LANDING AI™

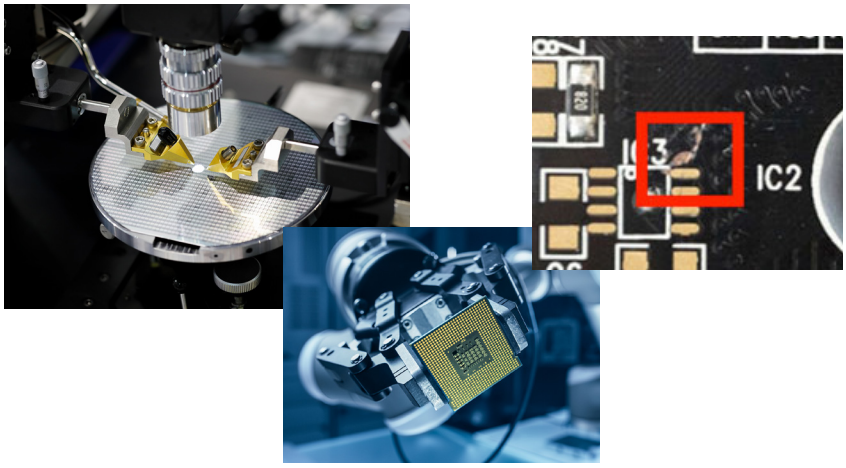
Solve Complex Semiconductor Inspection Challenges with Deep Learning

Semiconductors offer conductivity between conductors such as metals, and nonconductors or insulators such as most ceramics. Integrated circuits (ICs), comprised of electronic circuits on a single piece of semiconductor material, are small, complex components that must be accurately inspected for defects during the manufacturing process.

While machine-vision systems provide an effective means for identifying defects, rules-based machine-vision algorithms may struggle with advanced IC packaging and the volume of defects that may be present. Programming all possible defects into a traditional algorithm would require defining hundreds of rules and extracting features, with the potential for many false positives and false negatives. Deep learning offers a more reliable and accurate means for inspection.

Complicated Chip Challenges

Semiconductor chips are used in electronic devices of all types, from smartphones and televisions to advanced medical equipment and automobiles. During the manufacturing process, semiconductor chips must be inspected at the front end, during wafer fabrication and probing, with each dye on the wafer being electrically tested. Wafer inspection also involves checking for defects on each individual layer before applying the next layer. Defects can include scratches, cracks, peeling, missing components, and edge defects.



"Once we started to adhere to LandingLens, things started to work astonishingly well, and we have managed to detect defects we have tried and failed to detect before with our AOI (automatic optical inspection). With a little help from LandingAI and our engineers, we could easily complete the two projects successfully in a very short time."

Ronen Frish
Chief Operating Officer
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Accurate front-end semiconductor inspection is one of the most sophisticated tasks in the inspection process. Manual inspection has proved inefficient and lacking in the required level of precision. Machine-vision systems have long served this space, but the growing complexity of ICs has complicated the process, as rules-based machine-vision algorithms can struggle with large numbers of potential defects.

With deep learning, using the common supervised training method, a convolutional neural network is trained on labeled images. The images are tagged or labeled manually, a process that identifies defects for the model. The labeled dataset teaches the model by example. This makes deep-learning software less susceptible to errors, and it can automatically classify anomalies and defects in parts based on images from the dataset.

Improve Accuracy, Reduce Development Times

Landing AI's LandingLens deep-learning software not only helps improve accuracy in complex applications like semiconductor inspection, but it also makes the process easier. The company takes an innovative, data-centric approach to deep learning: high-quality, accurately labeled clean data feeds the model, because even the most elegantly conceived model will produce inadequate results if inaccurate or incomplete data is used for training.

LandingLens includes a digital Defect Book that consolidates labeling activity in a central location to improve accuracy without burdening the customer. This living document helps resolve ambiguities and allows team members to reach a consensus, thereby feeding clean data to the deep-learning model. Additionally, the LandingLens Smart Tagging Tool delivers cross-functional collaboration capabilities for accurate labeling, no matter the location.

The end-to-end workflow makes it easy for semiconductor manufacturers to iterate the model-building process, even when environments and requirements change. During deployment, the software offers metrics for insights at the factory, line, product, and even defect levels. LandingLens ultimately simplifies the deep-learning process and offers an efficient, intuitive method for continually improving models for long-term success. The software also offers a standardized platform that reduces development time and allows companies to easily scale projects across several facilities.

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