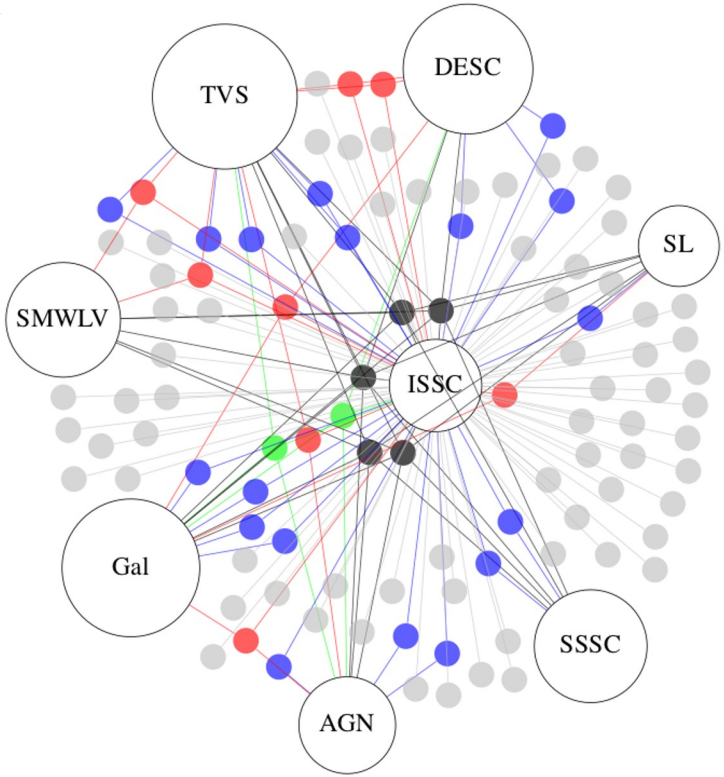
Mission of the ISSC

- **Pursue research and provide consultation** to the Rubin community on challenging computational and statistical problems that arise in LSST-related research.
- Direct and dedicate effort on **cross-cutting problems** arising in multiple astrophysical application areas.
- Coordinate and support **interdisciplinary data analysis methodology research and development** in collaboration with all SCs.

Why a dedicated SC on statis- and informa-tics?

- Larger and more complex data than ever before
  - Accessing and processing datasets even for a conventional type of analysis is non-trivial.
  - Interpreting the data poses new challenges (e.g. blending).
    => Need specific developments in statistics, ML, and computing to enable Rubin science.
- Higher standards of analysis quality and reproducibility
  - SCs have learned from experience than reproducing analyses is non-trivial.
    => Need for standards, good practices, and tools/infrastructure.
- Very fast evolution of data science research
  - The rate of ML papers is “astronomical,” and informatics tools used professionally to manage pipelines and big data in industry are constantly evolving.
    => Need dedicated effort and specialized expertise to keep up with ever-changing landscape.

Membership



Over 150 members

Includes **astronomers** with research expertise in astroinformatics and astrostatistics

and **data scientists** with backgrounds outside astronomy

e.g. statisticians, computer scientists, engineers, applied mathematicians, operations researchers, and more

