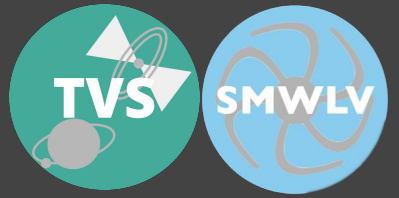
Welcome to the April 13th SMWLV-TVS Cadence Hack Day!



Tuesday, April 13th 2021

"Morning:" 10:00am- 12:00 Noon EDT

"Afternoon:" 1:00 - 3:00pm EDT

The two sessions are identically scheduled - attend as much or as little as you like!

Hosted on Gathertown: click here to enter

Passcode: smwlvtvs

Click here for a cheat sheet to gathertown.

Meeting homepage: this Community Post

“Morning” schedule (from this doc)

“Morning” session: 10:00am - 12:00 Noon EDT Tues Apr 13 (all times EDT)	
10:00 - 10:05 am	Participants assemble: log in to Gathertown, go to the “SMWLV” room
10:05 - 10:15 am	Welcome: breakout room sign-up
10:15 - 11:00 am	Hack session 1 part 1
11:00 - 11:45 am	Hack session 1 part 2
11:45 am - 12:00 Noon	Groups encouraged to add the link(s) to their cadence note(s) to slide 6 in these welcome slides. (Will be transcribed to Community after this hack day.)

We’ll stay in Gathertown for the welcome unless more than about 15 people are present.

“Afternoon” schedule (from this doc)

“Afternoon” session: 1:00 pm - 3:00 pm EDT Tues Apr 13 (all times EDT)	
13:00 - 13:05	Participants assemble: log in to Gathertown, go to the “SMWLV” room
13:05 - 13:15	Welcome: breakout room sign-up
13:15 - 14:00	Hack session 2 part 1
14:00 - 14:45	Hack session 2 part 2
11:45 - 15:00	Groups encouraged to add the link(s) to their cadence note(s) to slide 6 in these welcome slides (Will be transcribed to Community after this hack day).

We’ll stay in Gathertown for the welcome unless more than about 15 people are present.

Anticipated observing strategy hack days

Goal: help ensure the community provides the Rubin Observatory with our cadence input by the April 15th (midnight PDT) deadline. Anticipated (in Feb) sequence w/ suggested foci:

1. Thurs Feb 18 - specification
2. Thurs Mar 04 - specification and implementation
3. Thurs Mar 18 - implementation, evaluation (on OpSims); share projects in progress
4. Thurs Apr 01 - implementation, evaluation, analysis
5. Thurs Apr 08 - Cadence notes writing (comment: April 09 = HST deadline)
6. **Tues Apr 13 - Cadence notes writing**

Objectives for this Hack Day:

1. **Continue the writing of your cadence note;**
2. **Identify what still needs doing to finish your cadence note**

Comments:

- The SCOC provided some guideline questions at the solicitation page, which should provide a useful framework for many (most?) cadence notes.
    - Here is an example cadence note in Google doc form (John Gizis' Brown Dwarf Astrometry)
    - For those who prefer Overleaf, here is a template cadence note by Igor Andreoni

* The SCOC solicitation for cadence notes can be found here.

Links to the lists of planned cadence notes thus far: (SMWLV , TVS)

Cadence notes in progress

If you are working on a cadence note, please provide a link here. After the hack day, these links will be added to the Community page for hack day 6.

Link to cadence note	Any comments / collaboration	Link to cadence note	Any comments / collaboration
Brown Dwarf Astrometry	SMWLV	Microlensing/Galactic Footprint	https://www.overleaf.com/6261487627xgsctdrbxhrf
Bright objects with LSST	SMWLV / TVS	Classical variable stars in different Galacticenvironments: pulsation behaviour recovery	TVS
Local Volume science	SMWLV	The Galactic Bulge with LSST	SMWLV, TVS
Anomaly detection	TVS		
Blazars	TVS		

