MACHINE LEARNING SOFTWARE **"TRUSTWORTHINESS"**

DSTI – [DS] PROJECT PROPOSAL

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BACKGROUND

- My background
  - Aeronautical and electronics engineer.
  - 19+ years professional experience in the Civil Aviation Industry.

- AI in the Civil Aviation Industry
  - The Civil Aviation industry is a highly regulated industry.
  - Stringent requirements apply to the development of systems in general and software in particular.
  - However, the current software development assurance frameworks are no longer adapted to ML software.
  - ML Software "trustworthiness" must be demonstrated through other means.

OBJECTIVE

- To "mimic" the design, development, verification and certification phases of an embedded ML software in a highly regulated environment (such as the Civil Aviation Industry).
- To implement a set of processes and techniques in order to demonstrate the "trustworthiness" of an embedded ML software:
  - "Learning assurance" processes, e.g. :
    - Data assurance process: data quality, data sets selection and verification,
    - Learning model selection, tuning and evaluation,
    - Software verification.
  - ML techniques aiming at producing an "explainable" model.

Note – Adaptative learning in operation is out of the scope of this project

PROJECT OUTLINE

- Selection of a COTS Robot (e.g. Car Kit + Raspberry Pi or Arduino) on which the ML software would be embedded.
- Definition of the mission to be completed by the Robot:
  - For example, follow a line on the ground and/or avoid obstacles.
  - This mission would remain relatively simple as it is not the main focus of this project.
- Definition of a set of "regulatory" requirements to fulfil.
- Development of the ML software:
  - Data collection and development of the model,
  - Implementation of the "learning assurance" processes and ML techniques throughout the development phase.
- Verification of the "trustworthiness" of the ML software, i.e. compliance (or non-compliance) with the "regulatory" requirements.

PRELIMINARY RESEARCH

- Interpretability of software
  - "An Introduction to Machine Learning Interpretability", second edition - Patrick Hall and Navdeep Gill (link)
  - "Interprétabilité des systèmes de data science", Emmanuel Lin ToulemondeBlog (link)
- AI regulatory requirements
  - "Artificial Intelligence Roadmap – A human-centric approach to Ai in Aviation", EASA Report (link)
  - "Regulating the safety of autonomous vehicles using artificial intelligence", Roger Kemp (link)
- Embedded AI using Raspberry Pi
  - "L'IA embarquée : entraîner, déployer et utiliser du Deep Learning sur un Raspberry", Samuel Rochette, Constant Bridon, Paul De Nonancourt (part 1, part 2, part 3)