



NANYANG
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The Hybrid AI-Human Air Traffic Management

European Aviation FLY AI webinar: Research and
Innovation in AI for Aviation, 23 March 202

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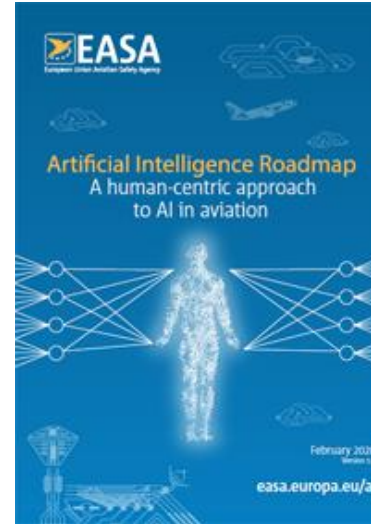
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Co Director, Saab-NTU Joint Lab





Preparing Air Transportation for Industry 4.0



ATM Research Community Explores AI



Fourteenth USA/Europe Air Traffic Management Research and Development Seminar

20 - 24 September 2021
New Orleans, LA, United States of America
ATM2021 Call For Papers



USA & Europe
ICRAT

International Conference
on Research in Air Transportation



ICNS > ICNS 2020

ICNS 2020

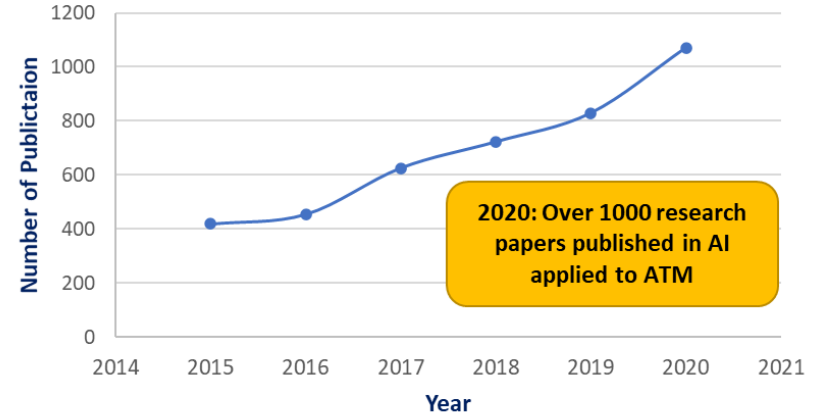
Theme: iCNS Horizons: "intelligent CNS" for Evolutionary and Innovative Air Transportation