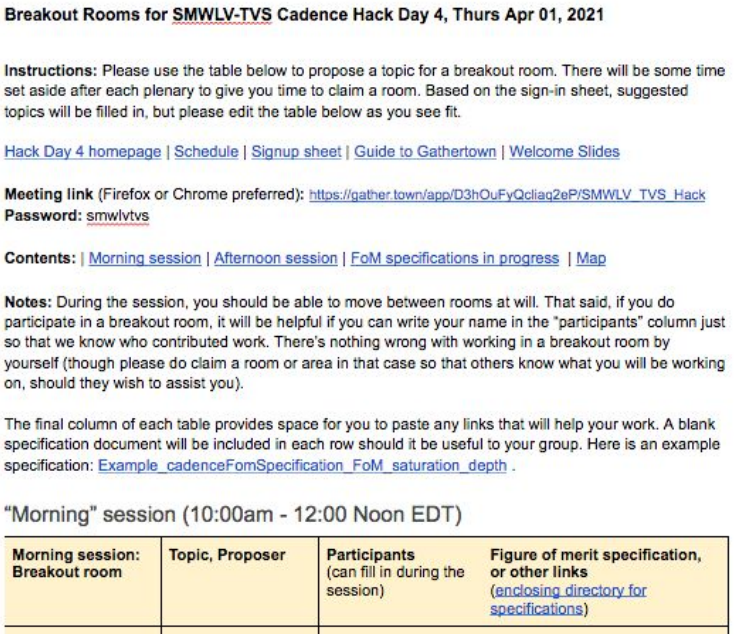
Organizing the breakout rooms

To propose a topic for a breakout room, please use the hack day 6 breakout room signup page (time will be provided after this plenary).

(A suggested plan will be be input based on the sign-up sheet, but you should feel free to edit this.)

During the session, you should be able to move between rooms at will. That said, if you do participate in a breakout room, it will be helpful if you can write your name in the "participants" column so that we know who contributed work.

At the end of the session, groups will be invited to comment on any issues or difficulties encountered.



Breakout Rooms for SMWLV-TVS Cadence Hack Day 4, Thurs Apr 01, 2021

Instructions: Please use the table below to propose a topic for a breakout room. There will be some time set aside after each plenary to give you time to claim a room. Based on the sign-in sheet, suggested topics will be filled in, but please edit the table below as you see fit.

Hack Day 4 homepage | Schedule | Signup sheet | Guide to Gathertown | Welcome Slides

Meeting link (Firefox or Chrome preferred): https://gather.town/app/D3hOuFyQcliaq2eP/SMWLV_TVS_Hack
Password: smwlvtvs

Contents: | Morning session | Afternoon session | FoM specifications in progress | Map

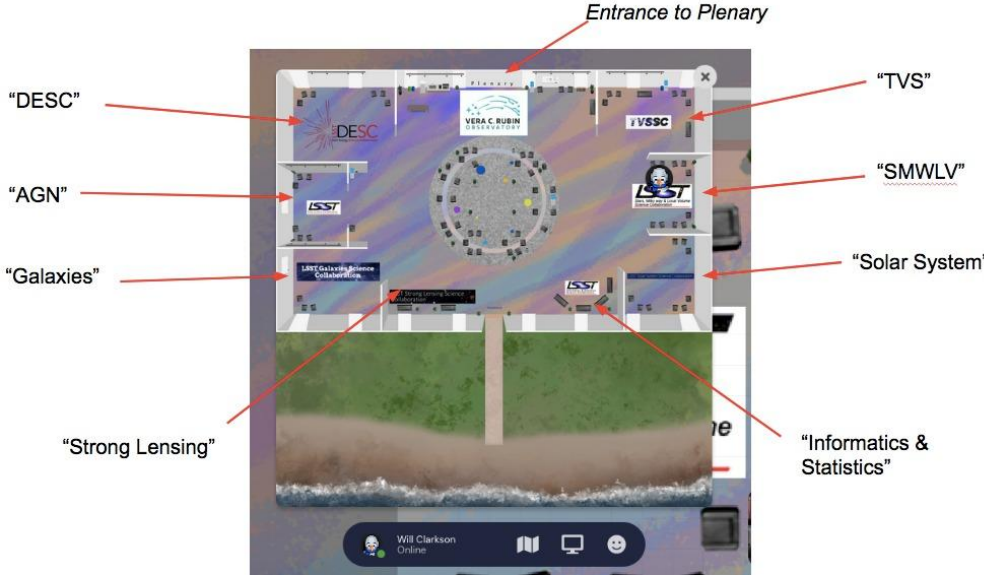
Notes: During the session, you should be able to move between rooms at will. That said, if you do participate in a breakout room, it will be helpful if you can write your name in the "participants" column just so that we know who contributed work. There's nothing wrong with working in a breakout room by yourself (though please do claim a room or area in that case so that others know what you will be working on, should they wish to assist you).

The final column of each table provides space for you to paste any links that will help your work. A blank specification document will be included in each row should it be useful to your group. Here is an example specification: Example_cadenceFomSpecification_FoM_saturation_depth .

