ETH ORD Programm

Contribute call 2 - deadline 28th July 2022

Number of projects submitted : 12 / Number of projects financed : 6 / 50% success rate

Project title	Abstract	Applicant	Institutes
Mitigating spaceborne radio frequency interference through satellite database	The tremendous growth of satellite mega-constellations such as Starlink and OneWeb, emitting signals at radio frequencies, threatens radio astronomy. The emitted satellite signal can cause radio frequency interference (RFI) or saturate the wideband receivers of the highly sensitive radio telescopes leading to an information loss or even failed observations. As a countermeasure, the International Very Long Baseline Interferometry Service for Geodesy and Astronomy (IVS) community, and the International Astronomical Union (IAU) have launched working groups on the measurement and mitigation of satellite RFI. One promising approach is to avoid observations close to potentially harmful satellites. Within this work, we plan to support this attempt by establishing an open database of satellite orbits and emitted satellite frequency spectra. We will curate existing orbit information and connect them with existing frequency information and measurements taken at the observatories. The database will be openly available and provides access via a web interface and an application programming interface (API). This ensures seamless integration into existing state-of-the-art software pipelines.	Matthias SCHARTNER	ETH Zürich
Standardizing Encoding Elements for Lensless Cameras	In this work, we plan to extend an open-source hardware and software toolkit for lensless imaging called LenslessPiCam. A key component of lensless imaging is the optical element that replaces the lens, ypically a thin mask. While there exist several approaches to designing this mask, there is no unified way for designing and fabricating this optical element that takes into consideration interoperability and reproducibility. The goal of this work is to add such mask-design tools to LenslessPiCam so that it can be more relevant to the research community. Moreover, the FAIR principles and using accessible resources guide our methodology such that LenslessPiCam can continue to be an affordable and performant toolkit for lensless imaging for educators, hobbyists and researchers.	Eric BEZZAM	EPFL

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Establishing Structures for an Efficient Management of Materials and Processing Data	The Coating Technologies (CT) group at Empa develops new coatings and thin film materials for a variety of technical applications. An important part of our research is the accelerated development of thin film materials using combinatorial methods. The resulting large data sets offer unique opportunities, but also necessitate efficient and transparent data management practices. Currently, many published experimental datasets are missing accurate descriptions (i.e. relevant metadata). In this project, we want to establish workflows for automated meta-data generation and storage. This includes developing software-solutions for deposition and measurement equipment, which interface directly with OpenBIS, to record critical parameters with minimal user input. The raw data is meanwhile stored on LAN servers using standardized file structures. In addition, we will develop software solutions that allow our data analysis tools (e.g. CombIgor) to query meta-data as well as measurement data directly from the servers. The processed, high-quality datasets will be stored in an open format, which can be used internally, but also published to open data repositories (e.g. NOMAD or Zenodo). This solution will also benefit other labs working on thin film deposition. Several of our partners across Switzerland have already expressed interest in a streamlined workflow for metadata collection and storage and with more and more labs starting to use combinatorial methods the demand is growing.	Sebastian SIOL	EMPA
Pycsou FAIR: A Community Marketplace for Discovering and Sharing Image Reconstruction Plugins	Pycsou is an open-source computational imaging software framework for Python with native support for hardware acceleration and distributed computing. The latter adopts a modular and interoperable microservice architecture providing highly optimised and scalable general-purpose computational imaging functionalities and tools, easy to reuse and share across imaging modalities. One key specificity of the framework is its domain-agnosticity, which helps it remain lightweight (with only a few core dependencies), accessible to most imaging scientists, and portable/scalable across computing platforms and imaging modalities. However, this domain-agnosticity also limits the adoption of the framework by certain imaging communities with very specific computational imaging needs. This project adresses this issue by introducing Pycsou FAIR, a web platform, meta-programming framework and interoperability protocol for Pycsou aiming at facilitating the discovery, installation, development and sharing of FAIR-compliant community-based image reconstruction plugins at scale. This platform will allow imaging scientists to develop, share and take full advantage of modern computational imaging methods in their routine processing pipelines.	Matthieu SIMEONI	EPFL

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Enabling compliance with ORD standards for cutting-edge time-resolved experiments at high data-rates	The upcoming Swiss Light Source 2.0 machine upgrade and the advent of free electron lasers (SwissFEL) enable novel and exciting advancements in X-ray science. One of the emerging techniques is time-resolved serial crystallography. The technique can provide good insight into biomolecular processes at micro- and millisecond timescales but is extremely data intensive. A single experiment can, already at this moment, produce a continuous stream of X-ray images at a rate of 2'000 images per second (17 GB/s), running for hours.Dataset size for the technique is many terabytes. The dataset size makes complete raw data deposited in the public repository difficult to access. Within this project, I will create reduced datasets with improved accessibility by applying existing protein diffraction labeling algorithms to filter images. The resulting dataset will only contain images with high-quality diffraction (usually 0.1-10% of all images) and will be available in the PSI public data repository alongside the complete dataset. I will also improve metadata content by including labeling results to help the datasets 'interoperability and findability.	Filip LEONARSKI	PSI
MiShMASh: Microbiome sequence and metadata availability standards	The emerging field of microbiome research is driven by large-scale, high-dimensional datasets. Unrestricted access to sequence data and metadata is necessary for scientific innovation and re-use, and is consequently required by the scientific community, certain journals, and funding agencies. Unfortunately, many microbiome studies suffer from poor data accessibility and metadata interoperability, hampering scientific advancement. The project aims to close open research data (ORD) gaps in the microbiome field by addressing (1) the ineffectiveness of sequence data availability statements, which leads to poor reporting, reproducibility, and re-use; and (2) lack of consistent metadata standards for annotating microbial ORD. We propose a two-pronged solution in (1) developing a tier-based FAIR ORD standard for the field, and (2) building software to assess adherence to FAIR ORD standards. This project would contribute open resources intended for use by a diverse range of users, including researchers, journals, and funding agencies. Combined with the tier-based system, validation software will enable users to assess how well microbiome studies meet data availability and metadata standards. The tools and guidelines developed here will improve sequence data and metadata reporting practices for greater accessibility, interoperability, and future re-use.	Lina KIM	ETH Zürich