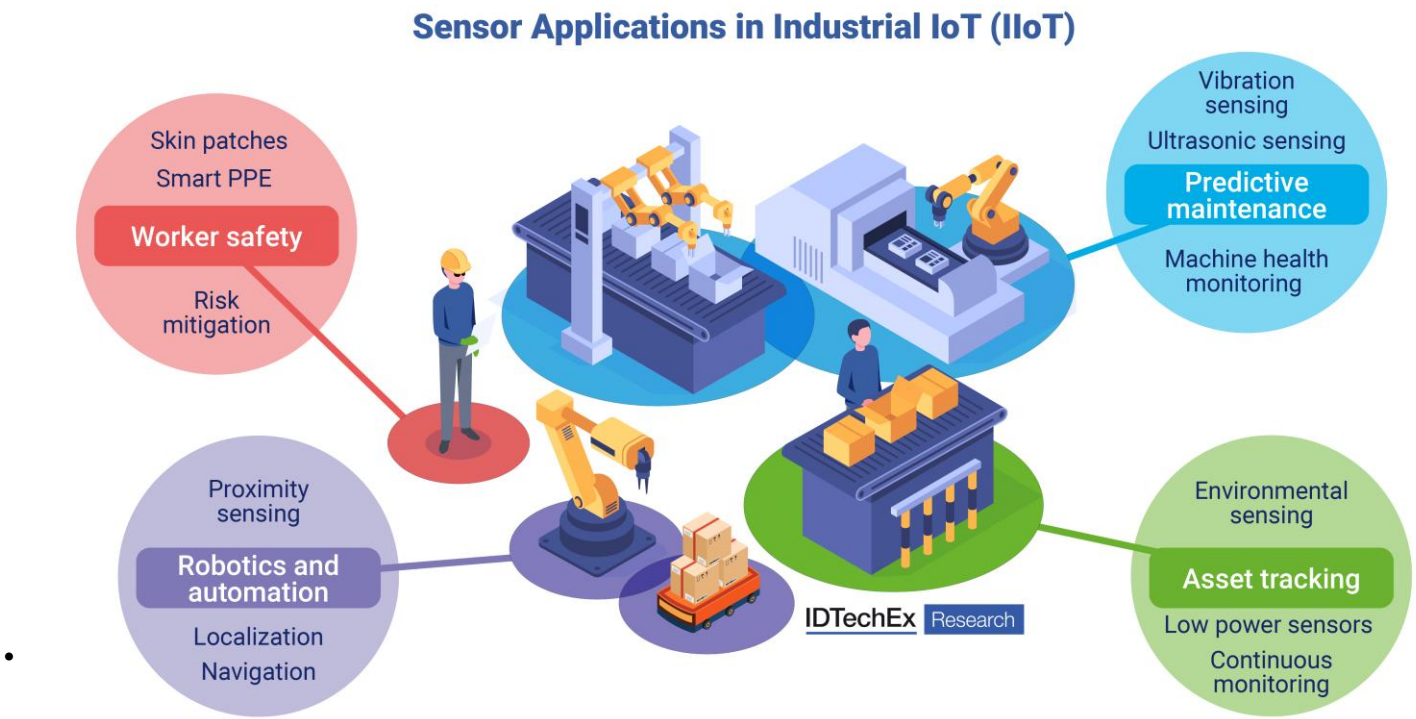
AI for Industrial Safety

Executive Workshop for EHS Professionals



Technology Roadmap and Maturity

Source: Verdantix

EHS Technology Roadmap
- Maturity Phases

1. Research & Development

Early innovation with experimental prototypes and limited pilots; commercial viability not yet established.

2. Launch

Market entry phase where solutions demonstrate initial business value and competitive positioning emerges.

3. Growth

Accelerated adoption driven by validated use cases and expanding ecosystem participation.

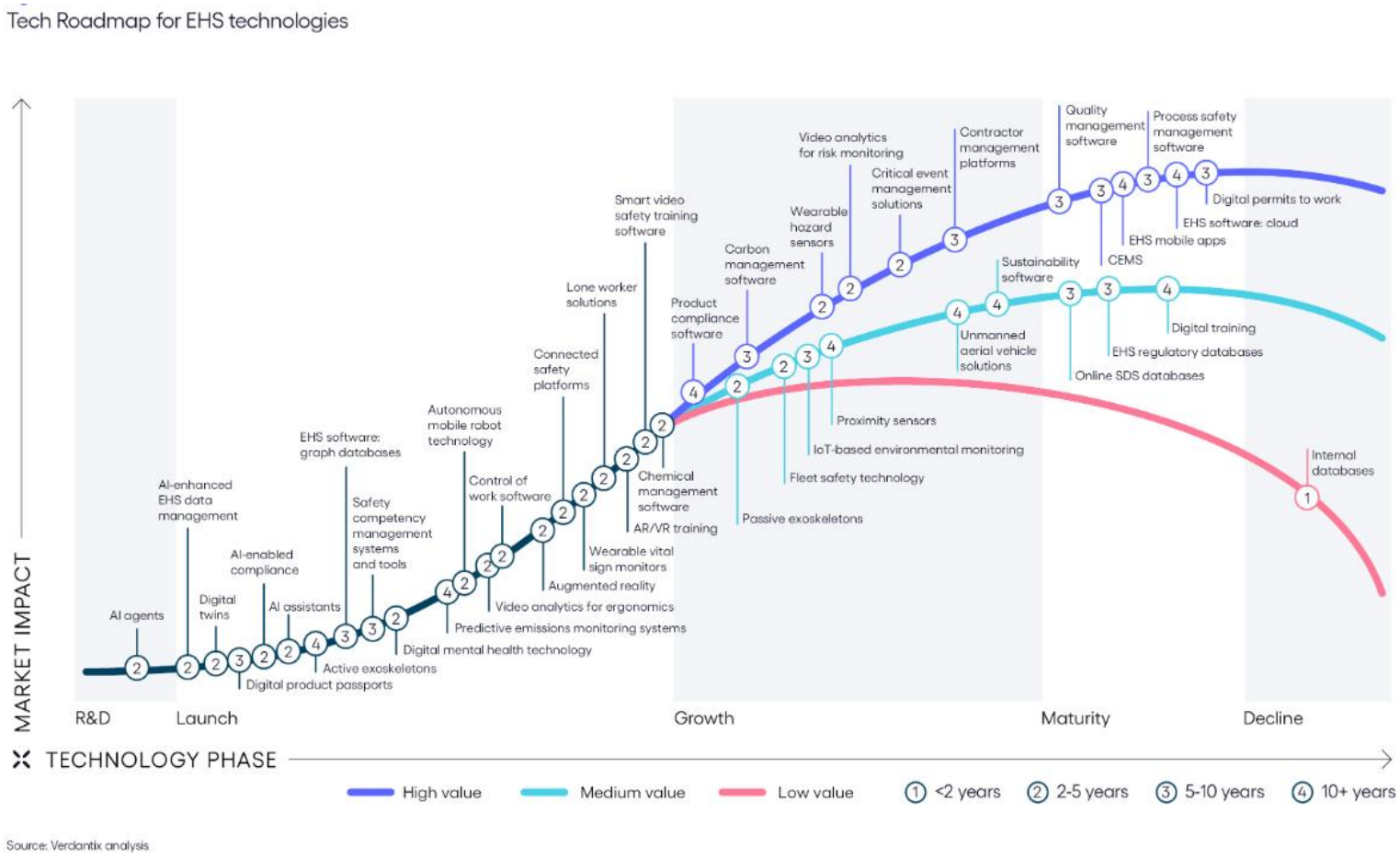
4. Maturity

Mainstream adoption with stable demand, standardized solutions, and consolidated vendor landscape.

5. Decline

Market contraction as superior technologies drive substitution and legacy usage diminishes.

EHS Technology Roadmap



Source: Verdantix (2025)

EHS Technology Roadmap

- By Solutions

Technologies	Maturity phase	Business value	Pace of innovation
Compliance, regulatory and product management			
AI-enabled compliance	Launch	Promising	2-5 years
Carbon management software	Growth	High	5-10 years
Digital product passports (DPPs)	Launch	High	5-10 years
EHS regulatory databases	Mature	Medium	5-10 years
Product compliance software	Growth	High	10+ years
Quality management software (QMS)	Mature	High	5-10 years
Sustainability software	Growth	Medium	10+ years
Data analysis, monitoring and platforms			
AI-enhanced EHS data management	Launch	High	2-5 years
Continuous emissions monitoring systems (CEMS)	Mature	High	5-10 years
Digital twins	Launch	Medium	2-5 years
EHS software: cloud	Mature	High	10+ years
EHS software: graph databases	Launch	Promising	5-10 years
Internal databases	Decline	Low	Less than 2 years
IoT-based environmental monitoring	Growth	Medium	5-10 years
Predictive emissions monitoring systems (PEMS)	Launch	Medium	10+ years
Proximity sensors	Growth	Medium	10+ years
Unmanned aerial vehicle (UAV) solutions	Growth	Medium	10+ years
Video analytics for risk monitoring	Growth	High	2-5 years

Source: Verdantix (2025)

EHS Technology Roadmap

- By Solutions

Mobile worker solutions			
Augmented reality (AR)	Launch	Low	2-5 years
Autonomous mobile robot (AMR) technology	Launch	High	2-5 years
Connected safety platforms	Launch	Medium	2-5 years
EHS mobile apps	Mature	High	10+ years
Lone worker solutions	Launch	Medium	2-5 years
Safety and workflow management			
AI agents	Research and Development	Promising	2-5 years
AI assistants	Launch	Promising	2-5 years
Chemical management software	Launch	High	2-5 years
Contractor management platforms	Growth	High	5-10 years
Control of work software	Launch	High	2-5 years
Critical event management (CEM) solutions	Growth	High	2-5 years
Digital permits to work	Mature	High	5-10 years
Fleet safety technology	Growth	Medium	2-5 years
Online SDS databases	Mature	Medium	5-10 years
Process safety management (PSM) software	Mature	High	5-10 years

Source: Verdantix (2025)

EHS Technology Roadmap

- By Solutions

Worker health and wellbeing			
Active exoskeletons	Launch	Low	10+ years
Digital mental health technology (DMHT)	Launch	Medium	2-5 years
Passive exoskeletons	Growth	Medium	2-5 years
Video analytics for ergonomics	Launch	Promising	2-5 years
Wearable hazard sensors	Growth	High	2-5 years
Wearable vital sign monitors	Launch	Medium	2-5 years
Workforce training			
Augmented reality (AR)/virtual reality (VR) training	Launch	Promising	2-5 years
Digital training	Mature	Medium	10+ years
Safety competency management systems and tools	Launch	Medium	5-10 years
Smart video safety training software	Launch	Medium	2-5 years

Source: Verdantix analysis

Source: Verdantix (2025)

Autonomy / Agency Spectrum
in AI System

Quick mental model

- **AI Assistant** = Helpful friend who answers questions
- **AI Agent** = Reliable employee who completes assigned tasks
- **Agentic AI** = Competent manager who owns the entire goal and delivers the result

This progression is exactly why companies in 2026 are moving from **ChatGPT-**style assistants → **single agents** → full **agentic workflows** for real business impact.

AI Assistants for EHS

Definition: Cognitive engines leveraging **NLP** to provide context-aware actions or prescriptive plans

Maturity Phase — Launch Phase

77% of organizations have deployed chatbots (Verdantix 2024)

Business Value (Promising)

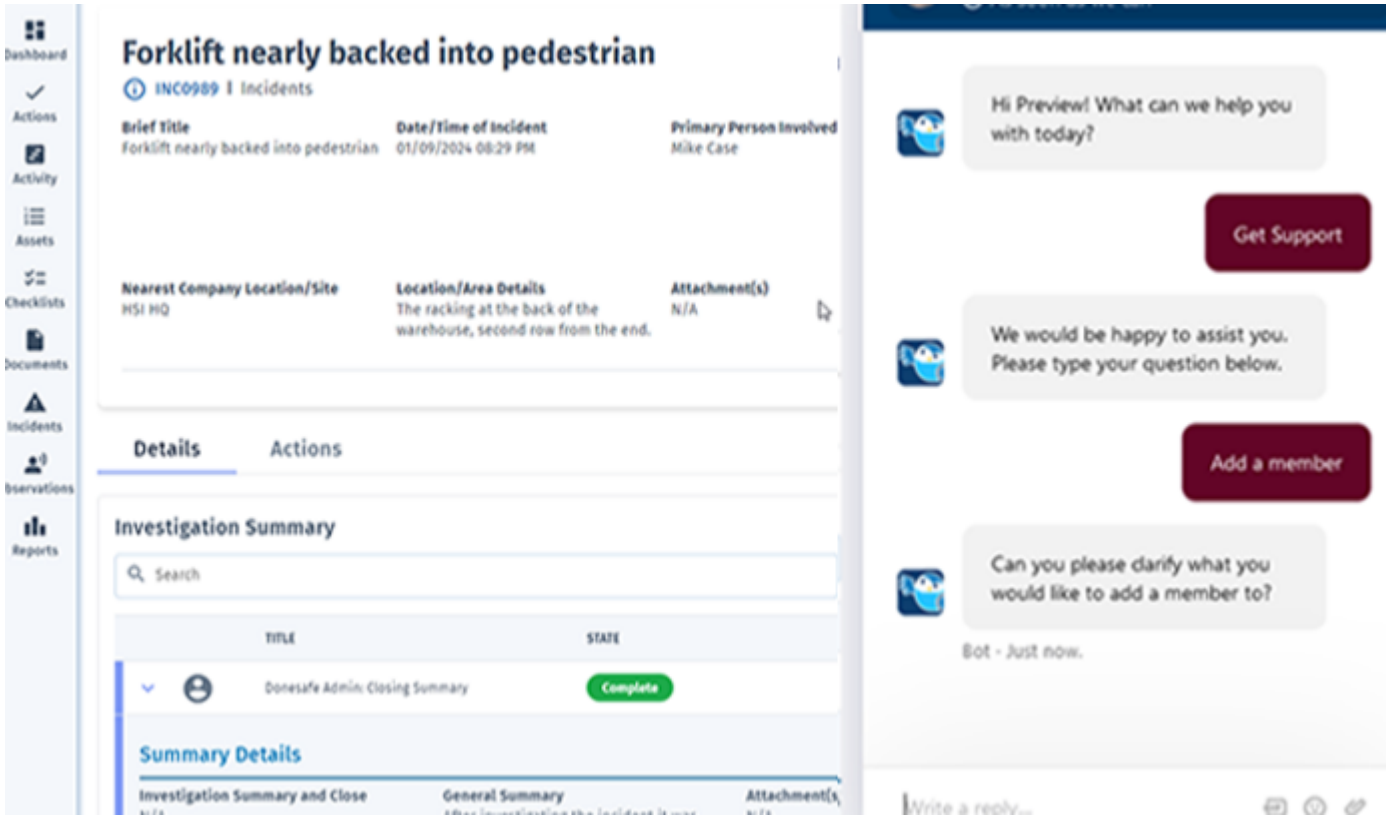
Reduces human errors caused by fatigue (~13% of US workplace injuries)

Supports worker resilience and remote assistance without extra staffing

Enhances safety, compliance, and operational efficiency in EHS environments

Innovation Pace (2–5 Years)

Rapid improvements in **LLMs, retrieval-augmented generation, and GenAI platforms**



AI Agents in EHS — Key Highlights

Definition

•AI agents are **autonomous software systems** that perceive their environment, collect data, and execute goal-oriented actions within human-defined boundaries.

