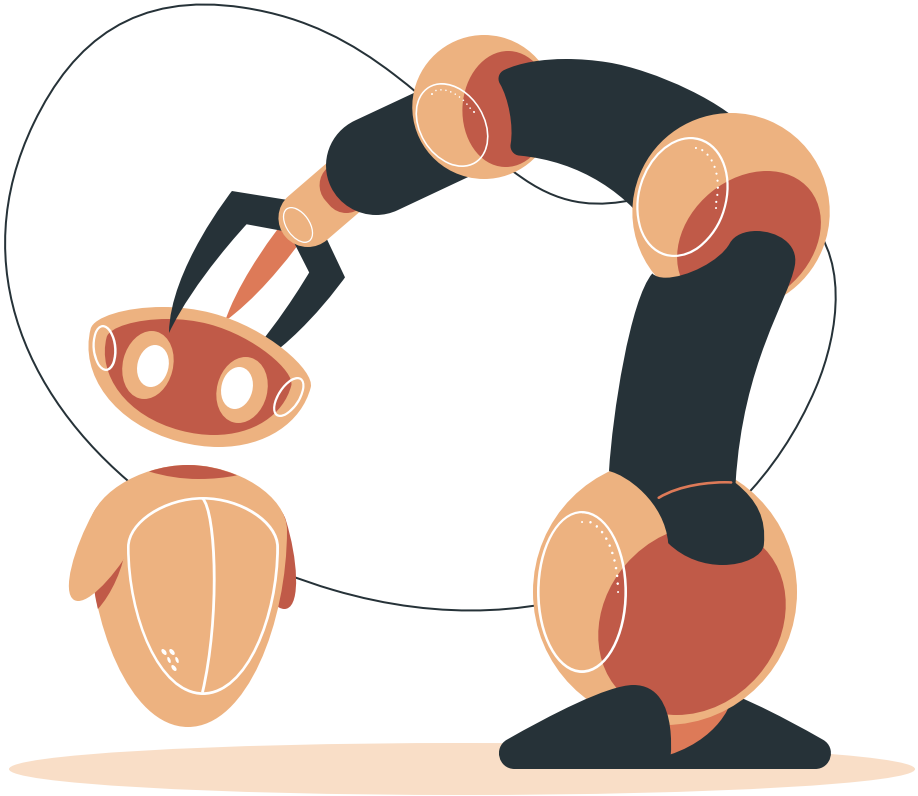
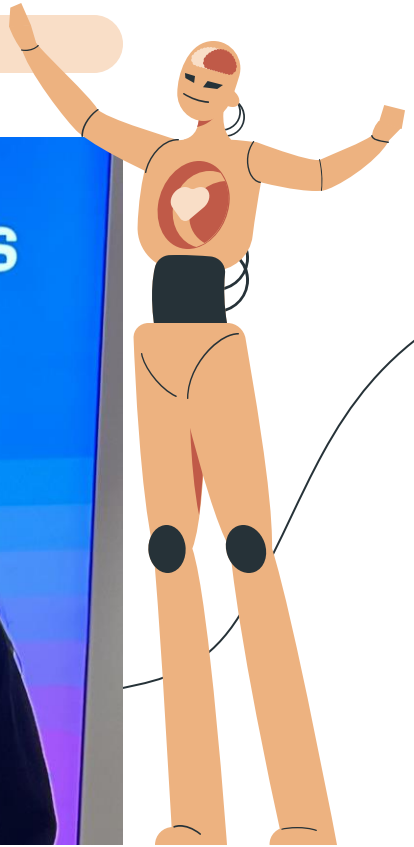
Robotics in Nuclear Operations

