

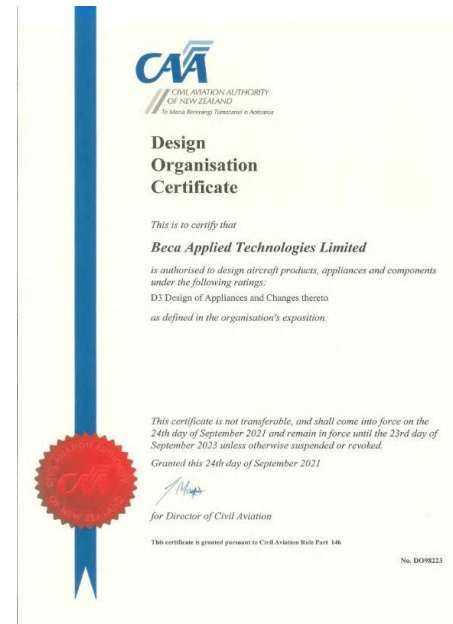
Certification of Disruptive Tech in NZ

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Introduction

- About myself:
 - Experience in AI/ML
 - PhD in mathematics
 - Background in engineering and maths
- Beca Applied Technologies:
 - CAA accredited to develop airborne software and complex electronic hardware
 - Experience in mission critical software, and supporting flight critical software
 - Certifying Merlin Labs take-off to touch-down autonomy system



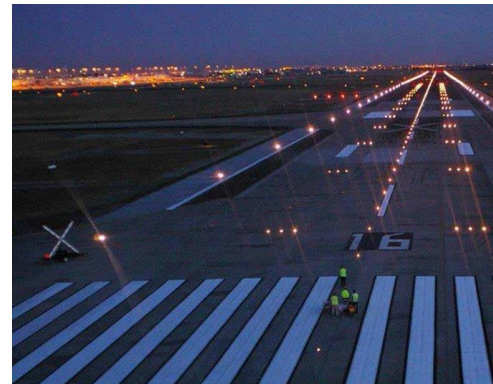
Agenda

- Define AI/ML
- Give a background of the challenges raised by AI/ML in the aviation domain
- The approach we are developing for certification



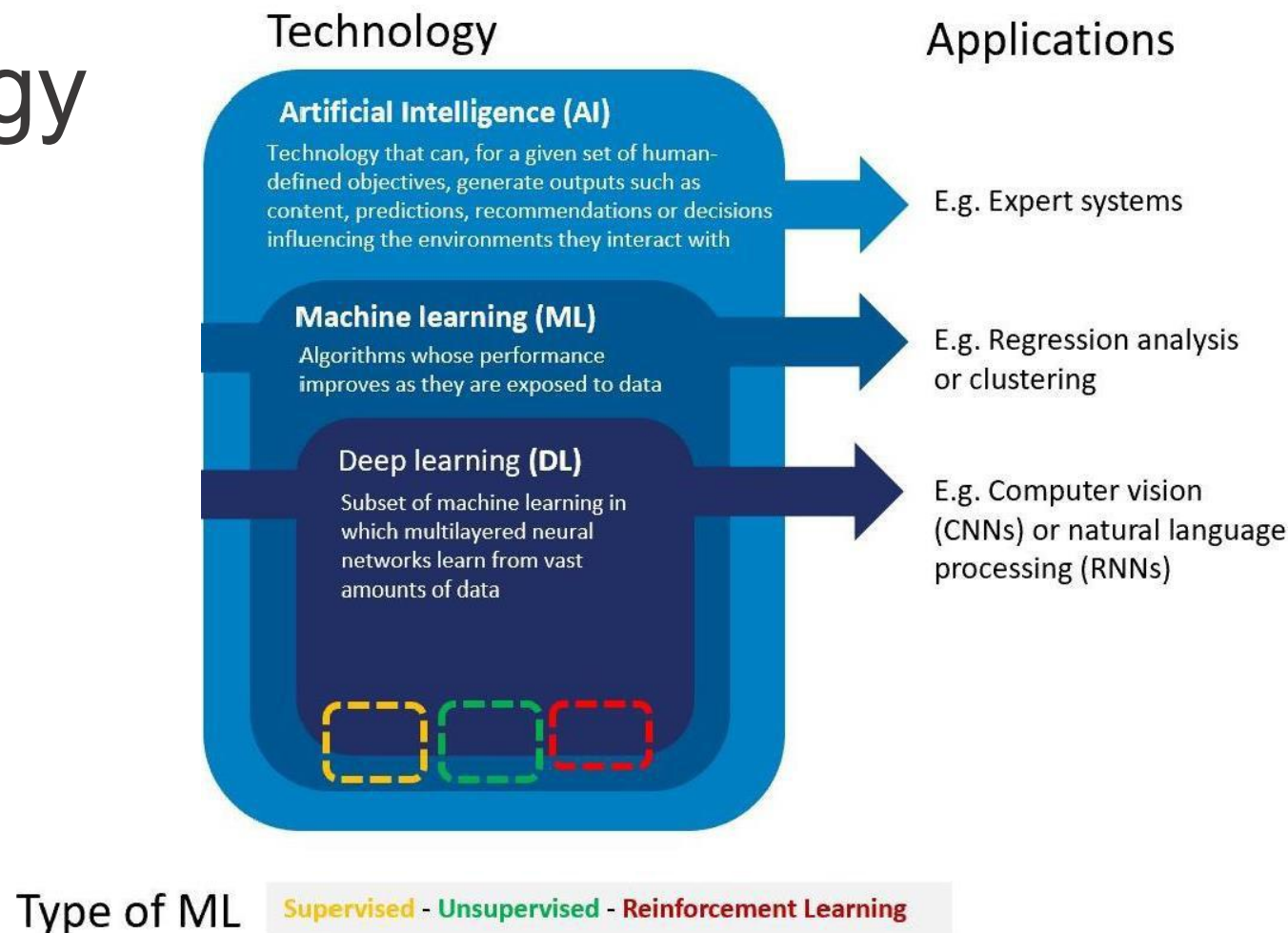
Potential applications of AI in aviation?

