

# ISIF WORKING GROUPS REPORT

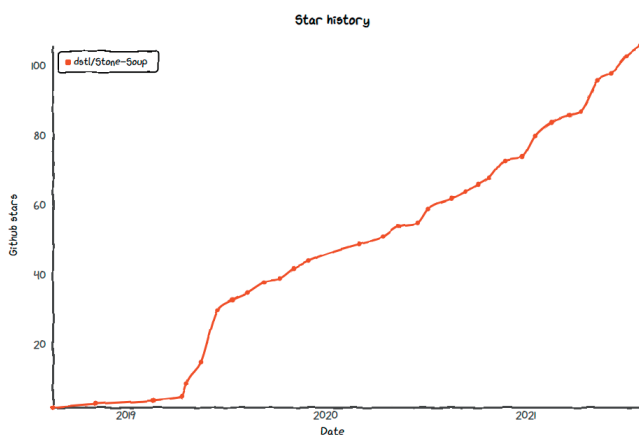
## UPDATES ON WORKING GROUPS

The International Society of Information Fusion (ISIF) sponsors working groups by providing recognition and status. The working groups bring together researchers who share a common interest. For more information on working groups, or for submitting a proposal for a new working group, please see the ISIF website<sup>1</sup> or contact Darin Dunham, Vice President Working Groups ([darin@vectrass.com](mailto:darin@vectrass.com)).

Currently, there are two active working groups sponsored by ISIF, and a report of their recent activities is included.

## STONE SOUP DEVELOPMENT CONTINUES APACE

Stone Soup was described in the March 2019 issue of *Perspectives*. It has continued to both grow and develop over the last year. It is now supported via ISIF's Open-Source Tracking and Estimation Working Group (OSTEWG) as well as a North Atlantic Treaty Organization (NATO) Exploratory Team activity (SET-ET-124). Stone Soup also has now a digital object identifier (DOI):10.5281/zenodo.4663993. With biweekly user-focused telecons, an active Slack workspace, 105 “stars”<sup>2</sup> (see Figure 1), a peak of 164 downloads in a single day, 50 forks, and 15 active developers contributing 15,392 insertions (and 4,594 deletions) to the repository<sup>3</sup> in the last year, Stone Soup now includes, for example: a vectorised implementation of a particle filter; multiframe assignment; square-root and iterated Kalman Filters; particle flow implementations; and tree-based data structures for very efficient gating. These enhancements have led to Stone Soup being applied across a growing



**Figure 1**  
Stone Soup has consistently grown in maturity since its March 2019.

<sup>1</sup> <https://isif.org/working-groups/isif-working-groups>

<sup>2</sup> <https://star-history.t9t.io/#dstl/Stone-Soup>

<sup>3</sup> <https://github.com/dstl/Stone-Soup>

variety of domains spanning countering drones (in which context it was used by two of the winners of a Kaggle challenge<sup>4</sup>), analysis of air traffic, sonar processing, global maritime surveillance, and space situational awareness. Training courses at the UK University Defence Research Collaboration's summer school (in June 2021) and at Fusion 2020 have taken place and the material from those sessions is online.<sup>5</sup> Current development includes a focus on development of user interfaces, further enhancing the set of state-of-the-art algorithms that Stone Soup implements, and on configuring Stone Soup to operate effectively in sensor management contexts. For example, under the auspices of ISIF OSTEWG, an international workshop on Stone Soup for sensor management was convened virtually at various ends of the day on 2 November 2020. This drew contributions from academia, government, and industry participants. The activity at the workshop has culminated in amendments to the Stone Soup code base, to sensor classes which are now actionable, and most obviously to new sensor management classes. These are to be augmented with novel, more efficient methods in 2022. More generally, new contributors wanting to integrate their algorithmic advances into an increasingly mature open-source library and/or compare their new algorithms with ever-more sophisticated preexisting baselines are very welcome. Similarly, users wanting a taste of Stone Soup's algorithmic gastronomy should get in touch: visit <https://isif-ostewg.org/>; or highlight barriers to use as “issues”<sup>6</sup>; or initiate or engage in discussions.<sup>7</sup> Help us to enable Stone Soup to help you!

—By Simon Maskell

## UPDATES ON THE ETUR WORKING GROUP ACTIVITIES

The Evaluation of Techniques for Uncertainty Representation Working Group (ETURWG) is an official activity of ISIF with the products posted at <https://eturwg.c4i.gmu.edu/>. The ETURWG is going on 10 years of collaboration continuing to refine, update, clarify, and implement the Uncertainty Representation and Reasoning Evaluation Framework (URREF) ontology. On

<sup>4</sup> <https://www.ncia.nato.int/about-us/newsroom/agency-announces-winners-of-drone-data-challenge.html>

<sup>5</sup> [https://stonesoup.readthedocs.io/en/v0.1b5/auto\\_tutorials/index.html](https://stonesoup.readthedocs.io/en/v0.1b5/auto_tutorials/index.html)

<sup>6</sup> <https://github.com/dstl/Stone-Soup/issues>

<sup>7</sup> <https://github.com/dstl/Stone-Soup/discussions>

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average, 15 people participate at the biweekly meetings. The ETURWG activities include developing a URREF tutorial, incorporating artificial intelligence and machine learning (AI/ML), and defining metrics.

The first activity developed a tutorial that advocates for the URREF, the implementation, and use cases. Since the ETURWG URREF tutorial was organized from the group discussions, it incorporates the perspectives from many activities of ISIF members. Given the Fusion 2020 format, the tutorial is recorded and the results available to the community.

The second major point lies in the current ETURWG discussions. AI and ML are two areas of constant attention with many overlaps with data fusion. Still, some challenges remain with the understanding of deep learning, much as situation assessment in information fusion. Hence, the group sought to align the uncertainty analysis to that of emerging metrics in AI/ML of *explainability*, *interpretability*, and *transparency*. The 2021 ETUR Special Session is focused on trust and its connections with uncertainty representation and reasoning within the Information Fusion context. Topics covered include human-machine teaming,

cognitive security, hybrid systems, explainability and interpretability, autonomy, multiple intelligence, and decision making.

The third development is exploring the URREF to support explainability, interpretability, and transparency. Since the URREF supports a system-level understanding of the data pedigree and the reasoning strategy, the ETURWG put together a few papers addressing the elements of transparency that include data handing, data reasoning, and data reporting. Hence, data turned into information should incorporate the system contextual knowledge that supports the information fusion pipeline.

The ETURWG continues to explore new topics in data and information fusion processing, reasoning, and decision making with the focus on uncertainty analysis. The URREF ontology semantically captures the many elements for deploying information fusion systems, while at the same time explores metrics of analysis, use cases, and philosophical elements of the community. All ISIF members are welcome to join the discussions and to propose future topics aligned with the ETURWG interests.

—By Erik Blasch