Brought to you by
The Soul Coders



About the Team



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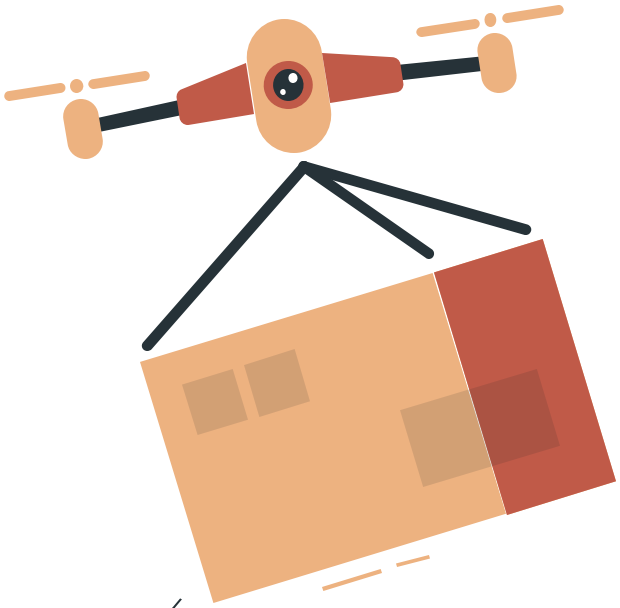
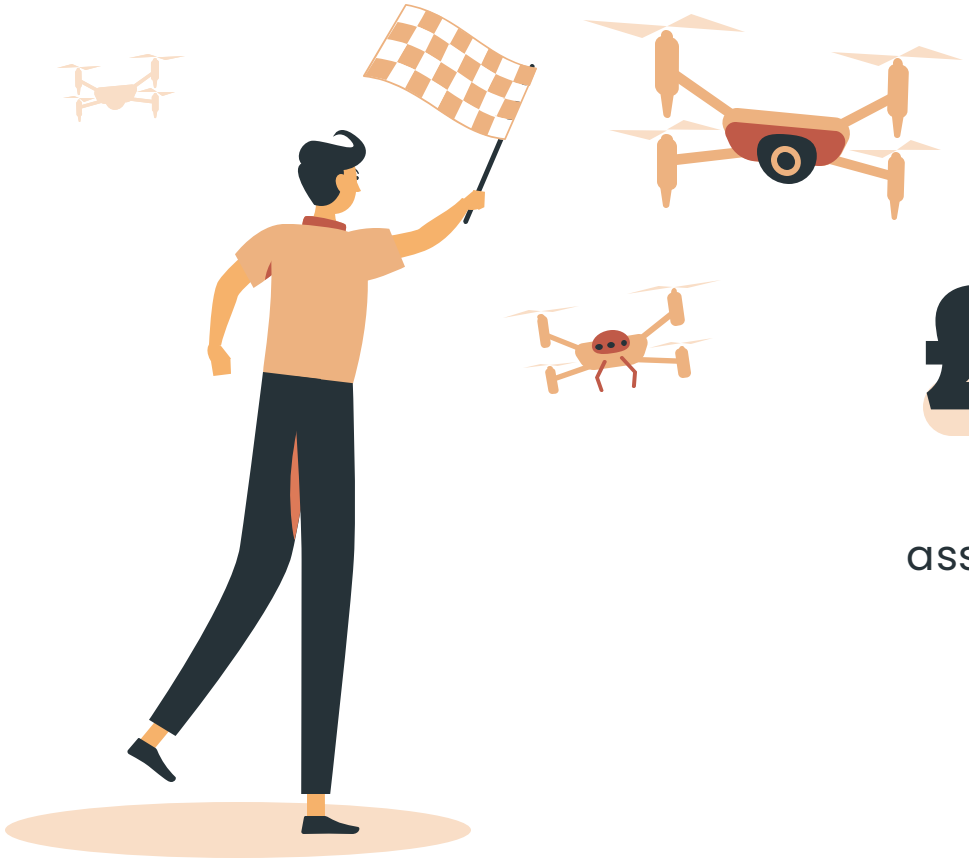
WHY?

1. Why are we using Robotics in Nuclear Operations?
2. And how is it better than having an actual human in the field?





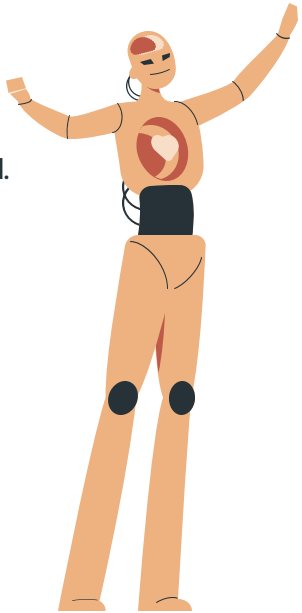
£24,500

That is how much cost is associated with traveling to sites (one person, per year).