LSST data rights not required to join

Collaboration Organization

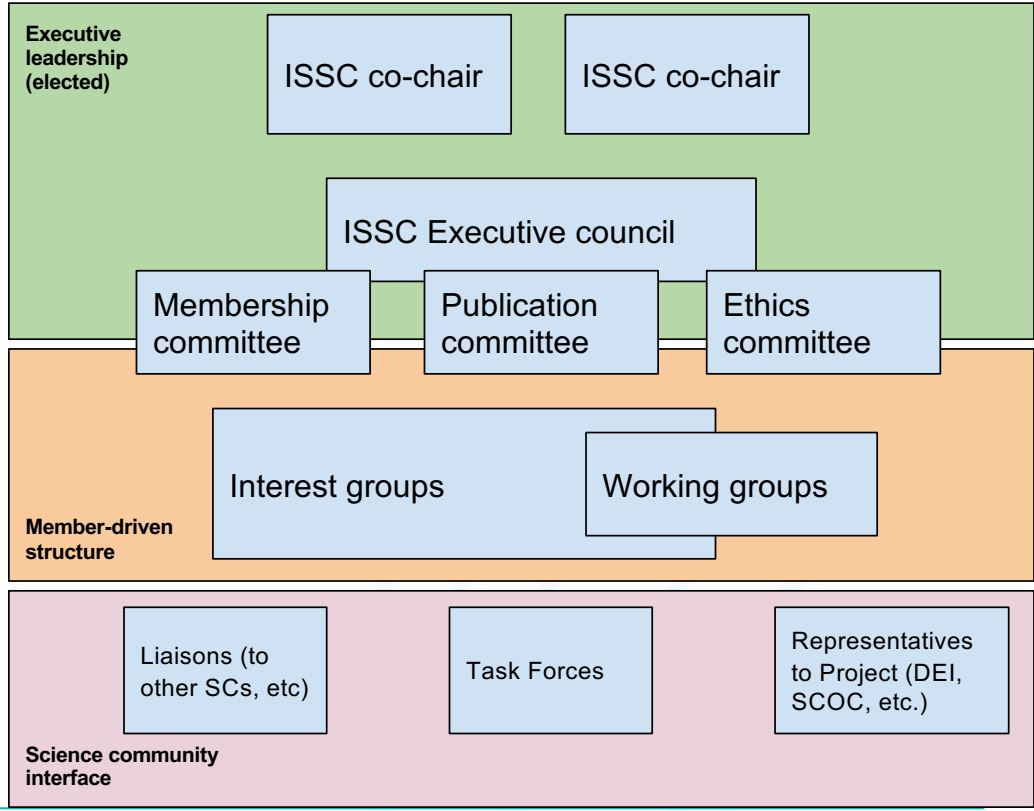
Co-chairs: Alex Malz and Melissa DeLucchi

Executive Council:

John Wu, Chad Schafer, Ashish Mahabal, Matthew Graham, Alex Gagliano

Key Documents

- Charter
- Membership Policy
- Publication Policy
- (Interim) Code of Conduct



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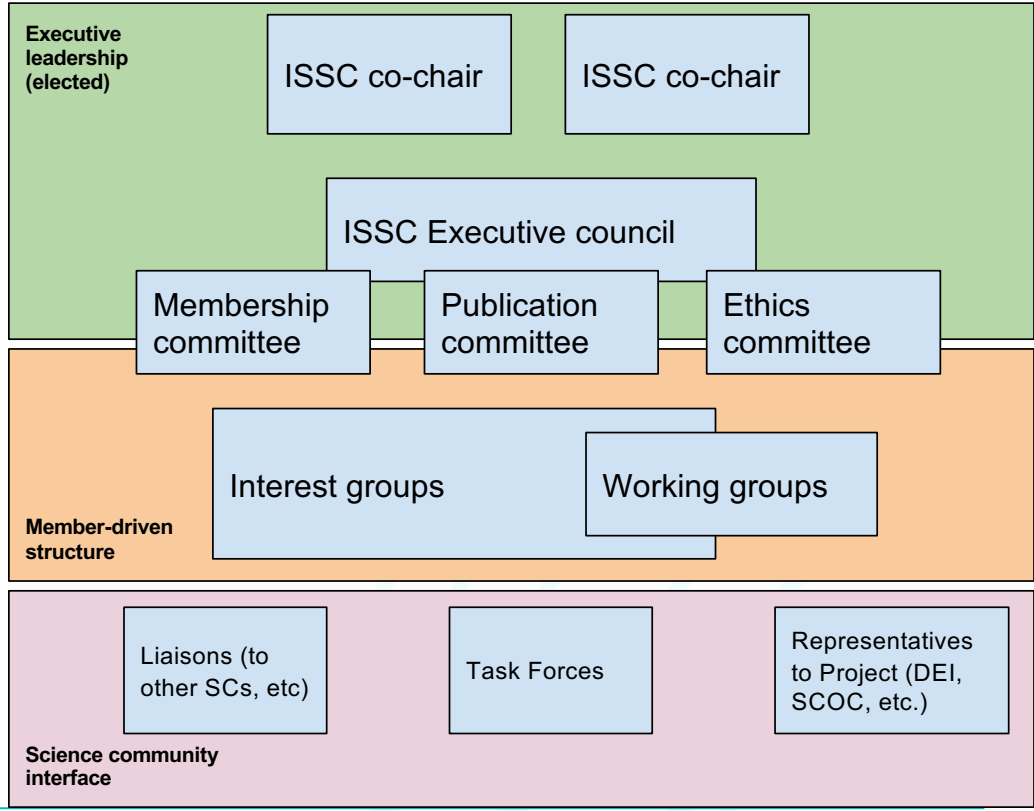
Interest Groups (IGs) focus on a topic from which multiple research projects could arise.