•Unlike AI assistants, agents **self-determine actions** while escalating sensitive or high-risk decisions to humans.

•Represent a shift from *decision support* → *decision execution*.

Maturity Phase — Research & Development

Executive Implication
controlled experimentation in 2025

Business Value — Promising but Emerging
•Near-term value : **administrative automation and operational efficiency**:
•Significant **future applicability to EHS workflows**

Strategic Impact on EHS Functions
•Potential to automate routine, rule-based practitioner activities.
•Enables scalable interaction with employees while maintaining human oversight.
•May reshape workforce roles from execution → supervision and governance.

Pace of Innovation (2–5 Years)
•**one of the most disruptive digital technologies** in EHS.
•Adoption dependent on:
- Cost reduction of underlying AI models
- Organizational trust and accountability frameworks
- Maturity of AI governance and regulation

•Trust expansion will be reflected by gradually reduced operational constraints placed on agents.

From GenAI to Agentic AI (1 of 2)

- multiple sources (based material from Verdantix with collaboration with ChatGPT and Grok)

Aspect	AI Assistant	AI Agent	Agentic AI (Agentic System)	Example Use Cases of Agentic AI
Core Nature	Reactive conversational responder	Autonomous task executor (single entity)	Goal-driven outcome owner (often multi-agent orchestra)	Automatically runs an entire product launch: researches market, creates content calendar, books ads, monitors ROI, and adjusts strategy in real time until revenue target is hit
Autonomy Level	Low – waits for user prompts	Medium – can loop, use tools, follow instructions	High – independently sets sub-goals, makes decisions, recovers from failures	A personal CFO agent that receives "I want to save $50k this year" and then creates budget, finds side-income opportunities, negotiates bills, and invests automatically
Scope & Focus	Single-turn or short conversation	Specific tasks or multi-step workflows	End-to-end outcomes & complex projects	Full software development: takes a product idea, writes specs, codes frontend + backend, deploys to cloud, writes tests, and launches a live MVP
Planning & Reasoning	None (or very basic chain-of-thought)	Basic planning (ReAct, tool calling loops)	Advanced multi-step planning, reflection, and replanning	Travel agent that books your dream 2-week trip in Southeast Asia: researches flights, visas, hotels, activities, creates daily itinerary, monitors price drops, and rebooks if better deals appear
Tool & Resource Use	Minimal or none (just knowledge cutoff)	Uses tools/APIs in a controlled loop	Dynamically discovers, spawns, and coordinates tools + sub-agents	Enterprise sales agent: scrapes leads, qualifies them, writes personalized emails, books meetings, updates CRM, prepares proposals, and closes deals with minimal human input

From GenAI to Agentic AI (1 of 2)

Aspect	AI Assistant	AI Agent	Agentic AI (Agentic System)	Example Use Cases of Agentic AI
Adaptability	None – stuck if prompt is unclear	Handles simple errors with retries	Self-corrects, changes strategy, learns from outcomes	Crisis-response agent for a brand: detects PR issue on social media, drafts responses, coordinates legal & PR teams (via sub-agents), monitors sentiment, and reports resolution
Memory & Learning	Short conversation context only	Session or simple vector memory	Long-term memory + reflection + continuous improvement	Personal life agent that over months: tracks health goals, books doctor appointments, adjusts meal plans based on bloodwork, finds workout partners, and reports progress every Sunday
Collaboration	None (single model)	Usually single agent	Multi-agent orchestration & dynamic team formation	Company "Growth OS" that spawns specialized agents (marketing, sales, product, finance) to collectively grow monthly recurring revenue by 25% in 90 days
Human Supervision	High – every response needs review	Medium – user triggers or approves steps	Low – user only sets high-level goal and receives final outcome	Legal contract agent: given "secure a $2M vendor deal", it drafts contract, negotiates terms with counterparty's AI, flags risks, gets human sign-off only on final version, and executes e-signature

AI Readiness Assessment

The Importance of AI Readiness in EHS

Key Challenges & Statistics

- Up to 95% of AI projects fail due to poor data readiness, misaligned metrics, and integration issues. Poor data quality is the #1 reason for 80% of AI projects failing before production.
- Gartner predicts 60% of AI initiatives without AI-ready data will be abandoned by 2026.
- In EHS, unprepared AI can lead to safety risks, compliance violations, or ineffective hazard predictions—costing lives, fines, and billions.

Benefits of Readiness

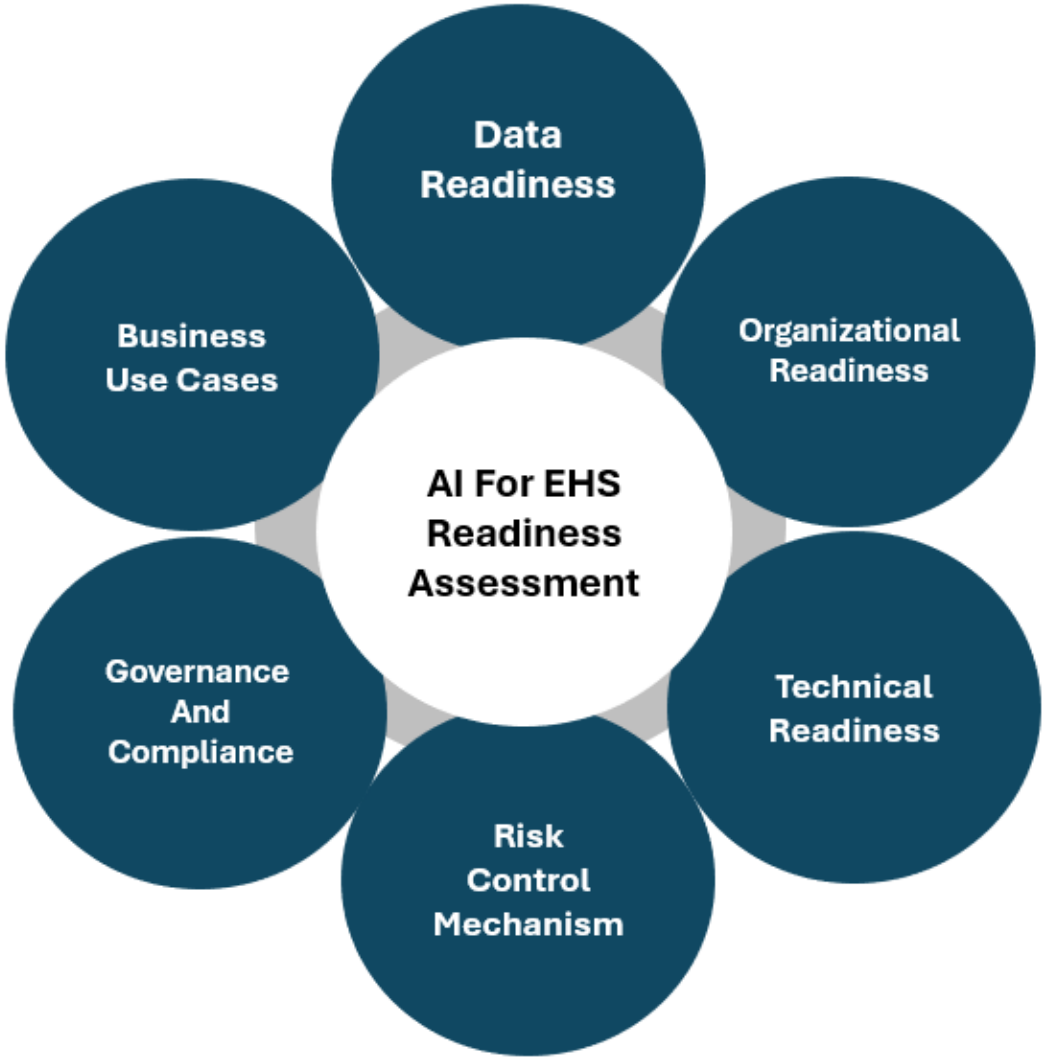
- Reduces failure rates by up to 47% with proper assessments.
- Enables trustworthy AI: Safe, ethical, and scalable for EHS applications like predictive maintenance or risk monitoring.

AI for EHS Readiness Assessment

The 6 Pillars (Wheel Diagram):

- Data Readiness: Quality, governance, privacy.
- Business Use Cases: Strategy, impact assessments.
- Technical Readiness: Talent, tooling, TEVV.
- Organizational Readiness: Literacy, accountability, reporting concerns.
- Governance & Compliance: Ethics, risks, policies.
- Risk Control Mechanism: Prioritization, monitoring, inventory, suppliers.

(enhanced with NIST AI RMF and ISO 42001)



TEVV – Test, Evaluation, Verification, and Validation (NIST)

- **What is TEVV?** Iterative processes to rigorously assess AI systems for trustworthiness and risk mitigation.
- **Key Goals (NIST Alignment):**
- Ensure validity, reliability, safety, security, explainability, fairness, and privacy.
- Provide evidence-based insights for risk management across the full AI lifecycle.
- **Why Critical for EHS AI?**
- Prevents failures in high-stakes safety predictions (e.g., hazard detection, compliance monitoring).
- Enables mid-course corrections and post-deployment monitoring.

- **Test** → Experiments, simulations, red teaming, adversarial testing.
- **Evaluation** → Metrics for performance, trustworthiness (fairness, robustness, safety, etc.), qualitative/quantitative assessment.
- **Verification** → Confirm system built correctly (meets specs, code/data integrity).
- **Validation** → Confirm system solves the right problem in real-world context (generalizes safely).

How to Apply the Tool: From Assessment to Action

- **Assessment Process:** Use discovery questions (e.g., "How do you manage third-party AI risks?") to score sub-criteria 0-5.
- Calculate averages: 0-29 Low (build foundations), 30-59 Moderate (develop roadmap), 60-75 High (scale AI safely).
- An assessment tool you can use

DEKRA
On the safe side.

AI Readiness Assessment Framework

This framework evaluates an organization's readiness for implementing AI successfully. Each criterion is scored from 0 to 5 based on defined maturity levels. [Draft Mei-Li Lin, PhD]

1. DATA READINESS

Sub-Criterion	What to Assess	Sample Discovery Questions	Scoring Guidance (0-5)
Data Availability	Presence of relevant structured and unstructured data	What types of data do you collect? Are these data sources centralized or siloed?	0 = No access, 5 = Multiple, centralized and accessible sources
Data Quality: Completeness	% of missing values, sparsity	What percentage of your data is complete?	0 = Sparse, 5 = Near 100% complete
Data Quality: Consistency	Uniformity in formats, values	Are formats and values consistent across systems?	0 = High inconsistency, 5 = Fully harmonized
Data Quality: Accuracy	Validity of recorded values	Has your data been validated against ground truth?	0 = Not validated, 5 = High trust in data
Data Quality: Timeliness	Freshness and update frequency	How often is the data refreshed?	0 = Stale, 5 = Real-time updates
Data Quality: Uniqueness	Duplicates and ID management	Do you have issues with duplicate records?	0 = Common duplicates, 5 = Fully deduplicated
Data Quality: Validity	Format compliance	Are there format rules for data fields?	0 = No validation, 5 = Strong enforcement
Data Quality: Relevance	Business use-case alignment	Is this data relevant to your AI goals?	0 = Misaligned, 5 = Highly relevant

Global AI Governance Human-Centered Ethics Checklist

- Policy alignment
- Data privacy & security
- Bias monitoring
- Human-in-the-loop validation
- Audit & accountability

Source: OECD AI Principles
https://oecd.ai/en/ai-principles

1. *Drift Detection and Lifecycle Management*
    1. Predictive models degrade as conditions evolve.
2. *Fairness, Bias, and Responsible Use Reviews*
    1. Expanding upstream indicators increases the risk of unintended bias or demographic skews.
3. *Explainability and Interpretability Requirements*
    1. As upstream signals grow more complex, interpretability becomes essential for model credibility.
4. *Decision Boundaries and Human-in-the-Loop Controls*
    1. Even in the most advanced AI-assisted environments, safety-critical decisions must retain human oversight.
5. *Data Pipeline Quality, Version Control, and Auditability*
    1. Model reliability depends on stable and well-governed data flows.

AI Enabled Technologies

Digital Twin

Definition: Virtual replicas of physical assets or systems powered by **IoT real-time data feeds**

Enable live visualization, monitoring, and simulation of operational environments

Maturity Phase — Launch Phase

Innovation Pace (2–5 Years)

Accelerated by advances in:

- Sensors
- AI & analytics
- Computing power

Increasing enterprise investment
New solutions emerging (e.g., digital twins for product safety & traceability)

Bottom Line
👉 Digital twins are becoming a critical platform for **safer, smarter, and more resilient industrial operations**, with rapid innovation expected in the near term.

Autonomous Mobile Robots (AMRs)

Definition: Application of **AI (Machine Learning & Natural Language Processing)** to improve EHS data lifecycle:

- Data extraction & aggregation
- Data cleansing & quality improvement
- Insight generation & trend analysis
- Forecasting and decision support

Maturity Phase — Launch Phase

Bottom Line:
AMRs are a **high-value, rapidly evolving technology** that improves safety, efficiency, and compliance while enabling humans to focus on higher-value tasks.

Business Value (High)
Enhances **safety, compliance, productivity, and quality**
Performs hazardous or repetitive tasks → reduces injuries, labor costs, and errors
Cobots ensure **safe human-robot collaboration**
RPA automates routine tasks; intelligent automation expands potential for end-to-end systems

Pace of Innovation (2–5 Years)
Improvements in **robotic intelligence, environment interaction, and human collaboration**
Adoption challenges: expertise gaps, risk management, and operational uncertainty
Early successes show **cost savings, efficiency, and safe human-robot collaboration**

Future: AMRs expected to handle **more complex tasks**, becoming integral in industrial environments

Edge Computing:

Enabling Real-Time Autonomy in the Device–AI–Edge Triad

- **Core Concept** — On-device / onboard processing delivers sub-100 ms decisions, independent of cloud latency.