S.W.O.T.

S Strengths

- Improving & Data Processing with AI.
- Minimizing Exposure to Danger.
- Scalability for Nuclear Expansions.



W Weaknesses

- Limited Accessibility— Incomplete Inspections.
- Aging Infrastructure.
- Workforce Shortages.

O Opportunities

- Expanding robot capabilities— growth potential.
- Real-time analysis through cloud.

T Threats (Potential)

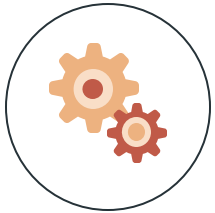
- Cybersecurity risks.
- High Initial Costs.
- Regulatory Approval.

2

Our Solution

How are we enhancing the strengths and improve the weaknesses?

About the solution



Part 1

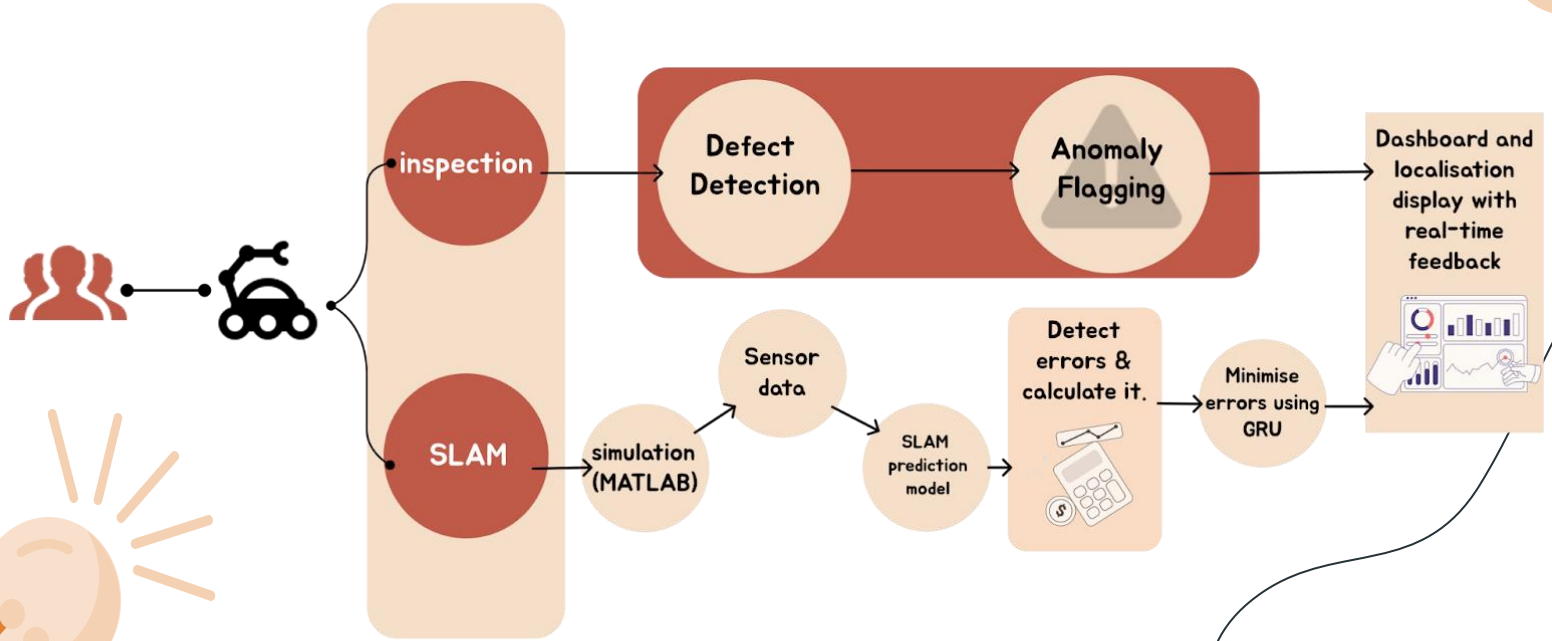
Enhancing SLAM accuracy using Deep Learning