- Traffic avoidance
- Vision based auto-landing
- ATC communication
- Maintenance, failure prediction, etc...
- Flight planning



AI/ML terminology

- Deterministic
- Stochastic



ML Training

- Learned AI vs Learning AI (Offline Training vs Online Training)
- Data:
 - For training. The model gets better the more diverse data it ingests.
 - For testing. To verify the actual performance of the model after training.
- Types:
 - Supervised Learning: Classification
 - Unsupervised Learning: Clustering
 - Reinforcement Learning: Robotics

Challenges posed by ML systems

- New source of uncertainty:
 - Data sourcing
 - Generalisability
 - Data drift
 - Interconnectivity
- No current framework for statistical methods
- Human understanding of the tool
- Trust in new technology

Scope of certification

- Safety
- Understanding ML is an engineering tool:
 - Limit the hype, it is not magical
 - Limit the fear, it is not conscious, and we have experience with it
- ML is only a component of a larger system

Leveraging current Means of Compliance

- DO-178C is the current means of compliance for airborne software.
 - It will be used for all other aspects of the software
 - It has several limitations for ML applications:
 - No data driven tests
 - No independence in training and testing
- DO-33X

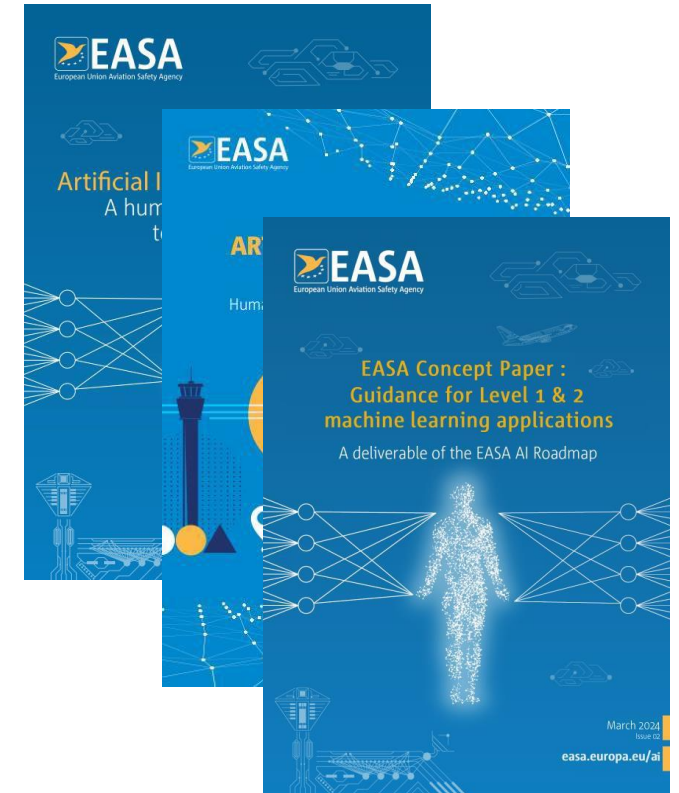
Being aware of what is being done

- EASA:
 - Artificial Intelligence roadmap
 - MLEAP Project
- FAA
- SAE G-34: ARP6983

Roadmap for Artificial Intelligence Safety Assurance



Federal Aviation
Administration



WIP 2023-06-26

Process Standard for Development and Certification/Approval of
Aeronautical Safety-Related Products Implementing AI ARP6983

Path forward

- Start with low complexity (e.g. deterministic using offline supervised learning)
- Start with lower safety impact (DAL C-D)
- Best practice vs safety impact: The goal of certification is safety, and we need to understand which parts of the development process are safety related and which ones are best practice
- Collaborate with the regulators
- Be ready to adapt to new regulations in a rapidly changing field



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