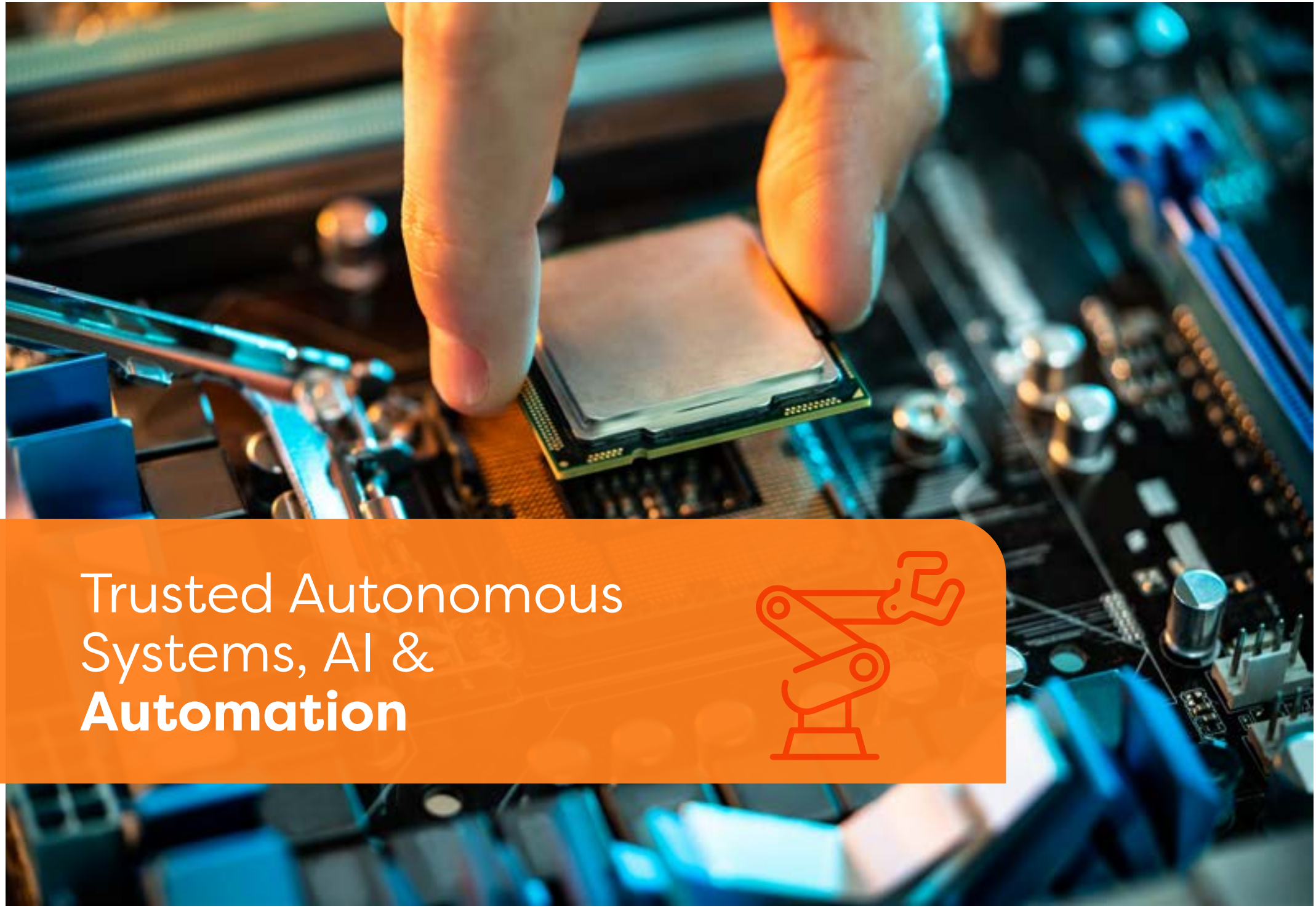
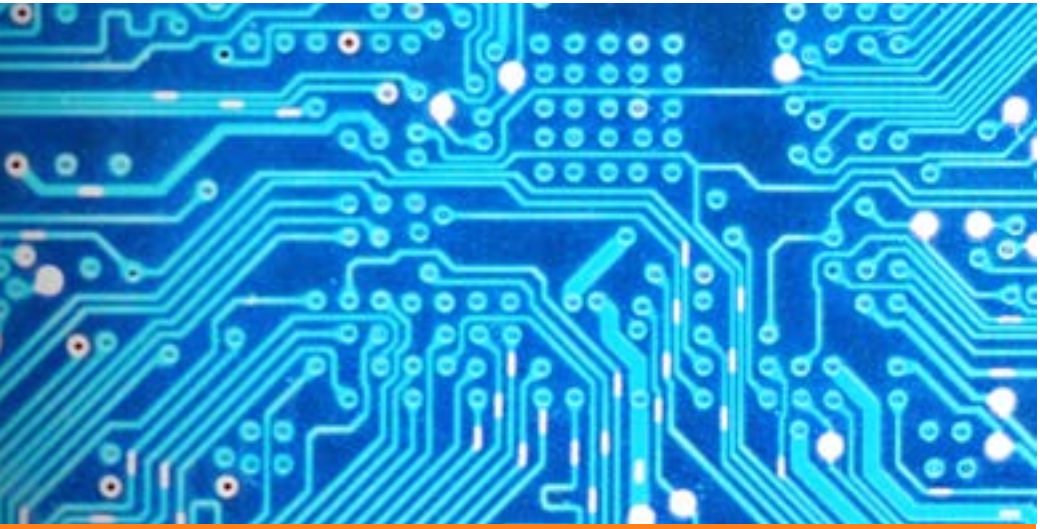


