Guidelines and Policy for Surveys using Space Warps

Phil Marshall, Aprajita Verma & Anupreeta More

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Abstract

Space Warps was conceived as a strong lens discovery *service*, that any survey science team can make use of (within the logistical constraints). In this document we discuss the relationship between the survey science teams and the Space Warps collaboration. This document includes guidelines for data provision, the data policy and for publications of Space Warps-enabled discoveries.

1 Introduction to Space Warps

The Space Warps website is designed to motivate and enable tens of thousands of people to perform the scientific tasks of strong gravitational lens identification and classification. Space Warps comprises a primary classification interface (http://spacewarps.org) that allows citizen scientists to inspect images and mark those that contain potential gravitational lenses. In addition, these volunteers are shown simulated lenses (appropriate for the survey being conducted) as an interactive training tool that also allows us to establish the citizens' likelihood of identifying potential lenses and blank fields using the Space Warps Analysis Pipeline (SWAP).

A key part of the Space Warps project is the ability for all members of the Space Warps collaboration (see Section 2) to communicate with each other and discuss interesting candidates through Talk[1]).

The PIs of the Space Warps project are the authors of this document, P. Marshall, A. More and A. Verma, please do not hesitate to contact us if you require any further information or have any questions. The PIs may be collectively contacted via the email address spacewarpspi@googlegroups.com

2 Collaboration Membership Types

The Space Warps collaboration comprises the Space Warps science team, Space Warps development team, and all the volunteers who have logged in[2] and contributed classifications to the project.

[1] Talk (found at `http://talk.spacewarps.org`) is a forum for Space Warps collaborators to discuss individual sources and the Space Warps project in general. Bugs can also be reported. This is the direct portal for communication with the Space Warps community.

[2] with a Zooniverse ID. It is possible to classify anonymously, and we count those classification but as we don't know who they are, we are unable to collaborate with them directly.

An expanded definition of the Space Warps membership is given in the document "Space Warps Publication Policy: CFHT-LS". In this document we discuss the relationship between the Space Warps collaboration and future Survey Science Teams (SST) who wish to use the Space Warps interface to investigate their data. The SSTs will liaise with the Space Warps science and development teams to ingest their survey data into the Space Warps interface. Space Warps was established with future surveys in mind and therefore there may be some overlap between current Space Warps members and the future SSTs.

In the remaining sections we look at discovery publications that might arise from future Space Warps projects, and suggest reasonable guidelines for deciding on their authorship. First, however, we remind ourselves about data access via Space Warps.

3 Survey Data Policy

Space Warps is a public website. All images displayed there are by definition in the public domain, and so must be expected to be downloaded, copied and redistributed by any Space Warps user. This is a **good thing**: images of the sky taken with publicly-funded telescopes belong to everyone.

However, some surveys come with their own proprietary access policy. It is the responsibility of the SSTs to provide images to Space Warps in a way that is consistent with their own data access rules. There are two things that SSTs can do to in order to respect any proprietary period that they have imposed on themselves:

1. Add a "LICENSE" keyword to the FITS and PNG image headers, explaining what the rules for redistribution of these images are. This will almost certainly be ignored, but it would be a nice reminder that nothing comes free of either cost or responsibility. Other keywords could also be included as well: data provenance is important, and links to useful survey webpages would be most welcome!

2. Remove all WCS information from all images provided. The Space Warps interface "dashboards" do allow FITS and JPG files to be downloaded. If images from a proprietary dataset being made available is a concern for an SST, they should remove the WCS. This also has the consequence that it minimises the potential "scooping" of lens candidates by anyone other than the SST. In practice, the objects contained in the Space Warps images will be too faint for anyone without access to a large telescope to observe, and may also be absent from any public catalogs, so the opportunities for follow-up will be quite limited. Images with field of view less than about 3 arcminutes in diameter are not solvable by `astrometry.net`. **Please note**, however, that we cannot exclude the possibility that object co-ordinates are posted in Talk. For example, co-ordinates of previously published lens candidates or recognisable fields from CFHT-LS have been posted in Talk by a very small number of citizens.

4 Data Preparation and Publications for Future Survey Teams

4.1 Future Project Proposals

Any future Space Warps projects are requested to liaise with the Space Warps PIs regarding their project. We ask that potential project teams first approach the Space Warps PIs (Phil Marshall, Anupreeta More, Aprajita Verma, collectively contacted via spacewarpspi@googlegroups.com) with a short description of their project that includes the following information.

