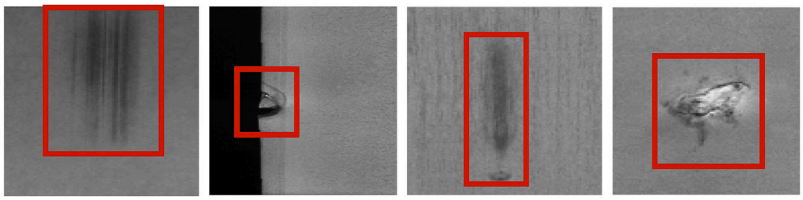
LANDING AI™

LandingLens Deep-Learning Software Cracks Complex Steel Inspection Code

Data-centric workflow increases inspection accuracy by more than 20%

Manufacturers in many industries rely on visual inspections to detect critical defects during production. Landing AI, a developer of deep-learning software for industrial applications, recently used its LandingLens platform to increase one steel manufacturer's inspection accuracy. The end-to-end platform offers tools for managing data, resolving defect ambiguity, promoting labeling consensus, and delivering models.

Examples of Defects



Using the LandingLens platform and workflow, Ivan Zhou and a handful of local workers were able to rapidly prototype a new deep-learning model that was 93% accurate at detecting critical defects.

Traditional Visual-Inspection Challenges

AI provides an efficient alternative to traditional machine vision systems that require lots of expertise to implement, maintain, and scale across lines and plants. For example, traditional machine vision systems require highly specialized expertise to define defects via rules and are hard to adapt to changing conditions. The deep-learning-based systems, on the other hand, can have flexible defect definitions and learn continuously to adapt to changing conditions.

So why, before Landing AI joined the project, had the existing AI model failed to surpass the steel customer's manual inspection regimen? Andrew Ng, Landing AI CEO and founder, faults the data quality.

"Ask a project team, which is mainly programmers, why a system is underperforming, and they will point at the code," said Ng. "They will say we need to build a smarter brain."

"The customer had been developing a visual inspection model for years and had it running in production. But it achieved only 70% to 80% accuracy, which was less than the customer's baseline for manual inspections."

Ivan Zhou
Engineer
Landing AI

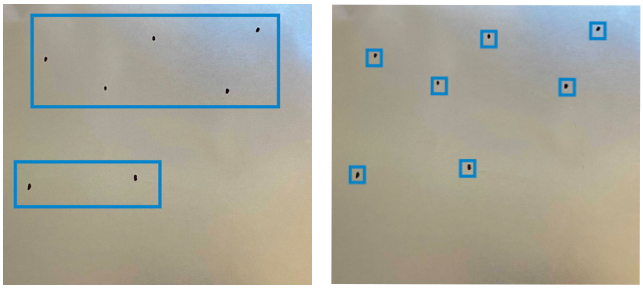
sales@landing.ai

Accurate Datasets Matter More Than Smarter Code

But Ng says the real issue is not the code or, in the case of deep learning, the neural network. What sinks most projects is data quality. Ensuring quality is critical because the 0s and 1s, the bits and bytes, are the foods that nourish an AI system. Even the most elegantly conceived model will produce subpar results if it is consuming inaccurate or incomplete information.

Labeler Consistency Example

Steel defect detection (39 classes).
Class 23: Foreign particle defect.



Incorrect labeling *Correct labeling*

"Improving labeling in datasets is the key," Zhou agreed. This was one of the first tasks his team tackled when working with the steel manufacturer. They spent less than 10% of their time doing model iterations.

Labeling datasets involves categorizing defect images. Accuracy is important to resolve "noise" and to generate statistically reliable quality checks.

The poor results with the initial AI model suggest labeling issues. Invariably, labeling is assigned to the few production leads and quality engineers who have the knowledge and experience to classify defects. And while datasets may be "limited," they can still contain hundreds or thousands of images that must be evaluated within the project time frame. Under real-world conditions, the experts become overstretched, their labeling accuracy declines, and overall dataset noise increases.

Is there a better way to handle what is arguably the most critical step in the AI system-building process?

Connected Workflow Improves Project Efficiency

"Good tools and workflow are the key," Zhou said. Using the LandingLens digital **Defect Book and the Agreement-based Labeling** tool improves accuracy without burdening customer experts. With clear defect definitions and instructions, these tools help resolve ambiguities and reach consensus between the manufacturer's subject matter experts and the project team's engineers.

The Defect Book also makes it possible to shift much of the image-labeling workload to locally hired temporary workers. "The Defect Book is a way to rapidly acquire and share knowledge," said Zhou. Non-experts can take on time-consuming tasks such as classifying defects, annotating bounding boxes, and organizing images while the experts focus on reviewing, revising, and approving their work.

With an entire workflow in one system, LandingLens also makes it easy to iterate the AI system even as environments and requirements change. During deployment, platform metrics provide insights at the factory, product, line, and even defect levels.

> *"The LandingLens platform's workflow and tools bring a systematic approach to a subjective decision-making process. It provides a path to a solution."*
>
> Andrew Ng
> CEO and founder
> Landing AI

sales@landing.ai
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