Part 2

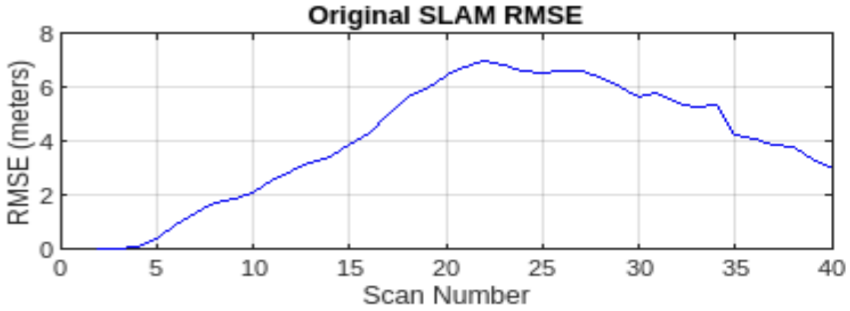
Remote inspection and monitoring dashboard

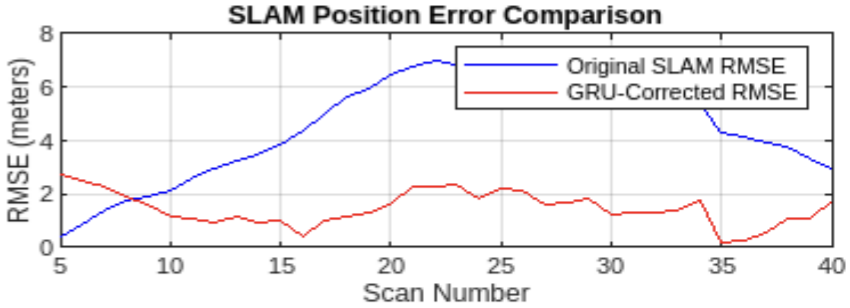
GRU - Gated Recurrent Unit
SLAM - Simultaneous Localisation And Mapping

Architecture Model



SLAM Localisation Error Comparison





Traditional SLAM

4.143m

Average RMSE

GRU-Enhanced SLAM

1.475m

Average RMSE

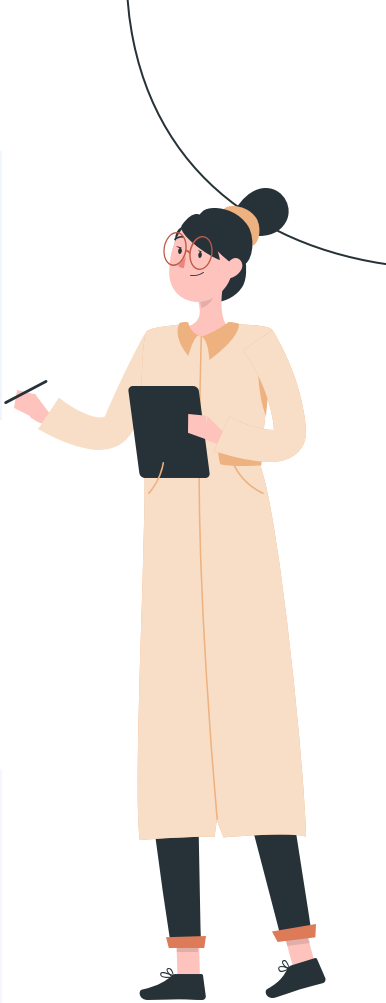
Novel Aspects

- Deep Learning Integration with SLAM
- Advanced LiDAR Feature Processing
- Real-time Error Prediction & Correction

