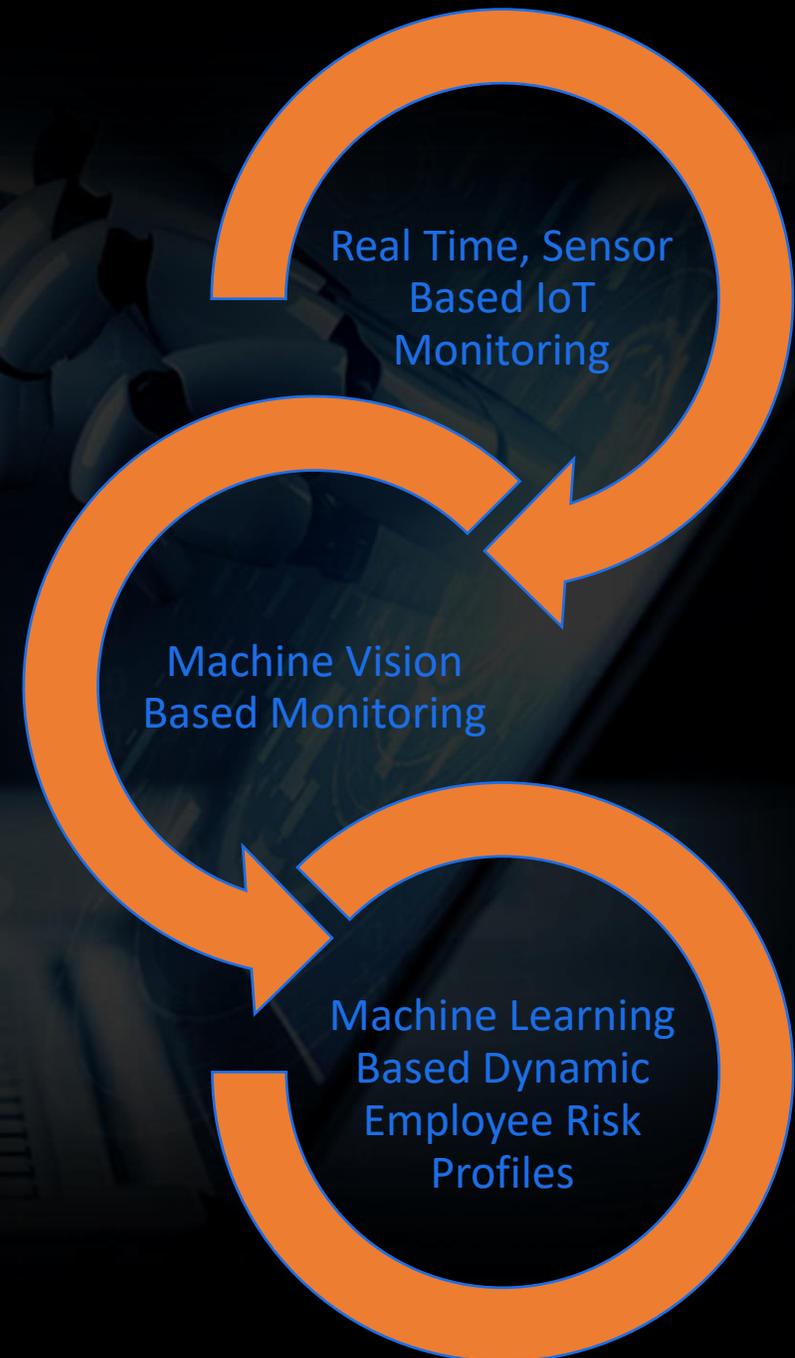


Predict & Prevent OH&S Incidents using Machine Learning, Machine Vision, IoT & Digital Twins



AI & ML Based, Safety, & Risk Minimisation

- **MONITOR** - Monitor Real-time IoT and Machine Vision based alerts (incl. personal protective equipment, hazards and mobile equipment risk) to ensure safety compliance today. Use Digital Twins for real-time visualisation and scenario modelling.
- **PREDICT** – Predict OH&S incidents by creating forward-looking machine learning-based 'Dynamic Employee Risk Profiles' to calculate an employee's chances of being involved in an incident on any upcoming day.
- **INTERVENE & PREVENT** – Prevent incidents by retraining, proactively removing employees from potentially dangerous situations and send live compliance alerts to employees to immediately eliminate dangerous working conditions.