- **Key Value in Industrial Safety**:
  - Real-time hazard response & autonomy (e.g., anomaly detection → immediate action on drone).
  - Reliable operation in harsh/remote environments (GPS-denied, signal dropout).
  - Reduced cloud dependency → 85–95% data reduction, lower costs, enhanced security/privacy.

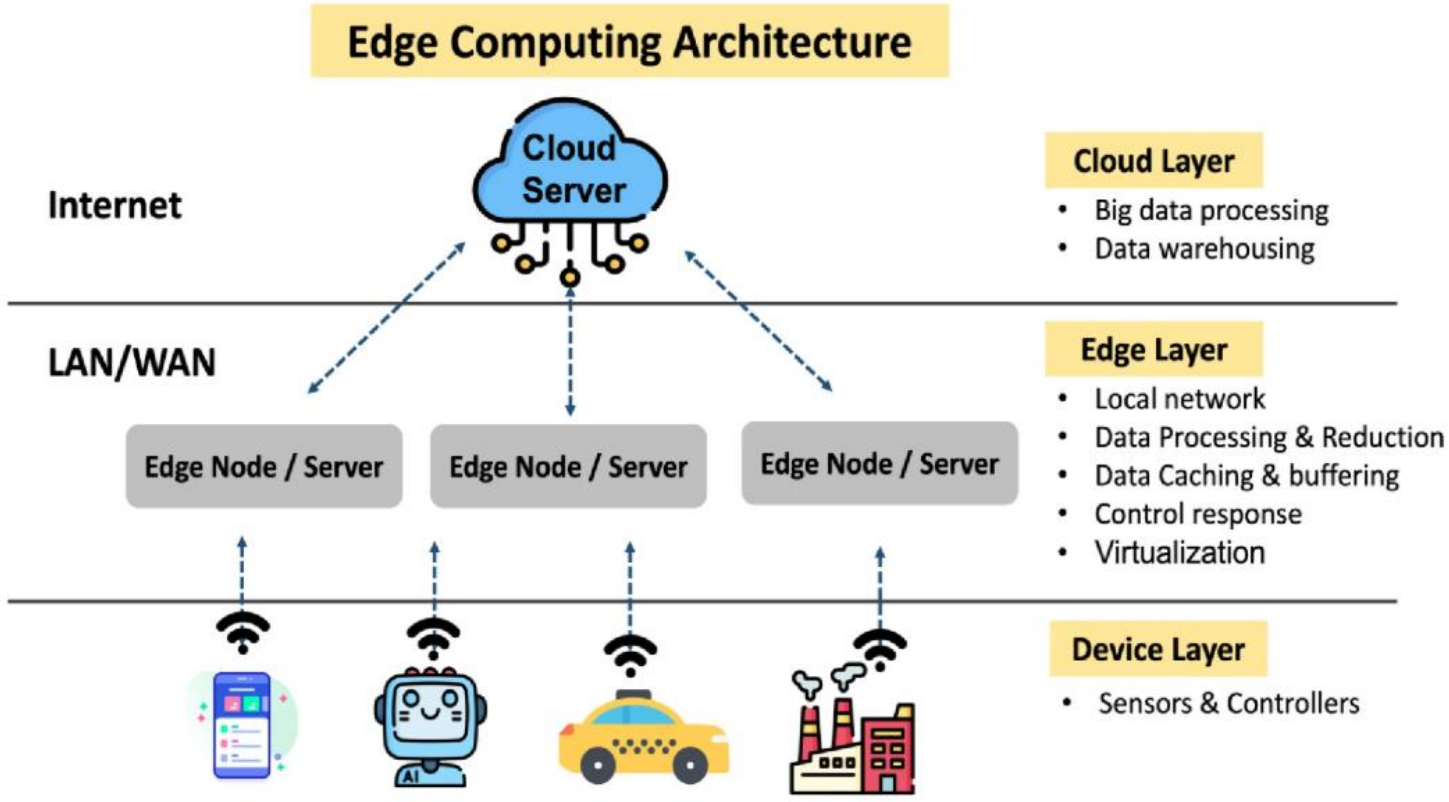
- **Triad Synergy** — Robotics provides access → AI interprets data → Edge executes instantly.

- Source: Adapted from industry architectures (e.g., XenonStack, NVIDIA Edge AI)

Edge Computing for EHS

– The Real-Time Decision Engine for EHS Enabling Instantaneous Autonomy in Hazardous Environments

- **Detects hazards** and responds instantly without human delay.
- **Reliability in Remote/Harsh Zones**: Operates offline during signal dropout where connectivity fails.
- **Reduced Human Exposure**: Enables closed-loop autonomy
- **Bandwidth & Cost Efficiency**: Minimizes cloud uploads → faster decisions, lower data costs, enhanced privacy/security.
- **Overall Impact**: Transforms reactive monitoring into predictive, zero-incident operations.

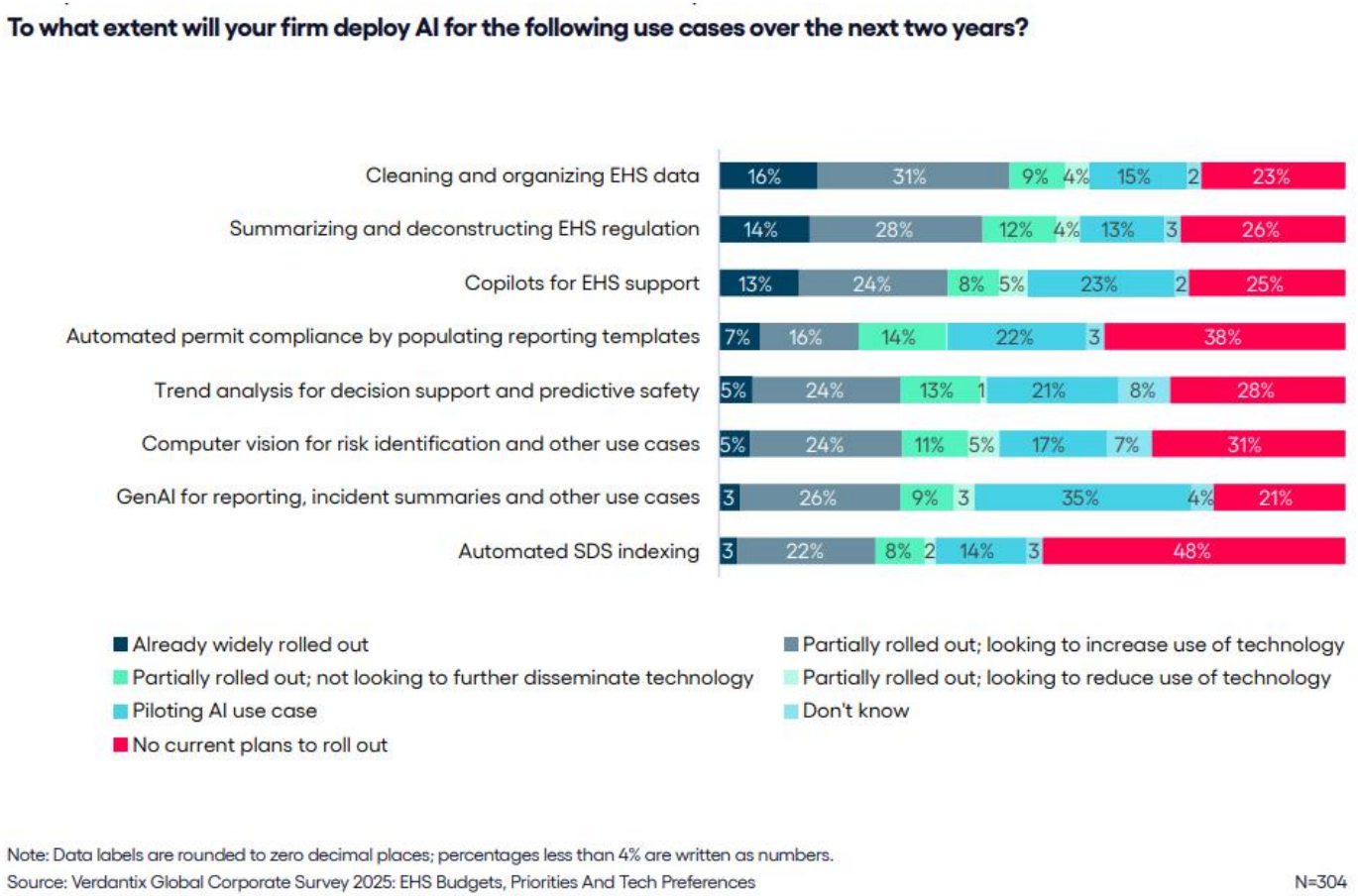


edge computing makes everything happen instantly, right where the action is.

AI Industrial Applications

AI use cases in EHS

- Legacy Systems & Poor Integration Fragmented
- Data Privacy & Security Risks
- Skills & Talent Shortages and Low AI Literacy
- Cultural & Psychological Resistance
- Unclear ROI & Proven Value
- Governance, Trust & Maturity Gaps



Note: Data labels are rounded to zero decimal places; percentages less than 4% are written as numbers.
Source: Verdantix Global Corporate Survey 2025: EHS Budgets, Priorities And Tech Preferences

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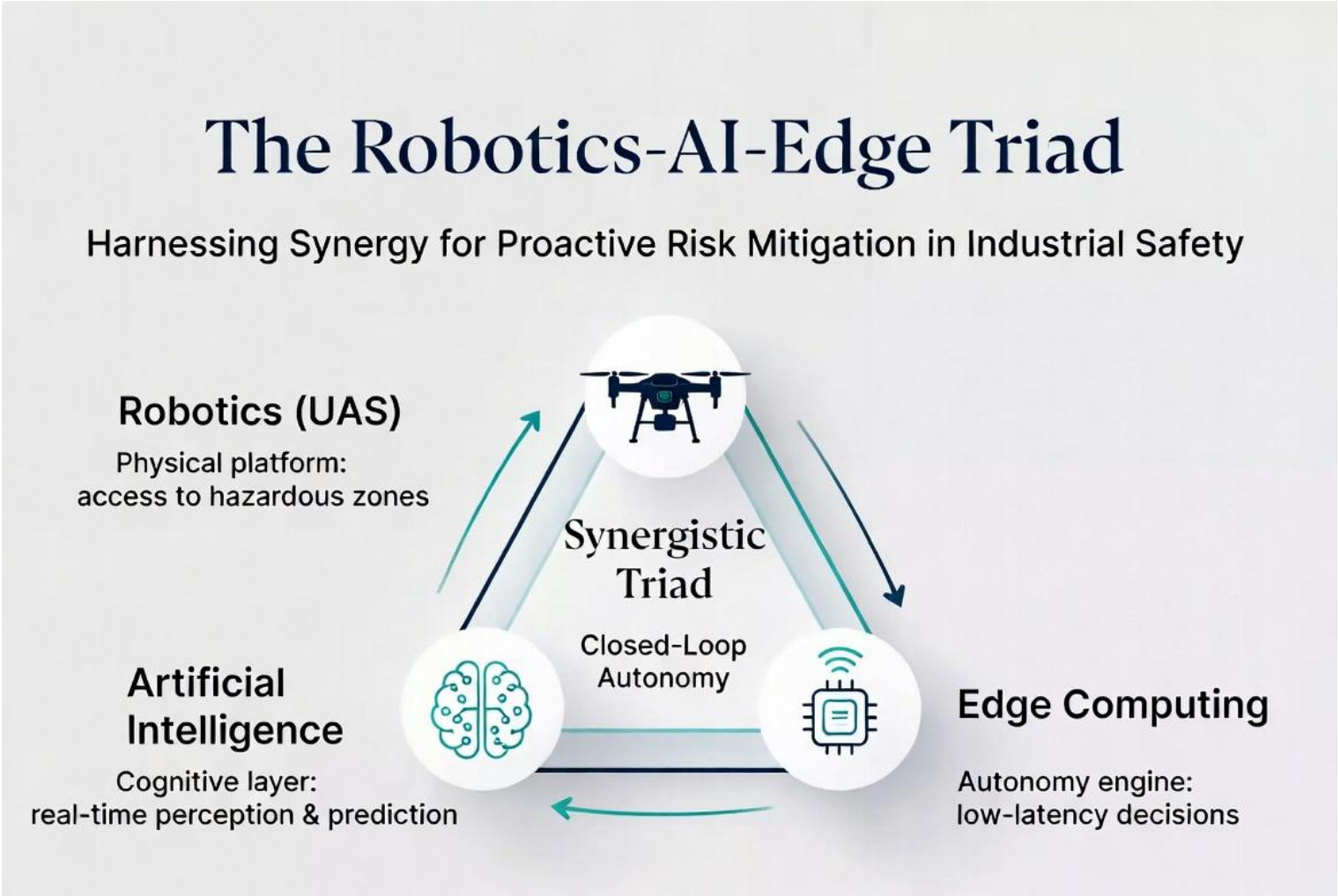
Industrial Applications – UAS



Robotics, AI, and Edge Technology Triad

Component	Role in EHS	Synergistic Impact	Reference
Robotics (UAS)	Physical platform: agile flight, multi-sensor integration, payload deployment	Grants access to inaccessible or hazardous areas (e.g., heights >50m or toxic zones)	FAA UAS Integration Report, 2025[1]
AI	Cognitive layer: real-time perception, anomaly detection, adaptive learning	Transforms raw data (e.g., thermal/LiDAR) into predictive insights	IEEE AI for Robotics Survey, 2024[2]
Edge Computing	Autonomy engine: on-board processing, low-latency execution	Facilitates <100 ms responses independent of cloud latency	NVIDIA Edge AI Whitepaper, 2025[3]