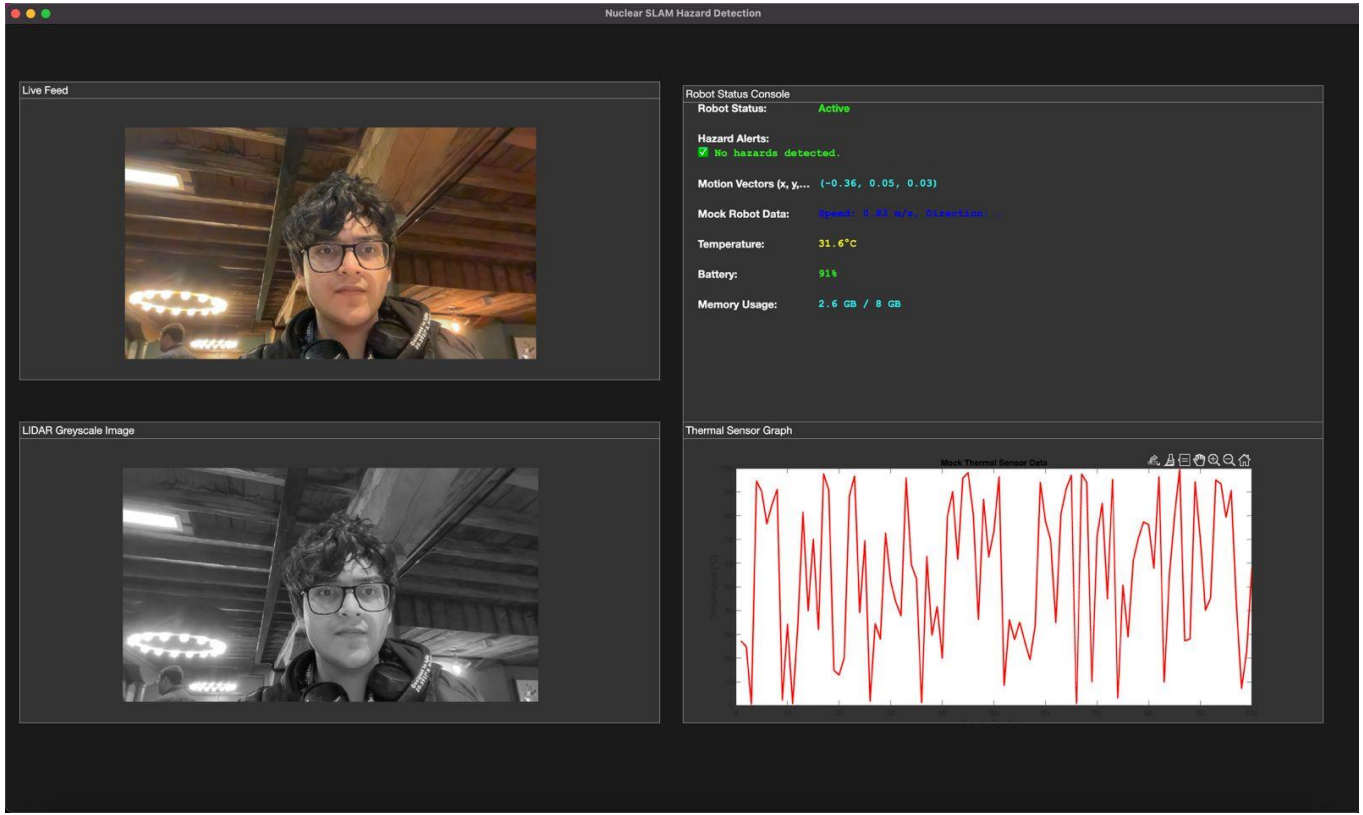
Error Reduction

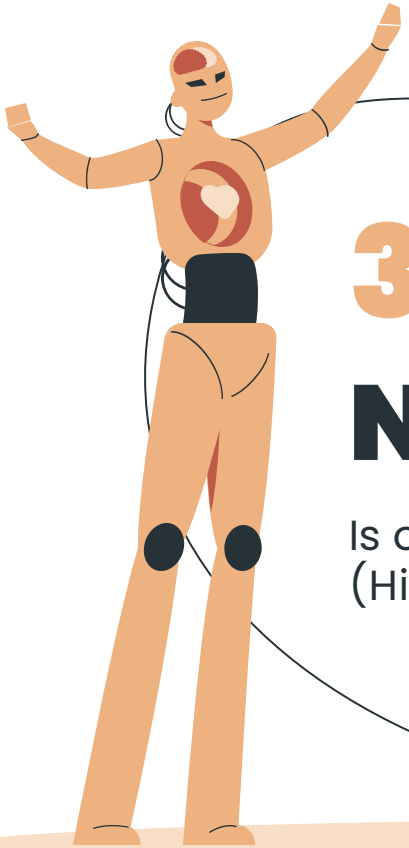
64.4%

Overall Improvement



Our Dashboard





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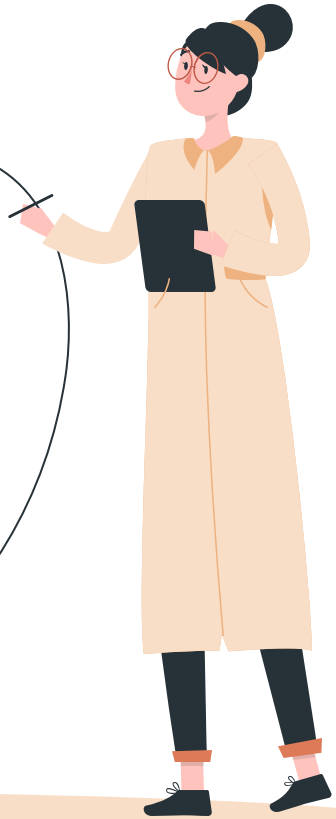
Novelty

Is our idea really THAT good?
(Hint: I’m sad you had to ask!)



How is ours better than the rest?

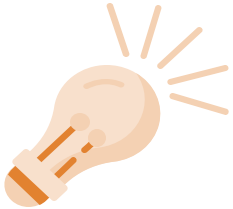
Our Model

vs.

Traditional SLAM

We aren’t done yet...

- Our model also has a **remote-inspection and hazard detection system**.
