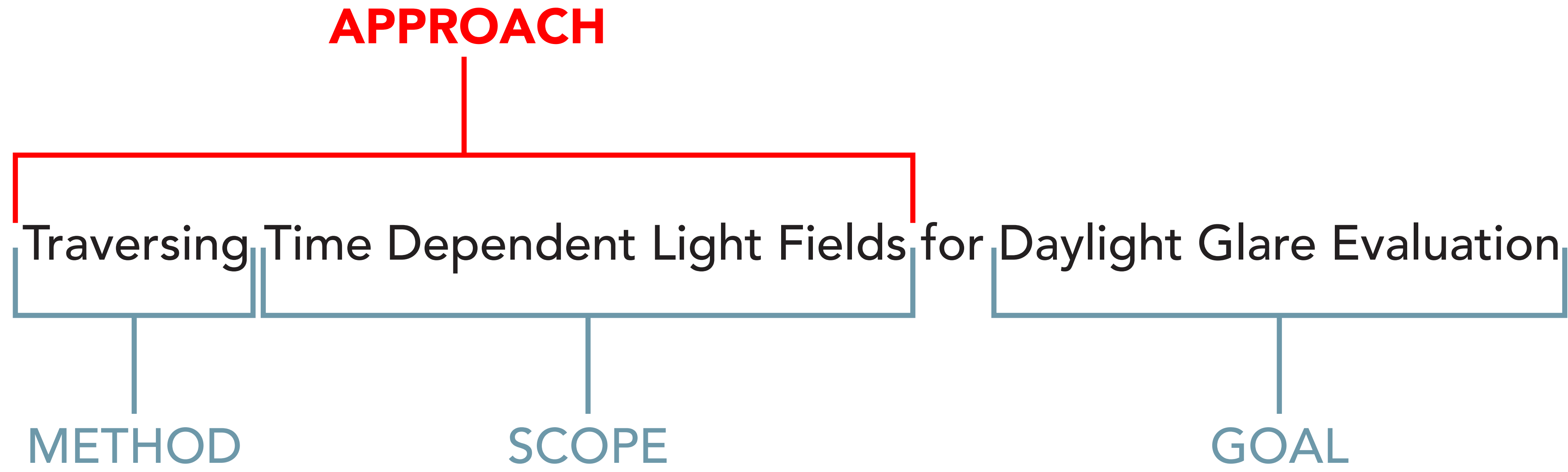


Working Title:

