Enterprise Neurosystem: Activity Report 5

Satellite Data Working Group and PoC

We held a number of meetings with Tomás Acuña, CTO and Co-founder of AgroSpace and Bloom Alert. He was referred to the community by Abrosio Yobanolo del Real at the UNFCCC TEC. Tomás has joined the community and initiated a working group and PoC, which was accepted via board vote. His proposal follows:

> **Working Group Scope:** Collaborative group focus on remote sensing solutions to tackle challenging aspects related with climate change, security awareness and optimize the use of natural resources.
>
> **Project:** Remote Sensing - Marine Litter / Pollution
>
> a) Expected Output
> - Open source software to detect marine debris using ML&AI and public/private sensors.
> - Open data to calibrate and validate algorithms related to marine debris.
> b) Milestones
> - Short Term: Discuss general needs for centralizing the scope of this group. Connect with further researchers in the field (e.g. IOOC-RSML, Ocean CleanUp, etc.).
> - Medium Term: Define 2-3 prototype studies to exemplify the scope of the working group and add the code to GitHub.
> - Long Term: Establish cooperative connection with public (NASA/ESA) and private (PLANETS/DigitalGlobe/etc.) organizations to enhance our capacity to monitor key sites that are highly polluted, which decrease the value of pristine ecosystems and cause damage to wildlife.

In addition, we met with Yara Mohajerani, Co-founder and CEO of EnvAI, and Tharshi Srikannathasan, his Co-founder and CTO, who was referred to us by board member Vish Hari. Yara and Tharshi have also joined the community, and Yara suggested the following projects as additional areas of focus for this new working group. This proposal was also approved by board vote.

- Immediate term: Using GRACE (Gravity Recovery and Climate Experiment) data to quantify water scarcity through direct mass change. The basic framework is in place, so this should be a straightforward proof point (e.g. https://yaramohajerani.github.io/dynamic_mascons/).
- Intermediate term: Using high resolution surface displacement data from differential interferometric synthetic-aperture radar data with existing automated tools that are in place to assess environmental risk such as ground subsidence as well as infrastructure. Relevant work: https://www.nature.com/articles/s41598-021-84309-3
- Long term: More ambitious project - work in synergy with Tomas' project to provide an automated early warning system for harmful algal blooms, by providing an ML framework to classify phytoplankton species based on microscopic imagery from floating cytobots, and plugging that information into ecosystem predictive models (existing contacts). The real bottleneck is the cost of measuring equipment, but worth exploring. Important note: This requires more expertise than just what we can provide, but we can help with the ML component and bring in existing contacts at MIT and UC Santa Cruz to provide input for the modeling and measurement platforms, respectively. Also contingent on Tomás' input.

Central Intelligence Working Group

- The Self-Defined Digital Asset catalog development continues, and the next development milestones are set for completion in 8/22.
- The SMC2022 paper on Self-Describing Digital Assets was submitted, and the paper is now in the review process. This is for presentation at the Smoky Mountains Computational Sciences and Engineering Conference (August 23-25, 2022), and the notification date for acceptance is 7/19.
- Josh Purcell has proposed incorporating his team's work at Redpanda (re. event driven systems) into the SD Catalog development effort. He will return with a related update during the next workstream meeting.
- Tong Zhang will arrange a presentation to the working group by a colleague at Intel, who is working on a Federated AI project.
- We had a meeting with community member Elias Castro Hernandez of Microsoft Azure. He indicated the Azure team is becoming more interested in open source platforms, and may be inclined to use our code base as our development matures. We will set up another call with Elias, to better understand their requirements.

Secure AI Connectivity Fabric Workstream

- A number of integration proof points have been targeted, including the Satellite Data PoCs, and discussions with Ryan Coffee and Omar Quijano/Stanford SLAC on use cases.
- Sanjay Aiyagari has updated the home page of the group wiki to indicate the names of all the members, per the requirements of our Governance documents. He has also placed the recent White Paper up on the wiki - if anyone has feedback, please forward this to Sanjay.

https://github.com/Enterprise-Neurosystem/Secure-AI-Connectivity-Fabric/wiki/whitepaper-202206

Telco Vertical Development Track

- O-RAN Next Generation Research Group (nGRG): This is a new organization in O-RAN dedicated to 6G research and future architectures, led by our Telco workstream chair Ravi Sinha. He is interested in establishing a development link between our organizations, and five areas of research will be initiated in this new group - 1) 6G Use Cases and Gap Analysis, 2) 6G O-RAN Architecture, 3) Native AI and Cross Domain AI, 4) Native Security, and 5) R&D Platforms. Given the widespread support of O-RAN in the telco industry, creating a bridge between EN and this research team will strengthen our efforts in this area. Participants include Reliance Jio, Intel, NVIDIA, AT&T, Ericsson, Samsung, CTC, CMCC, Qualcomm, Rakuten and others.
- Transport for satellite data: We had a discussion on using telco networks as the communication layer for a large scale Neurosystem infrastructure, involving satellite/IoT data and sensors, and Edge/Core compute.

Acoustics AI / Bee Population PoC

Ryan Coffee, Leo Hoarty and Dennis O'Connell have been working on preparing the PoC, with input from Dr. Noah Wilson-Rich of Best Bees. Leo has completed the design of the beehive microphone system, and now has both block diagrams and schematics completed. A prototype microphone has also been created by Leo for initial hive testing. Once more is learned from the initial testing, printed circuit board designs will be completed. On the software side, the system is still manually driven until a better understanding of the workflow is gained from mic to ML. Following that, a control system will be coded to largely automate the data acquisition process.

Summer Intern

Ryan Coffee has introduced Ella Litsur, an inbound summer intern who will be working on a new AI Acoustics PoC in Stanford SLAC's data center. She will be using the AI Acoustics code base created by community member David Wood, and working under our community name while engaged at SLAC. She will be building this use case with Ryan and David's guidance - a great development in terms of our community's partnership with SLAC, and our education and AI training charter.