Duale Hochschule Baden-Württemberg Ravensburg

Zentrum Digitalisierung und Elektrifizierung von Luftfahrtsystemen

Congress contribution

AI Transfer Congress - DHBW

Heilbronn, 23.09.2022

Artificial Intelligence in Aviation

Adrian Hechelmann

Wissenschaftlicher Mitarbeiter
Duale Hochschule Baden-Württemberg Ravensburg
Campus Friedrichshafen
Fallenbrunnen 2, 88045 Friedrichshafen

Philipp Drescher

Wissenschaftlicher Mitarbeiter
Duale Hochschule Baden-Württemberg Ravensburg
Campus Friedrichshafen
Fallenbrunnen 2, 88045 Friedrichshafen

Content

Abstract

The congress contribution "Artificial Intelligence in Aviation" created by ZDEL displays an overview of developments and trends of AI in aviation and the AI related projects **i+sCabin2.0** and **BELUGA-KI** referred to AI.

The importance of AI is increasing more and more in aviation. Already today, various applications can be found in different Airport, Airlines, Manufacturer and In Flight Operation. Examples are:

- Improval of single components [1]
- Optimization of loading [2]
- Fuel efficiency optimization [3]
- Predictive maintenance [4]
- Pilot relief for simple operations [5]
- Runway throughput improvement [6]
- Fuselage corrosion detection [7]

Developments and trends of AI in aviation: An Overview

For a better insight into current fields of AI in aviation, Figure 1 shows various areas in which AI is already used today. This is sorted by different categories, as airlines and manufacturers, for example, since they have different requirements and areas of application. In addition, there is another point that sheds light on the difficulties in dealing with AI: Challenges. Above all, due to the high requirements for safety and transparency, many aspects must be taken into account when using AI in aviation. As the figure points out, AI is used for supporting activities. The future will show how AI can be further utilized in safety-critical aspects.

Figure 1: Developments and trends of AI in aviation: An Overview[1],[2],[3],[4],[5],[6],[7]

Zentrum Digitalisierung und Elektrifizierung von Luftfahrtsystemen (ZDEL)

The ZDEL (Zentrum Digitalisierung und Elektrifizierung von Luftfahrtsystemen) is a competence center at the DHBW Ravensburg, Campus Friedrichshafen. Its objective is to address the central current research needs in aerospace technology and to contribute to national and international research trends in a targeted manner.

The ZDEL focuses on the operational behavior of aviation gearboxes, the digitalization and electrification of aviation engines, digitalization in the field of cabin systems, and flight physics.

Projects with respect to AI at ZDEL

Different research projects are placed at ZDEL. Projects with reference to AI are introduced in the following:

I+s Cabin 2.0

The approach of the new **i+sCabin2.0** research project is to enable sharing of data obtained from the cabin with ground stations during the flight for automated processing and evaluation using artificial intelligence. A smart networked cabin that communicates with the ground can optimize maintenance planning, increase airplane availability, digitize and standardize processes, and ultimately help keep airplanes running on schedule and passengers satisfied with their flying experiences.

Industrial alliance partners are Bühler Motor Aviation GmbH, Diehl Aerospace, Diehl Aviation, Jeppesen GmbH, Safran Cabin Germany GmbH, Thales Deutschland GmbH and the Hamburg University of Technology.

The project is supported by the Federal Ministry of Economic Affairs and Climate Action.

Beluga KI

For the next generation of aircraft engines, a planetary gear unit in the "Ultrafan" will be used under the highest performance requirements. To this end, a system is being developed that uses intelligent algorithms to infer the performance of the gear unit from production data. In this cooperative research project **BELUGA-KI**, production data is linked using AI in a way that is not possible using conventional methods. It has the advantage for the dual partner that inspection intervals are to be extended or cost-intensive tests are simplified.

Industrial alliance partner is Aerospace Transmission Technologies GmbH.

The project is supported by the Baden-Württemberg Ministry of Science, Research and Art.

Literature

[1] Izzo, Dario; Märtens, Marcus; Pan, Binfeng (2019): A survey on artificial intelligence trends in spacecraft guidance dynamics and control

[2] Shmelova, Tetiana; et al. (2020): Handbook of artificial intelligence applications in the aviation and aerospace industries.

[3] European Organisation for the Safety of Air Navigation (2020): The FLY AI Report

[4] Shukla, Bibhudhendu; Fan, Ip-Shing; Jennions, Ian (2020): Opportunities for Explainable Artificial Intelligence in Aerospace Predictive Maintenance

[5] Airbus S. A.S (2020): Airbus concludes ATTOL with fully autonomous flight tests

[6] Lufthansa Industry Solutions (2021): Artificial Intelligence as a Service.

[7] Brandoli, Bruno; et al. (2021) Aircraft Fuselage Corrosion Detection Using Artificial Intelligence