# SCOPING CERTIFIABLE AUTONOMOUS NUCLEAR ROBOTICS

**12th April 2019, Manchester**

Registration is required but attendance is free. Full details and registration information can be found on the website.

This workshop will explore the challenges of certifying nuclear robotic systems. Groups of attendees will examine realistic nuclear robotic case studies, discussing how the introduction of autonomy, machine learning, or long-term use will impact the verification techniques and evidence required for certification. Representatives from the Office for Nuclear Regulation will be at the workshop to provide their feedback certification for robotics with higher levels of autonomy.

Each discussion group will tackle one case study, considering in-depth the current challenges to certification and the future challenges as we introduce higher levels of autonomy. Attendees will have the opportunity to select one case study for the discussion sessions, and descriptions of the case studies will be available before the workshop.

Attendees are welcome from industry, academia, or government; with an interest in robotics, autonomy, AI, safety, assurance, and certification; and particularly those involved in EPSRC/ISCF activities such as the RAIN Hub, the NCNR Hub, the Robotics for Nuclear Environments programme, and the Assuring Autonomy International Programme. All attendees should be prepared to participate fully in the discussion.

Output of the discussion sessions that is of particular interest include:

- common barriers to introducing higher levels of autonomy,
- techniques for the verification of autonomy,
- observations about current safety documentation practice, and
- areas for collaborative work in the future.

The key points from the discussion sessions will be collated and distributed to the attendees after the workshop.

## Programme

Overview: After a brief introduction, the 'owners' of robotic case study will give an overview of the robotic system and the task it performs-- highlighting and unusual hazards or challenges. Representatives from the ONR will give a broad overview of the key points of nuclear certification.

## Discussion Session 1: Current Hazards

The first group discussion session; each discussion group will consider the certification of the current case study (before introducing any autonomous challenges). Each group will consider:

- the key hazards that a safety case for that system must account for
- how to mitigate these hazards
- what evidence can be provided for these mitigating factors, and;
- how we might constrain the system's environment to improve or ease its safety.

At the end of this discussion session, each group will have the opportunity to feedback key points of their discussion to the other groups.

## Discussion Session 2: Future Hazards

The second discussion session; each discussion group will consider the certification of the case study if we introduce challenges posed by autonomy. Each group will consider the points from Discussion Session 1, but with their case study extended to include:

- higher levels of autonomy,
- long-term autonomous systems,
- disposal or recovery at the robot's end-of-life, and;
- adaptive or machine learning components.

Again, at the end of this discussion session, each group will have the opportunity to feedback key points of their discussion to the other groups.

## Summary and Close

To close the workshop, we will provide an initial overview of the key points from the discussion sessions and representatives from the ONR will provide initial feedback on their view of the discussions.

## Case Study Owners

- Sally Forbes, UK Atomic Energy Authority
- Howard Chapman, National Nuclear Laboratory
- Andy Melia, Sellafield Ltd
- Andrew Wallwork, Atomic Weapons Establishment

## Organisers

Michael Fisher & Matt Luckcuck-- University of Liverpool, RAIN Hub