SDSS & Chandra Source Catalog + NHFP Report

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for the Sep 2023 CUC meeting
**SDSS-V** 2020 - 2027  
[http://www.sdss.org/future](http://www.sdss.org/future)

**All-Sky Spectroscopy**
- Black Hole Mapper
  - Repeat QSO spectra
  - eROSITA followup
  - $r < 21.5$ mag
- Milky Way Mapper
  - stars in IR at high-res
  - $H < 14$ mag
- Local Volume Mapper
  - IFU of nearby galaxies
SDSS-V, SAO + CXC

- SAO joined SDSS-V as a full member: $230k/yr for 4 years
  Includes the 50% funds from the CXC

- CSC:
  - Only covers ~2% of sky
  - Much better sensitivity and spatial resolution than eROSITA!
  - ~50% have opt/IR counterparts with mag <21

- Stellar and XRB CSC counterparts in the Galactic Plane will be a unique treasure trove

- CXC will serve SDSS-V data products (spectral properties and flux-calibrated digital spectra) to the community (unfunded)
CSC2.1p Opt/IR Counterparts: Targets for SDSS-V Spectroscopy

- Re-ran with CSC2.1p
- We only include for matching the following magnitude ranges
  - GAIA DR2 \( 14 < G < 20 \)
  - Legacy \( 14 < (g | r | z) < 21.5 \)
  - PS \( 14 < (g || r || i || z) < 21.5 \)
  - 2MASS \( H \leq 14 \)
- 188k total candidate targets (up from 148k) -
  - 172k optical; 16k IR only
- Include a priority Pri, derived solely from the X-ray S/N xsn.
- Targeting simulations say expect ~40k spectra (cf.~ 300k eROSITA)
- About ~10k new spectra to date from SDSS-V (7k CSC targets)
CSC Counterpart Targets for SDSSV Spectroscopy

Virgo Cluster

Equator; Stripe82

Galactic Center
CSC2.1p Opt/IR Counterparts: and Public SDSS DR17 Spectroscopy

- A preliminary version of the Chandra Source Catalog v2.1 as of 2022 Nov contained 387441 unique Chandra X-ray sources.
- Matched to each of 4 opt/IR catalogs - Gaia DR3, PanSTARRS-1 DR2, Legacy DR10, and 2MASS using NWAY (Salvato, M. et al. 2018) with no mag limits imposed.
- 229,045 (~⅔) have an optical or infrared counterpart.
- Simple 3arcsec match between SDSS DR17 spectroscopy and X-ray position yields 17,666 spectra with ZWARNING=0
- 3,207 have NSPEC obs > 1
X-ray Flux vs Optical Mag with SDSS DR17 Classifications
SDSS-V/CSC Spectroscopy
Equatorial Coordinates

Virgo Cluster
Equator; Stripe82
Galactic Center
SDSS-V/CSC Spectroscopy

Flux vs Redshift

All Existing Matches

CSC2.1p 2022 Oct Matched (3") to DR17 + spAll-v6_1_0_ through 60229

17106 AGN
4811 Galaxies
1085 Stars
51 CVs

23053
Introduction

This page contains links and short descriptions of the tables of crossmatches between versions of the Chandra Source Catalog 2 and catalogs of sources from several multi-wavelength surveys. All crossmatches have been performed with a Bayesian method developed by Budavari & Szalay (2008) as implemented and extended by either A. Rots (2020) in the Xmatch code that takes into account local source density as well as both error ellipses and raw-size ellipses of the sources, or in the NWAY code (Salvato et al. 2018).

CSC 2.0 sources are extracted from the CSC 2.0 Master Sources table. For each crossmatched source pair the match probability (between 0.0 and 1.0), match type (x when positional error ellipse is used, x if source raw size is used) and match grade (o for definite matches, v for likely matches) are provided. The details on these columns can be found here. In addition, ambiguous matches are provided in separate tables.

SDSS

PRELIMINARY CSC 2.1 Production Current Database Crossmatches and SDSS Spectra

Using the NWAY algorithm, we have crossmatched the set of X-ray sources extracted from the CSC 2.1 production current database on 14 November 2022 (389k sources) to four catalogs – Gaia DR3, Legacy Survey DR10, PanSTARRS-1, and 2MASS, finding counterparts for 229k CSC 2.1 production current database sources. Cross-matching this table with SDSS DR17 spectroscopy yields more than 17k objects with SDSS spectra, including pipeline classifications and radial velocities. The resulting catalog lists a subset of X-ray information for these sources, includes catalog IDs, positions and magnitudes for all optical/IR matches. We present a README file describing the catalog, and the cross-match catalog itself in FITS and CSV format.

Because this cross-match is performed using the preliminary CSC 2.1 production current database while processing continues, the user should be aware that a few percent of the matches may be wrong, have incorrect positions and/or position errors, or may be rejected entirely by catalog quality assurance when the final CSC 2.1 catalog is released.

A crossmatched table of 188k sources has been submitted to the SDSS-V project as potential targets for spectroscopy. Those that are observed will be matched to upcoming CSC 2.1 sources after the SDSS-V spectral data become public.
NASA Hubble Fellowship Program

- Deadline for 2024 Fellows applications was Nov 2
- Now permanent: eligibility extension to 4 years post PhD
- Selection Review (virtual) Jan 16-23, 2024
- Stats: oversubscription up from 15 to 19

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Leads are implementing or drafting responses to 32 recommendations from NASA review

Leads have implemented
- Orientation for new fellows
- Remote work program (cf telecommuting)

Hoping to enable NASA centers to host NHFPs

Fellows have implemented their own Astronomy Mentoring Program for Upcoming Postdocs (AMP-UP)
Symposium

September 18–22, 2023

NASA Hubble Fellowship Program

Science talks by NHFP Postdoctoral Fellows across the full range of astrophysics.

Program & Info at
https://cxc.cfa.harvard.edu/fellows/2023-nhfp-symposium/

Student Organization
Center at Hilles
59 Shepard St.
Cambridge, MA 02138

Or online at
https://www.youtube.com/

- Sep 18-22 in Cambridge, MA
- 3 non-science sessions
  - Mentoring/DEIA
  - Grants & Benefits
  - Careers
  - Open Mic
NHFP Open Mic

How to create a research project for O(10) undergraduate students?

- Do you have a dataset that:
  - can be divided into multiple chunks, and
  - each chunk needs similar analysis, but it is not straightforward to automate?
- Can an undergrad start working on the analysis with 1-2 months of training?
- Can you reach out to a community of undergrad students who lack the typical channels for access to research?