Trusted Autonomous Systems, AI & **Automation**



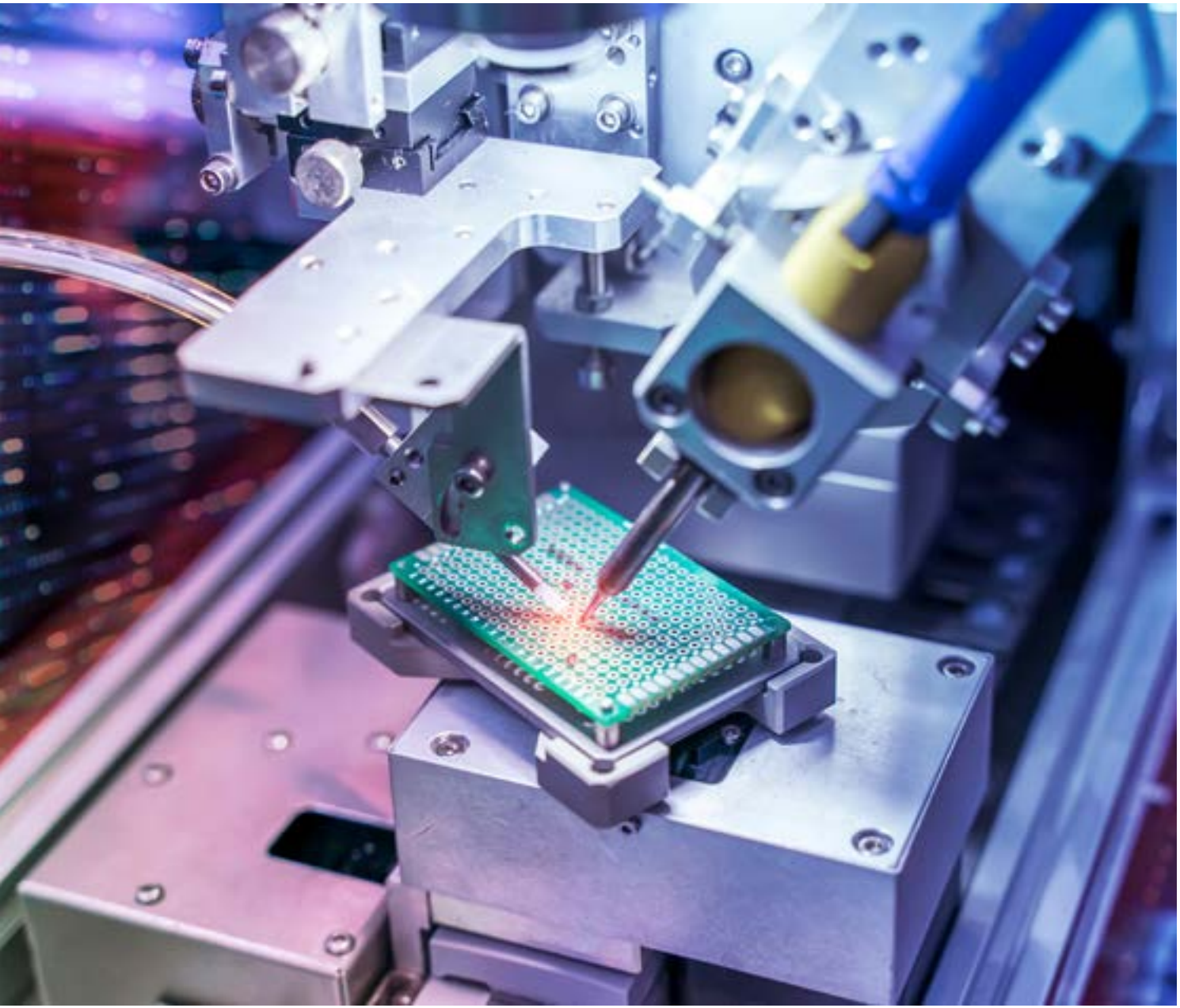
Effective integration of information across machines (AI, automation) and humans (human-automation teaming) to achieve decision superiority on the modern battlefield. Applications include surveillance and reconnaissance, and real-time information processing, to enable military operations to be planned and executed with reduced risk to personnel and expensive platforms.