"Morning" session (10:00am - 12:00 Noon EDT)

Morning session: Breakout room	Topic, Proposer	Participants (can fill in during the session)	Figure of merit specification, or other links (enclosing directory for specifications)

Breakout room “locations”



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“Morning” session (10:00am - 12:00 Noon EDT)

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Resources

- How to apply your metric to lots of opsim runs and summarize the results (maf_contrib notebook by Peter)
- Family analysis for groups of metrics (Lynne Jones)
- Community Survey Strategy Highlights
- SCOC page, including Cadence Notes solicitation
- Summary metrics that are already run on simulated surveys (for some cases, this might already meet your needs)
- Updated "cheat sheet" summarizing the simulated strategies
- The 2020 cadence report PSTN-51
- Github repositories for **maf** and **maf-contrib**
- Current planned cadence notes by SMWLV (has "getting started" information) and TVS
- The SMWLV-Metrics github repository
- The 2018 Cadence Whitepapers
- The 2017 "COSEP", which includes some FoM specifications and evaluations
- 2021-02-26: Report on crowded field processing using DM, by Ian Sullivan & Eric Bellm (https://dmtn-171.lsst.io/)

(See also the Community thread for this workshop. The community thread for hack day 1 also has useful discussion.)

Useful links to FoMs in progress / problems you have solved / helpful resources

Intention: links to notebooks or other resources you think others will find useful.

- Saturation notebook (Note: needs updating now that Datalab sims_maf has been updated): https://github.com/LSSTScienceCollaborations/SMWLV-metrics/blob/main/notebooks/2021-03-24_trySaturatedSeveral.ipynb
- Using 3D extinction (in this case the saturation distance for a given absolute mag): this repository
- Local Volume notebook: https://github.com/jeffcarlin/SMWLV-metrics/blob/main/notebooks/LV_metric_scratch.ipynb
- Cadence Note draft on AGN variability observables, jupyters' GitHub links inside PDFs :https://lsstc.slack.com/files/U0146G669KN/F01T210K45R/cadence_notes_agn_var.pdf https://github.com/LSST-sersag/white_paper/blob/main/data/Cadence_Notes_AGN_Var.pdf
- Jo Bovy's mwdust module:
  - https://github.com/jobovy/mwdust
-

Communication

This meeting:

- Gathertown
  - The “chat” feature in Gathertown (not persistent after this meeting). Useful to send messages to others at the meeting.

- The Community thread for this workshop - public on the internet
- The LSSTC Slack channel #cadence-hack-days-smwlv-tvs - LSSTC members
  - Will will add all participants to this Slack channel, using the Breakout Room Sign-up page as a roster of attendees. (If you want to be added to this channel but don’t want to sign up for a breakout room, just add your name to the end of that document.)
  - The LSSTC Slack channel #sims-maf has useful information and discussion on MAF

Miscellaneous resources / scratchspace for sharing notes, figures

Slides not used in this session / kept from previous hack days

Useful links to FoMs in progress / problems you have solved / helpful resources (continued)

Intention: links to notebooks or other resources you think others will find useful.

- Your helpful resources here!
-
-

TODOS / Issues you have encountered

- Loredana: update notebook on counts of young stars in the Galactic Plane to include the 3D extinction map under development here
- sdf

Issues and TODOs from the April 1 morning session

Please use this space to indicate any issues and actions from the morning session.

- ~~Will: install and use Bovy's "mwdust" module to explore generating the run of E(B-V) vs distance. Merge with Alessandro's stilism_local.py script which interpolates Lallement et al. 2019. Produce the run of E(B-V) with distance at one NSIDE (probably 64).~~
- ~~Alessandro: check usage of Lallement (2019) 3D dust map in stilism_local.py, originally made for the 2018 version of the map.~~
- Sara & Laura: tests on a new developed OpSim focused on the Carina Nebula study for YSOs and their variability (new OpSim by Peter; we have explored different available OpSims also for the cadence of DDFs and our science case required a new db); wee have also worked on the draft of the Cadence Note and on the answers to each Q1-Q7 in the Cadence Note call (also for the Galactic Plane coverage for the star forming regions with Loredana)

Issues and TODOs from the April 1 afternoon session

Please use this space to indicate any issues and actions from the “afternoon” session.

- Will: specify confusion limited legacy survey in a way it can be implemented
- RachelS: Implement star density map for GP footprint
- ~~Knut: message Peter Y to specify color confusion limits~~

Specifications for some FoMs in progress

Specification doc	**Lead author** (if known)
GP_covarage_for_star_forming_regions	Sara Bonito
young_stars_variability_carina	Sara Bonito
brown_dwarf_astrometry	John Gizis
cadenceFoM_stellarMetallicity	(Will Clarkson)
cadenceFoMSpecification_MagClouds_Variability	Knut Olsen
cadenceFoMSpecification_09_LVscience	Jeff Carlin
Short_exposures (also serves as example spec)	Will Clarkson
More? What are we missing?	

TODOs arising from Hack Day 3 (Thurs March 18)

Please indicate here any actions you have identified for yourself or your group arising from this hack day.