Traversing Time Dependent Light Fields for Daylight Glare Evaluation

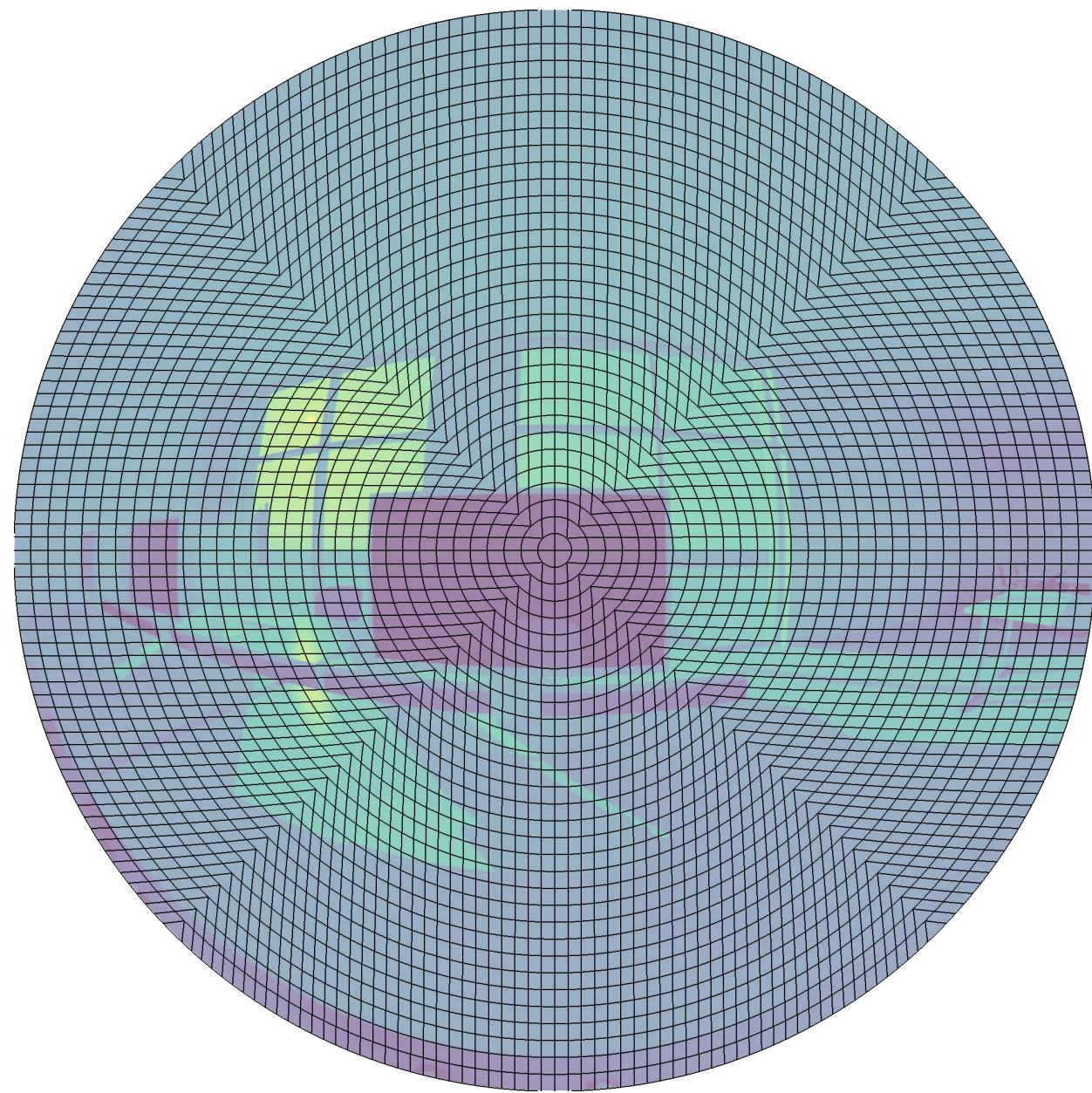
Stephen Wasilewski



The Light field can be represented as a series of 2-D representations

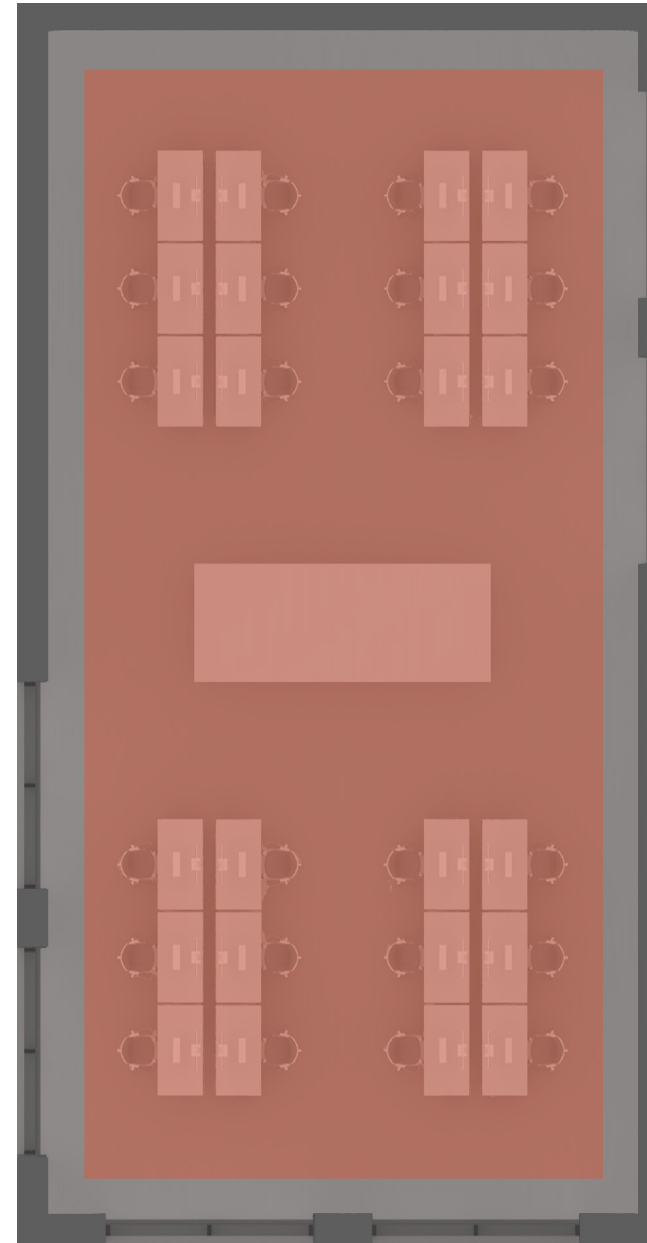
Directions

$$\theta_v \varphi_v$$



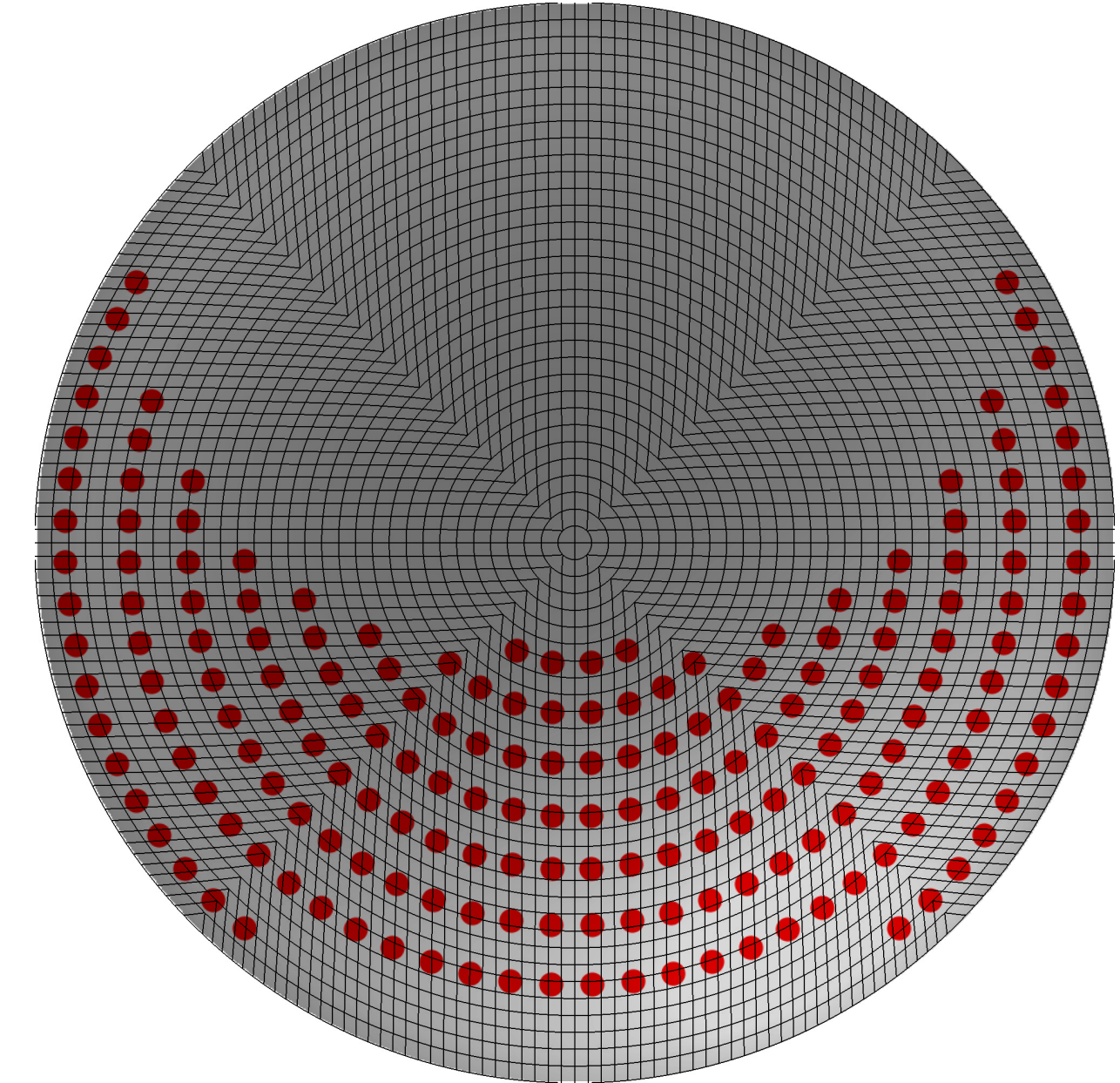
Positions

$X Y$ (ignore Z , for now...)

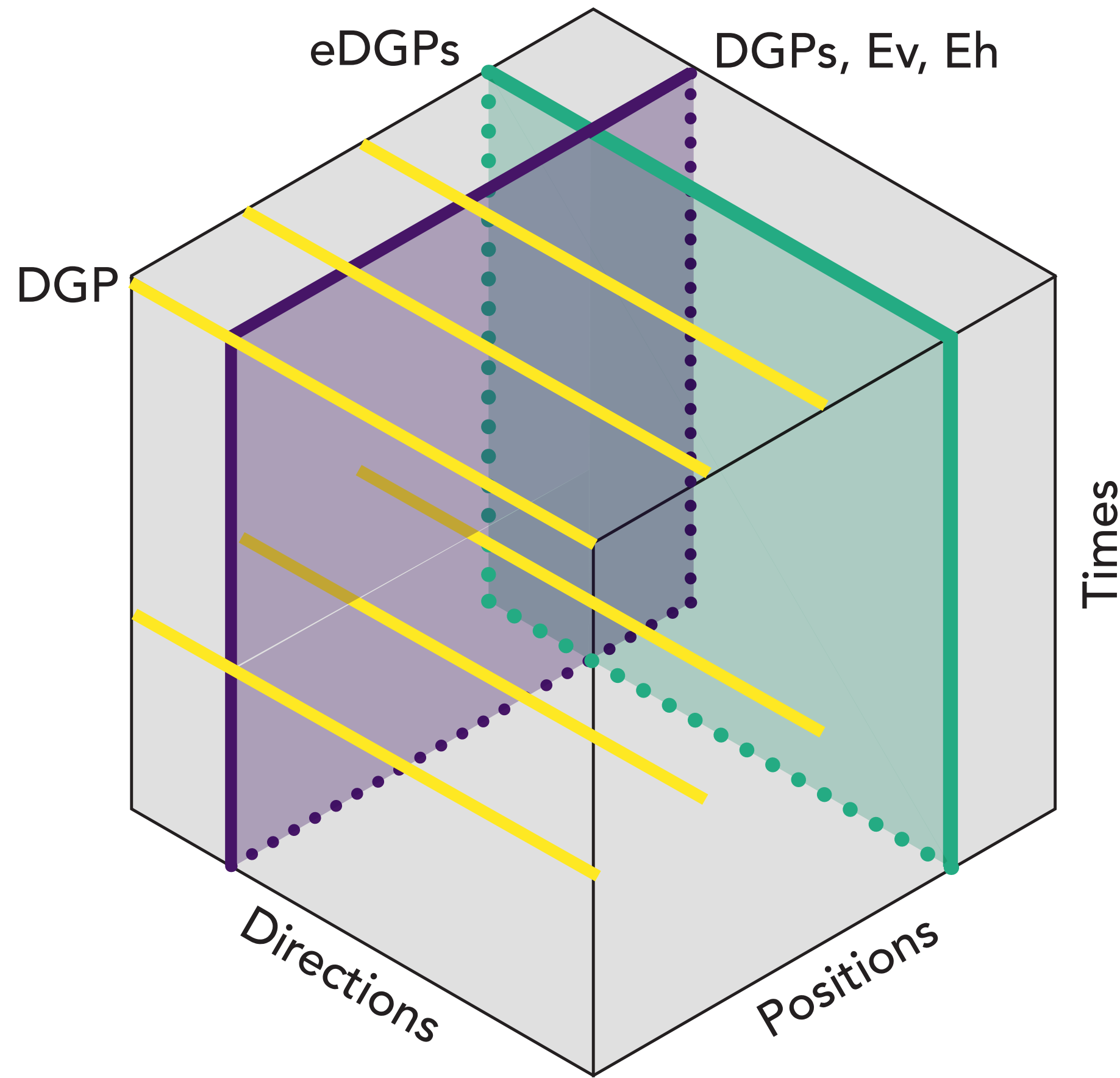


Sun Position/ Sky Condition

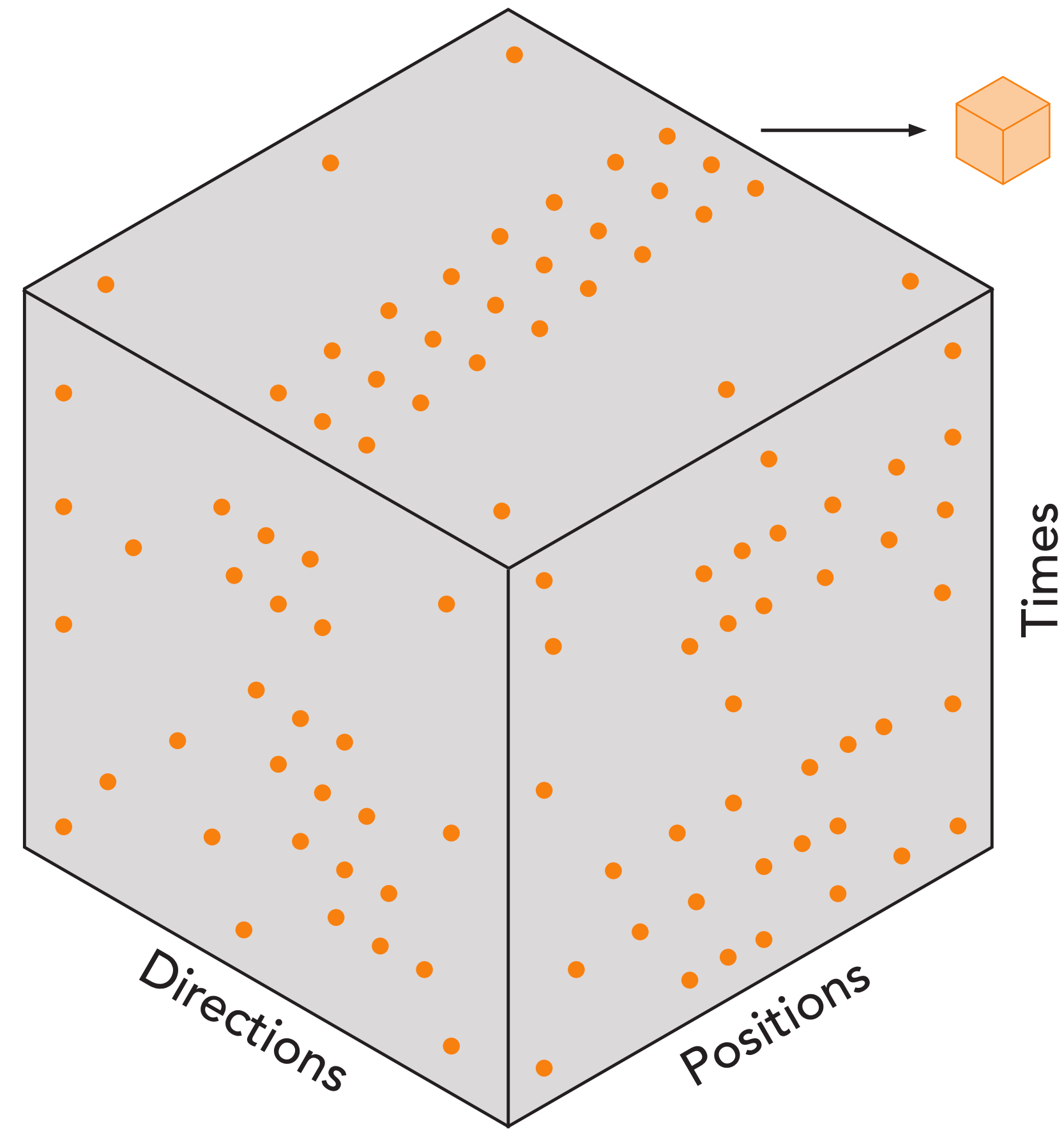
$$\theta_s \varphi_s$$



Existing Methods:

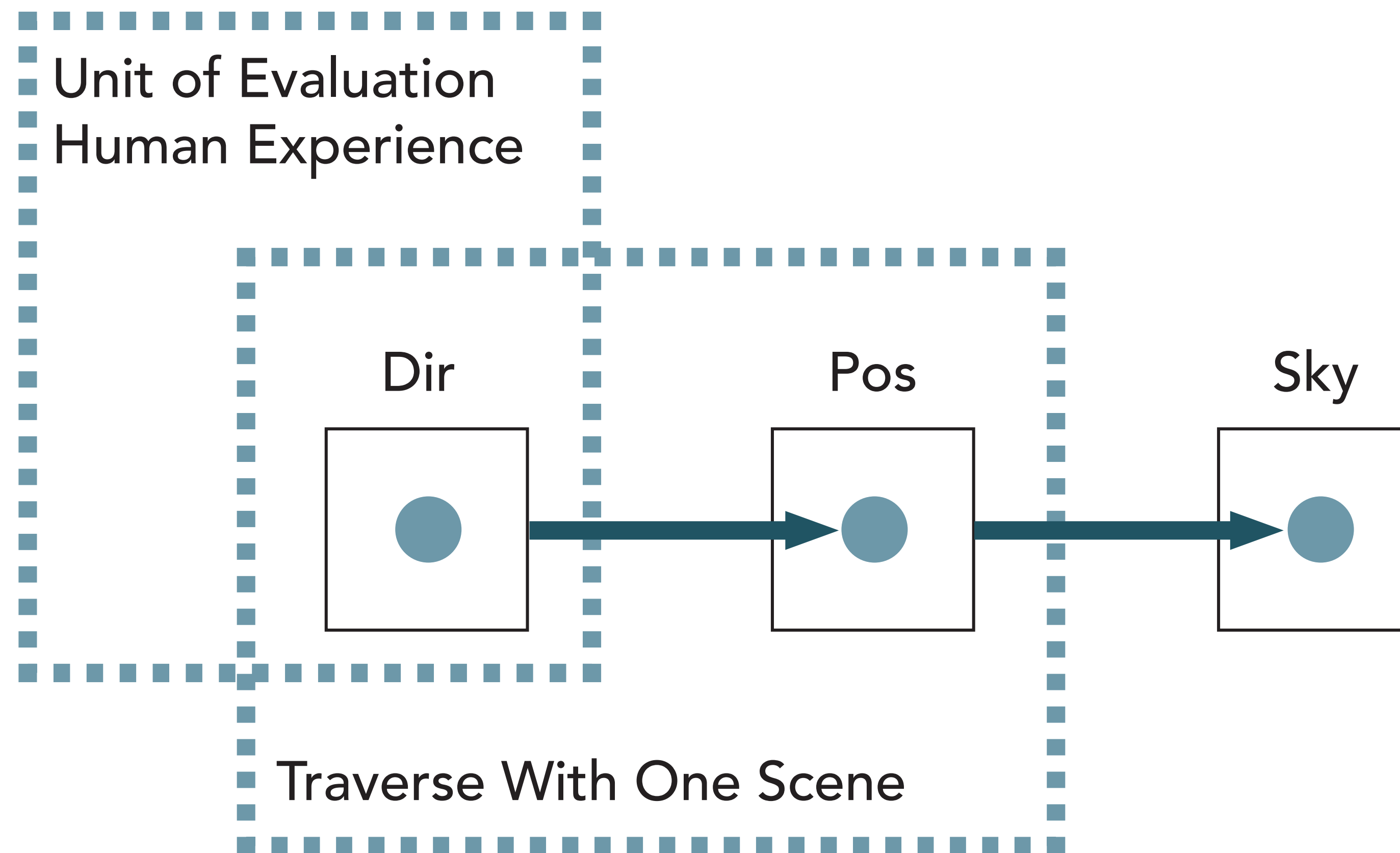


Goal:



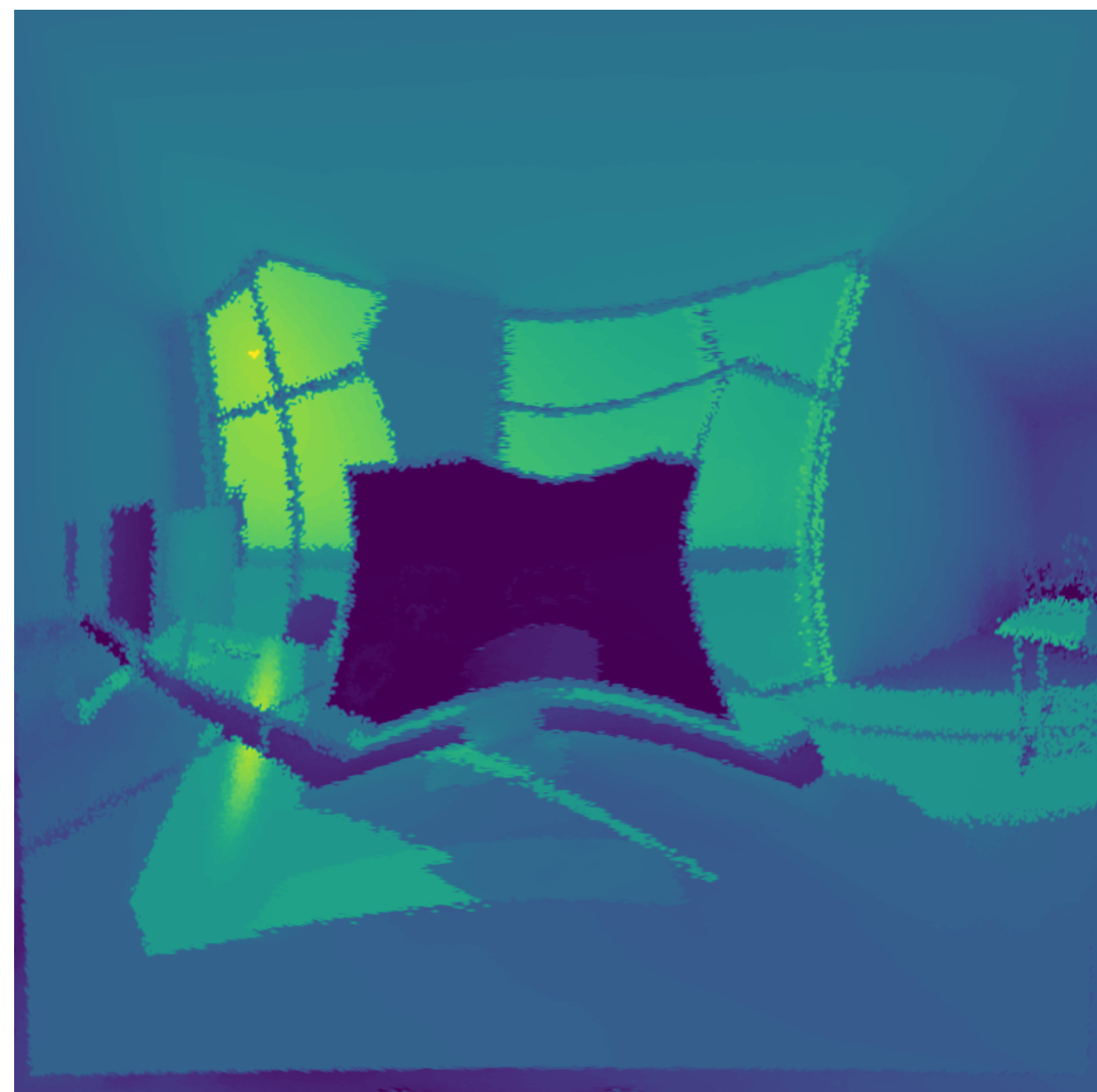
The 2-D representations can be nested to store the unique value (Luminance) of each evaluated point in the Lightfield.