Dynamic Risk Profiles

PREDICT – Create forward-looking AI/ML-based ‘Dynamic Employee Risk Profiles’ using role type, role risk, experience, age, recent overtime, recent sick leave, near misses, recent incidents, weather, risk culture, recency of training, and many other features to accurately predict the chances of an employee being involved in an OHS incident. Simplified example below:



Weather		Age	Rain Dependency	Heat Dependency	Role Risk Index	Years of Experience	Hours Worked LW	Calculated Overtime Worked LW	Sick Leave Taken LW	Dynamic Risk Rank
Rain	1	32	1	1	5	15	20	0	2	1
Heat	0	25	1	1	3	7	30	0	1	2
		52	0	1	6	11	69	31	0	3
		20	1	1	9	3	69	31	4	4
		35	0	0	2	6	38	0	0	5
		26	1	1	9	9	55	17	0	6
		43	1	1	8	6	38	0	3	7
		37	1	1	6	17	55	17	0	8
		48	1	1	7	23	20	0	3	9
		36	0	0	5	20	69	31	0	10
		30	0	0	7	14	47	9	5	11
		41	0	0	7	6	56	18	0	12
		39	0	1	6	11	21	0	2	13
		40	1	1	8	10	48	10	1	14
		25	1	1	8	3	70	32	3	15
		21	0	0	6	2	26	0	1	16
		52	0	0	2	16	26	0	0	17
		19	0	1	9	3	70	32	4	18
		32	0	1	8	10	28	0	0	19
		22	0	0	4	2	64	26	0	20
		32	0	0	4	3	45	7	0	21
		35	1	1	5	7	34	0	0	22
		37	1	1	10	6	62	24	0	23
		52	1	0	9	15	62	24	0	24
		56	1	1	6	19	35	0	2	25
		31	1	1	7	3	37	0	1	26
		58	0	0	2	20	64	26	4	27
		64	1	1	1	24	43	5	0	28
		31	1	0	7	14	70	32	5	29
		48	1	0	4	5	65	27	2	30

Weather		Age	Rain Dependency	Heat Dependency	Role Risk Index	Years of Experience	Hours Worked LW	Calculated Overtime Worked LW	Sick Leave Taken LW	Dynamic Risk Rank
Rain	1	20	1	1	9	3	69	31	4	1
Heat	0	31	1	0	7	14	70	32	5	2
		25	1	1	8	3	70	32	3	3
		52	1	0	9	15	62	24	0	4
		19	0	1	9	3	70	32	4	5
		48	1	0	4	5	65	27	2	6
		48	1	1	7	23	20	0	3	7
		56	1	1	6	19	35	0	2	8
		58	0	0	2	20	64	26	4	9
		26	1	1	9	9	55	17	0	10
		37	1	1	10	6	62	24	0	11
		43	1	1	8	6	38	0	3	12
		40	1	1	8	10	48	10	1	13
		64	1	1	1	24	43	5	0	14
		37	1	1	6	17	55	17	0	15
		30	0	0	7	14	47	9	5	16
		52	0	1	6	11	69	31	0	17
		32	1	1	5	15	20	0	2	18
		31	1	1	7	3	37	0	1	19
		25	1	1	3	7	30	0	1	20
		36	0	0	5	20	69	31	0	21
		22	0	0	4	2	64	26	0	22
		41	0	0	7	6	56	18	0	23
		35	1	1	5	7	34	0	0	24
		39	0	1	6	11	21	0	2	25
		21	0	0	6	2	26	0	1	26
		52	0	0	2	16	26	0	0	27
		19	0	1	8	10	28	0	0	28
		32	0	0	4	3	45	7	0	29
		35	0	0	2	6	38	0	0	30

Machine Vision, Monitoring & Alerts

Real Time, Sensor Based IoT Monitoring

- Noise, Vibration, Movement, Lighting, Hydration
- Hydration, Fatigue, Inattention
- Temperature, Machine Speed, RPM, Torque, Coolant Temperature
- Chemical Detection, Air Quality, CO2
- Real-time data on Recent Hours Worked, Overtime/Sick Leave, Role Risk Rating, Years of Experience

Real-time analytics from IoT sensors in the environment are used for alerts and also stored for advanced analytics.



Machine Vision Based Monitoring

- Safety Equipment, PPE (Hard Hats, High Visibility Vests, Eye Protection etc), Hazardous Material Security (Locks, Unauthorised Access, Appropriate Safety Equipment), Dust, Liquid Spills, Trip Hazards, Proximity Detection, Location Awareness, Poor Mobile Equipment Practices.
- Understanding complex video events in real time (e.g. traffic flow, people movements, weather events, accidents, incidents, threats, inspections, defect reduction, tracking, environmental assessments, drone footage assessment and much more.



This is one of our consultants on CCTV being assessed for appropriate PPE, in real time, with alerts and monitoring!

Predictive Analytics & Optimisation

Predict Events Using Machine Learning & Artificial Intelligence

Predict Incidents

- Predict OHS Incidents by combining incident history with environmental variables and staff activities.
- Machine-Learning-Based Dynamic Employee Risk Profiles.
- Hazard Identification.