- Knut, Will - investigate what would be involved in implementing a **Crowdingm5Metric** for color (see Olsen, Blum & Rigaut 2003 Section 2.2)
- ~~John, Will - convert the bright object metric into a figure of merit and run on some opsims. Use the version at the SMWLV metrics github repository.~~
- TBA - Cadence variability cadence note
- TBA - NEw techniques for ~~young~~ cluster detection, should translate into figure of merit-friendly constraints
- TBA - Globular cluster cadence investigation - specify?
- RachelS - Review newest OpSims, develop GPfootprint metric

Issues and TODOs arising from Hack Day 2: “Morning”

To be entered by participants after their hack session

- ***TODO Crowding:*** *compare the peak in the apparent magnitude histogram to a given completeness level (say 0.5), to get a 1st-order relationship between the observed magnitude distribution and the achieved crowding level. Probably start with VVV. [Will, Leo, Alessandro]. Re-read Olsen, Blum & Rigaut 2003 to get a sense for the size of the filter:filter effects on the luminosity functions [Will,]]*
- ***TODO Young stars/Galactic Plane:*** *explore notebooks of interest (e.g. TDE notebook for the YSOs variability cadence, as suggested by Peter Y.); finalize the definitions of FoMs for YSOs variability and for the GP coverage for star forming regions [Sara, Loredana, Laura]*
- ***TODO Crowding:*** *compute cumulative depth per Healpix and compare to crowding limit of worst-seeing image in the cumulative set [Knut]*
- ***TODO Fast Transients****: explore notebooks, especially TDE metric. Prepare light curves from grids of models. Tweak the metric if needed. Improve transient injection, to have the sources uniformly distributed in volume (tentative and if needed) [Igor, Michael]*
- *sdf*

Issues and TODOs arising from Hack Day 2: “Morning”

To be entered by participants after their hack session

- *Compile the list of OpSim simulations to run against the MC metrics [Knut]*
- *Look at installing gatspy @ DataLab [Knut]: have made request to install as system package, but can also install locally like this, from the notebook:*

```
import sys
pp = sys.executable
%%bash -s "$pp"
$1 -m pip install --user gatspy
```

-
- *sdf*

Issues and TODOs arising from Hack Day 2: “Afternoon”

To be entered by participants near the end of their hack session. Please also indicate your name so that others know who to work with.

- ***TODO Fe/H and reddening:*** *decide which four filters are needed to get both Fe/H and reddening (u,i, and what others?). Look in the literature to determine how photometric uncertainty in these filters translates into uncertainty in reddening and in extinction. Finish specifying the metric. [Will, Annalisa, Mike, Max]*
- ***TODO crowding:*** *Determine what (if any) DECam artificial star tests are available in crowded regions. [Annalisa, Will, Mike]. It seems that the SMASH survey of David Nidever et al. has done artificial star tests for parts of the MC’s at least.*
- *sdf*

[Some discussion notes from Thurs Feb 18]

Notes from initial discussion - what to work on:

1. Peter Yoachim - lots of ingredients already available in maf for some of the ideas we just heard.
    a. E.g. brown dwarf population: astrometry metrics take in SED and filters. One thing to do would be to define a population of brown dwarfs, distribute on sky, and recover the precision of recovery. E.g. here's N, if we change strategy, N changes like so...
        i. (Question - is there an example notebook that does population recovery?)
    b. Bright stars - the saturation stacker in the notebook linked has been merged into MAF and an error corrected [Will: don't use the one in my example notebook, use MAF instead!]
        i. Variable conditions do spread out the saturation level.
    c. LMC/SMC metrics would be great. LG's stellar density maps are now in MAF. If you have a metric that needs Nstars / sq arcmin, we have that in the MAF now.
    d. u-band for metallicities v useful. Hope folks even more aggressive, e.g. if we have photometric depths in 6 filters, can we convert those into uncertainties in all the stellar parameters?
        i. Would be v helpful in driving the distribution of filters, particularly for "minisurvey" regions - doesn't exist yet
            1. LG - this would be about 5 lines of python code
        ii. Example of population recovery for variables and transients, e.g. 10,000 SNe, how are they observed, what are the criteria. Example: [**see next slide**]

[Comment from Feb 18th slides]

[Comment from Peter Yoachim:]

For folks interested in defining a population of objects and then seeing how well they are observed, the microlensing metric is a good example.
Source code here:
https://github.com/LSST-nonproject/sims_maf_contrib/blob/master/mafContrib/microlensingMetric.py
Example notebook running it here:
https://github.com/LSST-nonproject/sims_maf_contrib/blob/master/science/Transients/Microlensing.ipynb

This should be easy to modify to other populations (say, brown dwarf stars, Cepheid Variables, whatever). Just define your spatial distribution, then define your detection criteria, and you're good to go.