



# CTFG Workshop 2020+

Canadian Tracking and Fusion Group  
Workshop Technical Program

Day 1: Monday, January 18, 2021

12:45-13:00	Rami Abielmona (General Co-Chair) <sup>1</sup> , Ratnasingham Tharmarasa (General Co-Chair) <sup>2</sup>	<sup>1</sup> Larus Technologies, <sup>2</sup> McMaster University	Welcome Speech and Introductory Remarks
<b>13:00-13:45</b>	<b>Invited Speaker: Erik Blasch</b>	<b>Program Officer, United States Air Force Research Laboratory</b>	<b>Correspondence of AI/ML with Data Fusion</b>
<b>COVID-19 Prediction (Chair: Anne-Laure Jousset)</b>			
13:45-14:10	Lise M. Bjerre et al.	University of Ottawa	“Getting ahead of the curve”: Predictive COVID-19 Case Identification using an Iterative Propensity Score Modelling and AI Approach
14:10-14:35	Steven Horn	DRDC-CORA	Tracking COVID-19 Prevalence with Bayesian Inference and Integration of Uncertain Epidemiology
14:35-15:00	Zhen Qu, Zhen (Jack) Ding	DRDC-CORA	Predicting the Retweet Level of COVID-19 Tweets with Neural Network Classifier
15:00-15:15	Break		
<b>Machine Learning (Chair: Elisa Shahbazian)</b>			
15:15-15:40	Dave Galley	Leonardo Company	Introduction to LCE and Incorporating Sensor Fusion in Electronic Warfare Simulation – A Roadmap for Advanced Threat and Target Capability Modelling
15:40-16:05	Melita Hadzagic	OODA Technologies	On Some Emerging and/or Disruptive Technologies in Defence
16:05-16:30	Ahmed Zaidi, Ratnasingham Tharmarasa, Thia Kirubarajan	McMaster University	Methods for Semi-automated Labeling With Multiple Algorithms And Sensors
16:30-16:55	Sayed Ahmed <sup>1</sup> , Ratnasingham Tharmarasa <sup>1</sup> , Daly Brown <sup>2</sup>	<sup>1</sup> McMaster University, <sup>2</sup> General Dynamics Mission Systems–Canada	Machine Learning Aided Track Management for Multitarget Tracking
16:55-17:20	Zhen Qu, Zhen (Jack) Ding, Peter Moo	DRDC-CORA	A Neural Network Based Algorithm Selector for Radar Task Scheduling
17:20-17:30	End of Day 1		



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## Canadian Tracking and Fusion Group Workshop Technical Program

