# CALL FOR PAPERS

## IEEE Transactions on Aerospace and Electronic Systems (T-AES)

### Special Section on META-LEVEL AND ADVERSARIAL TRACKING

### Scope and Aims

In recent years there has been a move towards a new paradigm in tracking applications aimed at a higher level understanding of complex scenes, potentially involving many objects and partial data from various sensors or data sources. The aim may be to calibrate future actions to deliver a more effective and safer operation and/or efficient deployment of the sensing platform(s), circumvent conflict or identify opportunities and learn the intent of groups or individuals or spot anomalies in their behaviour. This can be achieved by capturing the influence of any underlying regressors (e.g., intent/destinations), understanding "social interactions", which underlie a multi-object scene and its evolution over time, and determining capabilities or characteristics of potential adversaries/competitors. This is a shift away from the traditional viewpoint of a scene where objects move independently of one another in an unpremeditated manner and without regard to possible competition or group structures, towards an integrated viewpoint where objects intents (e.g., destination), anomalies, group interactions and competitors capabilities or strategies can be automatically learned. Such inference algorithms can not only facilitate automated decision making, planning and resources allocation, but also can enable more accurate and robust scene analysis by incorporating the learnt meta-level information (e.g., within a Bayesian framework). They go beyond state estimation as in numerous well-established tracking algorithms to address more general problems of adapting and optimizing resources or actions to effectively achieve a task or a set goal. Hence, meta-level and adversarial trackers can belong to a higher system level, compared with the conventional *sensor-level* tracking techniques. In this context, adversarial tracking refers to one side estimating over-time the capabilities or strategies of its competitors/adversaries and adapting its future actions, for instance to avoid detection or conflict. An example is inverse filtering in counter-autonomous systems, where the aim is to infer the adversary's tracker estimates and then predict its future actions.

These sophisticated and difficult problems can be posed elegantly using suitable multi-scale stochastic processes and/or hierarchical models together with associated inference and decision theoretic tools. There are substantial challenges in formulating tractable models as well as scalable, efficient and interpretable architectures that can capture complex target behaviours together with interactions and constraints, without imposing prohibitively high computational and training data requirements. This special section will serve both as a comprehensive primer on the state-of-the-art, and a showcase of current developments to address these modeling and computational challenges as well as the numerous application areas of the topic of meta-tracking and adversarial tracking.

### Topics of interest include (but are not limited to):

- Meta-level tracking, intent prediction and group interactions modeling in multi-object scenarios
- Situation and impact assessment and prediction
- Adaptive controlled, adversarial tracking and trajectory planning
- Pattern and behavioral analysis from image, video and multimodal data with meta-information
- NLP, graphical and kernel methods for scene analysis and automated decision making
- Game theoretic signal processing models for adversarial systems
- Robustness
- Non-Gaussian, nonlinear, and non-stationary models for meta-level and adversarial tracking
- Anomaly detection and pattern-of-life learning
- Adaptive beamforming and blind source separation with Bayesian priors on targets or systems
- Inverse filtering for tracking
- Other applications including intelligent vehicles, smart navigation for robotics and autonomous driving, biomedical applications and neuroimaging, human machine interaction, social networks, zoology, acoustic and audio, games, security and privacy and resource allocation in smart grids.

### Important Dates:

Manuscript submission due: ~~01 June 2020~~ 15 July 2020 (extended)
Revised manuscript due: 08 January 2021
Final manuscript due: 15 March 2021
First review completed: 30 September 2020
Second review completed: 15 February 2021
Publication date: second quarter of 2021

Submissions will be reviewed according to standard T-AES procedures for regular papers. Prospective authors should visit taes.msubmit.net for submission information. Use the category Special Section: Meta-level and Adversarial Tracking.

### Organisers:

Bashar Ahmad (Aveillant, THALES Land and Air Systems), bashar.ahmad@aveillant.com
Simon Godsill (University of Cambridge), sjg30@cam.ac.uk
Vikram Krishnamurthy (Cornell University), vikramk@cornell.edu
Peter Willett (University of Connecticut), peter.willett@uconn.edu
Muralidhar Rangaswamy (US Air Force), muralidhar.rangaswamy@us.af.mil