

# Knowledge-driven Artificial Intelligence

The University of New South Wales School of Computer Science and Engineering offers consulting, training, and engineering services based around key knowledge-driven Artificial Intelligence (AI) technologies.

Knowledge is a key asset for any organisation and exploiting this knowledge is crucial to an organisations ability to innovate and respond to change. Advances in AI offer a mature set of tools for capturing and exploiting knowledge. Combined with high performance algorithms, these tools can be used to support innovation and drive more effective decision-making within an organisation.

With our strong technical, consulting and research capabilities, we provide organisations with the opportunity to understand and take advantage of the latest advances in knowledge-driven AI.

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## The Opportunity

Artificial Intelligence (AI) is at the forefront of the technology revolution that is reshaping manufacturing and industry.

Advances in technology have produced highly integrated and interconnected devices offering real-time data collection and responsiveness. Combining these advances in automation and information gathering with AI enables more effective decision-making that can drive improvements in efficiency, reduce waste, and deliver positive economic and social outcomes.

AI provides a suite of technologies for understanding and enhancing the creative knowledge-driven processes that are at the heart of any organisation.



## Solutions

Knowledge-driven AI technologies can provide solutions to many application areas, including:

**Transport Planning**, where the challenge is to generate travel schedules subject to complex and changing optimisation criteria.

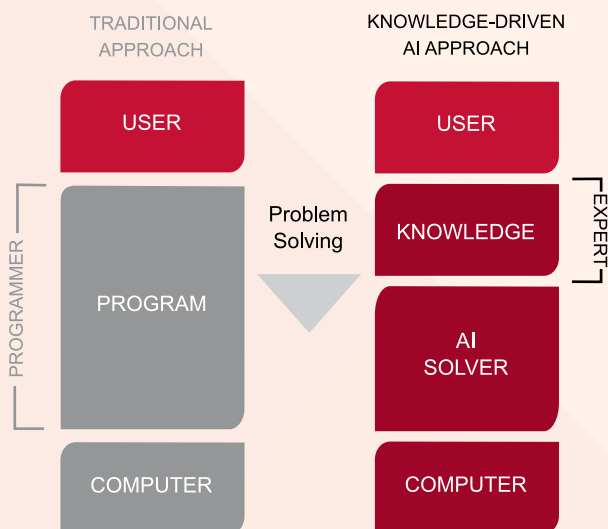
**Workforce Management**, involving both effective shift design based on varying labour requirements as well as individual staff scheduling.

**Logistics Management**, representing a broad class of problems for which a knowledge-driven, problem solving approach is well-suited; from efficient warehouse configuration through to supply chain management.

**Document Creation**, moving beyond simple template based creation to complex contractual documents that require content consistency and the satisfaction of multiple criteria.

## Knowledge-driven AI

The knowledge-driven AI approach separates the representation of knowledge from the underlying problem solving algorithms. In this way, domain experts can focus on concisely capturing organisational knowledge, while the AI technology provides the high performance engine necessary to exploit this knowledge.



Knowledge is captured in a concise, transparent, and easily maintainable representation language. This language also provides rich support for specifying both qualitative and quantitative optimisation criteria.

This approach provides the necessary tools for representing and solving complex *combinatorial optimisation* problems. Combinatorial problems are at the heart of complex decision-making challenges; from efficient resource management, such as asset allocation and shift planning, through to vehicle routing and remote system diagnosis.

By focusing on the representation language and ease of modelling it becomes possible to rapidly apply these technologies to a wide variety of areas within an organisation; from the very small scale through to the very large scale.

## Technology

Our knowledge-driven AI approach is the product of a multi-decade research program in classical AI, supported by strong international collaborations. In particular, we work closely with the leading group at the University of Potsdam, Germany, that have developed the *Potassco Suite* of high performance, industrial strength AI tools. We can leverage this expertise in an Australian context.