In theory these could be nested in any order, but on first glance this makes the most sense:

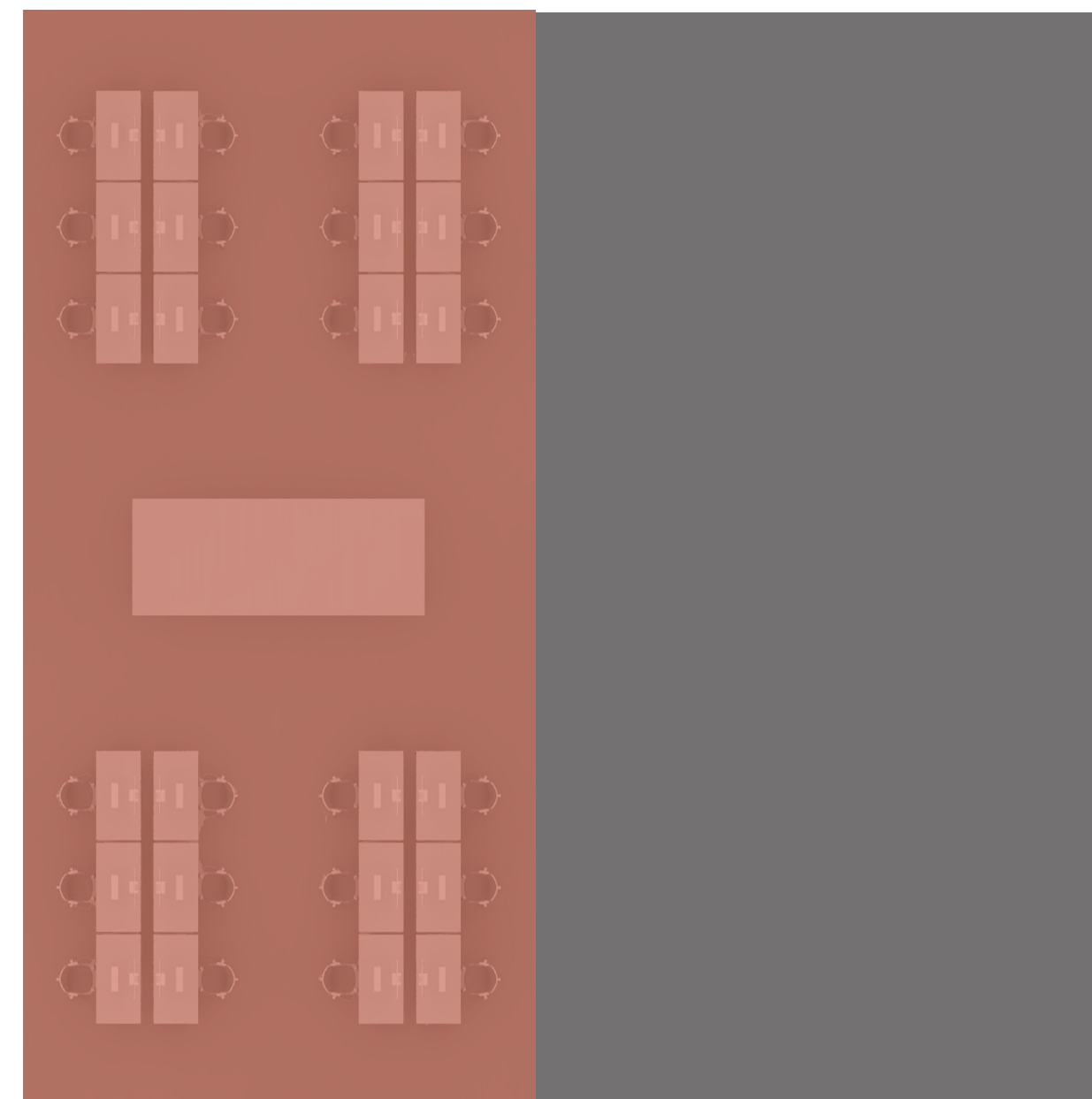


For straightforward sub-sampling, a concentric mapping (Shirley and Chiu 1997) can transform the angular dimensions to cartesian.

