelUp solution, assuming \$35/hour for an analyst wage:

Traditional Labeling Process: Tedious and time-consuming. Typically, about 50 seconds to label just one image with moderate accuracy. For a dataset of 10,000 images, this translates to approximately 17.4 workdays and \$4900 in wages.

LabelUp Accelerated Labeling: With the advent of LabelUp, based on prototype tests, the entire landscape of image labeling has transformed. Now, 50 images can be labeled in a mere 30 seconds. This astounding rate means that for the same dataset of 10,000 images, the labeling process is reduced to around 4.2 hours of computational time. The active user involvement is limited to only about 10 minutes, leading to substantial savings (<\$10).

Such groundbreaking improvements not only revolutionize the speed and efficiency of labeling but also yield substantial cost savings, making LabelUp the future of image and video labeling.

Milestones and Progress Evaluation

In its prototype phase, LabelUp has demonstrated considerable promise. It offers low-code auto-labeling, a familiar labeling interface, accelerated labeling, and can be installed in an air-gapped environment. Our prototype offers the advantage of leveraging the transformer neural network architecture, which fueled the recent foundational advancements

in AI. In Phase 1 of our proposed solution, LabelUp will be built on open source technology and fine-tuned on relevant Government domain data for increased accuracy.

Risk and Mitigation

Task	Cause	Mitigation
Security compliance	External dependencies	Purposeful consideration of security boundary during product design
Inaccuracy	Over-reliance on AI	QA in the UI; option for human review
Slow processing	Heavy datasets	Use of computational optimization; multi-GPU support
Limited adoption	Complexity	User-friendly UI; no-code solutions
Integration issues	Different labeling platforms	Integration with multiple open-source UIs; Python API for easy adaptation

Table 1: Risk and Mitigation Table

Prototype Progress and Future Ambitions

Feature	Prototype	Future Goal
Low-code / no-code auto-labeling	Implemented easy prompt labeling	Develop user-friendly no-code workflow
Familiar interface	Uniform UI + Label Studio	Integrate other open-source UIs like LabelBox
Accelerated labeling	In-context models provide efficient prompt labeling and auto labeling	Link with various "helper" models for versatility. Fine-tuned models. Explore OCR for image texts and video-to-text conversions.
Image prompt selection	Users select image prompts freely	Integrate advanced image embedding tool to leverage similarity, day/night conditions, entropy, etc.
Compute optimization	Single-process, single GPU	Launch multi-process, multi-GPU support

Table 2: Prototype Roadmap Table

Progress indicates a promising trajectory towards refining and expanding LabelUp's capabilities. Our commitment remains to continually innovate and adapt, ensuring that LabelUp stays at the forefront of the image and video labeling domain.

Other Applicable Information

LabelUp, an initiative driven by visionary data scientists and computer vision experts, comes from a pedigree of excellence. Our team has years of experience in delivering top-notch AI/ML solutions. We have witnessed firsthand the challenges of manual image and video labeling. LabelUp is not just a product; it is our solution to a problem we deeply understand.

MetroStar is an innovative U.S. business with 24 years of experience providing digital services, solutions, and highly trained staff for the Department of Defense (DoD), other Federal agencies, and commercial clients. Our Digital Services portfolio features expertise in Human-Centered Design (HCD), AI/ML, DevSecOps, Enterprise IT, Cyber, and Cloud. MetroStar is known for our proven ability to deliver highly qualified talent, Subject Matter Experts (SMEs), and technologists, on time and on budget, to meet the needs of our customers for their most critical initiatives. Recent wins include Prime contracts with the Army, Air Force, Marine Corps, and selection for the Joint AI Test Infrastructure Capability (JATIC) effort under the Chief Digital and Artificial Intelligence Office (CDAO). With large internal investments, MetroStar's R&D and Innovation team, The Client Solutions Group (CSG), partners with our customers and delivery teams to implement emerging technologies and develop cutting edge IT solutions. After the Government's review of this white paper, MetroStar would like to request a meeting with Government stakeholders to further discuss and demonstrate capabilities that support our approach within this white paper.

References

Kirillov, A. et al. 2023. Segment Anything. arXiv preprint arXiv:2304.02643v1 [cs.CL]. Ithaca, NY: Cornell University Library.

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