Proposed Roadmap to Photometric Redshifts
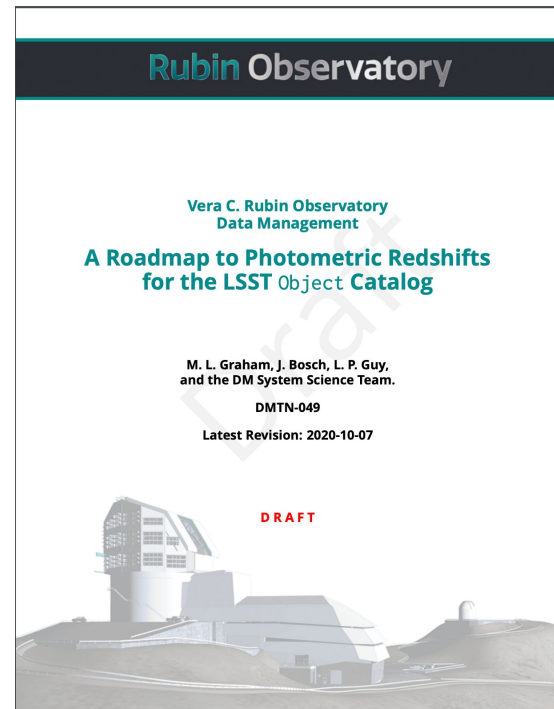
We propose:

Premise: DM will adopt one or more existing, community-vetted algorithms in order to generate DR1 Object photo-z estimates that represent a minimum viable product, which serves the widest variety of science applications.

DMTN-049 is designed to serve as a living document and evolve to incorporate input from the science community.

DM Science study led by Melissa Graham

Aim to issue by end 2020 and circulate to the community

Rubin Observatory

Vera C. Rubin Observatory
Data Management

A Roadmap to Photometric Redshifts
for the LSST Object Catalog

M. L. Graham, J. Bosch, L. P. Guy,
and the DM System Science Team.

DMTN-049

Latest Revision: 2020-10-07

D R A F T

Current working branch:
https://dmtn-049.lsst.io/v/DM-6367/index.html

Proposed Roadmap to Photometric Redshifts

Rubin
Observatory

Method: The Rubin science community has a wealth of expertise in photo-z, and will be included in the process to define the minimum viable product[1] and select the estimator(s).

Phase 1: Define the minimum attributes and estimator selection criteria via a series of "Photo-z Forums"[2] with the science community.

Phase 2: Prepare a ranked list of candidate photo-z estimators by soliciting "letters of recommendation" from the science community.

Phase 3: During commissioning, facilitate community preparation in a "Photo-z Validation Cooperative" based on shortlisted estimators.

1) A version of a product with just enough features and of sufficient scientific quality to be usable early adopters who can then provide feedback for future development and improvement.

2) LSST Photo- z Virtual Forums will be informal discussion sessions attended by Rubin project staff and the community, and held virtually at a variety of times so as to enable participation from all timezones. Community input will also be ingested to this roadmap from written postings in the Community Forum

PZ Requirements: Roadmap Provides Answers

Rubin
Observatory

- Which algorithms are adopted? How many?
  - The roadmap will lead the community to produce a ranked list of vetted algorithms.
  - The choice of how many estimators are adopted remains with DM.

- Who implements the estimator and its associated inputs?
  - The roadmap leads the community to assist with implementation during commissioning.
  - Responsibility for DR1 Object pz remains with DM.

- Who tests, verifies, and validates the estimator? How good is good enough?
  - The roadmap leads the community and the project to jointly define how good is good enough for DR1.
  - The roadmap leaves space for DM to define constraints (e.g. processing).
  - The roadmap leads the community to assist with validation during commissioning.

- How can the SCs contribute - they are very keen to engage. Especially DESC.
  - The roadmap is focused on enabling community participation.

- Which aspects of PZ can wait until after DR1 and be left to Operations?
  - Any improvements beyond the "minimum viable product" serving "a wide variety of science needs".

- How can the In-Kind Contributions be leveraged? (Next slides).

Proposed Roadmap to Photometric Redshifts

Phase 1

Post call for community input regarding photo-*z* minimum attributes and evaluation criteria.

Update **attributes and criteria** in DMTN-049.

Phase 2

Post call for community "letters of recommendation" that formally advocate for photo-*z* estimators.

Update DMTN-049 with shortlist of **community-vetted** estimator(s) for Phase 3.

Deadline for **letters.**

Phase 3

Facilitate community participation in a "Photo-z Validation Cooperative".