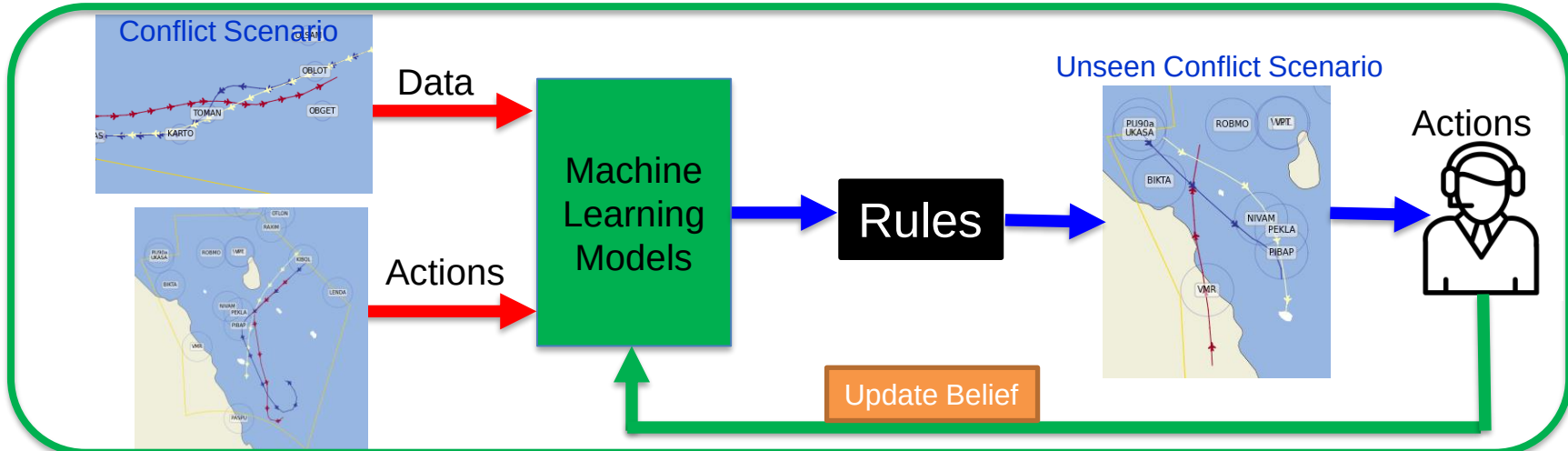
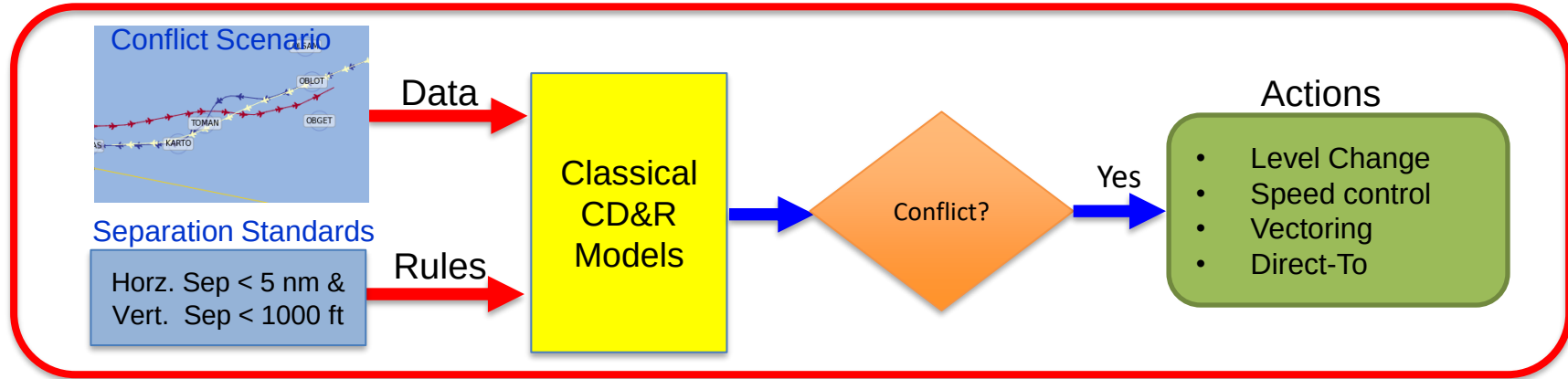
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Research Publications

Google Scholar (Key word: Air Traffic Management + Artificial Intelligence)



Why Machine Learning Approach?



The Hybrid AI-Human ATM Approach

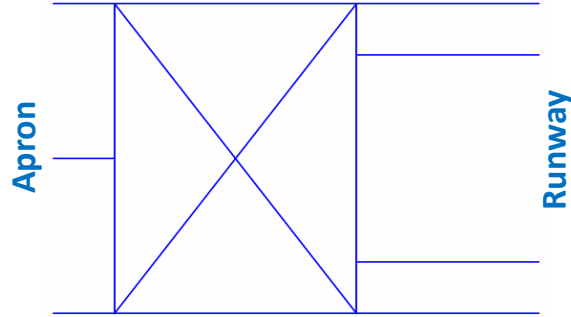
Combine the Expert Judgement with Relevant Data

- Extract human actions (intelligence) from data.
- Convert data into patterns and generalizations
- Use these patterns to predict actions.
- Update patterns based on human actions.