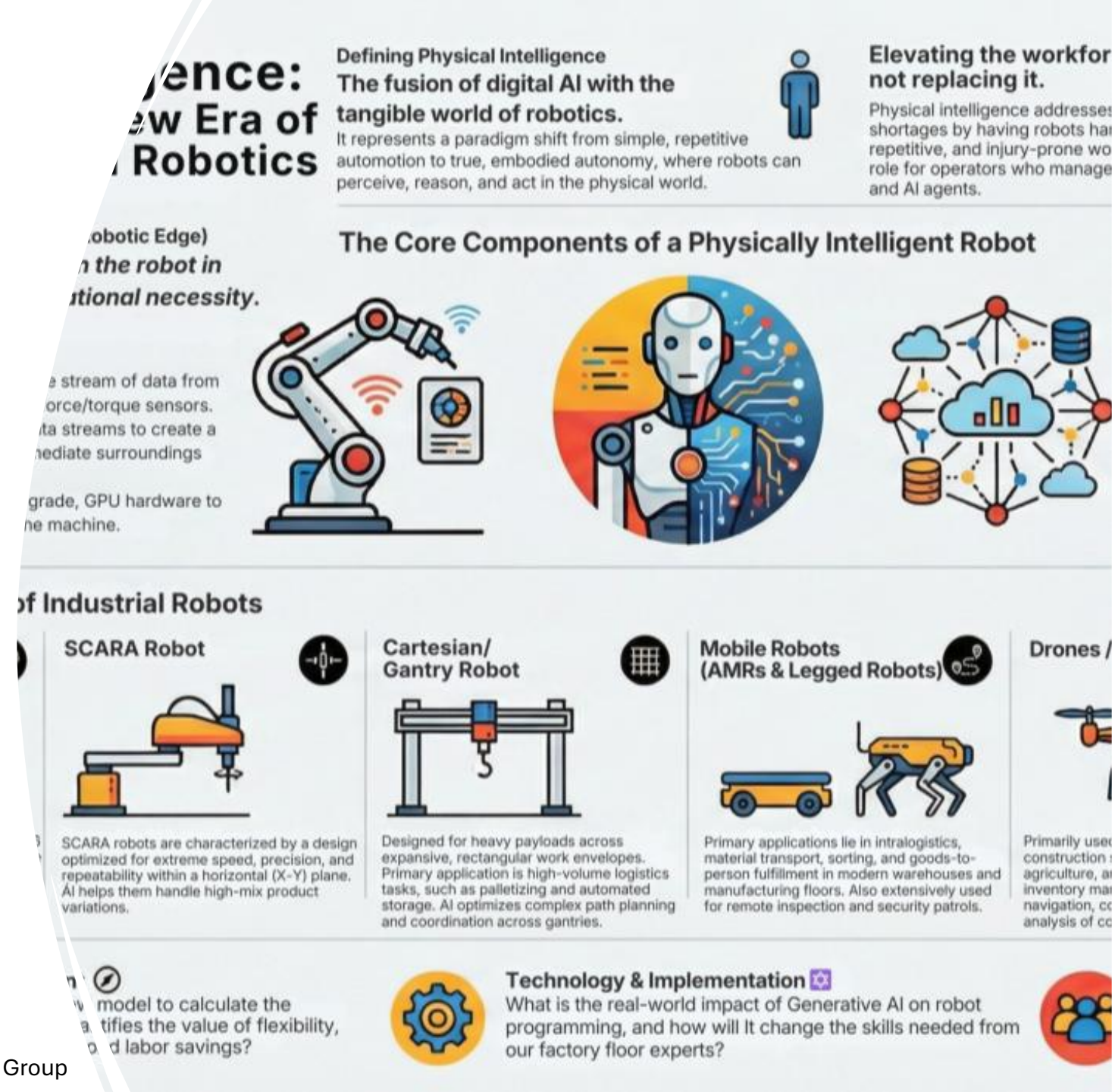
Source: Risk Hackers (2025)

Robotics, AI, and Edge Technology Triad

- **The whole is greater than the sum**:
    - **Robotics** ensures physical reach
    - **AI** deciphers complex patterns (e.g., gas dispersion models)
    - **Edge** enables split-second actions like evasive maneuvers.

- This yields **closed-loop autonomy**, evolving drones into proactive **EHS guardians**.

A 2025 MIT study confirms triad integration reduces human error by 87% in industrial inspections.[4]



Source: ARC Advisory Group

Oil & Gas + Chemical

– Confined Space Zero-Entry & Emission Hunting

•**Oil & Gas**: Flare-stack thermal imaging, tank/vessel inspections — 93% ↓ entry permits, $2.1M+ annual savings per site.

•**Chemical**: Fugitive VOC/emission detection with gas analyzers — 34% ↓ VOCs, rapid leak mapping.

•**Triad in Action**: AI spots >180°C anomaly or corrosion via hyperspectral imaging → Edge enforces safety buffer & replans → Robotics executes targeted scan (98% accuracy in pilots).

Source: Elios2, Flyability

Mining & Rail

– Autonomous Slope Monitoring & Predictive Track Maintenance

•**Mining**: LiDAR-based slope stability & stockpile monitoring — 95% ↓ worker exposure, 40% ↓ failures (Codelco-style operations).

•**Rail**: Swarm or single-drone track/bridge scans — 300% ↑ defect detection, 65% ↓ risk.

•**Triad in Action**: Robotics navigates dynamic terrain → AI generates 3D corrosion/erosion models → Edge plans optimal paths (cm-level precision).
•**EHS Impact**: Zero-entry reactor-style inspections + predictive maintenance prevent incidents before they occur.

Source: Progressive Railroading

Wildfire Response & Maritime
– Perimeter Mapping & Offshore Platform Integrity

- **Wildfire**: Swarm fixed-wing/VTOL drones for perimeter mapping, hotspot detection & autonomous retardant deployment — 70% faster containment, 50% ↓ firefighter exposure (CAL FIRE pilots).

- **Maritime/Offshore**: Wave-tolerant UAS with sonar/thermal payloads — 82% ↓ diver interventions, $1.5M+ savings (Equinor North Sea).

- **Triad in Action**: AI predicts fire spread from plume analysis; Edge adjusts for 40+ knot winds; Robotics deploys payloads safely.

UAS
Industry ROI, Future Vision & Activation Roadmap

ROI Summary (Triad-Enabled Outcomes):

- **Mining/Oil & Gas**: $2–3M+ annual savings; 93–95% exposure reduction.

- **Rail/Chemical:** $1.9–4.8M; 34–300% detection/risk gains.

- **Wildfire/Maritime:** 70% faster response; $1.5M+ + lives/property saved.

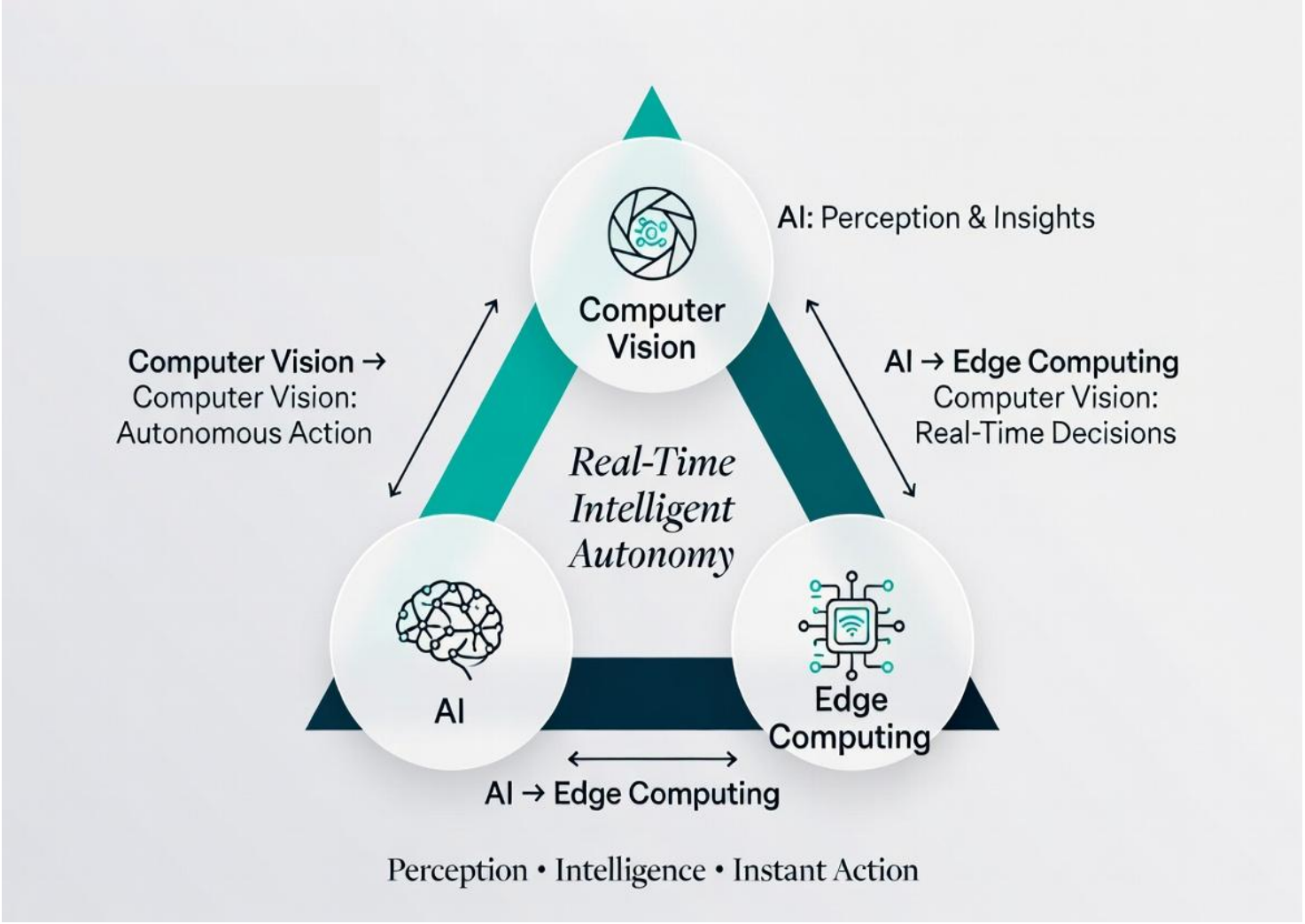
3-Phase Roadmap:
(0–3 mo) Pilot (Robotics + Edge) – 1–2 live use cases.

(4–12 mo) AI integration – 90% autonomy.

(12+ mo) Fleet scaling + BVLOS – ROI >300%.

Industrial Applications –

Sensor & Computer Vision



Real-Time Visual Intelligence for Proactive Risk Mitigation

The Computer Vision Triad

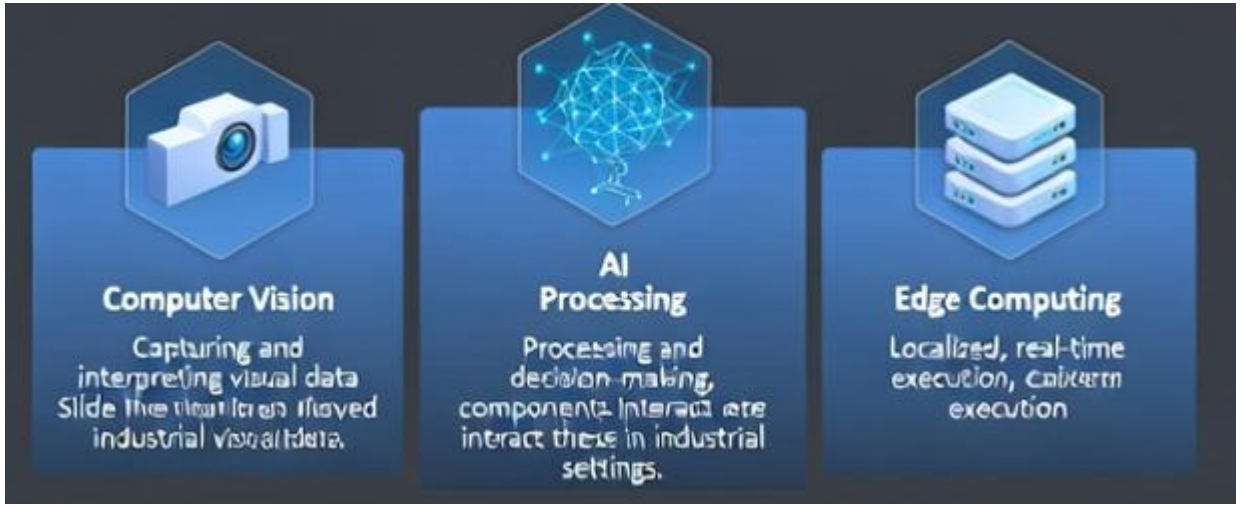
Sensors & Cameras: Fixed/PTZ + OGI/thermal for invisible threats.

AI/CV Models: 96%+ PPE/anomaly detection.

Edge Computing: Sub-100 ms inference, 85–95% data reduction.

Synergistic Impact: Transforms passive cameras into proactive guardians — up to 96% accuracy in PPE detection and 20–40% injury reduction.

Computer Vision (CV) and Sensors acts as the perceptive brain in EHS — processing RGB, thermal, Optical Gas Imaging (OGI), and multimodal feeds with deep learning to detect hazards, defects, and unsafe behaviors instantly, integrated with edge AI for autonomous alerts and robotics/drones for action.



Oil & Gas + Chemical

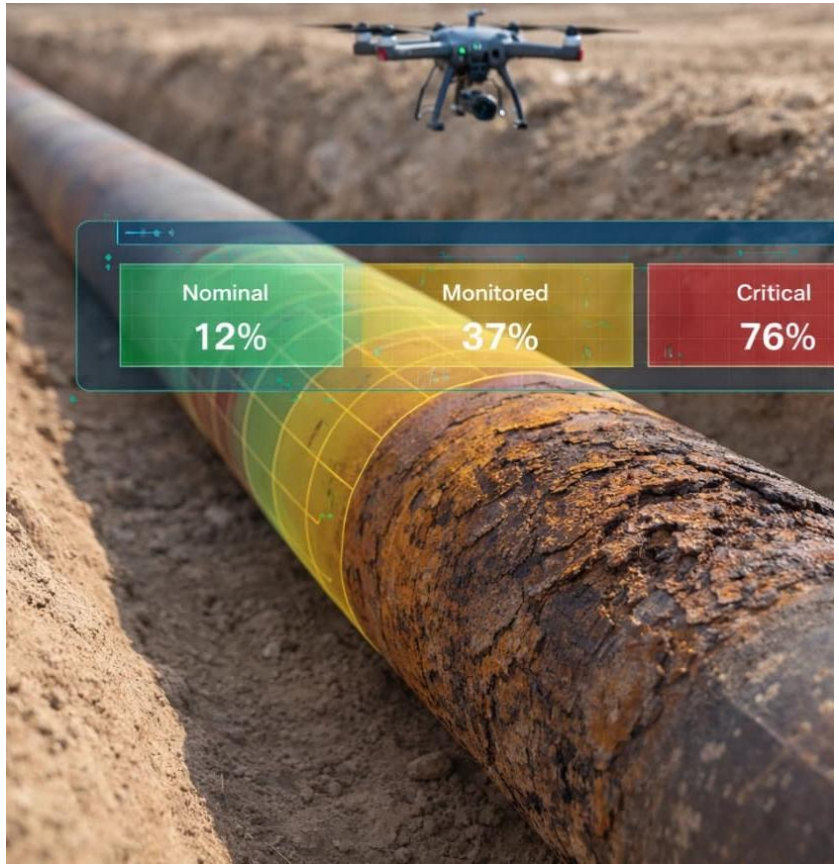
– Automated Leak Detection & Asset Integrity

•**Oil & Gas**: AI-enhanced OGI for methane/VOC visualization + corrosion mapping on pipelines, tanks, and flare stacks.