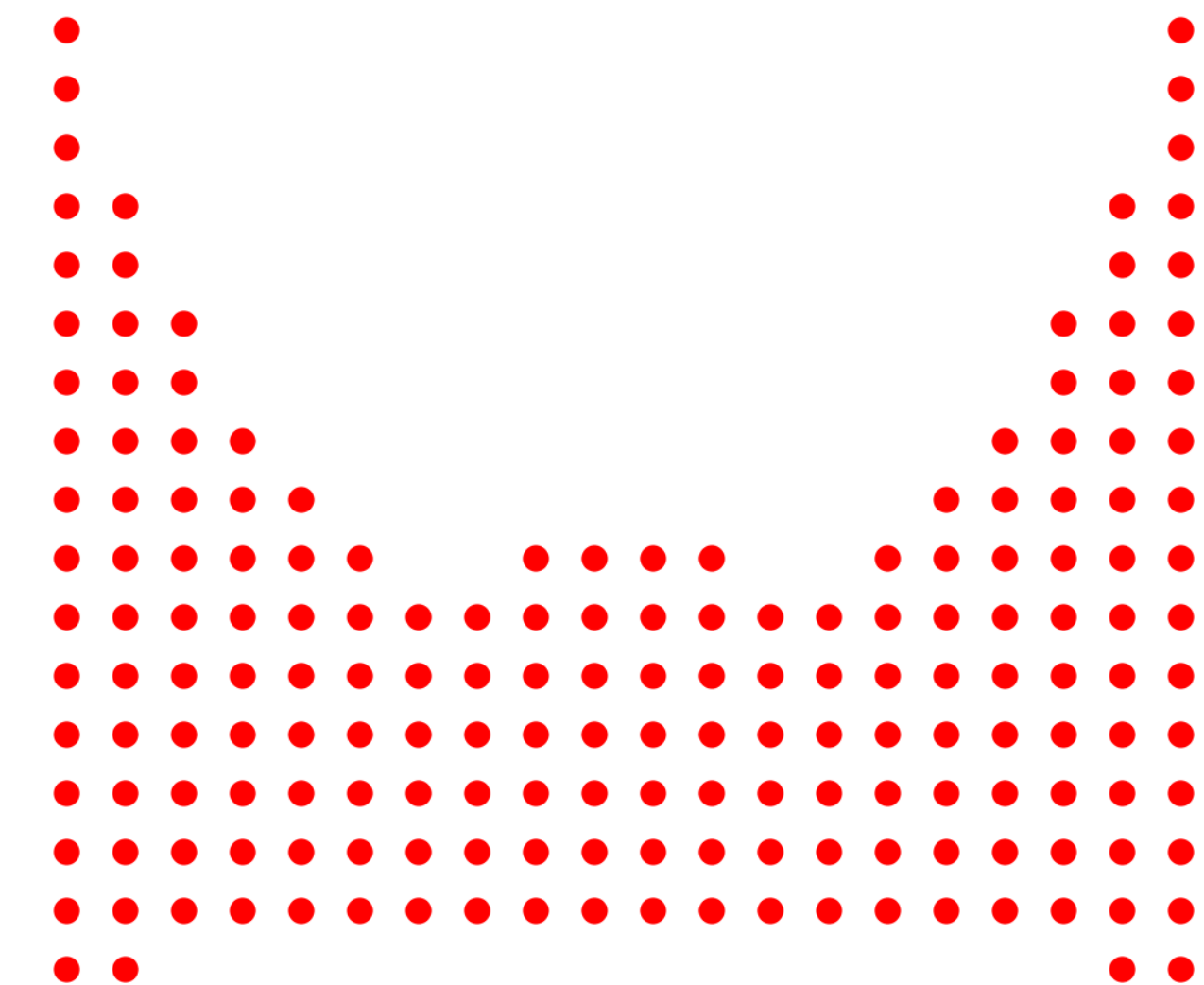
Directions

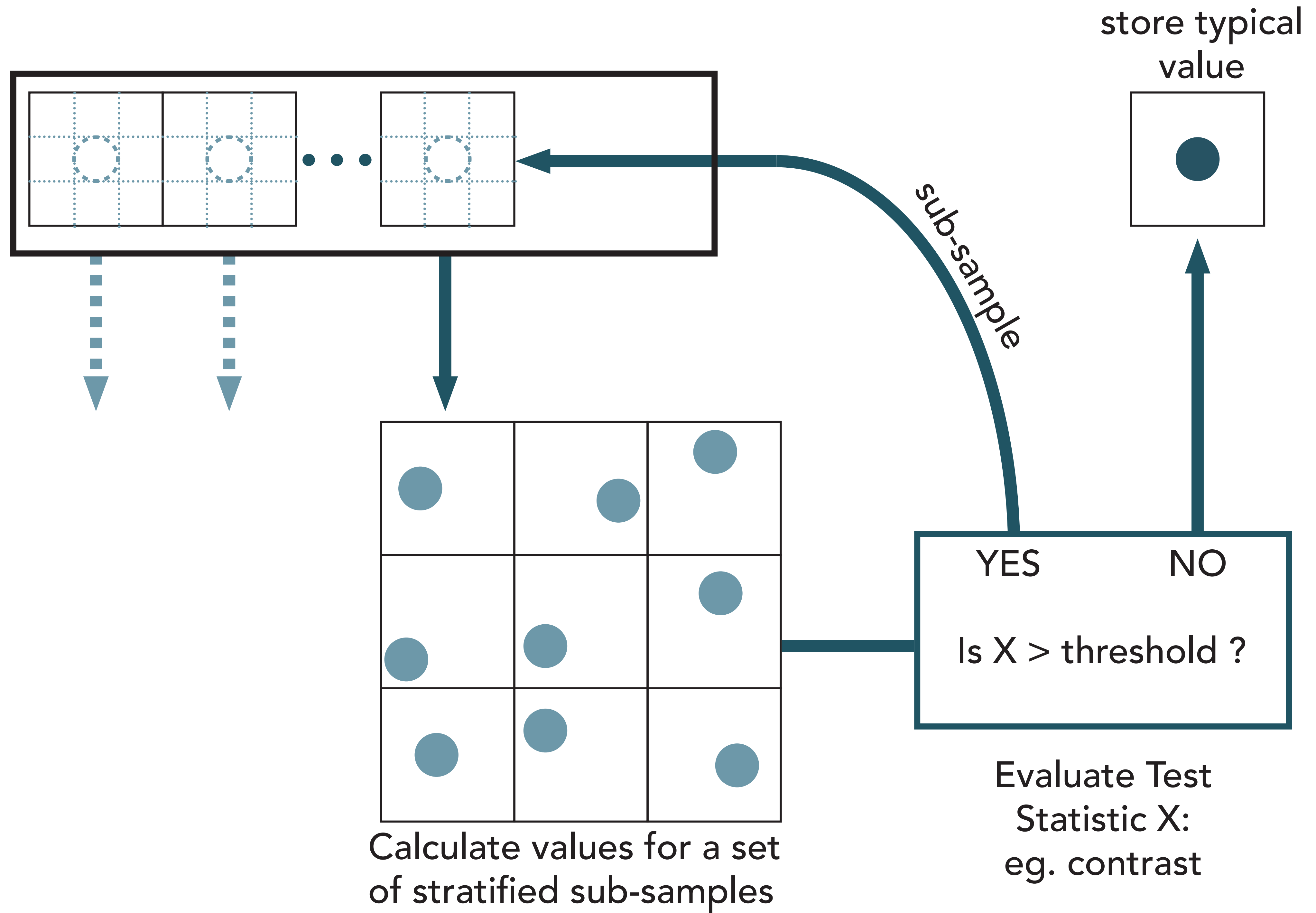


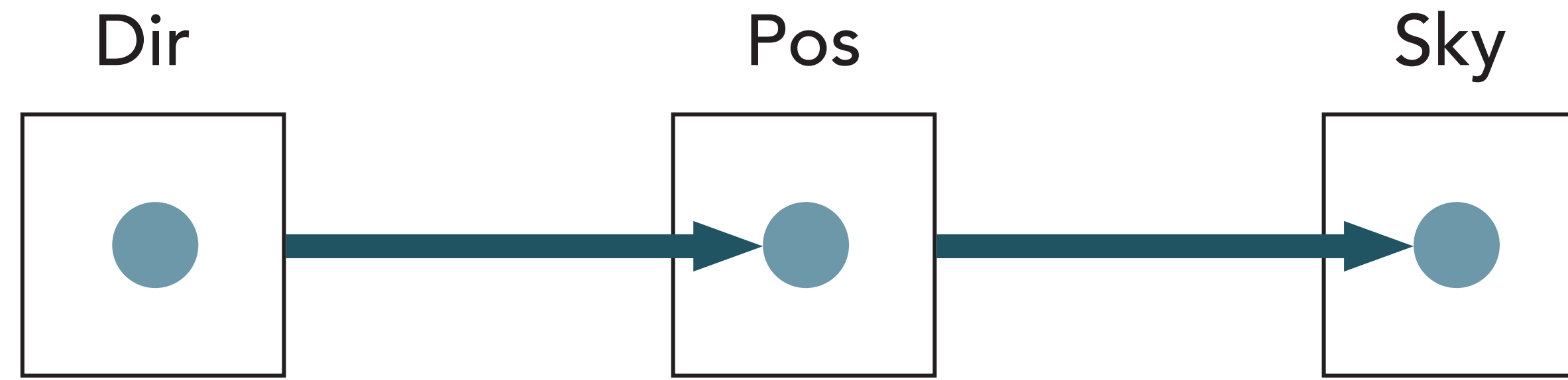
Positions



Sun Position/ Sky Condition







Values (n sub-samples):

Rays

Direction Map

Position Map

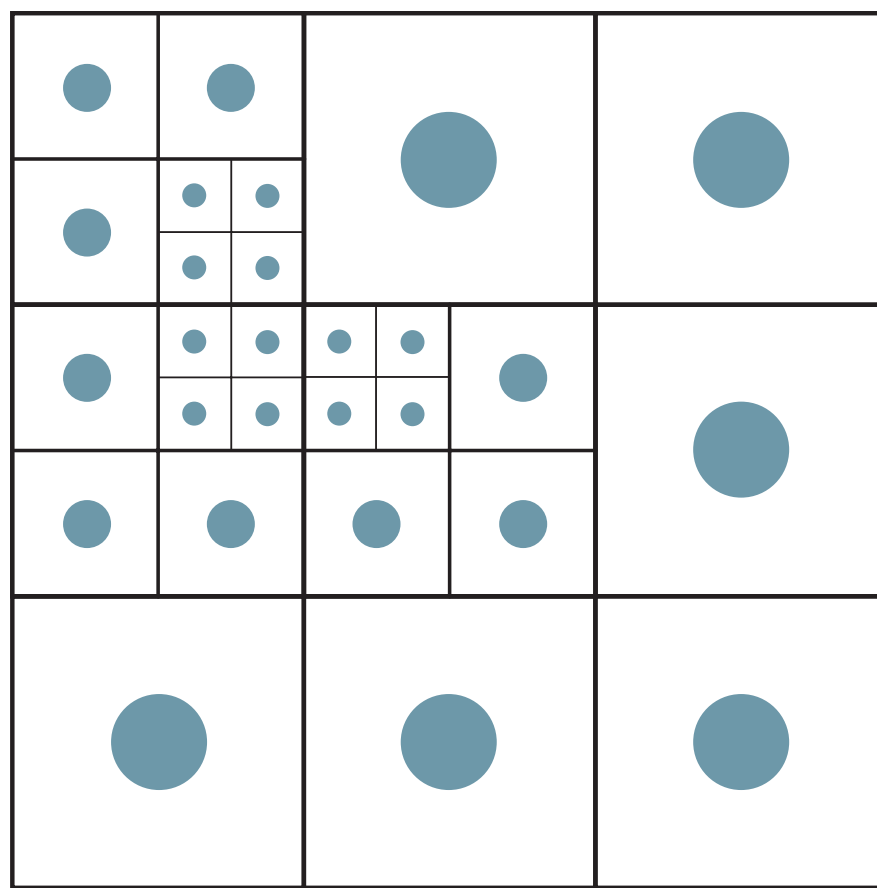
Possible test Statistics:

- contrast
+ max/(mid, min)
- mean, median
- max

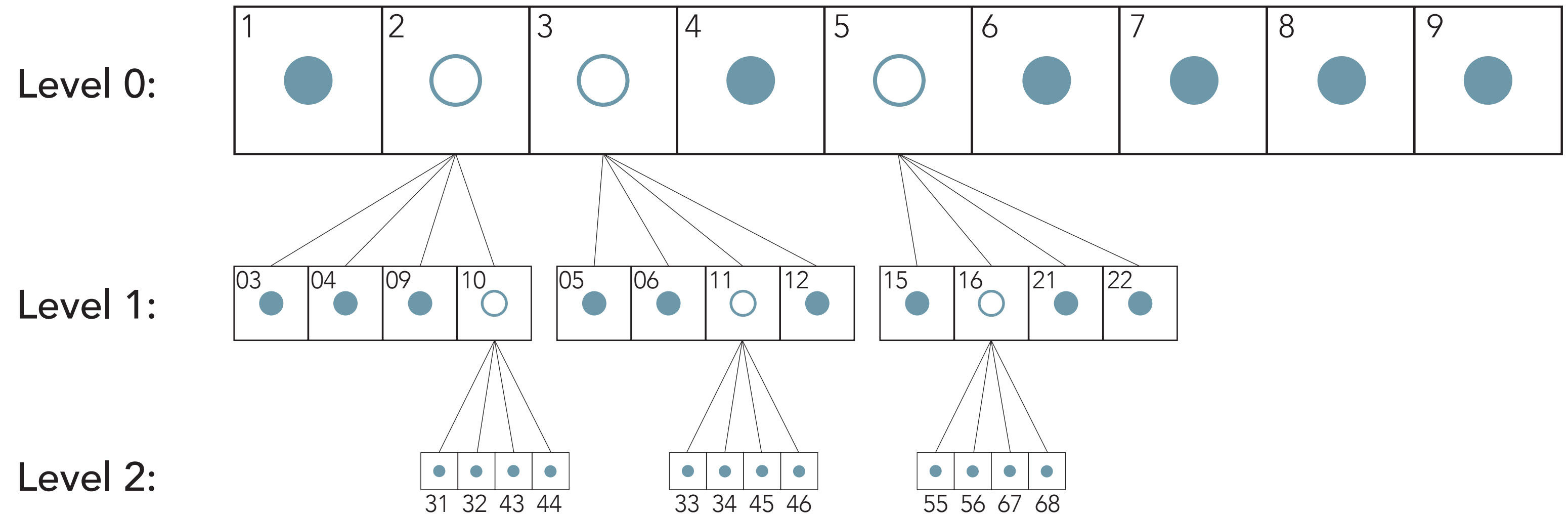
- avg. lum ratio
- contrast ratio
- direction (weighted by luminance)

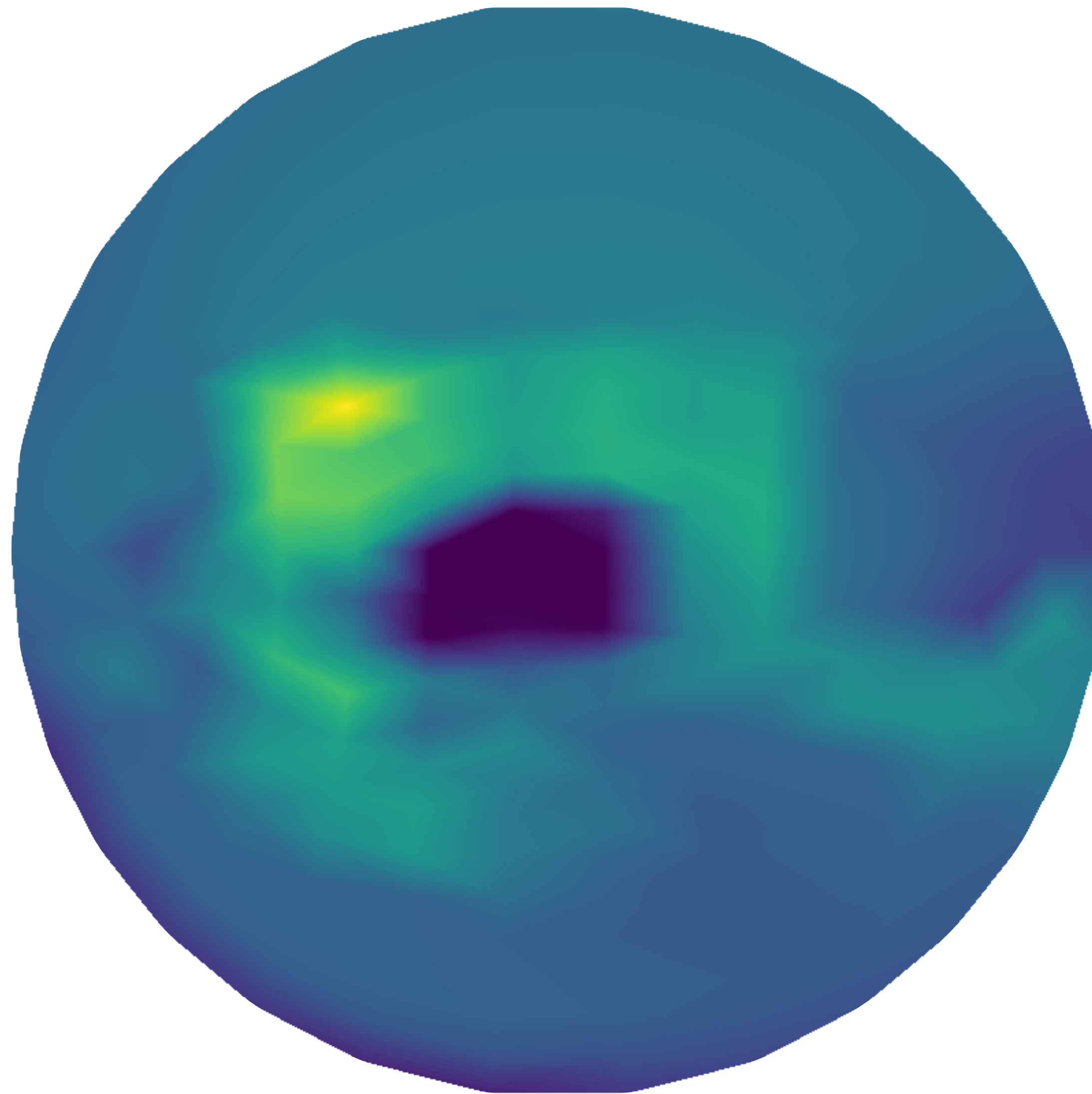
- percentiles
- avg. lum ratio
- contrast ratio
- position (weighted by avg. luminance)