Day 2: Tuesday, January 19, 2021

Video Tracking (Chair: Sreeraman Rajan)			
13:00-13:25	Jozsef Hamari <sup>1</sup> , Zheng Liu <sup>2</sup>	<sup>1</sup> TerraSense Analytics, <sup>2</sup> University of British Columbia	MIST: Multimodal Input Surveillance & Tracking
13:25-13:50	Keqi Wei <sup>1</sup> , Thia Kirubarajan <sup>1</sup> , Michael Bradford <sup>2</sup>	<sup>1</sup> McMaster University, <sup>2</sup> L3Harris Wescam	Tiny Moving Object Detection from Airborne Video
13:50-14:15	Jianfeng Hu <sup>1</sup> , Richard Lee <sup>2</sup> , Thia Kirubarajan <sup>1</sup>	<sup>1</sup> McMaster University, <sup>2</sup> General Dynamics Land Systems-Canada	A Framework for Text-based Traffic Sign Detection and Tracking in Video
14:15-14:30	Break		
14:30-15:15	<b>Invited Speaker: Eric Fournier</b>	<b>Director General Innovation, Innovation for Defence Excellence and Security, DND Canada</b>	<b>IDEaS – Deliverables and Future Plans</b>
Multitarget Tracking (Chair: Thia Kirubarajan/Ratnasingham Tharmarasa)			
15:15-15:40	Joshua Gilmour <sup>1</sup> , Thia Kirubarajan <sup>1</sup> , Michael Bradford <sup>2</sup>	<sup>1</sup> McMaster University, <sup>2</sup> L3Harris Wescam	Investigating and Extending the Quanta Tracking Algorithm
15:40-16:05	David Schonborn <sup>1</sup> , Thia Kirubarajan <sup>1</sup> , Ratnasingham Tharmarasa <sup>1</sup> , Mike McDonald <sup>2</sup> , Mike Bradford <sup>3</sup>	<sup>1</sup> McMaster University, <sup>2</sup> DRDC-Ottawa, <sup>3</sup> L3Harris Wescam	Terrain-Aided Tracking Using a Gaussian Mixture Measurement Model
16:05-16:30	Ming Chen, Ratnasingham Tharmarasa, Thia Kirubarajan	McMaster University	An Assignment Method for Multitarget Tracking with Azimuth Ambiguity Based on Pseudo Measurement Set
16:30-16:55	Mehrnoosh Heidarpour <sup>1</sup> , Ratnasingham Tharmarasa <sup>1</sup> , Jeyarajan Thiyagalingam <sup>2</sup> , Michael Bradford <sup>3</sup> , Thia Kirubarajan <sup>1</sup>	<sup>1</sup> McMaster University, <sup>2</sup> Science and Technology Facilities Council, UK, <sup>3</sup> L3Harris Wescam	Extended Target Tracking Using Student's-t Process With Heavy-Tailed Process and Measurement Noises
16:55-17:20	Mehrnoosh Heidarpour <sup>1</sup> , Ratnasingham Tharmarasa <sup>1</sup> , Michael Bradford <sup>2</sup> , Jeyarajan Thiyagalingam <sup>3</sup> , Thia Kirubarajan <sup>1</sup>	<sup>1</sup> McMaster University, <sup>2</sup> L3Harris Wescam, <sup>3</sup> Science and Technology Facilities Council, UK	Tracking Multiple Extended Targets In Occlusion Using Splines and Set-Membership Uncertainty Models
17:20-17:45	Prabhanjan Mannari <sup>1</sup> , Ratnasingham Tharmarasa <sup>1</sup> , Mike McDonald <sup>2</sup> , Thia Kirubarajan <sup>1</sup>	<sup>1</sup> McMaster University, <sup>2</sup> DRDC-Ottawa	Extended Target Tracking using Convex Hull
17:45-17:50	End of Day 2		



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## Canadian Tracking and Fusion Group Workshop Technical Program

Day 3: Wednesday, January 20, 2021

Signal Processing (Chair: Bhashyam Balaji)			
13:00-13:25	David Luong <sup>1</sup> , Sreeraman Rajan <sup>1</sup> , Bhashyam Balaji <sup>2</sup>	<sup>1</sup> Carleton University, <sup>2</sup> DRDC-Ottawa	Recent Results in Noise Radar Signal Processing
13:25-13:50	Andy Huang, Sreeraman Rajan, Yuu Ono	Carleton University	Detection of Arterial Wall using Singular Value Decomposition of Ultrasound Signals Obtained by Wearable Ultrasonic Sensor
13:50-14:15	Shane Steinberg, Sreeraman Rajan, Yuu Ono	Carleton University	Continuous Estimation of Artery Diameter Change Using Adaptive Chirplet Decomposition of Ultrasound Radio Frequency Signals
14:15-14:40	Andi Huang <sup>1</sup> , Bhashyam Balaji <sup>2</sup>	<sup>1</sup> Carleton University, <sup>2</sup> DRDC-Ottawa	Micro-Doppler Rotary Drone Detection using Parametric Spectral Estimation Techniques
14:40-14:50	Break		
Sensor Fusion (Chair: Steven Horn)			
14:50-15:15	Peter J. Young	DRDC-CORA	Covariance Relationships for Trivariate Distributions with Known Orientations in Cartesian Coordinates
15:15-15:40	Sarojini Vudumu <sup>1</sup> , Ratnasingham Tharmarasa <sup>1</sup> , Anne-Claire Boury-Brisset <sup>2</sup> , Thia Kirubarajan <sup>1</sup>	<sup>1</sup> McMaster University, <sup>2</sup> DRDC-Valcartier	Efficient Quantization for Multi-Target Tracking
15:40-16:05	Nikhil Sharma <sup>1</sup> , Mike McDonald <sup>2</sup> , Ratnasingham Tharmarasa <sup>1</sup> , Thia Kirubarajan <sup>1</sup>	<sup>1</sup> McMaster University, <sup>2</sup> DRDC-Ottawa	Chernoff Fusion with Gaussian Mixture Model
Satellite Scheduling (Chair: Jack Ding)			
16:05-16:30	Joel Muteba Kande <sup>1</sup> , Rami Abielmona <sup>2</sup> , Moufid Harb <sup>2</sup> , Jean Berger <sup>3</sup> , Rafael Falcon <sup>1</sup> , Emil Petriu <sup>1</sup>	<sup>1</sup> University of Ottawa, <sup>2</sup> Larus Technologies, <sup>3</sup> DRDC-Valcartier	Multi-Objective Heterogeneous Multi-Asset Collection Scheduling Optimization with High-Level Information Fusion
16:30-16:55	Abhijit Chatterjee, Ratnasingham Tharmarasa	McMaster University	Multiple Agile Satellite Scheduling Incorporating Reward Factor Based Task Allocation and Resource Constraints
16:55-17:20	Alexander Teske <sup>1</sup> , Jean Berger <sup>2</sup> , Rami Abielmona <sup>1</sup> , Moufid Harb <sup>1</sup> , Emil Petriu <sup>3</sup>	<sup>1</sup> Larus Technologies, <sup>2</sup> DRDC-Valcartier, <sup>3</sup> University of Ottawa	Cooperative Coevolution and Market-Based Approaches to the Distributed Multi-Satellite Collection Scheduling Problem
17:20-17:30	End of Day 3		