- Other robots only navigate— ours scans and analyses the environment **in real time** using AI and Computer Vision.
- It **automatically detects hazards** like fire, gas leaks, structural weaknesses, and radiation leaks, alerting operators with live updates.
- Instead of treating it as separate problems, our system **combines navigation and inspection into one** AI-driven workflow for seamless, autonomous monitoring.



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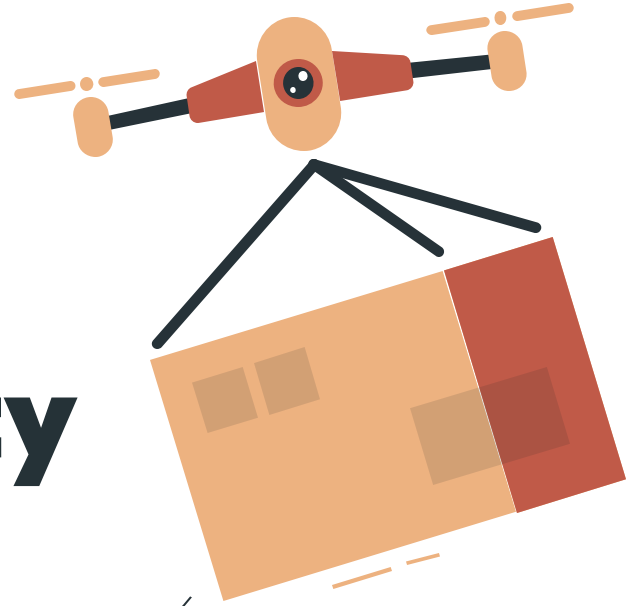
Safety/Security

How are we making sure that your data is safe with us?



What would we implement?