Working Groups (WGs) are centered on a project under the purview of one or more IG.

Currently recruiting liaisons to/from other SCs – reach out to chairs if interested!



What has the ISSC done?

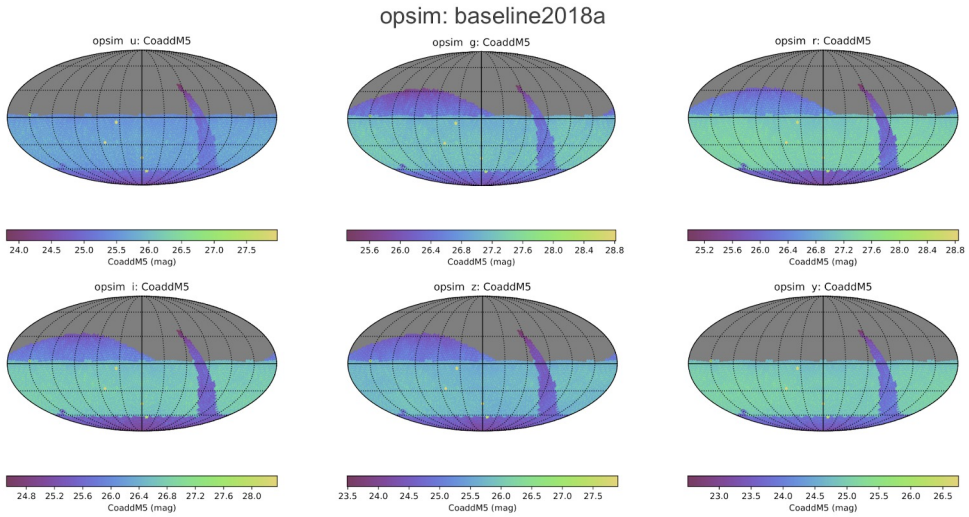
Highlights of Past Activities

Past activities: TVSxISSC Metrics Hackathon

Observing Strategy Metrics Hackathon *2020*

Selection of “Rubin LSST Survey Strategy Optimization” ApJ Supplement Series papers led by active ISSC members:

- An information-based metric for observing strategy optimization, demonstrated in the context of photometric redshifts with applications to cosmology
  - **Alex I. Malz**, François Lanusse, John Franklin Crenshaw, Bryan Scott, Melissa L. Graham (in press)
- An Evenly Spaced LSST Cadence for Rapidly Variable Stars
  - **Eric D. Feigelson**, Federica Bianco, Rosaria Bonito 2023 ApJS 268 11
- The Impact of Observing Strategy on Cosmological Constraints with LSST
  - **Michelle Lochner** et al 2022 ApJS 259 58



Past activities: ISSC Ambassadors

ISSC Ambassadors Program *2021-22, led by Alex Malz & Kara Ponder*

- **Goal**: pair up ISSC members with members of other SCs to co-advise interdisciplinary student projects
- The ISSC coordinated 8 submissions to LSSTC 2021 Enabling Science Call. **6 were successfully funded**.

Examples of resulting **student-led papers**: *(*ISSC member authors)*

- **The Sensitivity of GPz Estimates of Photo-z Posterior PDFs to Realistically Complex Training Set Imperfections**

Natalia Stylianou, *Alex I. Malz**, Peter Hatfield (Galaxies SC, DESC), *John Franklin Crenshaw**, Julia Gschwend

- **Detecting galaxy tidal features using self-supervised representation learning**

Alice Desmons, Sara Brough (Galaxies SC), *François Lanusse**

Past activities: Bayesian Deep Learning Workshop

Bayesian Deep Learning Workshop *2022 @APC (Paris) led by E. Aubourg, F. Bianco, A. Boucaud, F. Lanusse, C. Roucelle, C. Schafer*