- Survey
- Bands to be included
- Total number of images to be viewed (approx.)
- Targeted survey or blind field search [3]
- Brief outline of the overall goal(s)
- Proprietary data issues

The Space Warps PIs will then arrange a telecon with the SSTs to discuss their project further.

The original Space Warps papers, by definition, provide a complete description of the system, and its results from the CFHT-LS survey. The science team of any other survey (such as DES, RCS, KIDS, PS1, HSC *etc.*) should be able to read these papers before designing their own Space Warps project, and cite them as justification for some of their experimental decisions. As the Space Warps paper series get published, links to the papers will be given in this draft. Prior to publications, draft papers can also be shared on request by the Space Warps PIs (spacewarpspi@googlegroups.com)

4.2 Collaborating with Space Warps Science Team

Implementing a new project based on different survey data will require support from the Space Warps Science Team, in three respects:

1. In **preparing data** for the site, and uploading it onto the Zooniverse servers. There is a reasonable amount of work in preparing data and images by the SSTs for delivery to Space Warps. The Space Warps team will provide assistance to SSTs in data preparation. The benefits of using the Space Warps service will far outweigh the time needed to prepare data. The Space Warps Science Team can advise on suitable Training Subjects and image display settings, and also on formatting the data ready for ingestion and display.
2. In **reconfiguring the site itself** ready for the new data. The SST will need to include new Spotter's Guide images and text, modified tutorial content, and additional survey-specific site content; the Space Warps Science Team can help with all of this.

[3] Targeted: inspection of a list of candidates; Blind: inspection of tiles of a survey area

3. In **maintaining the site** so that it continues to function correctly. This will involve technical support from the Zooniverse and Space Warps science teams, but will also require the continued engagement of the wider collaboration by the SST in Talk. Since this social filter is a key part of the sample refinement, the latter may involve a significant time commitment.

4.3 Resulting Publications

4.3.1 Journal Papers

In return for the work outlined in Section 4 in setting up the new surveys, the Space Warps PIs will nominate a small number of core Space Warps collaboration members as authors on **papers that present discovery of a lens or sample of lenses enabled by the** Space Warps **system**. A "discovery" is defined by the announcement of the source(s) to the astronomical community in a journal paper. We would expect the Space Warps author list to be a small number (less than ten), primarily the Principal Investigators and a few others working on the ingestion of the new data. All post-discovery follow-up papers would of course be exempt from this: the idea is that Space Warps is purely a gravitational lens discovery service, but not one that runs by magic.

We request that authors of Space Warps-enabled discovery papers should circulate drafts to the list of Space Warps authors and allow a minimum of two weeks to give time for comments. We also request that any papers based on Space Warps enabled discoveries should cite the Space Warps system papers. This policy document will be updated with the correct citations to the Space Warps system papers when available.

Space Warps runs an analysis pipeline (SWAP) that will be tailored to the science goals of each new survey. Any large changes to the analysis code will be documented by the Space Warps Science Team. The Space Warps Science Team reserve the right to update the Space Warps methodology papers.

4.3.2 Zooniverse Letters

Any Space Warps collaboration member, simply by virtue of their Zooniverse registration, may write a Zooniverse Letter[4] describing their investigation of any lens candidate they find in Space Warps. This, along with posts in Talk, is the primary means by which we expect collaboration members will communicate their findings to the rest of the astronomical community. The investigation of any Space Warps images that are provided without world coordinate system (WCS) information will be necessarily limited but the Space Warps Zooniverse Letters will contribute to the collective knowledge and understanding of the presented system(s). Zooniverse Letters are citable objects, and in some cases will appear listed on ADS[5].

As Space Warps classifications are a community wide activity, it is impossible to attribute the discovery of a candidate to a single community member, or group of members. Therefore, in recognition of their contribution to the Space Warps project, Space Warps community members will be listed (on their approval) on the Space Warps members web page. This web page will be linked in every

[4] `http://letters.zooniverse.org`
[5] To be confirmed.

ensuing Space Warps publication. If a community member makes a significant contribution e.g. in the further investigation of a lens candidate with modelling tools, they are strongly encouraged to write Zooniverse Letters. This may lead to them being invited to join journal publications by the lead author of a "discovery" publication.

5 Summary of Publication Guidelines

Any Space Warps series and Space Warps enabled discovery papers should include

- citations to the Space Warps system papers, Space Warps I & II
- a small number of Space Warps authors proposed by the Space Warps PIs (see 4.3.1).
- the collaboration should be acknowledged in the acknowledgement section with a link to the collaboration membership page (URL: to be confirmed when available).