1

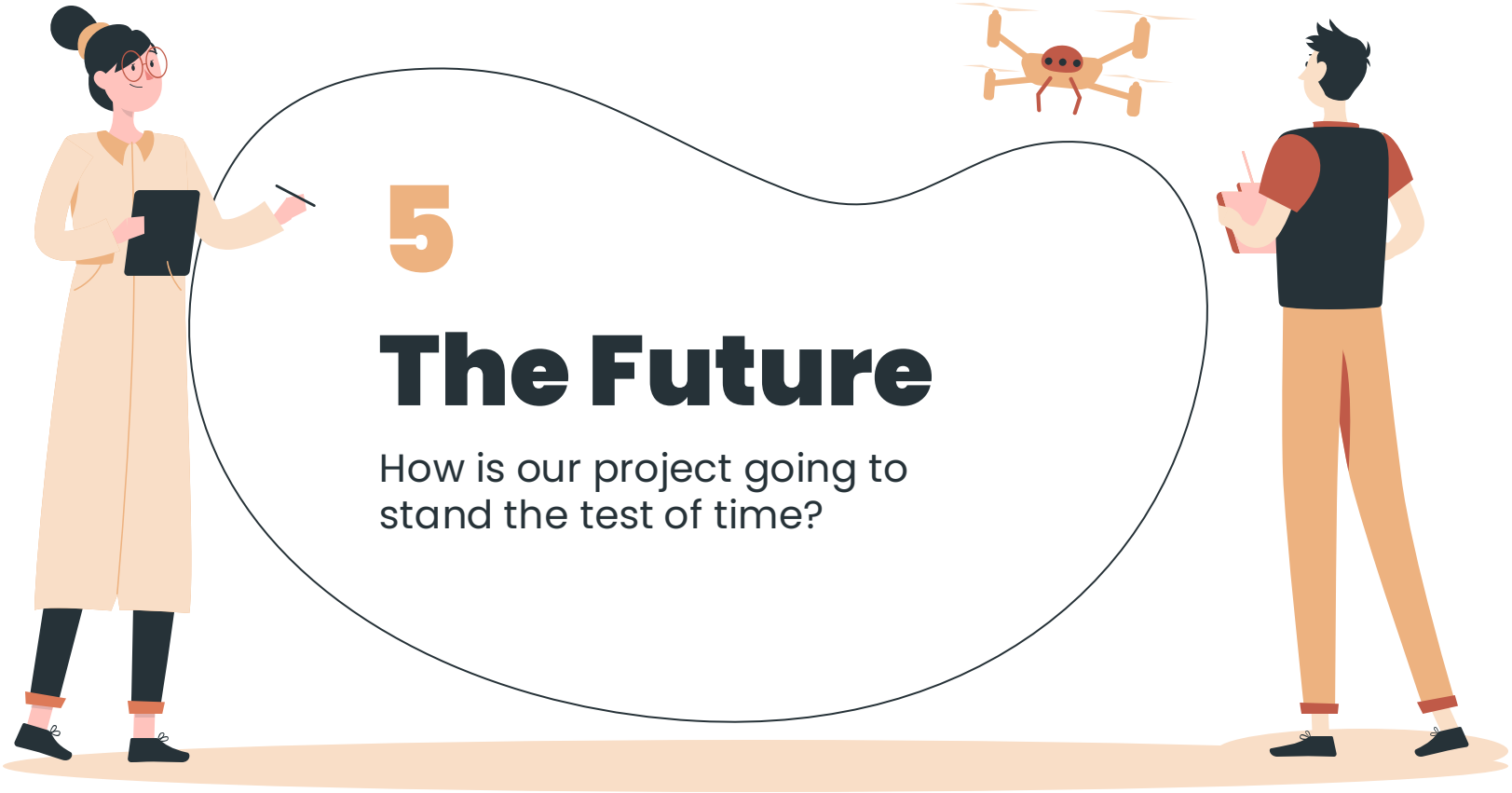
Cybersecurity Threat Detection & AI Anomaly Monitoring

2

Failsafe Mechanisms & Emergency Shutdowns

3

Compliance with Industry Standards



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The Future

How is our project going to stand the test of time?

Scalability and Sustainability

- Supports nuclear power by increasing the lifespan of the nuclear facilities.
  - Less reliance on fossil fuels and **smooth transition to clean energy**.
- **Reduces emissions** from transportation and industrial inefficiencies.
- Prevents energy waste through **early hazard detection**.
- **Minimises e-waste** by extending the lifespan of robotic systems.
- Designed for **multi-industry use**
  - Our robots can adapt to new roles and supports **circular economy.**
- Future iterations— **solar-powered** charging stations and **hydrogen-powered**.

Does it get better with time?

- **Yes!**
- We have implemented **continuous learning** models— adjusts to new environments easily!.
- **Swarm Robotics**— faster and better mapping and real-time decision making.
- **Cross Industry Use**— future-proofing growth, funding potential and impact.
- **Global Certifications**— our solution could be the industry-standard tool.
- **5G Connectivity**— quicker response-time & ultra-low latency hazard detection.

Thank You!