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## Canadian Tracking and Fusion Group Workshop Technical Program

Day 4: Thursday, January 21, 2021

High Level Fusion (Chair: Melita Hadzagic)			
13:00-13:25	Jun Ye Yu, Melita Hadzagic, Elisa Shahbazian	OODA Technologies	Situation Tool: a Decision-aid Tool for Situation Related User Queries
13:25-13:50	P. Kowalski, M. Zocholl, A.L. Joussemle	NATO ST Centre, Italy	Explaining Threat Assessment with Multiple Sources Through Evidential Networks
13:50-14:15	Elisa Shahbazian <sup>1</sup> , L.O. Marion-Ouellet <sup>1</sup> , T. Brand <sup>2</sup>	<sup>1</sup> OODA Technologies, <sup>2</sup> Canadian Coast Guard	Fusion Enabled Capability Injection into Legacy Systems
14:15-14:30	Break		
Resource Management (Chair: Rami Abielmona)			
14:30-14:55	Anbang Deng <sup>1</sup> , Thia Kirubarajan <sup>1</sup> , Rahim Jassemi <sup>2</sup> , Dan Brookes <sup>2</sup> , Ratnasingham Tharmarasa <sup>1</sup>	<sup>1</sup> McMaster University, <sup>2</sup> DRDC-Ottawa	Joint Path Planning and Power Allocation for Multitarget Tracking in Multistatic Radar System
14:55-15:20	Anne-Claire Boury-Brisset <sup>1</sup> , Jean Berger <sup>1</sup> , Rami Abielmona <sup>2</sup> , Moufid Harb <sup>2</sup> , Alex Teske <sup>2</sup> , Jinsuk Solomon <sup>2</sup>	<sup>1</sup> DRDC-Valcartier, <sup>2</sup> Larus Technologies	Semantic Matchmaking and Multi-Objective Optimization applied to Dynamic Tasking Problems
15:20-15:45	Hong Li <sup>1</sup> , Jonathan Fournier <sup>2</sup> , Mike McDonald <sup>3</sup> , Thia Kirubarajan <sup>1</sup>	<sup>1</sup> McMaster University, <sup>2</sup> DRDC-Valcartier, <sup>3</sup> DRDC-Ottawa	Formation Control, Collision Avoidance and Trajectory Optimization with Coverage and Energy Efficiency of UAV Swarm Under Urban Environment
15:45-16:10	Ben Liu <sup>1</sup> , Ratnasingham Tharmarasa <sup>1</sup> , Daly Brown <sup>2</sup> , Thia Kirubarajan <sup>1</sup>	<sup>1</sup> McMaster University, <sup>2</sup> General Dynamics Mission Systems-Canada	Multi-Batch Incremental Strategy for Sonobuoy Deployment from High-altitude Airplane with Spatial-Temporal Atmospheric Uncertainty
16:10-16:20	Rami Abielmona (General Co-Chair) <sup>1</sup> , Ratnasingham Tharmarasa (General Co-Chair) <sup>2</sup>	<sup>1</sup> Larus Technologies, <sup>2</sup> McMaster University	End of Workshop - Wrap up