Asset Monitoring and Safety Optimisation

- Predict catastrophic equipment failure that could lead to injury or fatality.
- Defective equipment identification.
- Determine safe asset use via statistical analysis and optimise asset safety.



Digital Twins

Real Time Visualisation & Scenario Modelling using Digital Twins

- 
- Centralise and Collect Data (SSOT).
 - Reporting and Dashboards.
 - Visualise Over Maps and Building Models (2D, 3D, Model).
 - Real-time, 4D model to include real-time data from systems and telemetry (i.e. APIs and IoT).
 - Feedback to/from systems and telemetry for decision support around operational safety and risk.
 - Complete Autonomous Operations and Risk Minimisation.

Collect Data and Model Relationships between:

- Personal Protective Equipment
- Environmental Factors
- People Data
- Employee Mental Condition
- Employee Physical Condition
- Environmental Telemetry, Sensors
 - Temperature
 - Input Speed
 - Power Input
 - Vibration
- Digital Signage
- Operating Limits

Case Studies

EXPERIENCE

TRAINING

LEARNING

KNOWLEDGE

SKILLS

Risk Reduction and Safety

We can expedite the delivery of your outcomes using IP and accelerators...

Predict, Intervene & Prevent OHS Incidents

Reduced incident frequency by identifying predictors of OH&S incidents and building a predictive model. The model combined incident history, weather, annual leave, overtime, role types and more to automatically alert employees who had that had a high risk of being involved in an incident that day. Intervention and prevention included reminders, re-training and duty changes.

Risk Culture, Safety Culture and Psychological Wellbeing Surveys

Various surveys across various industries to identify areas of risk or concern based on questions around Risk Culture, Safety Culture/Compliance, and Psychological Health. Results allow drilling to problem departments, locations and site to focus training and remediation activities.

Monitor and Alert for PPE Compliance

Improve PPE (Personal Protective Equipment) use and compliance by monitoring real-time CCTV feeds of high risk, PPE environments. Artificial Intelligence and Machine Learning based models were trained to be able to identify hard hats, goggles and vests, but could easily be extended to identify gloves, boots, badges and any other PPE measure. Monitoring over months showed a decline in non-compliance.

Asset Safety

Predict catastrophic equipment failure that could lead to injury or fatality by understanding causes of failure, likelihood of failure and predict failure events. Identify defective equipment using machine vision and IoT and determine safe asset use via statistical analysis and optimise asset safety.



Appendix

EXPERIENCE

TRAINING

LEARNING

KNOWLEDGE



SKILLS

OHS Risk & Drivers

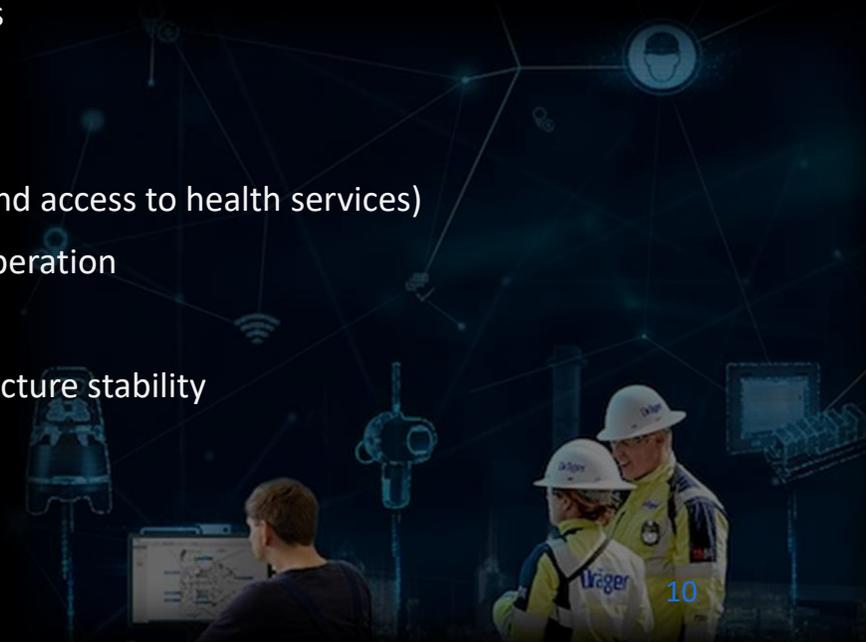
Personal and Operation Risk Examples

Personal

- Long term health
- Weight and habit management
- Food quality
- Sleep quality
- Sedentary work
- Drug and alcohol
- Relationship stress
- Boredom
- Fatigue
- Early starts and/or late finishes (particularly after dark)
- PPE compliance
- Training