•**Chemical**: Real-time fugitive emission hunting and micro-defect detection.

•**CV in Action**: spot gas plumes or corrosion (≥0.05 mm) → Edge confirms and quantifies instantly → Triggers PTZ zoom or alerts (high accuracy in FLIR-style deployments).

•**EHS Impact**: Eliminates manual inspections in hazardous zones, cuts regulatory fines, and prevents incidents before they escalate.

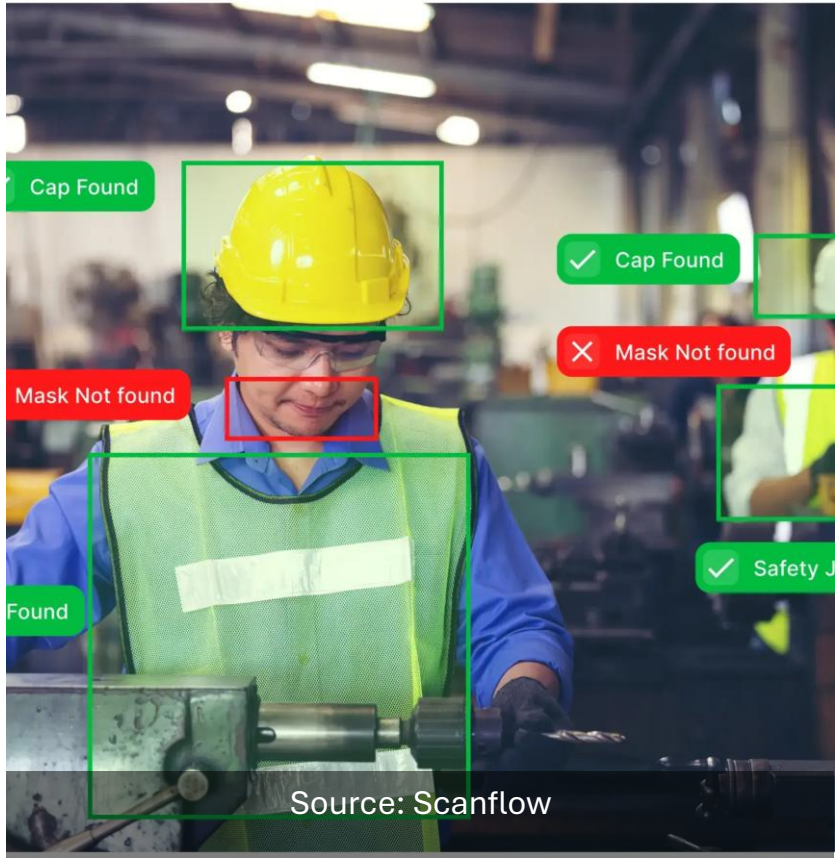


Construction & Manufacturing
– PPE Compliance, Hazard Monitoring & Defect Detection

- **Construction**: Real-time PPE detection (helmets, vests, harnesses), fall-hazard & proximity alerts, unsafe behavior monitoring on dynamic sites.
-
- **Manufacturing**: Assembly-line defect detection, machine-guarding violations, ergonomic posture monitoring.

- **CV in Action**: Edge AI analyzes live feeds at 96%+ accuracy → Instant alerts + automated shutdowns or PTZ zoom (Visionify-style deployments).

- **EHS Impact**: PPE compliance reaches 96%, 30–50% accident reduction, plus quality improvements from early defect catching.



Mining & Rail

– PPE Compliance & Hazard Monitoring

•**Mining**: Real-time PPE detection, restricted-zone intrusion alerts, and visual slope stability monitoring.

•**Rail**: Track/bridge defect detection and obstacle identification via fixed or mobile cameras.

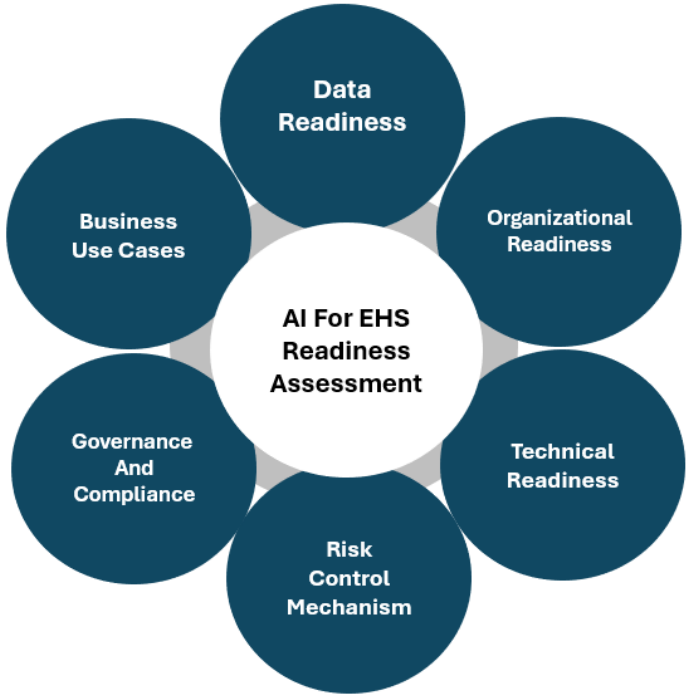
•**CV in Action**: Cameras feed video to edge models that analyze PPE compliance and unsafe behaviors at 96%+ accuracy → Immediate audible/visual alerts + 3D mapping support.

•**EHS Impact**: PPE compliance jumps to 96%, with 30–50% accident reduction in dynamic environments.

Source: Ripik Vision AI

Case Study:

AI for Serious Injury and Fatality Prevention



Business Value

Why use an Intelligent SIF Prevention Application?

Value

- Improve efficiency and consistency >> 99.9%.
- Instant response
- Scalable
- Resource optimization
- Reduced SIF events
- Lower operational downtime
- Insurance & compliance savings
- Workforce confidence & productivity

Quality Reliability

- Application of multiple experts/models
- Consistently applied evolving criteria
- Reliable reproducible outputs

Future Readiness

- Intelligence orientation
- Quality data asset sharpens decision making
- SIF recognition learning

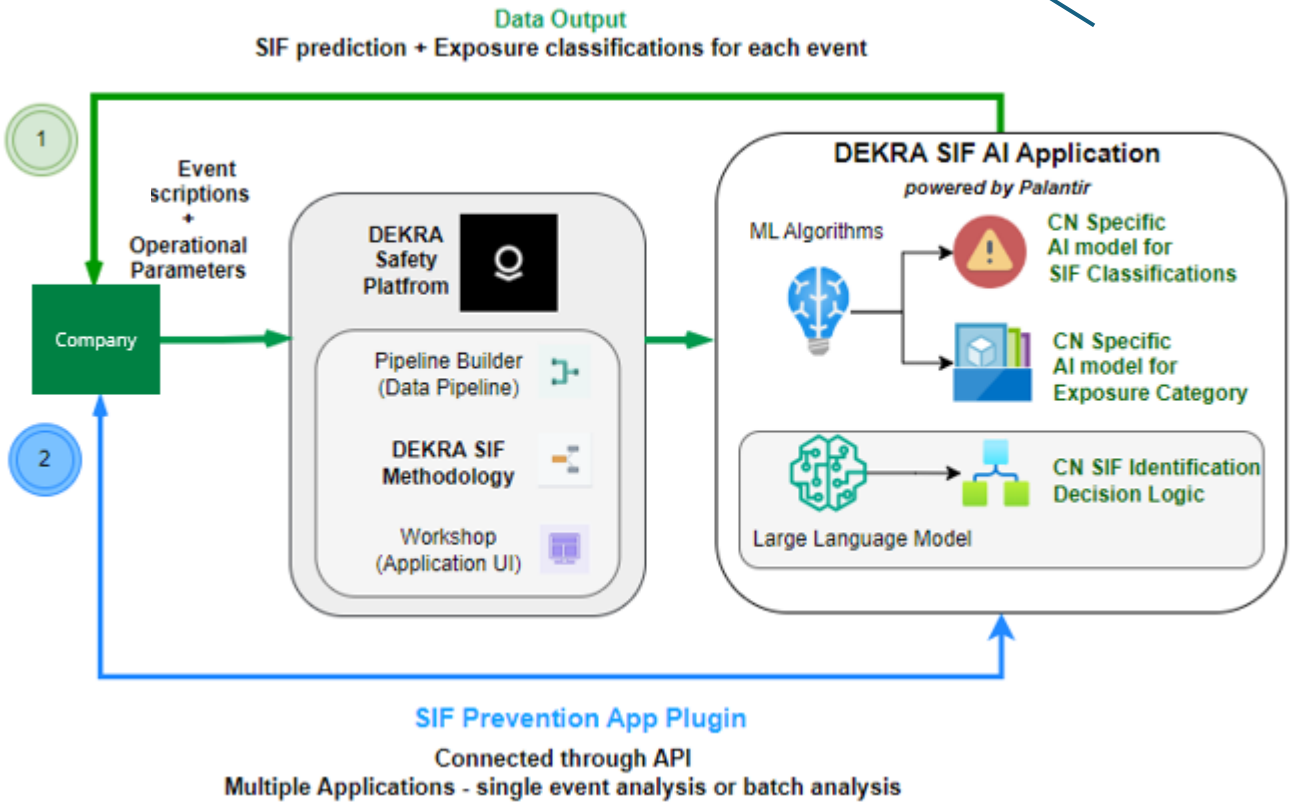
New Prevention Paradigm

- Increase system risk sensitivity – currently hidden or weak signals
- From predictive to prescriptive insights
- Internal and external benchmarking

• AI SIF Prevention Application

AI models specifically trained on Organization data specific event descriptions.

With prevention AI tool ready, organization can access, interact, download data with the SIF intelligent tool to classify SIF potentials and exposure categories to benefit from industry benchmarks



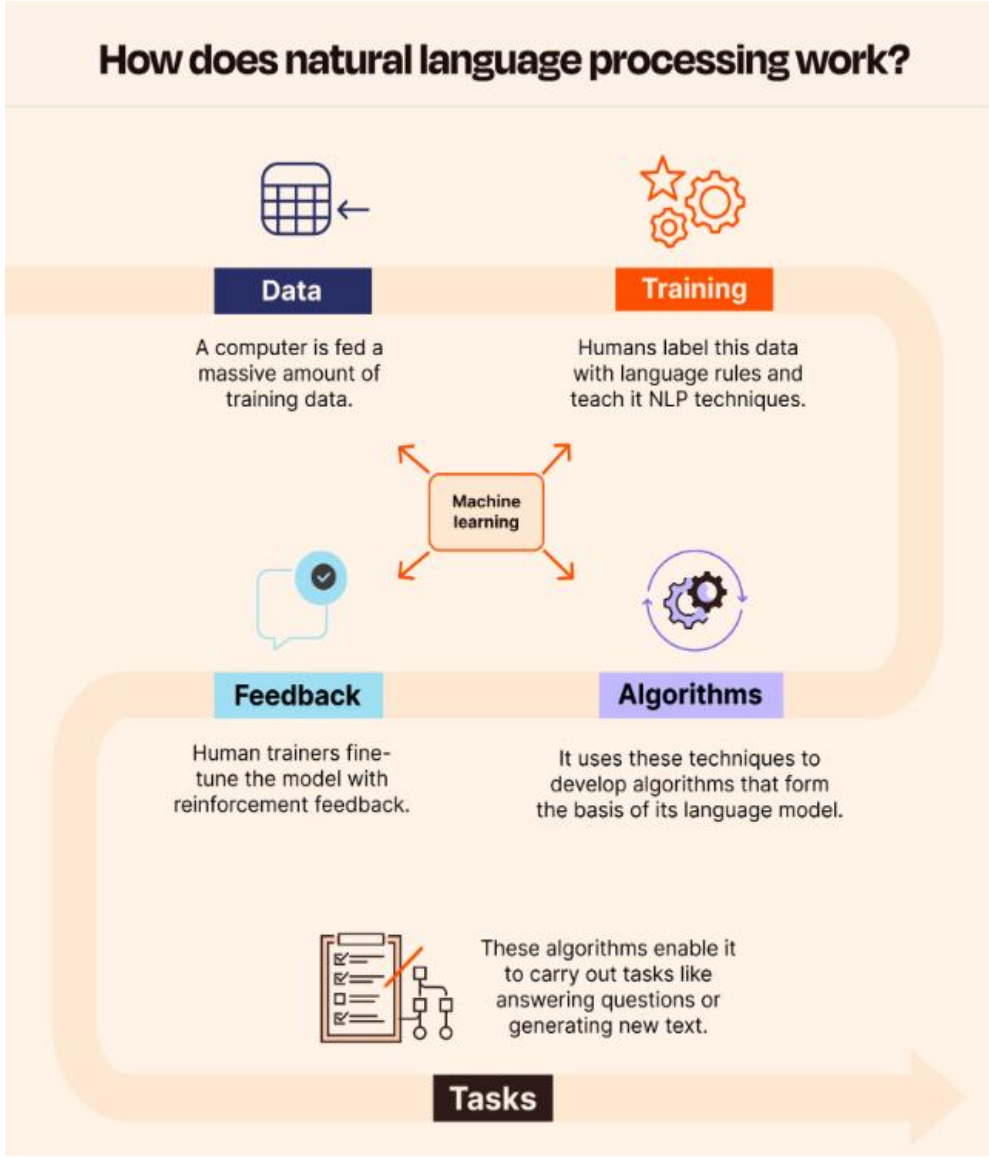
The Intelligent SIF prevention tool can be plugged in to an organization's management system via API to interact directly with the tool and access model outputs