Spatial Coordinates:

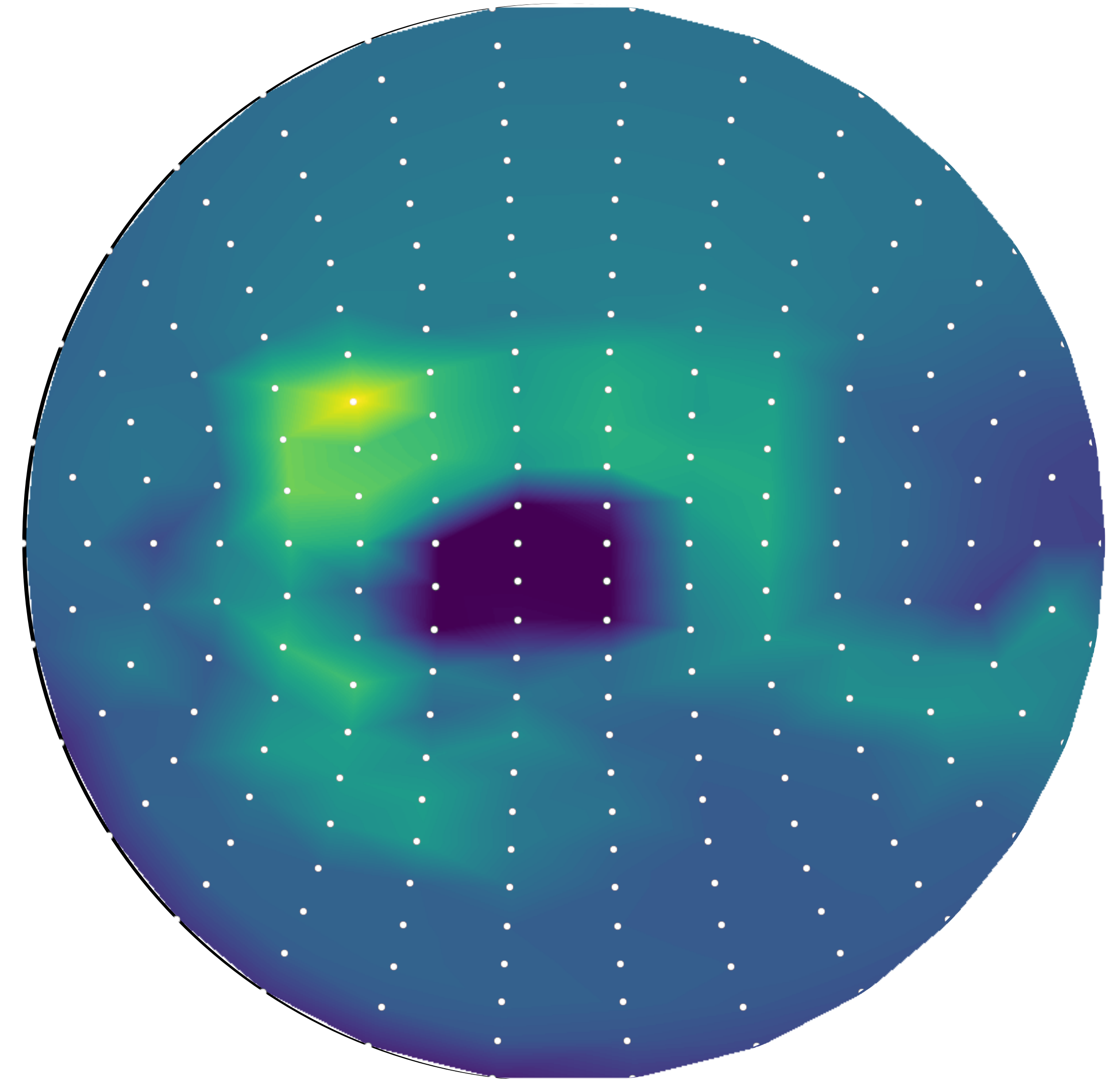


Level and Branch:





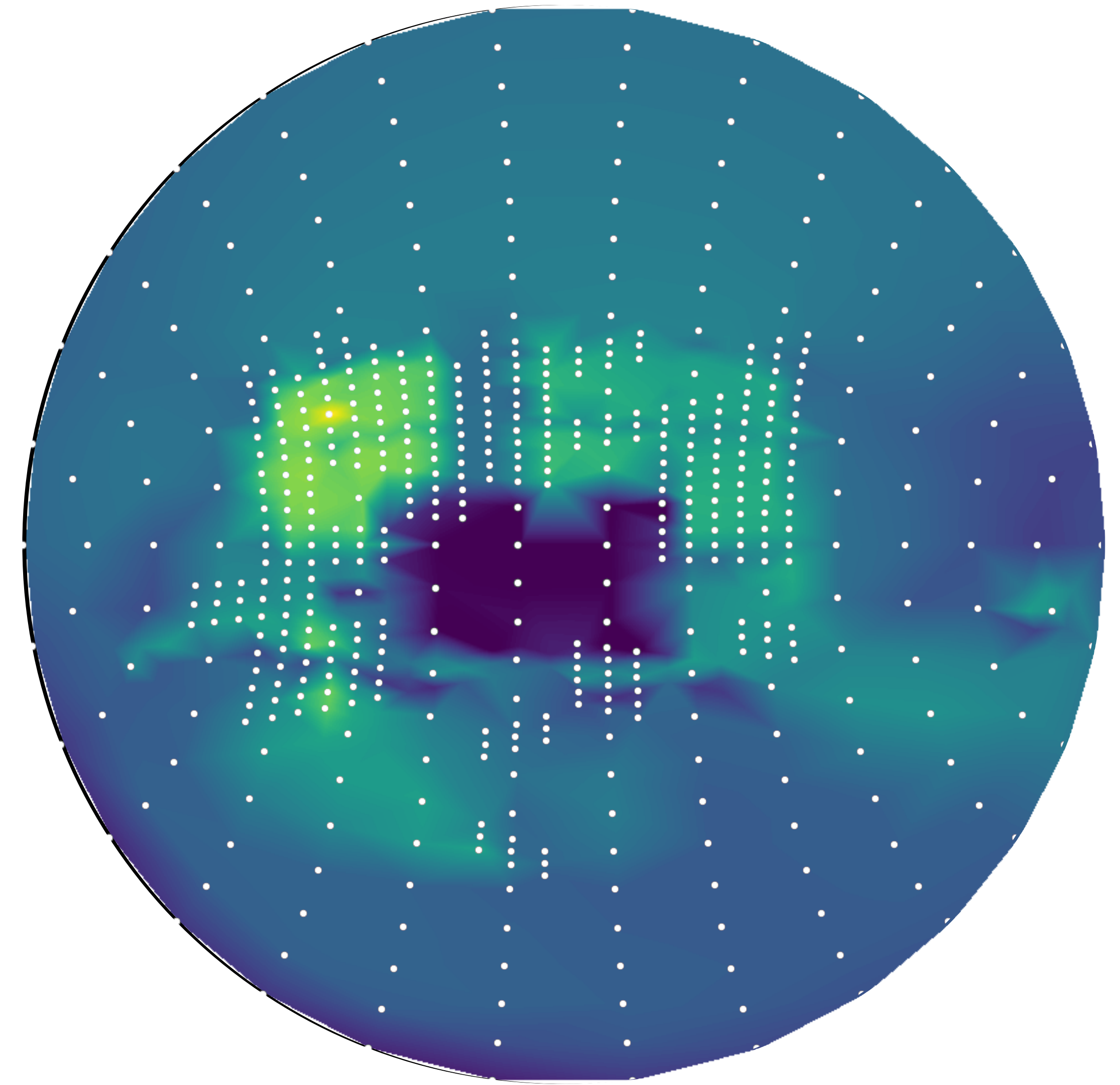
Full Sampling



Adaptive Sampling



Full Sampling



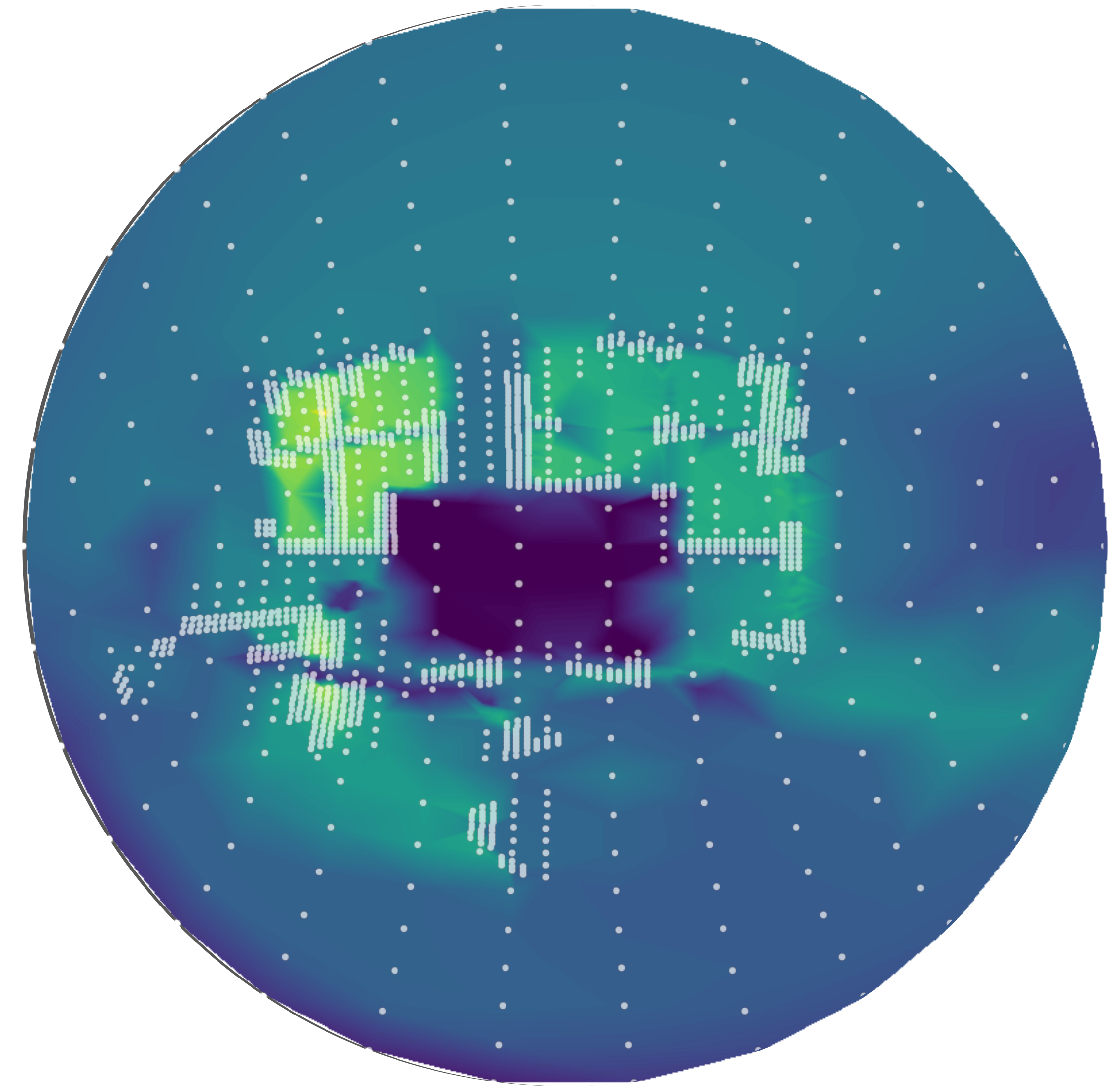
Adaptive Sampling

■ CC: Gebäudehülle
Technik & Architektur

■ LIPID
Laboratory of Integrated
Performance in Design



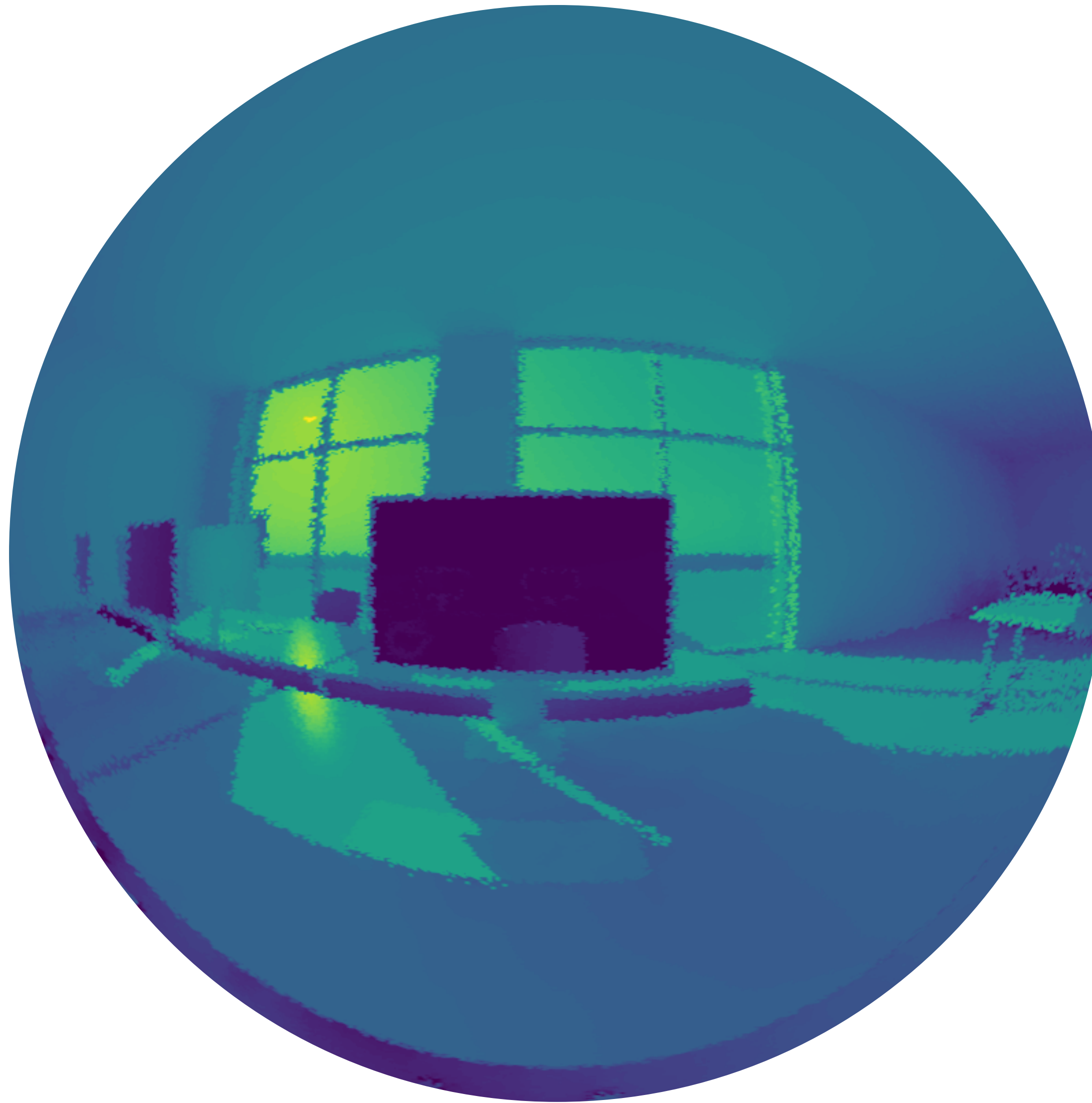
Full Sampling



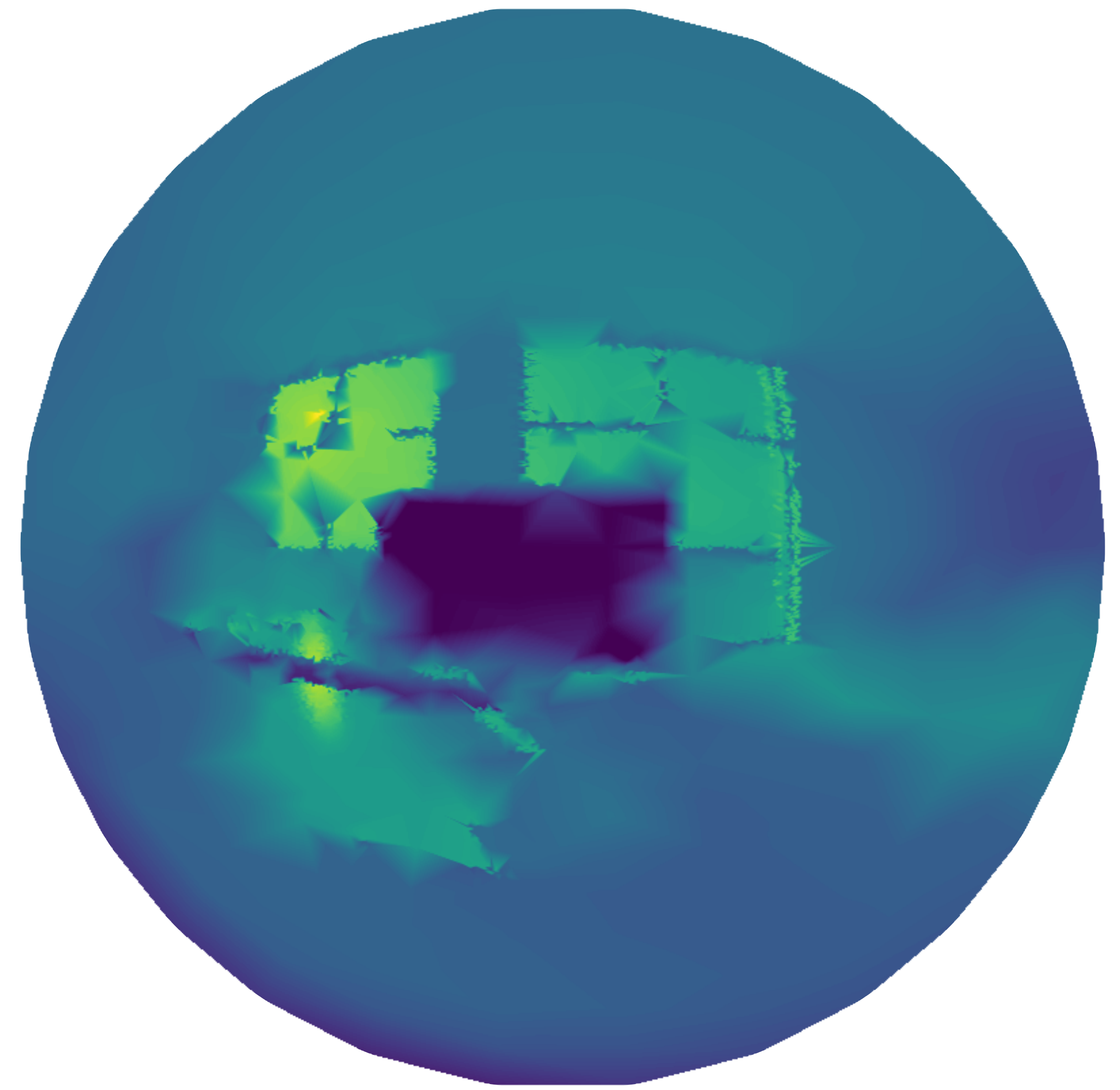
Adaptive Sampling

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Full Sampling

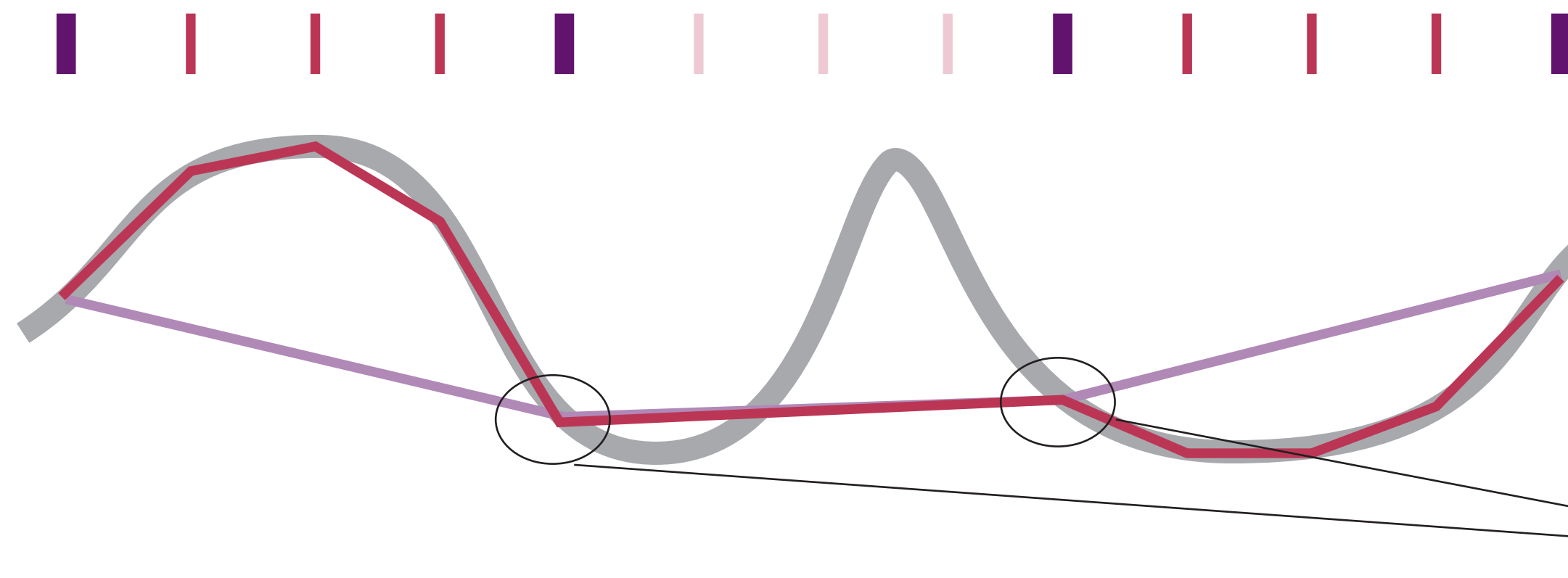


Adaptive Sampling

■ CC: Gebäudehülle
Technik & Architektur

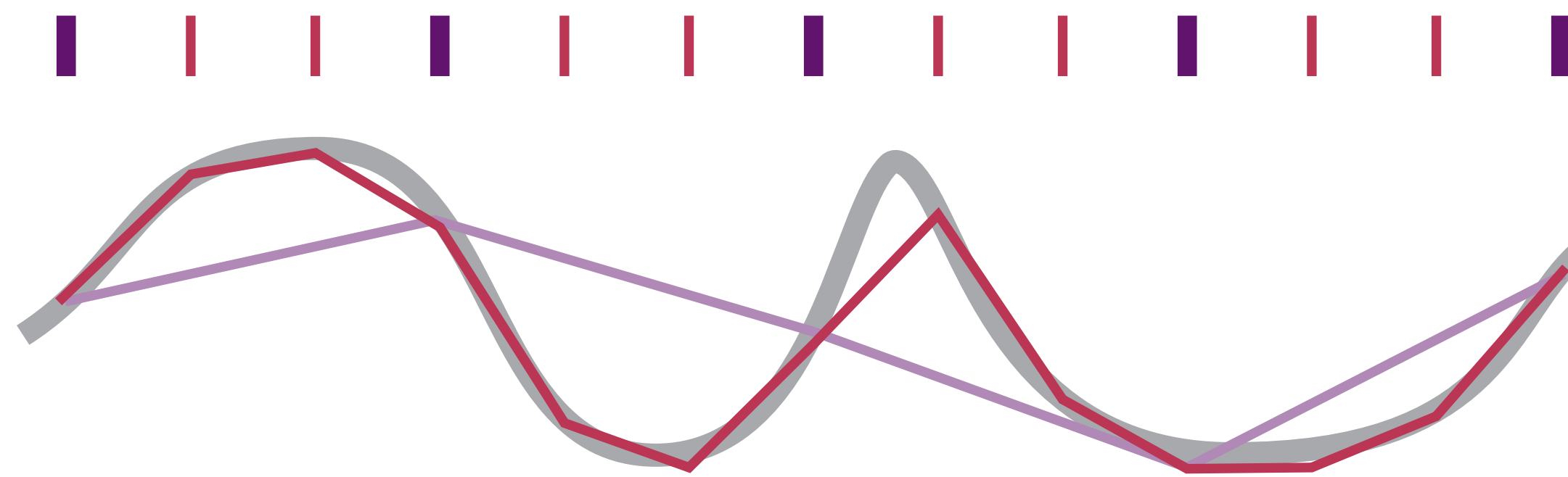
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Initial Sampling Density

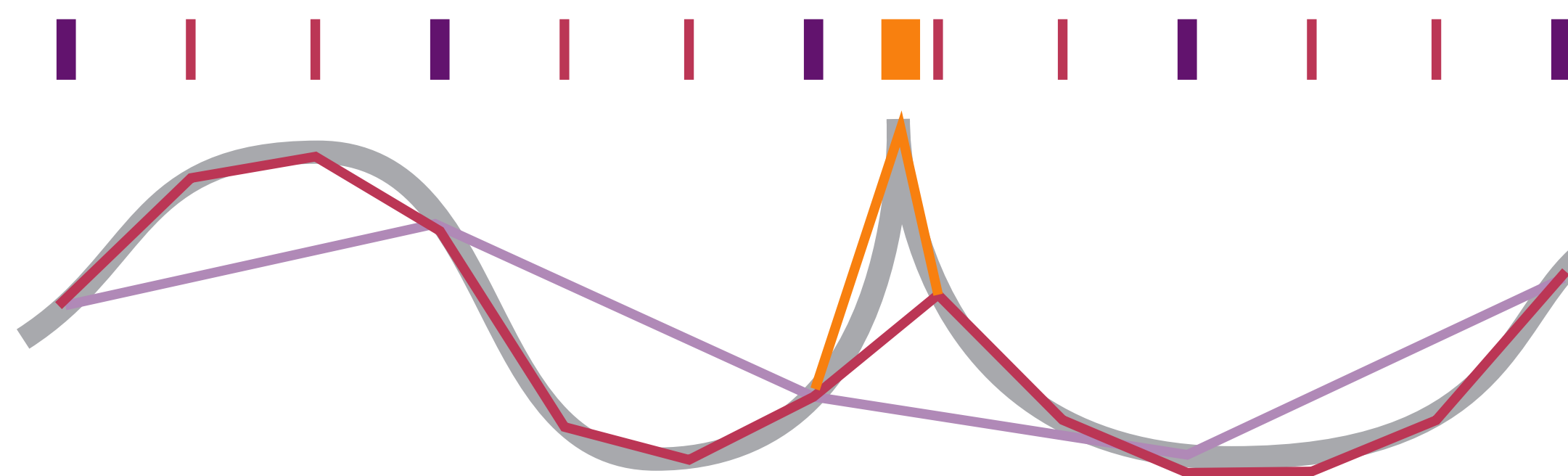


Without enough initial sampling, high frequency events are missed.

No Contrast



Once samples are on the slope, additional sub samples can easily refine...



But discontinuities (like direct sun) require a their own sampling method

- An over-abundance of parameters:
 - + subdivision statistics
 - + subdivision thresholds
 - + initial sampling and subdivision structure
 - + pre-computation / partial sampling to determine sampling densities
 - traversal order (breadth vs. depth vs. hybrid)
- Understanding the efficiency trade-offs between large matrix vs. small tree operations and simulation vs. post-processing.
- Understanding fundamental limitations versus easily solved code optimization
- Selecting subset of data for “ground truth” comparisons.
- Establishing a standard for acceptable accuracy to ground truth
 - + There is a bit of confusion within the literature, comparing apples and fried chicken.

Acknowledgments



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Stephen Wittkopf PhD
project applicant



Jan Wienold PhD
thesis co-director

Marilyne Andersen PhD
thesis director



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<http://p3.snf.ch/project-179067>