Fast-Learning. Real-Time Identification.
Accurate, Adaptable, Affordable.

visit www.mindtrace.ai to learn more

mindtrace

AI DRIVEN SURFACE DEFECT DETECTION FOR PRECISION PARTS MANUFACTURERS

WHY MINDTRACE IS THE BEST END-TO-END AUTOMATED A.I. DEFECT DETECTION SOLUTION

- Strong Cost/Benefit Support
- Accelerated Results
- Legacy System Compatible
- Adapts to Change
- Scalable & Flexible Deployment
- Secure Data Analytics

ABOUT MINDTRACE

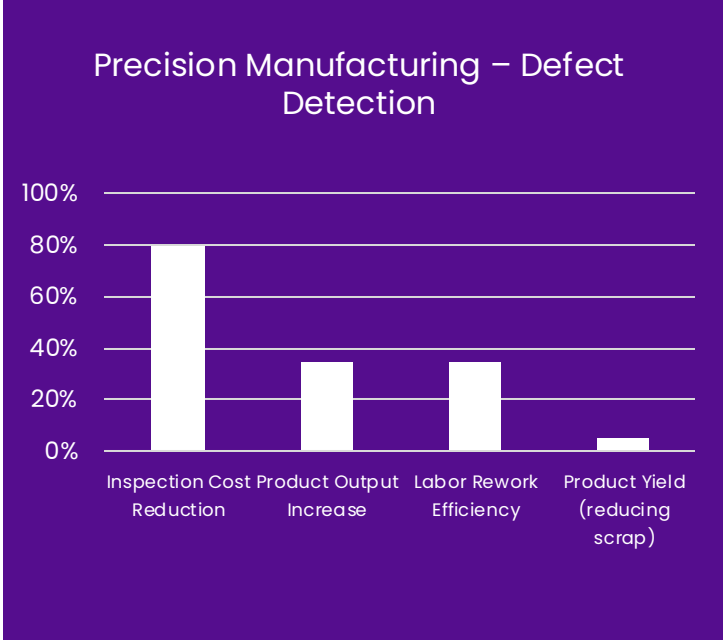
- Mindtrace develops self-learning, use-case specific AI "Brains" that deliver fully automated inspection solutions to the factory floor. The result is a powerful combination of next generation AI technology and industrial automation that provide unmatched ROI for enterprise customers.
- The Brain-Sense™ Computer Vision technology platform delivers 98%+ detection accuracy that eliminates defect escapes while minimizing false alarms, reduces costs and increase throughput.

FEATURES AND BENEFITS

- Immediate Value
- Fast Payback
- Reduced Overhead Costs
- Full Implementation
- Versatile & Transparent
- Flexible Deployments
- Actionable Analytics
- Real-Time Answers
- Affordable

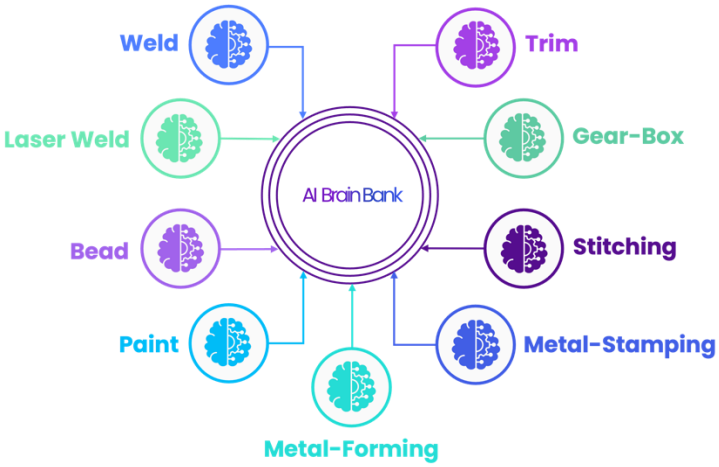
STRONG COST/BENEFIT SUPPORT

- 12-month payback on investment
- Delivers 98% Gage R&R score in 4 weeks
- 75–80% cost reduction via manual inspection headcount reduction, throughput increase, and yield improvements
- Zero defect escape, less than 2 to 3% false alarms
- Enterprise specific digital audit trail on all parts inspected – by serial/part number. Full compliance to FMEA standards required by major OEMs
- Capex friendly - bundle software and hardware in a single purchase order
- Automation of manually intensive rejected part reinspection process providing an audit trail for root cause and recall analysis



ACCELERATED RESULTS

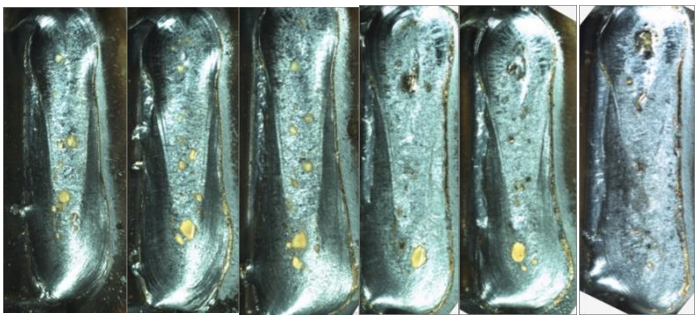
- <4 months from start to live production start-up (including Gage R&R)
- 90% fewer images required for training compared to traditional AI solutions
- Faster model convergence, achieving high accuracy with fewer training iterations and minimal setup time
- Incremental learning reduces data processing, transfer, and storage for faster onboarding and scaling
- Real-time performance: <1 second needed to classify and analyze 28 – 32 welds
- Automatic anomaly alerts trigger in real time, to minimize downtime and accelerate results