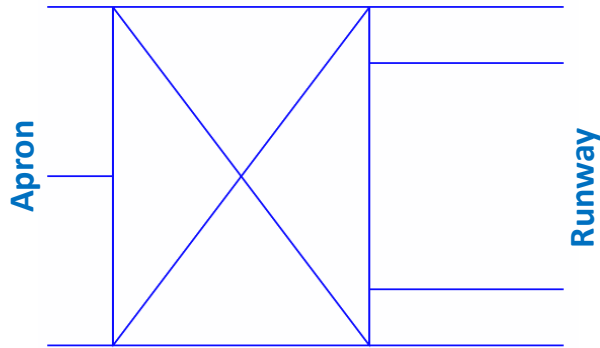


Machine Learning for Airside Optimization

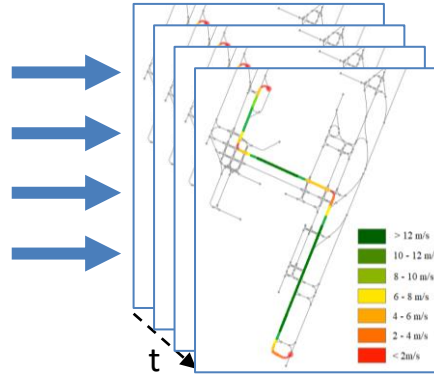
Non-Metering



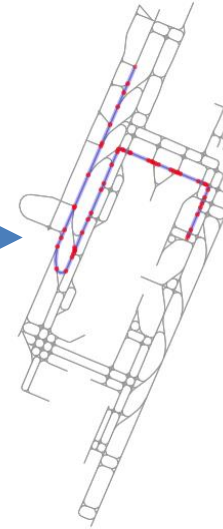
Intelligent Metering



Taxi-Routes with Predicted Velocities



Spatio-Temporal Taxi-Routing



Hot-Spot Prediction



Nam Tran, DucThinh Pham, Sameer Alam, Vu Duong (2020), Taxi-speed Prediction by Spatio-Temporal Graph-based Trajectory Representation and Its Applications. 9th Intl. Conference on Research in Air Transportation (ICRAT 2020), Florida, USA

Deep Learning for Runway Capacity Optimization

Runway 28, Zurich Airport

TMA Zurich Airport



Agent Learns Arrival Pattern, Wake Separation, Runway Occupancy Time to Predict the Inter-Arrival Gaps and Push Departure with **Indicated Confidence Level**.

Li Long, Thinh Pham and Sameer Alam, Deep Reinforcement Learning approach for Real-time Departure Slotting in Mixed Mode Runway Operation (2020), 30th International Joint Conference on Artificial Intelligence (under review), Montreal, Canada.