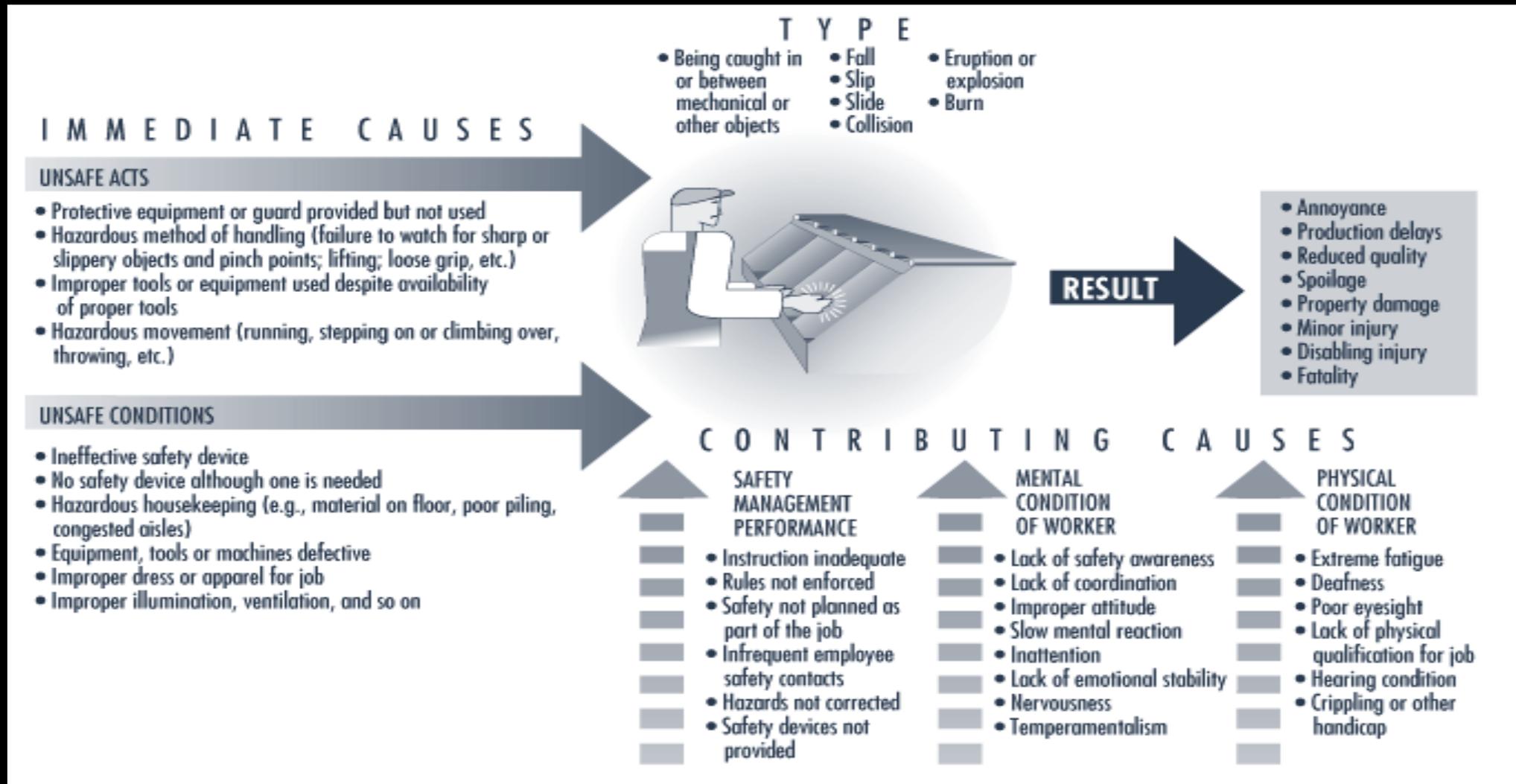
Operational

- Road conditions
- Wildlife on roads
- Chemical exposure
- Air quality
- Unplanned detonation and explosives
- Loading facilities
- Heights
- Confined spaces
- Remote work (and access to health services)
- Heavy vehicle operation
- Visibility
- Ground and structure stability



Risk Identification

Example of immediate causes and contributing risk factors for a manufacturing line worker...



AI Consulting Group Pty Ltd (ACN 635 430 634) is a Proprietary Limited entity, trading under the name of 'AI Consulting Group' (ABN 12 635 430 634).

AI Consulting Group has drafted and reviewed this document and every effort has been made to ensure that it is accurate. AI Consulting Group shall not be liable for any losses, damages or costs associated with errors in connection with the document, its contents, or any representations therein.

The information contained in this document is of a proprietary and confidential nature and was prepared exclusively for our client. It should not and must not be disclosed to third parties without the prior express written permission of AI Consulting Group.

