Artificial Intelligence @ Airbus Defence and Space

Forum Industriel de l'Intelligence Artificielle

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8 Octobre 2020

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Airbus Defence and Space - Digital Capabilities

- ***On-ground and on-board payload data exploitation***
- ***Sensors performance analysis***
- ***Support to Guidance, Navigation & Control and Mission execution, and to Manufacturing & Quality assessment***

Computer Vision

High-level understanding from digital images or videos.
Examples include: recognition, restoration, reconstruction.

- ***Support to simplified operations, incl. Intelligent Personal Assistant***
- ***Extraction of information to support to decision making***

Natural Language Understanding & Processing

Applications of artificial intelligence which use human language as an input or/and an output.
Examples: Knowledge extraction, conversational assistance, sentiment analysis.

Pattern Recognition & Anomaly detection

Class of applications focused on defining and recognizing patterns which may repeat in data. Examples: time series.

- ***On-ground and on-board spacecraft data analytics***
- ***Reliability, Safety, Security***

Decision Making (including Autonomy)

Process mining, mission planning, scheduling and autonomy.
Examples: swarming, reasoning, robotics.

- ***Mission planning support and optimisation***
- ***Guidance, Navigation and Control***
- ***Automated operations, Robotics, On-board autonomy***

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Cooperation landscape

Examples of Airbus DS cooperation with labs

AALBORG UNIVERSITY DENMARK
ONERA THE FRENCH AEROSPACE LAB
POLITÉCNICA
der bundeswehr universität münchen
Fraunhofer
ANITI
Toulouse, nouvelle place forte de l'intelligence artificielle
lium
LIG
DFKI German Research Center for Artificial Intelligence
IVADO
TELECOM ParisTech
Georgia Tech
Imperial College London
UNIVERSITY OF OXFORD

Examples of Airbus DS partnership with SMEs and start-ups

deepomatic
Saagie
MONDECA
KERMAP next-geoservices
voxygen
KALRAY
up42
esa business incubation centre

Example of involvement of Airbus DS in AI certification

KIEZ4-0 Project: European Certification of AI for Aeronautics

Examples of Airbus DS representation in AI committees

Committee	Extent
AI HLEG - High-Level Expert Group on AI	Europe
EUROCAE WG-114 Artificial Intelligence	Europe
SAE G-34 Artificial Intelligence in Aviation	US
ASD (AeroSpace & Defence) experts group on AI	Europe
EOS (European Organisation for Security) AI task force	Europe
DIN Working Committee “Artificial Intelligence”	Germany
BBFA: British Business Federation Authority Working Group on AI	UK
Manifest for Artificial Intelligence	France
GICAT (French Land Defence Manufacturers Association) Working Group GT I2A	France
Hub DSAI (Data Science and Artificial Intelligence) System@tic Paris-Region	France
Industrial college of AFIA (French Association for Artificial Intelligence)	France

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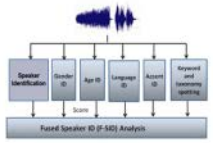
Examples of AI activities in Airbus DS

Natural Language Processing

Business Context:
Important capability for MoDs, for low resource languages

Capabilities:
Real time Speech translation, Speaker identification, Emotions analysis (incl. for rare languages)

Insights & AI added-value:
- AI will allow end-to-end speech translation (without prior transcription)
- Several past and running cooperation projects (incl. RAPID, ANR, H2020)
- Challenge: Limited training dataset



Virtual / cognitive assistant – CIMON

Business Context:
Assistance for astronauts in the International Space Station

Capabilities:
AI-based autonomous and free flying astronaut assistant on board ISS. In partnership with IBM for the AI API Services.
One experiment with first version, a second version just arrived in the ISS for new experimentations, and continuation is being proposed (ISS Free Flyer).

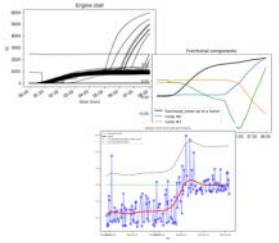
Insights & AI added-value:
- Natural language processing (speech recognition, understanding of content in context and intention, detection of emotions, vocal feedback and results)
- Decision making
- Vision Based Navigation (own GNC system)
- Challenge: Training with the astronaut

Predictive maintenance

Business Context:
Maintenance, Repairs and Operations (MRO) have a strong need of powerful tools to anticipate the maintenance of systems

Capabilities:
Use data collected by sensors to achieve health monitoring, predicting the future failure events, recommendation of anticipative maintenance actions

Insights & AI added-value:
- Automatic extraction of rare meaningful events from a huge volume of sensors data: Anomaly detection, decision making, pattern recognition, faster than traditional approaches
- Challenges: Automatic predictions in real time during operations, Trusted-AI



Real-time objects detection in images and video

Business Context:
ISR (Intelligence, Surveillance, Reconnaissance) and Search & Rescue missions for Mission A/C, UAV (Unmanned Air Vehicles), Helicopters, …

Capabilities:
- Elaboration of situational awareness picture: Real-time video processing for Automatic Target Detection, Recognition and Identification (ATDRI), support to sensor automation and trajectories optimisation
- Support to navigation (VBN, real-time obstacles detection)

Trajectories and mission optimisation

Business Context:
Ensure optimised usage and mission efficiency for aeronautical platforms (Mission A/C, Combat A/C, UAV, Helicopters, …)

Capabilities:
Optimised trajectories / flight patterns, Increase of autonomy during mission execution

Insights & AI added-value:
- Optimisation and scheduling algorithms to optimise trajectories optimisation considering multiple criteria incl.:
  . Mission success (e.g. minimise time to find a target)
  . Environmental aspects (e.g. minimisation of fuel consumption, of noise footprint, weather aspects, etc.)
- Reduction of operator workload

Other usages of AI for Airbus DS applications

AI in Manufacturing & Quality assessment

Cyber-security and Secure communications:
- Detection of security threats (in the network and assets usage)
- Optimised network orchestration and tactical routing

Automatic Intelligence data exploitation:
- Enhanced situational awareness for decision making to improve safety, security and efficiency of critical services
- Automatic information extraction from multi-sources / sensors data, detection of threats (abnormal behaviour e.g. in maritime tracks)

Multiple assets / vehicles operations:
- Optimised multi-platforms / multi-layer mission planning and tasks allocation, incl. determination of optimal number of assets to involve and continuous re-planning capabilities during mission execution
- New operation concepts (increased abstraction in the tasking) to reduce time to prepare mission and reduce operator workload

Conclusion

Airbus Defence and Space is fully committed in the integration of AI in its products and systems, to improve operations' and systems' efficiency, and to enable new services, and **is actively building an "AI-driven culture"**.

Through the environment in place ("AI accelerator", DataLab, Innovation platforms, etc.), Airbus DS is **fostering synergies among teams and projects**, connecting the teams working on AI, and actively supporting them to develop new AI related capabilities.

Airbus Defence and Space is building a **wide cooperation and partnership network** and is fully connected with the other Airbus divisions. The activities performed with Agencies have a global contribution and directly benefit from this **active AI eco-system**.

Thank you

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