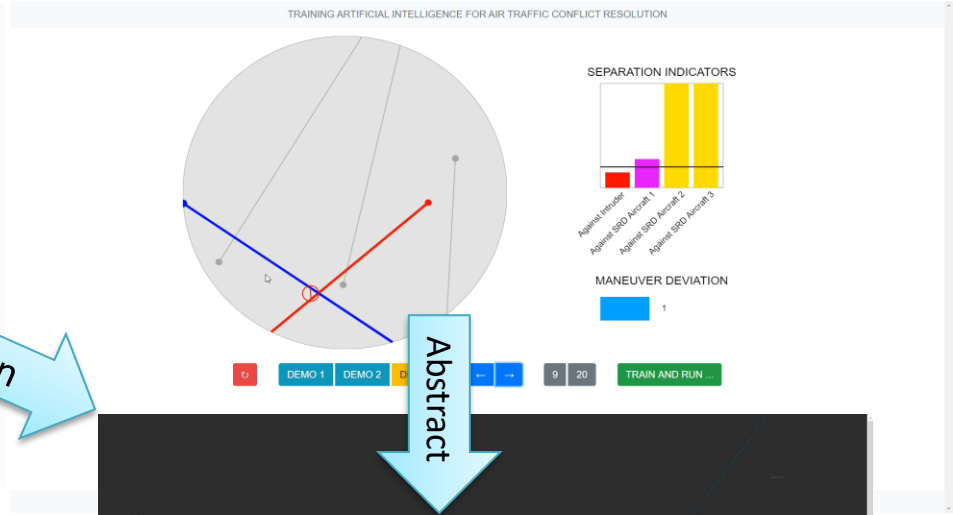
AI-Human Hybrid Learning for CD&R



Simulation



CD&R Data



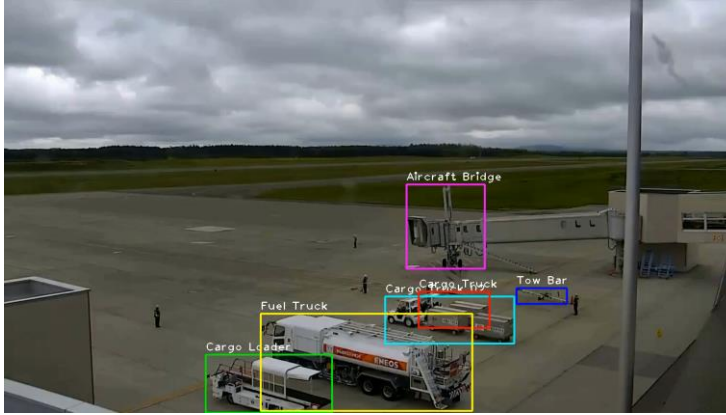
On-screen Real-time Conflict Resolution Advisories

Phu Tran, Duc-Thinh, SimKuan Goh, Sameer Alam and Vu Duong. (2020). An Interactive Conflict Solver for Learning Air Traffic Conflict Resolutions. AIAA Journal of Aerospace Information Systems, 17(6).



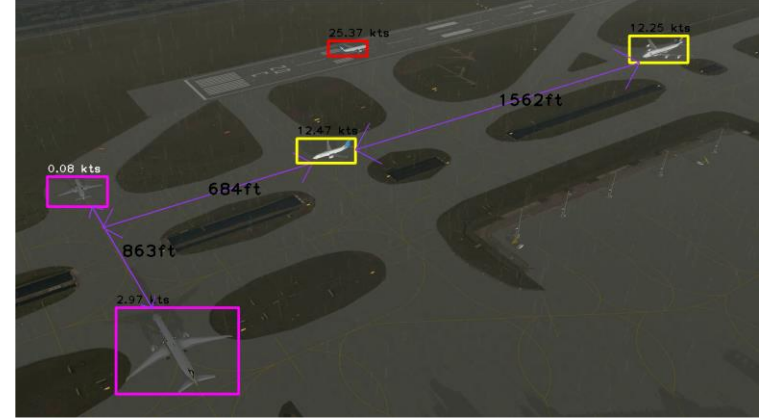
Machine Learning in Digital Control Tower

Deep Learning for Pushback Prediction



Van Phat, Sameer Alam, Nimrod Lilith, Phu Tran, Bui Nguyen (2020) Aircraft Pushback Prediction and Turnaround Monitoring by Vision-based Object Detection and Activity Identification. 10th SESAR Innovation Days (SID).

Deep Learning for Airside Tracking



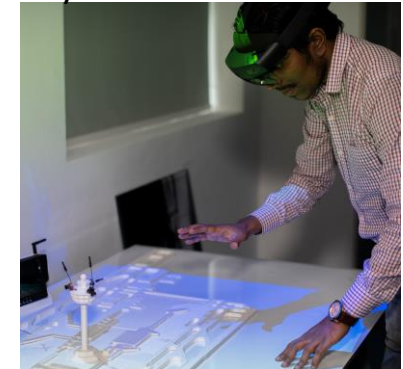
T.N.M Nadirshah & Sameer Alam Master's Thesis 2020, Predictive Analytics using AI Assistance & Spatial Augmented Reality for Singapore Changi Airport. NTU Singapore

Deep Learning for Airside Tracking



Van Phat, Sameer Alam, Nimrod Lilith, Phu Tran (2021) A Convolutional Neural Network Approach for Object Detection in Airport Airside Environments, IEEE ICME, China (under review)

VR/AR with HALO Lens 2



Open Research Challenges

- Trust of ATC in AI/ML system
- Integration issues with ATM system
- Safety Verification and Validation
- Post accident audit mechanism