LEGACY SYSTEM COMPATIBLE

- Seamless integration into legacy systems, including ERP, MES, and PLC
- Seamless data flow across existing ERP, MES, and PLC systems—no rip-and-replace required
- Actionable insights surfaced directly within your existing operational ecosystem
- Custom-fit to your existing infrastructure and workflow, not a one-size-fits-all solution

ARC WELD – "Undercut" Defect



Defect Sensitivity Control

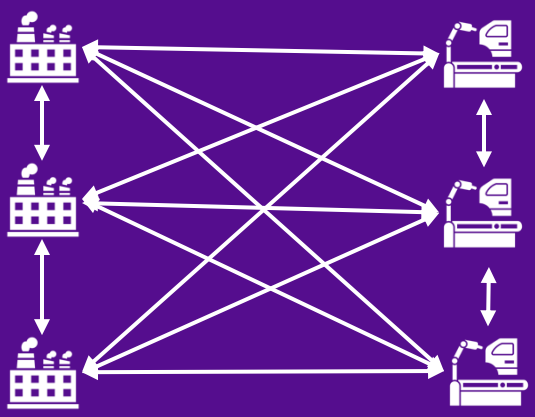
Pass

Unacceptable

ADAPTS TO CHANGE

- Ability to adjust defect severity acceptance criteria based on evolving operational conditions and real-time feedback
- Self-learns from daily and batch-to-batch variations in defect characteristics, reducing false positives and improving detection accuracy
- Continuously updates the central Defect Detection AI "Brain Banks" with incremental model updates, enabling fast response and overnight adjustments

FLEXIBLE SUPPLY CHAIN SOURCING



Global auto Tier 1 & OEM manufacturing plants

Assembly plants

FLEXIBLE DEPLOYMENT

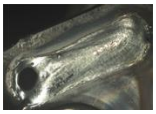
- Ready to deploy with less reliance on trained, location-based QC operator availability
- Combines a centralized defect detection AI brain with local, enterprise-based standards to seamlessly deploy across multiple production lines
- Consistent QC standard - across multiple lines, multiple plants, and multiple regions
- Designed for seamless integration at scale, eliminating the need for constant manual adjustments or custom workarounds
- Automatically adjusts to frequent changes in supply chain sourcing and production schedules

SECURE DATA ANALYTICS

- Digital Twin - audit trail on all parts and defects inspected
- Granular traceability across all levels—filter and track by plant, line, production lot, serial number, inspected region, defect type and grade, and pass/fail outcomes
- Secure – SOC2, type 2 certified

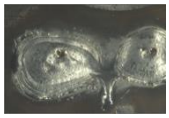
SOC 2 TYPE 2 Certified

CASE STUDY - WELD DEFECT INSPECTION WITH NUMEROUS VARIATIONS



BurnThrough

Porosity



Skip-Discontinuation

Coldweld-LackofFusion

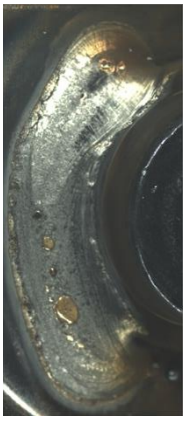
Unblown-Porosity

Burr

BlowHole

UnstableWeld

Power Assisted Armrest



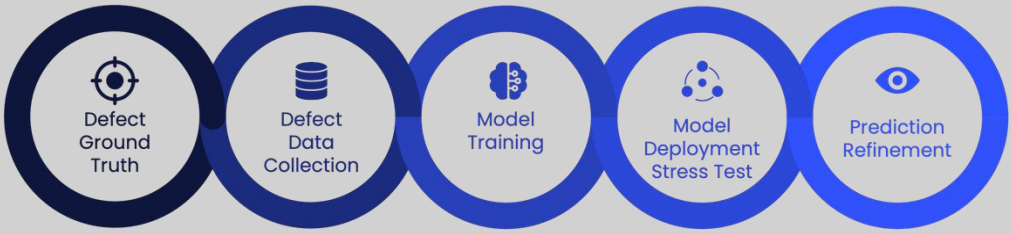
Undercut

- A global Tier 1 Automotive car seat supplier, needed an automated, AI weld inspection system to lower costs and improve the accuracy and productivity measures of manual inspections. Throughput needed to meet or exceed the current metrics of 45 seconds per part, and 600+ parts inspected per operator In 8hr shift.
- Requirements included 19 different weld defects, on 2 different shaped parts with up to 1,800 different inspection points per part. The high production rate required 1.23 million assessments to be made by the AI inspection station per day.
- A typical AI defect detection system would require thousands of reference images per defect variation and months of training to meet the customer's criteria. The Mindtrace, Brain-Sense™ AI platform utilizes GMAW specific AI "Brains" as a starting point and incrementally refines and creates a new use-case specific AI "Brains" using less than 20 new data samples. Finally, working with industry leading system integrator, the final inspection solution delivering 300% improvement in TAKT time:
  - 5-8 seconds defect classification time
  - 0.02% - defect escape
  - 2% - defect false alarm

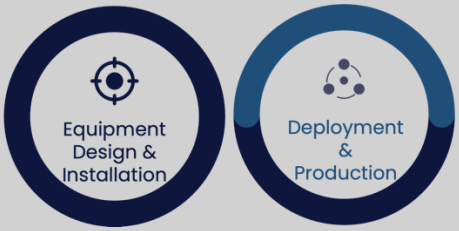
AUTOMATION PARTNERSHIP

End-to-End Turnkey Solution Delivery
AI Software + Automation

MINDTRACE'S AI SOLUTION



AUTOMATION PARTNERS



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