- **DEKRA SIF Prevention Expertise**
- **Powered by Palantir Platform**

- Rapid Data Injection
- Multiple AI Predictive Models

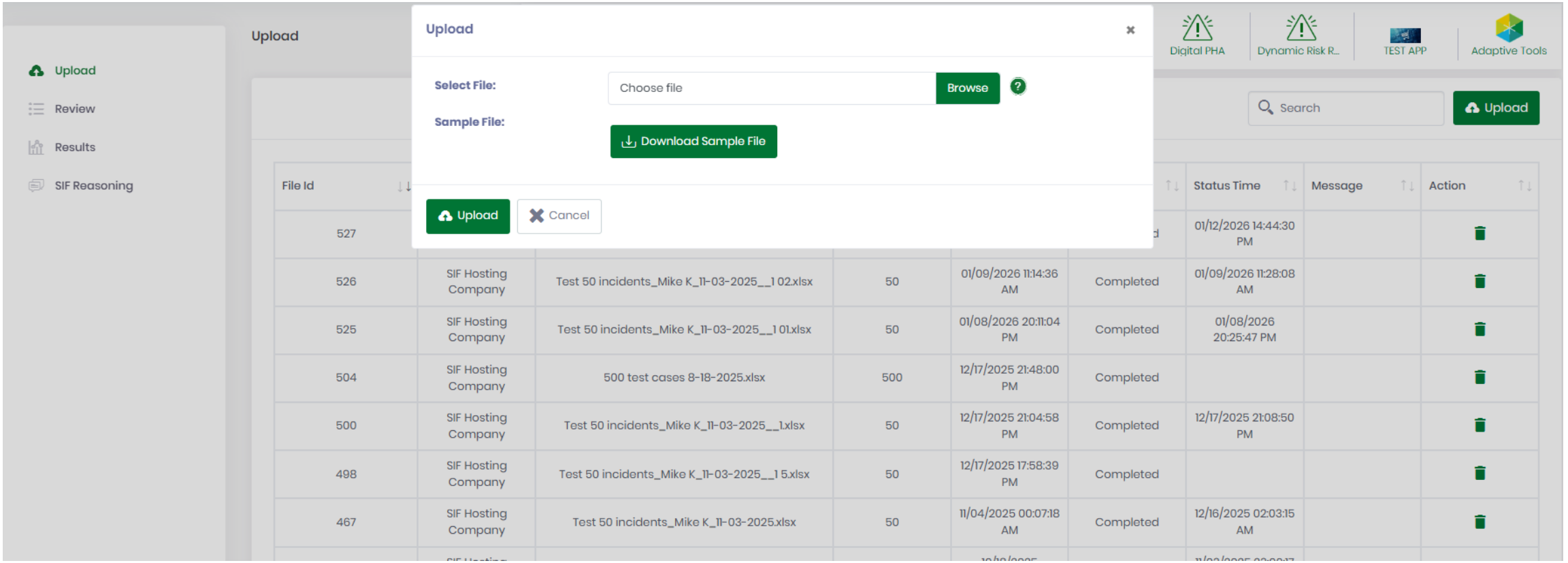
  + SIF prevention decision logic
- Continuous Learning from and for human and machine
- Intelligence at the incident entry point

  and throughout SIF prevention life cycle
- Progress together with evolving risk profiles



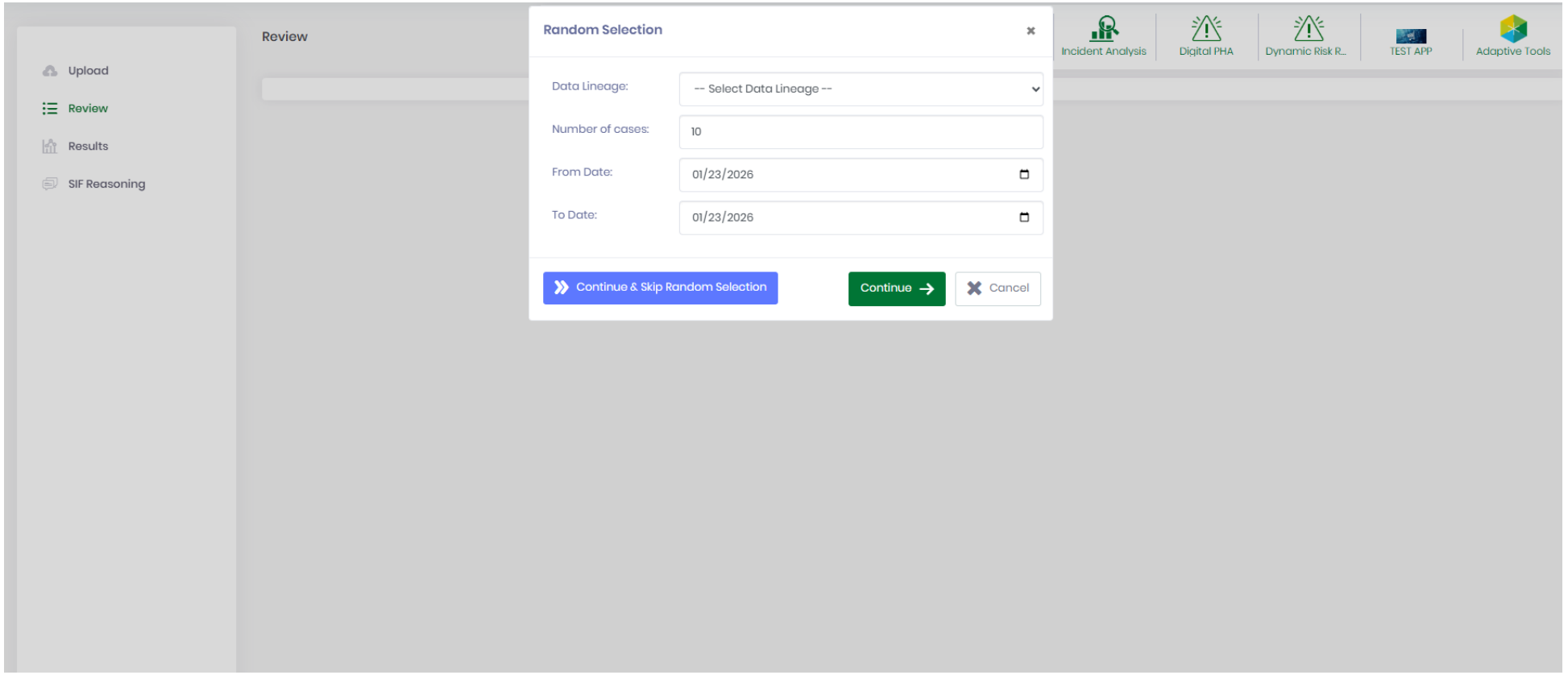
SIF Prevention

- **Data Upload UI**



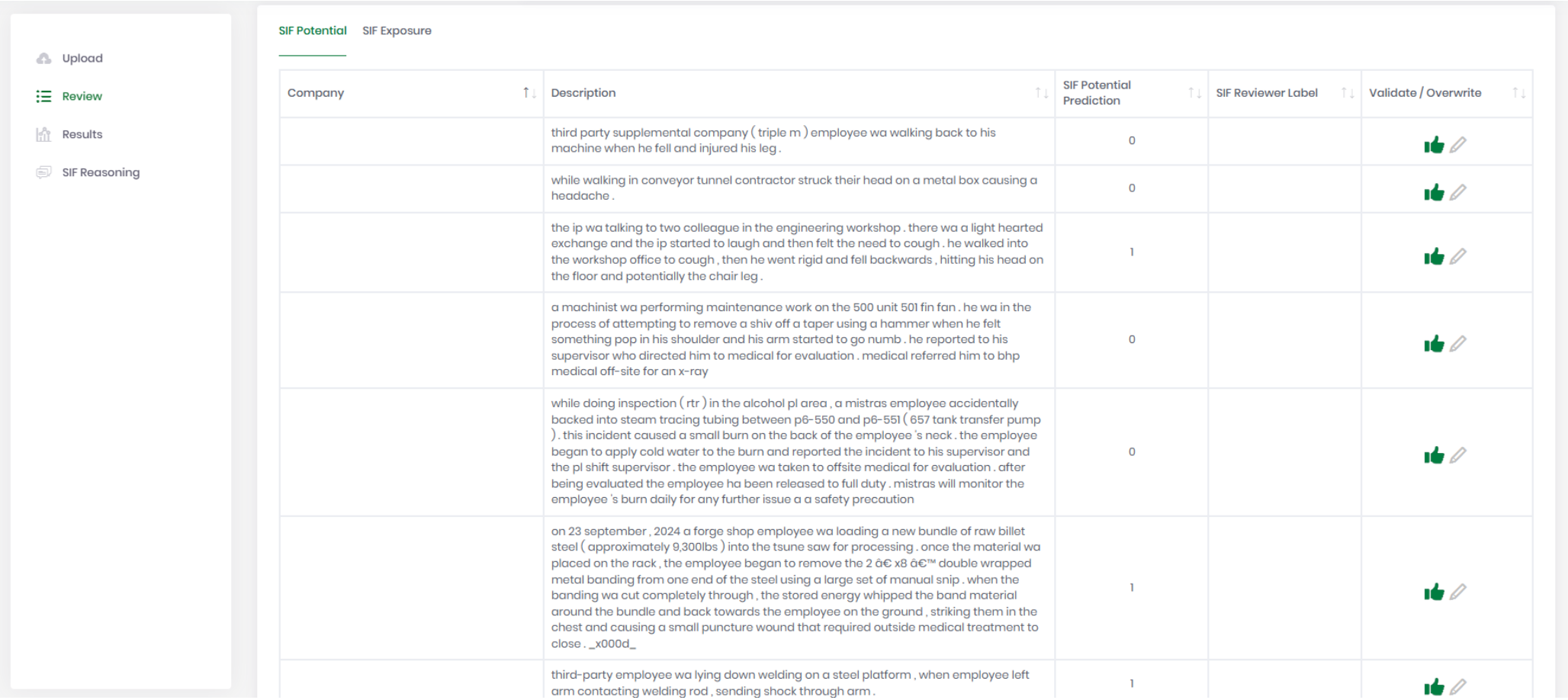
AI Prediction Augmented Expert Review Exercise

- Option for Randomized Review



AI Prediction Augmented Expert Review Exercise

- **Human in the Loop**
- **Review & Re-Training**



• Identify SIF Potential in Textual Data

Narrative Today, Video and Telemetry Tomorrow

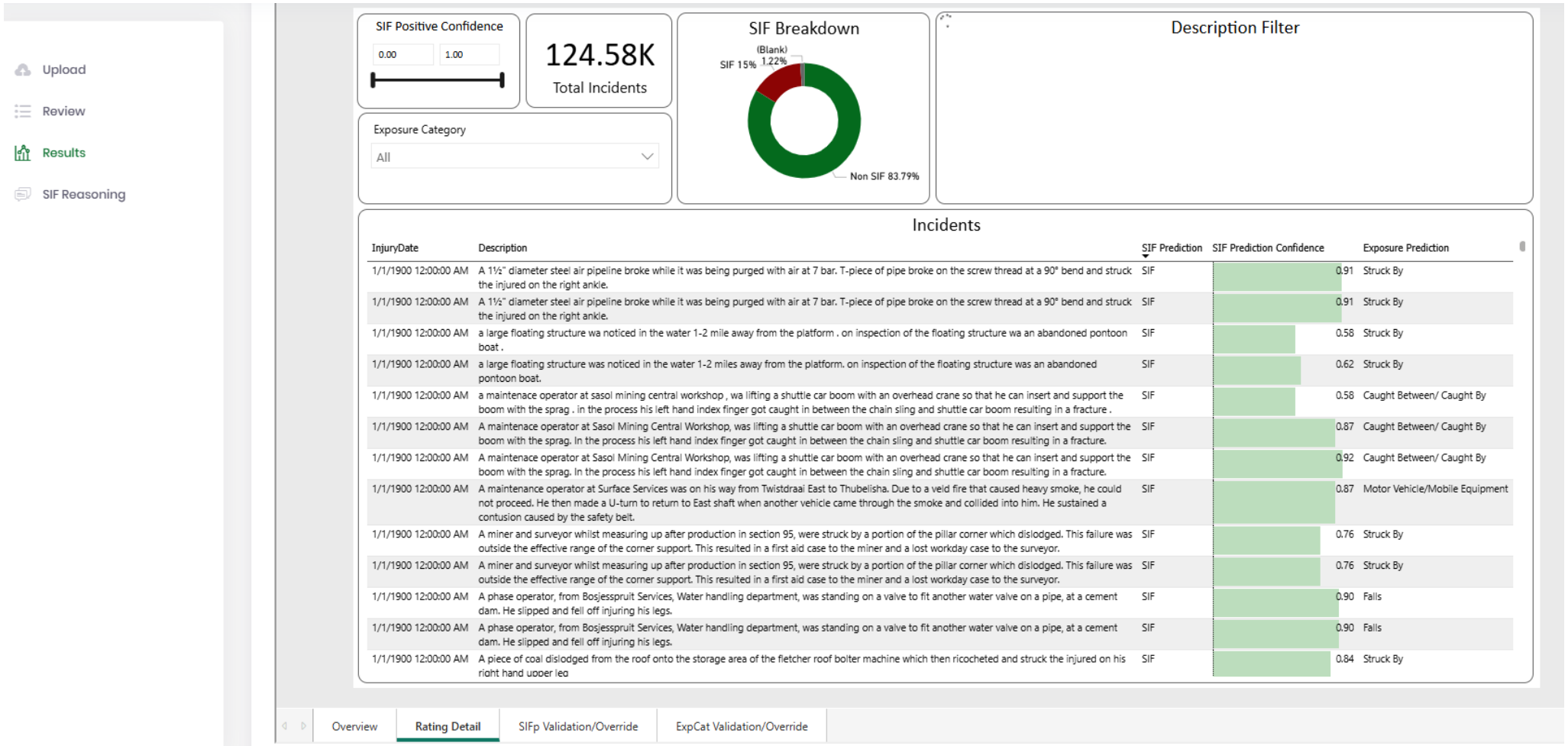
New data added to your narratives includes an expert SIF label, an AI prediction of SIF potential, and a confidence statistic

Enrich today's data with SIF potential classification using AI models trained by industry specific data

Description	SIF Label	Predicted SIF Potential	SIF Potential	Dekra Exposure	Data Source
aluminum cone, that was lodged in the second step, while walking down a set of stairs. This caused the employee to twist his right leg and fall the remaining 3 stairs. Employee immediately notified his shift manager who called safety and medical. Upon investigation it was found that the aluminum cone had traveled 22 feet over to the stairs from the Degas alloy area. Employee stated that he was using the hand rails when this happened and that he didn't see the cone while walking. Employee was transferred to Oakwood Hospital for further evaluation	SIF	Non SIF	30%	Hazardous Substance Contact	master
an employee was walking across the parking lot, slipped on ice and fell injuring the left knee.	SIF	SIF	90%	Missteps and Fall - Same and Different Level	osha
an employee was walking and fell breaking a rib and puncturing a lung.	SIF	SIF	100%	Ergonomic Risk Factor	osha
an employee was catching veneer material off a moving table. when the table moved upwards and then down, the employee's pinky fingertip was caught under the tabletop, resulting in a fingertip amputation.	SIF	SIF	100%	Struck Against/Struck By/Personal Contact	osha
an employee was helping unload a delivery truck while an all-terrain forklift was being used to remove a stuck side gate from the truck. the forklift began to raise the gate, which was caught on a pallet. the gate came loose from the pallet and struck the employee under the chin resulting in a broken jaw.	SIF	SIF	100%	Struck By/Contact With Power Equipment or Tool	osha