- Resulted from a successful application to the 2020 LSSTC Enabling Science Call, **co-sponsored by TVS, DESC, ISSC**.
- Featured sessions organized around machine learning themes common to many LSST science cases: Uncertainties, Time Domain data, ML Tools and Methodologies.
- Dedicated School Day with hands-on lectures:
  - **Introduction to Bayesian Modeling** *Alan Heavens, Imperial College*
  - **Bayesian Time-Series analysis with TensorFlow Probability and JAX** *Junpeng Lao, Google*
  - **Introduction to Probabilistic Deep Learning** *Francois Lanusse, CNRS*
  - **Simulation-Based Inference and Application to Cosmology** *Ben Wandelt, IAP*
- All presentations recorded and available on YouTube

Past activities: Collaboration Meeting

First ISSC Collaboration Meeting *April 2024 @Center for Astrophysics, Harvard/Smithsonian*

- Gathered representatives from SSSC, DESC, TVS, Galaxies, AGN.
- Featured sessions organized around community building and machine learning themes common to many LSST science cases:
  - Uncertainties, Time Domain data, ML Tools and Methodologies
- Dedicated Tutorials:
  - **Active Anomaly Discovery** *Malanchev*
  - **Deploying a Filter on Antares** *Narayan, De Soto*
  - **Uncertainty Calibration** *Dey*
  - **LINCC Python Project Template** *DeLucchi*
- Closing talk from D. Sculley, CEO of Kaggle

Past activities: ISSCxRAPID

ISSCxRAPID *March 2026 @ Caltech*

- "Hot-wiring the Next Generation of Time-Domain Science"
- Week-long meeting on how to combine information from multiple surveys and telescopes (such as *Fermi*, *Swift*, *Roman*, and Rubin) for transient discovery.
- Discussion of multi-messenger astronomy, and new alert streams.
- Machine learning and hardware topics.
- Dedicated ISSC day

What does/will the ISSC do?

Current and Planned Activities

Anomaly Detection (AD) Interest Group

- Co-leads: Kostya Malanchev & Fiorenzo Stoppa
  - Join #issc-ad to participate
- Objective: Coordinate development of Anomaly Detection methodologies across Rubin science cases, from images to time series.
  - Close ties to other relevant groups, esp. TVS
- Meetings on the fourth Monday of every month at 11am PT / 2pm ET
  - Mix of talks, updates, and discussions
- Stamps AD Working Group: Image based anomaly detection from ZTF alert triplets
  - Join #issc-ad-stamps to follow along and contribute

Uncertainty Quantification (UQ)

- Co-leads: Ricardo Baptista & Lilianne Nakazono
  - Join #issc-uq to participate

- Objective: Identify proper statistical research directions to address the specific needs of uncertainty quantification for various scientific analysis.
  - Close ties to other relevant groups, esp. TVS

- Meetings TBA

Interest Groups under development

Education IG

Aim: Produce and disseminate data science training materials for LSST community.

Join #issc-edu to participate; reach out to @Tom L if interested in leadership

Stay tuned for updates as these progress through the IG proposal process!

And if you have an idea, **propose an Interest Group** using this form.

How to get involved

Ask questions in #issc-ask-the-issc to consult with data science experts.

Get feedback on your publication draft **and endorsement** of your paper by the ISSC by requesting review (see Pub Policy for details).

Recruit collaborators by sharing your problem/project in an ISSC telecon. Reach out to co-chairs Alex Malz and Melissa DeLucchi to get on the schedule.

Join the ISSC! See application form here.

Takeaways

- Everyone can (and should!) join the ISSC. All are welcome!
- It isn't "just" machine learning, but if you use ML then this is the place to be too.
  - New Interest / Working Groups should be proposed if people want to see them!
- Even if you're not part of the ISSC, the ISSC can work for you.
  - Recruit ISSC collaborators, consultants, or simply keen helpers to your project, today!
- The ISSC Ambassador program had strong representation from the UK, and ISSC members can and would like to co-mentor students for interdisciplinary projects.
- If your project is significantly cross-field (e.g. spanning multiple SCs), then the ISSC are uniquely situated to provide a "big picture" viewpoint, and would be happy to chat about that too.