UWA researchers from diverse disciplines including computing and information systems, engineering, statistics and the psychological science work to enhance interactions between humans and machines to achieve human-automation teaming decision superiority on the battlefield.

DEFENCE RESEARCH CAPABILITY CATEGORY: **TRUSTED AUTONOMOUS SYSTEMS, AI & AUTOMATION**

UWA Competitive Advantage

- Expertise in natural language processing, machine learning, human-automation teaming and explainable AI.
- Developing advanced algorithms for improved automation, collaborative reasoning and decision-making processes in human-machine teams.
- Measuring human trust in automation, designing for transparent automation, and the computational modelling of how humans allocate attention and make decisions when teamed with automation.
- Computational systems that adapt to or learn from the data, knowledge or environment in which they are working. These systems employ evolutionary, learning, optimisation and modelling techniques to solve or improve performance on complex problems. Current projects in the AI area include:
  - » computational intelligence techniques for optimisation, modelling and control.
  - » applications of multi-objective evolutionary algorithms.
  - » evolutionary optimisation and design.
  - » hypervolume calculation for multi-objective optimisation.
  - » trust and social network analysis.
  - » integrating wind sensor and range finder scope information to automatically adjust the scope and thus accuracy of projectile direction in a rifle.
- Techniques that allow systems to sense and move within their own environment in either a fully self-directed or human-guided fashion.



Outcomes and Impact

- Robotics and automation research with proven applications in defence, mining and energy, medicine, advanced manufacturing and agriculture.
- Autonomous mobile robots, include intelligent driving and walking robots, autonomous underwater vehicles, and uninhabited aerial vehicles (reflecting outcomes from multidisciplinary collaboration between AI, computer vision, control robotics, signal and image processing robotics and automation).
- Extracting useful information and patterns (e.g. knowledge graphs) from large collections of industry data.
- Best practice guidelines for designing transparent and usable AI/ automated work systems (human-machine teaming)

Capabilities and facilities

Research Groups involved in this work include:

Human Factors and Applied Cognition Laboratory

Task simulation facilities (e.g., submarine command and control, uninhibited vehicle management, maritime/air contact classification, air traffic control, driving) for human-automation teaming experimentation (human-in-the loop studies)

Contact Details

Professor Shayne Loft
+61 8 6488 4610
Shayne.loft@uwa.edu.au