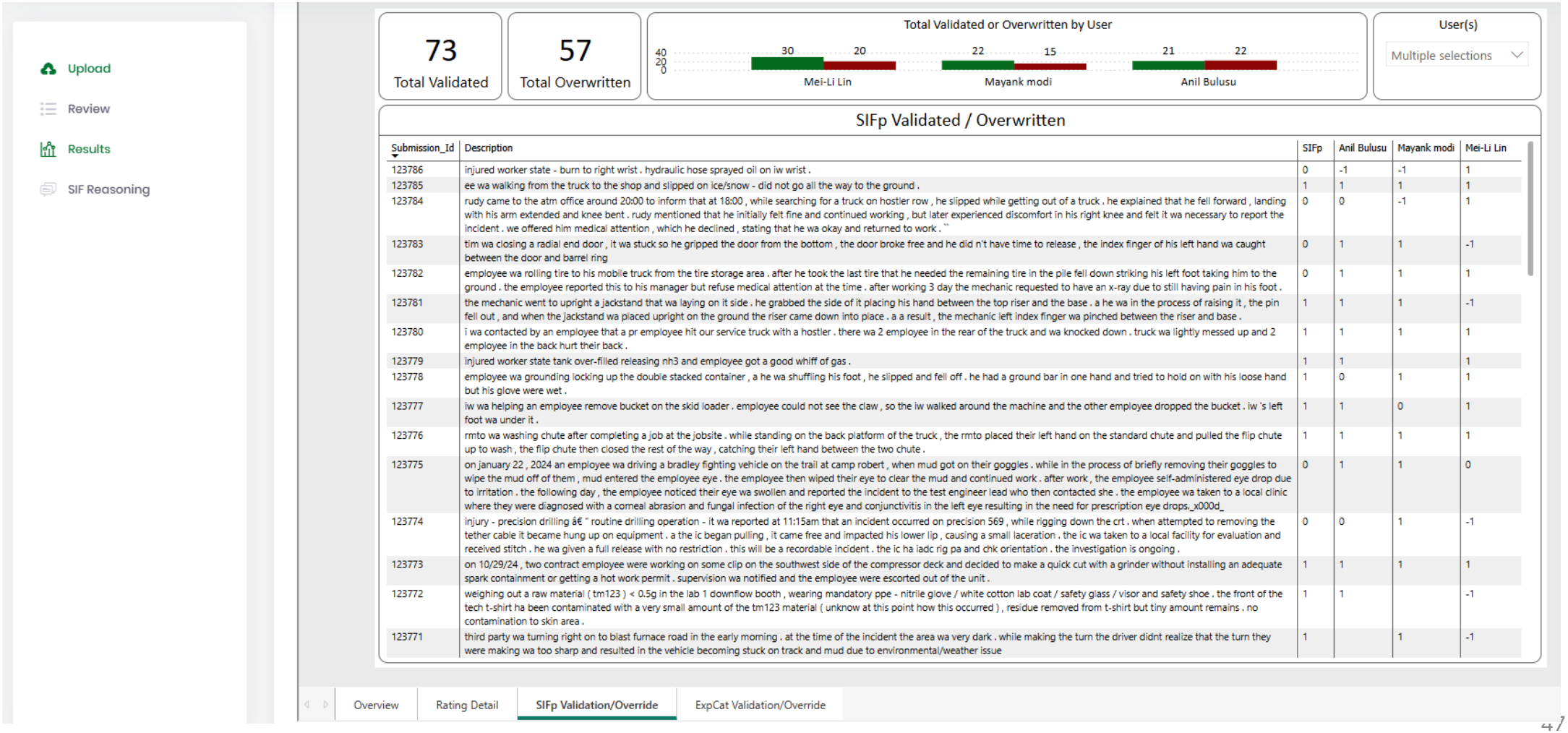
AI for SIF Prevention Decision Highlight

- **Confidence Scores**
- **User Experience**



AI for SIF Prevention

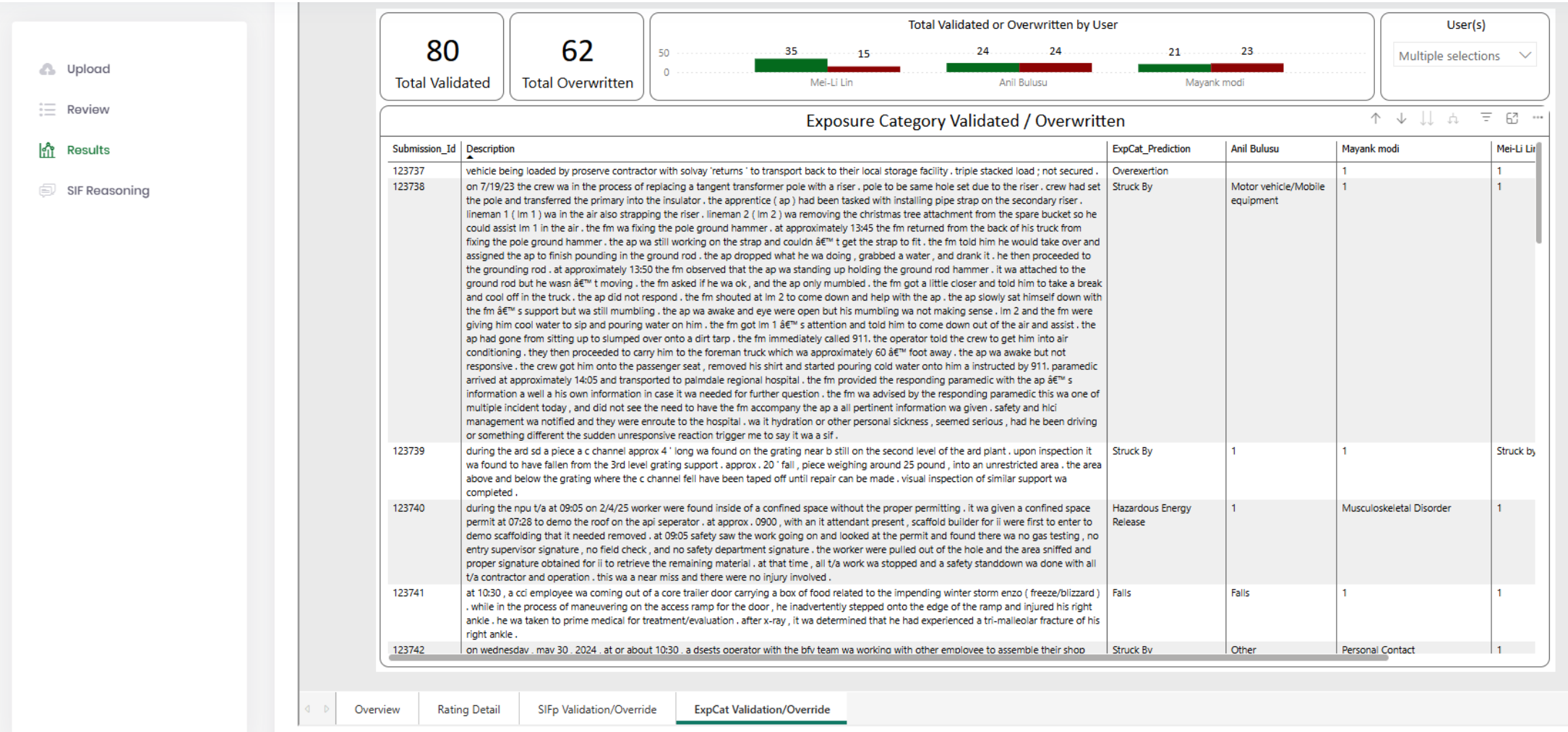
- **AI for SIF Sensitivity Training**



Submission_Id	Description	SIFp	Anil Bulusu	Mayank modi	Mei-Li Lin
123786	injured worker state - burn to right wrist . hydraulic hose sprayed oil on iw wrist .	0	-1	-1	1
123785	ee wa walking from the truck to the shop and slipped on ice/snow - did not go all the way to the ground .	1	1	1	1
123784	rudy came to the atm office around 20:00 to inform that at 18:00 , while searching for a truck on hostler row , he slipped while getting out of a truck . he explained that he fell forward , landing with his arm extended and knee bent . rudy mentioned that he initially felt fine and continued working , but later experienced discomfort in his right knee and felt it wa necessary to report the incident . we offered him medical attention , which he declined , stating that he wa okay and returned to work . ``	0	0	-1	1
123783	tim wa closing a radial end door , it wa stuck so he gripped the door from the bottom , the door broke free and he did n't have time to release , the index finger of his left hand wa caught between the door and barrel ring	0	1	1	-1
123782	employee wa rolling tire to his mobile truck from the tire storage area . after he took the last tire that he needed the remaining tire in the pile fell down striking his left foot taking him to the ground . the employee reported this to his manager but refuse medical attention at the time . after working 3 day the mechanic requested to have an x-ray due to still having pain in his foot .	0	1	1	1
123781	the mechanic went to upright a jackstand that wa laying on it side . he grabbed the side of it placing his hand between the top riser and the base . a he wa in the process of raising it , the pin fell out , and when the jackstand wa placed upright on the ground the riser came down into place . a a result , the mechanic left index finger wa pinched between the riser and base .	1	1	1	-1
123780	i wa contacted by an employee that a pr employee hit our service truck with a hostler . there wa 2 employee in the rear of the truck and wa knocked down . truck wa lightly messed up and 2 employee in the back hurt their back .	1	1	1	1
123779	injured worker state tank over-filled releasing nh3 and employee got a good whiff of gas .	1	1		1
123778	employee wa grounding locking up the double stacked container , a he wa shuffling his foot , he slipped and fell off . he had a ground bar in one hand and tried to hold on with his loose hand but his glove were wet .	1	0	1	1
123777	iw wa helping an employee remove bucket on the skid loader . employee could not see the claw , so the iw walked around the machine and the other employee dropped the bucket . iw 's left foot wa under it .	1	1	0	1
123776	rmto wa washing chute after completing a job at the jobsite . while standing on the back platform of the truck , the rmto placed their left hand on the standard chute and pulled the flip chute up to wash , the flip chute then closed the rest of the way , catching their left hand between the two chute .	1	1	1	1
123775	on january 22 , 2024 an employee wa driving a bradley fighting vehicle on the trail at camp robert , when mud got on their goggles . while in the process of briefly removing their goggles to wipe the mud off of them , mud entered the employee eye . the employee then wiped their eye to clear the mud and continued work . after work , the employee self-administered eye drop due to irritation . the following day , the employee noticed their eye wa swollen and reported the incident to the test engineer lead who then contacted she . the employee wa taken to a local clinic where they were diagnosed with a corneal abrasion and fungal infection of the right eye and conjunctivitis in the left eye resulting in the need for prescription eye drops._x000d_	0	1	1	0
123774	injury - precision drilling â€ " routine drilling operation - it wa reported at 11:15am that an incident occurred on precision 569 , while rigging down the crt . when attempted to removing the tether cable it became hung up on equipment . a the ic began pulling , it came free and impacted his lower lip , causing a small laceration . the ic wa taken to a local facility for evaluation and received stitch . he wa given a full release with no restriction . this will be a recordable incident . the ic ha iadc rig pa and chk orientation . the investigation is ongoing .	0	0	1	-1
123773	on 10/29/24 , two contract employee were working on some clip on the southwest side of the compressor deck and decided to make a quick cut with a grinder without installing an adequate spark containment or getting a hot work permit . supervision wa notified and the employee were escorted out of the unit .	1	1	1	1
123772	weighing out a raw material (tm123) < 0.5g in the lab 1 downflow booth , wearing mandatory ppe - nitrile glove / white cotton lab coat / safety glass / visor and safety shoe . the front of the tech t-shirt ha been contaminated with a very small amount of the tm123 material (unknow at this point how this occurred) , residue removed from t-shirt but tiny amount remains . no contamination to skin area .	1	1		-1
123771	third party wa turning right on to blast furnace road in the early morning . at the time of the incident the area wa very dark . while making the turn the driver didnt realize that the turn they were making wa too sharp and resulted in the vehicle becoming stuck on track and mud due to environmental/weather issue	1		1	-1

AI for SIF Prevention

- **AI for Exposure Identification**



• Automation in Exposure Category identification

Exposure category - what issues need attention for SIF prevention

Exposure categories fit for purpose and risk profile.

Increased confidence in exposure category assignment

New data added to your narratives includes an AI predicted Exposure Categories

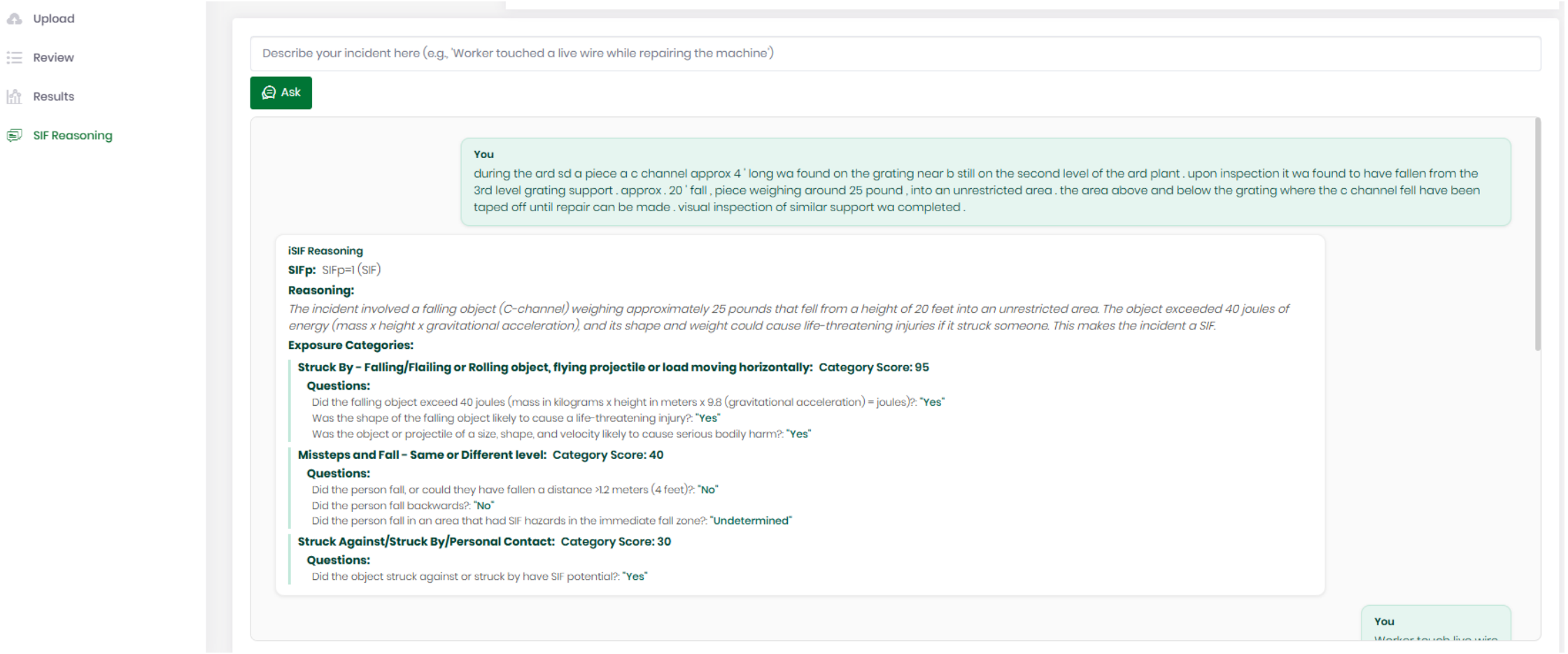
Description	an employee was leaving the sleep berth of a truck when she fell, breaking her left knee.
Dekra Expos…	Motorized Equipment Operation
Top 1 Score	90%
Data Source	osha
Top 2 Category	(Pedestrian) Struck By - Motorized Equipment or Vehicle
Top 2 Score	85%
Top 3 Category	Ergonomic Risk Factor
Top 3 Score	78%