LSST Commissioning

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
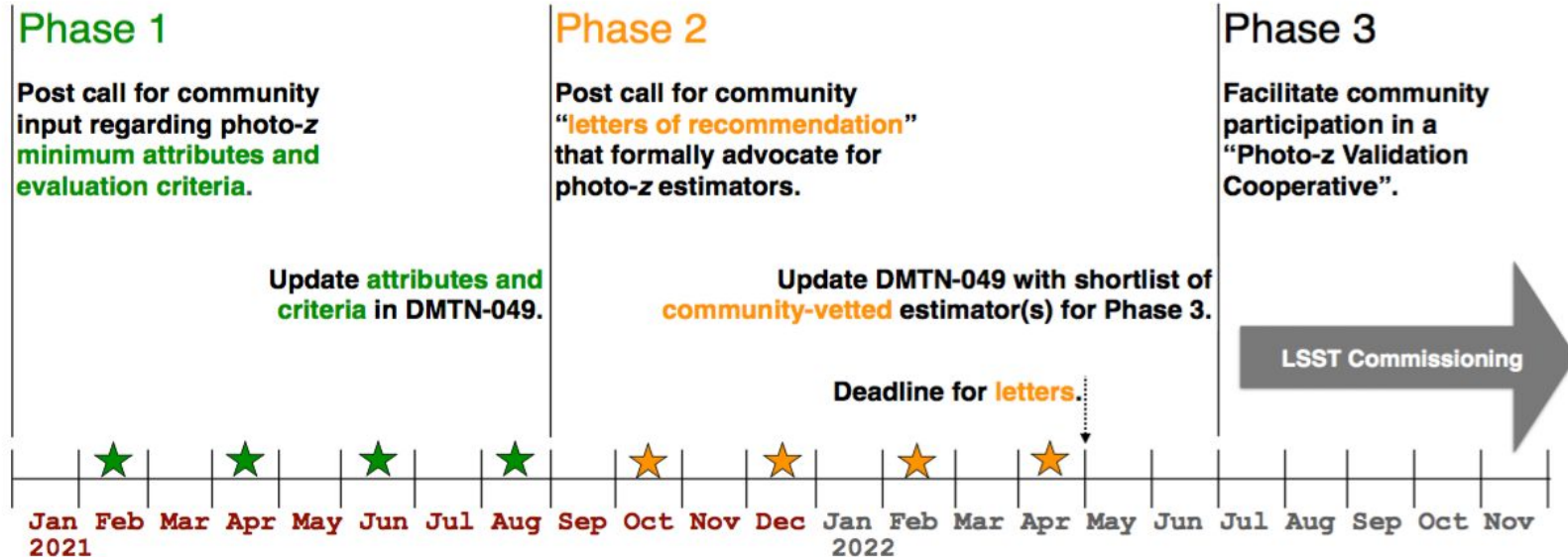2021

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov
2022

FIGURE 1: A schematic of the proposed timeline of DM activities to engage the community in the roadmap to DR1 photo-z. In addition to the virtual forums (stars), community input will be ingested from asynchronus discussions in the Community Forum (Community.lsst.org).

In-Kind Contributions to Photo-z

- Several teams have proposed different types of in-kind contributions to photo-z.

- A **photo-z in-kind coordination group** was formed to coordinate proposals between in-kind teams and their "recipient groups" (e.g., DESC, Galaxies SC, AGN SC, Rubin science pipelines).

  - Short-term: help teams optimize their proposals.

  - Long-term: help international teams towards the delivery, integration, and maintenance of their contributions within their recipient groups.

  - PZ In-Kind Coordination Group currently chaired by Melissa Graham.

- [Community.lsst.org -- "Science - Photometric Redshifts"](Community.lsst.org) is the primary venue for this group's conversations and for all discussion on photometric redshifts.

- The roadmap's focus on community participation on the path to DR1 Object photo-z will both leverage and enhance PZ in-kind contributions (next slide).

In-Kind Contributions to Photo-z for DR1 Objects

- PZ-related In-Kind Contributions are a mix of directable effort, infrastructure, software, and new or existing datasets.

- Recipient groups are a mix of the SC's and Rubin science pipelines.

- The roadmap aims to integrate DM-led efforts towards DR1 Object photo-z with SC-led efforts to produce science-specific photo-z. Thus, in-kind contributions to SCs' PZ estimates indirectly benefit DM's DR1 PZs.

- In-kind teams are being advised to work closely with the project and community at each phase of the proposed roadmap, and about how their proposed contributions could support DM-produced DR1 Object catalog photo-z.

Potential Issues with the Roadmap to DR1 Object PZs

Recall "*DMS-REQ-0046 (Priority: 2) : Provide Photometric Redshifts of Galaxies*"

Priority 2 means that the requirement is not a necessary condition for Operations.

A roadmap focused on community participation will set the expectation that the DR1 Object catalog *will have photo-z at the time of data release.*

However, keeping the DR1 Object PZ an internal endeavor only makes it more likely to suffer from time constraints during the final phases of Construction.

Furthermore, the roadmap focused on community participation makes it more likely that a user-generated photo-z catalog will be produced that can be federated with the DR Object catalog.