Description	the employee was removing panels from a roof during building demolition. he stepped on a weak section of the fiberglass roof and fell through breaking his femur.
Dekra Expos…	Ergonomic Risk Factor
Top 1 Score	88%
Data Source	osha
Top 2 Category	Struck Against/Struck By/Personal Contact
Top 2 Score	87%
Top 3 Category	Missteps and Fall - Same and Different Level
Top 3 Score	65%

Description	Laceration Thigh Right. The grinder kicked back while in use toward the team member.. Team member was grinding on a new metal plate.. Team Member was replacing a metal plate on a auger to prevent product from leaking out and getting water in the mill. The TM was in the last stages of replacing the plate and completing his task. Team member was grinding on the vertical plate of the auger , when the tool contacted the underside of the lid causing the grinder to kick back toward the team member.. The tool came back and struck the team member. Team member was grinding on the 1228 auger feeding pet 1 elevator and hit the underside of the lid
Dekra Expos…	Struck By/Contact With Power Equipment or Tool
Top 1 Score	98%
Data Source	nr
Top 2 Category	Struck Against/Struck By/Personal Contact
Top 2 Score	98%
Top 3 Category	Motorized Equipment Operation

AI for SIF Prevention

- **LLM for Reasoning**



• Applying SIF Decision Logic

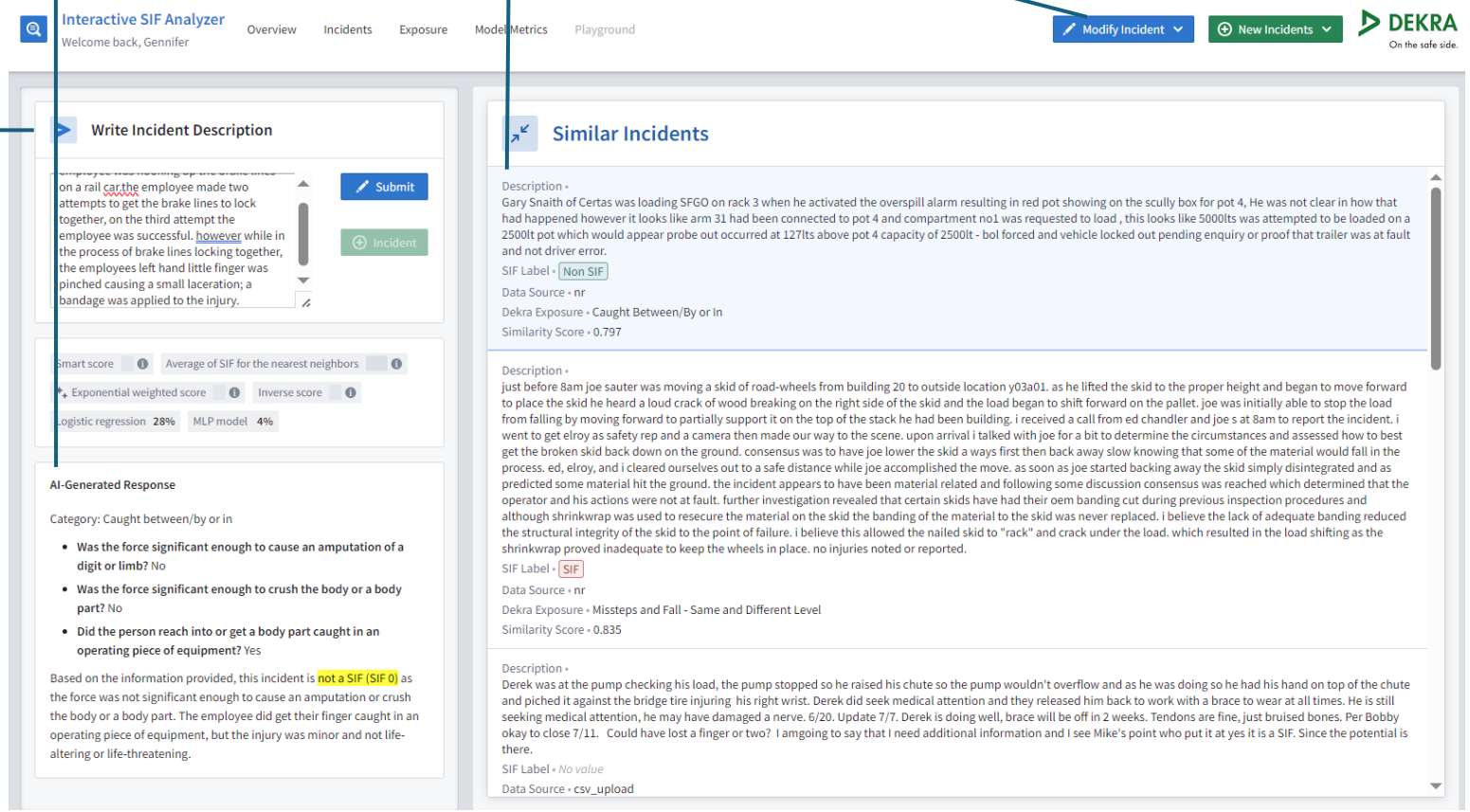
Fit for purposes and risk profiles

Insights into an event description (or other narrative).

Exposure classification questions identified with narrative answer

The referenced similar incidents are shown so that an expert user can see why the classification was selected

A correction can be made to the classification and/or the narrative



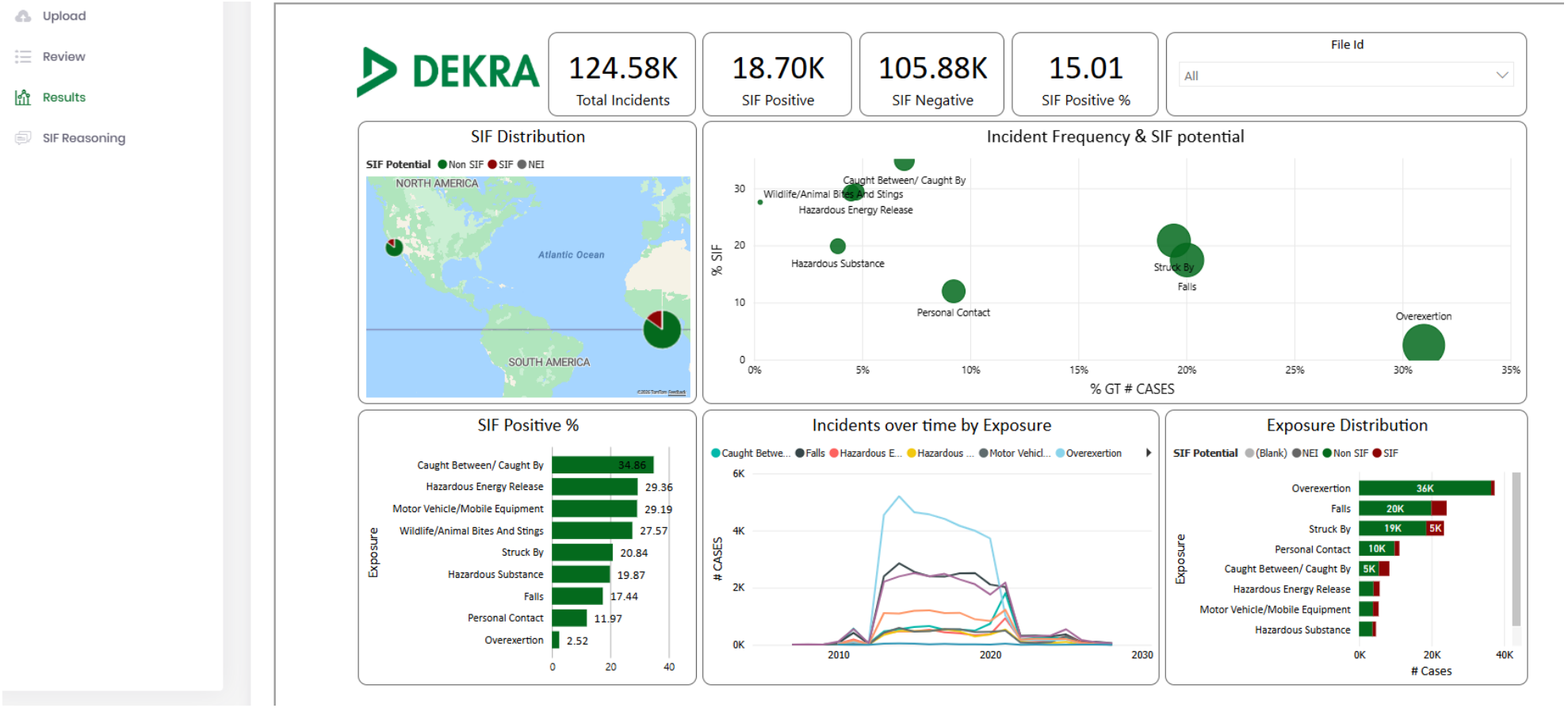
Experts support

- Classifications against decision workflows
- Classifying undecided (lower confidence items) and corrections
- Improving the questions asked for automation
- Further developing the model settings

The learning improves

AI for SIF Prevention

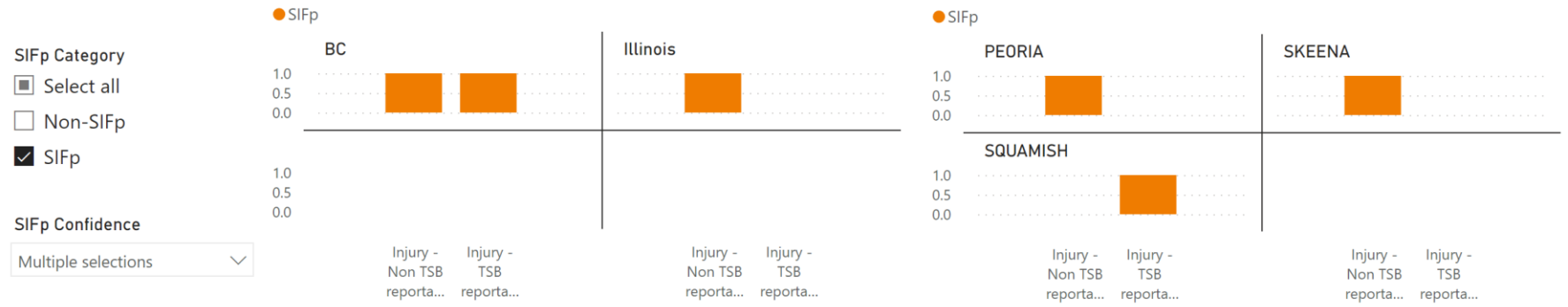
- **Focused Executable Actions**

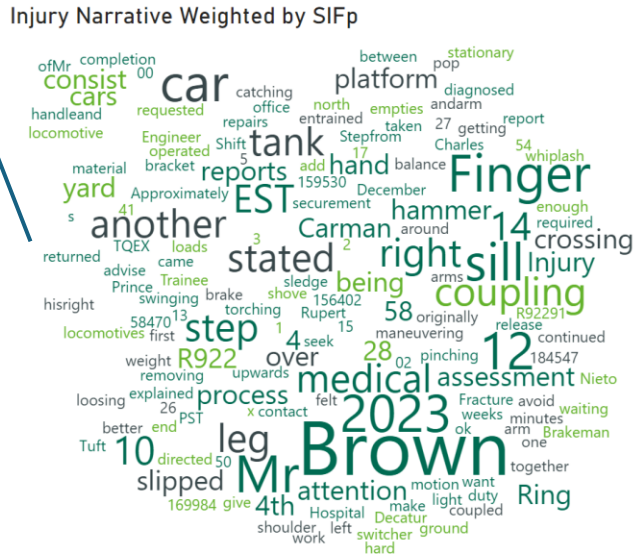


• Early Detection of Potential for Harm

Coupled with dashboards CN has developed, insights can point users to look deeper

The narrative commentary coupled with SIFp enables one to expand views about how the SIF potential is created and how to address it





Division	SIFp Category	SIFp Confidence	Narrative
BC	SIFp	0.85	* 2023/12/14 12:58:02 EST (156402) On December 13, 2023 at Approximately 10:50 PST Carman Charles Brown (159530) reports that he was in the process of removing a sill step to make required repairs on the TQEX 58470. After torching off the securement Mr. Brown reports that while in the process of swinging the sledge hammer in an upwards motion to release the Sill Stepfrom the bracket his 4th (Ring) Finger came into contact with the sill step pinching his finger between the hammer handleand the Sill Step material. Mr. Brown explained that he was ok and did not want to report the Injury. At the completion ofMr. Brown#s Shift (15:00) he returned to the office and advise that he would like to seek medical attention. Carman Brown was taken to the Prince Rupert Hospital for assessment. After medical assessment Mr. Brown was diagnosed with a #Tuft# Fracture of the 4th Finger (Ring) Finger on his right hand, and 4 weeks of light duty.
BC	SIFp	0.8	* 2023/12/27 14:26:58 EST (184547) Employee stated that he slipped while crossing over from one platform of a tank car to another platform of another tank car while they were coupled together. He stated this was to avoid maneuvering around the hand brake on the tank car he originally entrained. Crossing over first with his left leg and arm then with his right leg andarm. His right leg slipped, loosing his balance and catching his weight with his arms. This was when he felt a pop in hisright shoulder. He continued to work another 5-10 minutes when the injury was not getting better.
Illinois	SIFp	0.89	* 2023/12/28 17:54:41 EST (169984) Employee was on his stationary locomotive and consist (2 locomotives, 3 cars) at the north end of Decatur yard