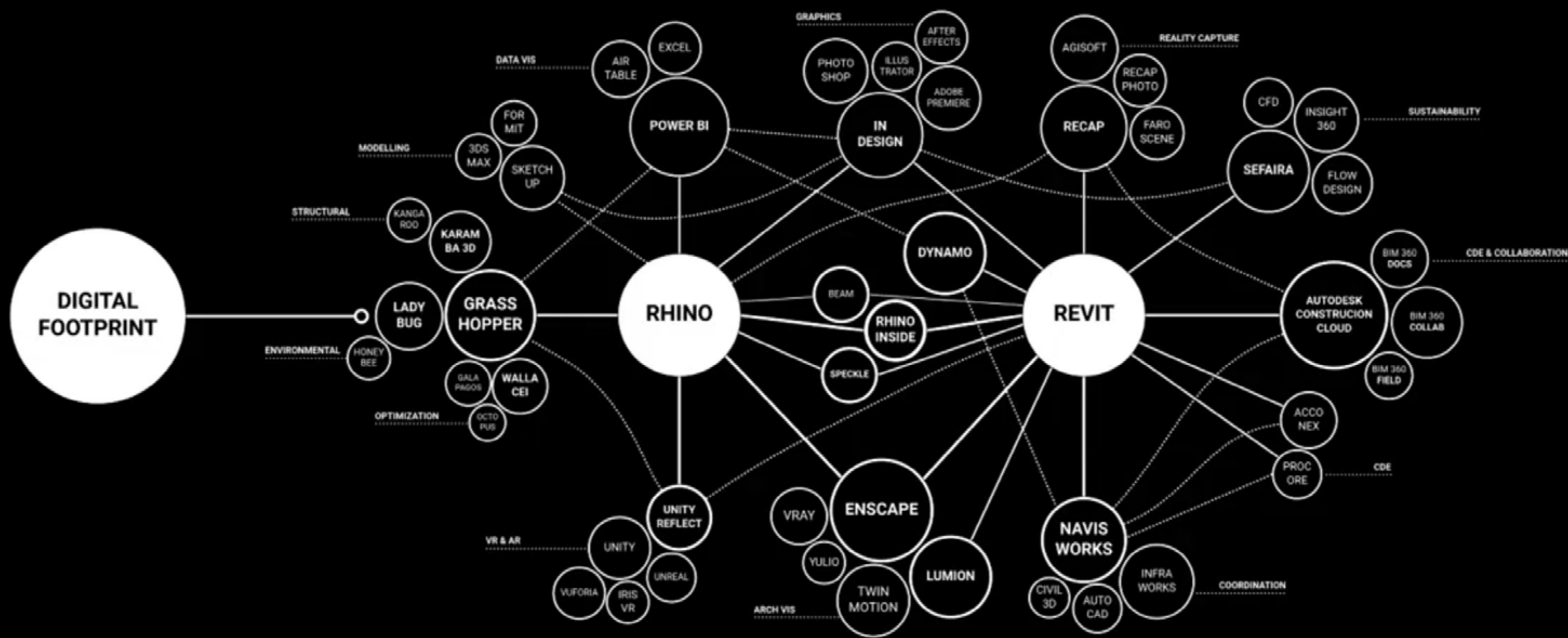
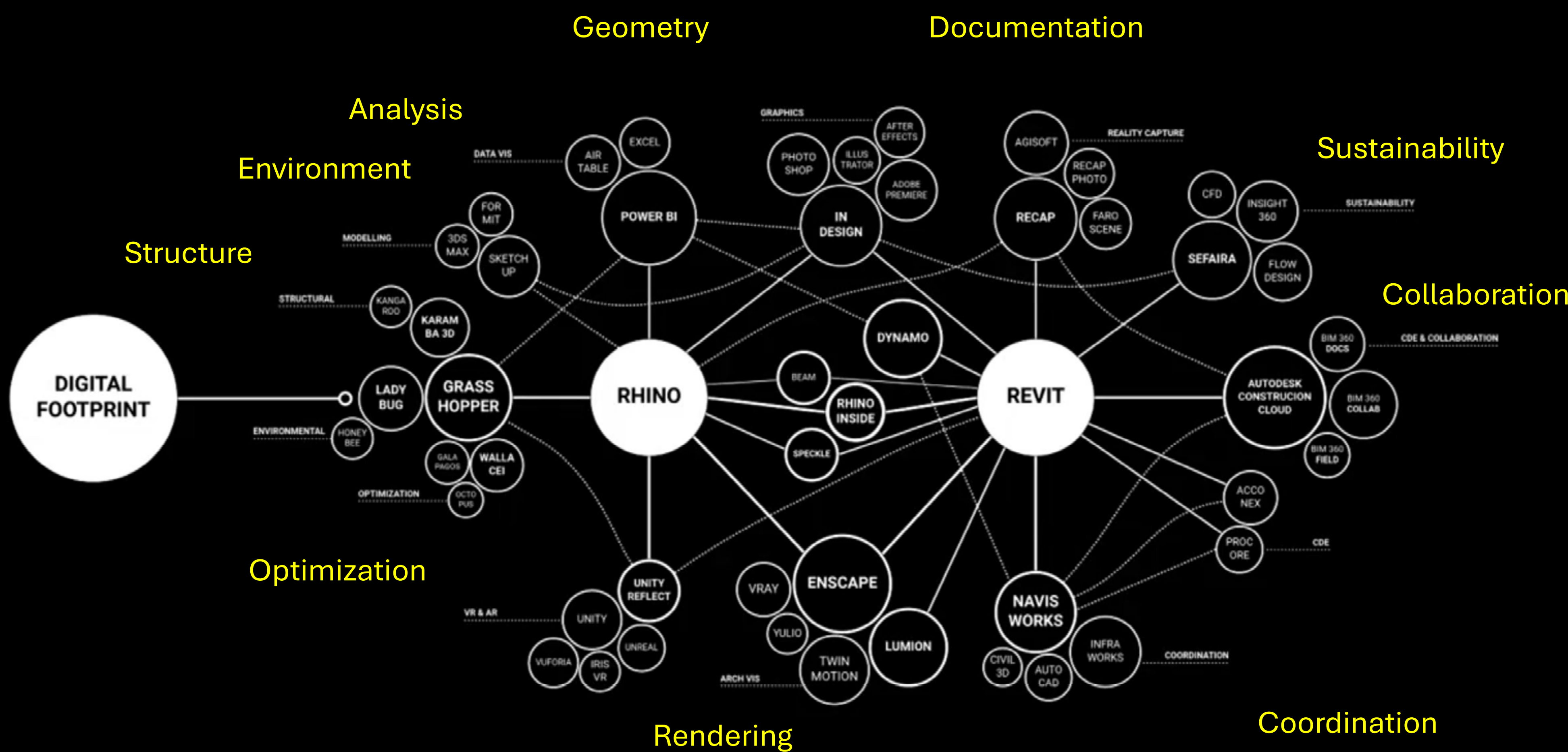
# ARCH 565

ADVANCED COMPUTER APPLICATIONS II



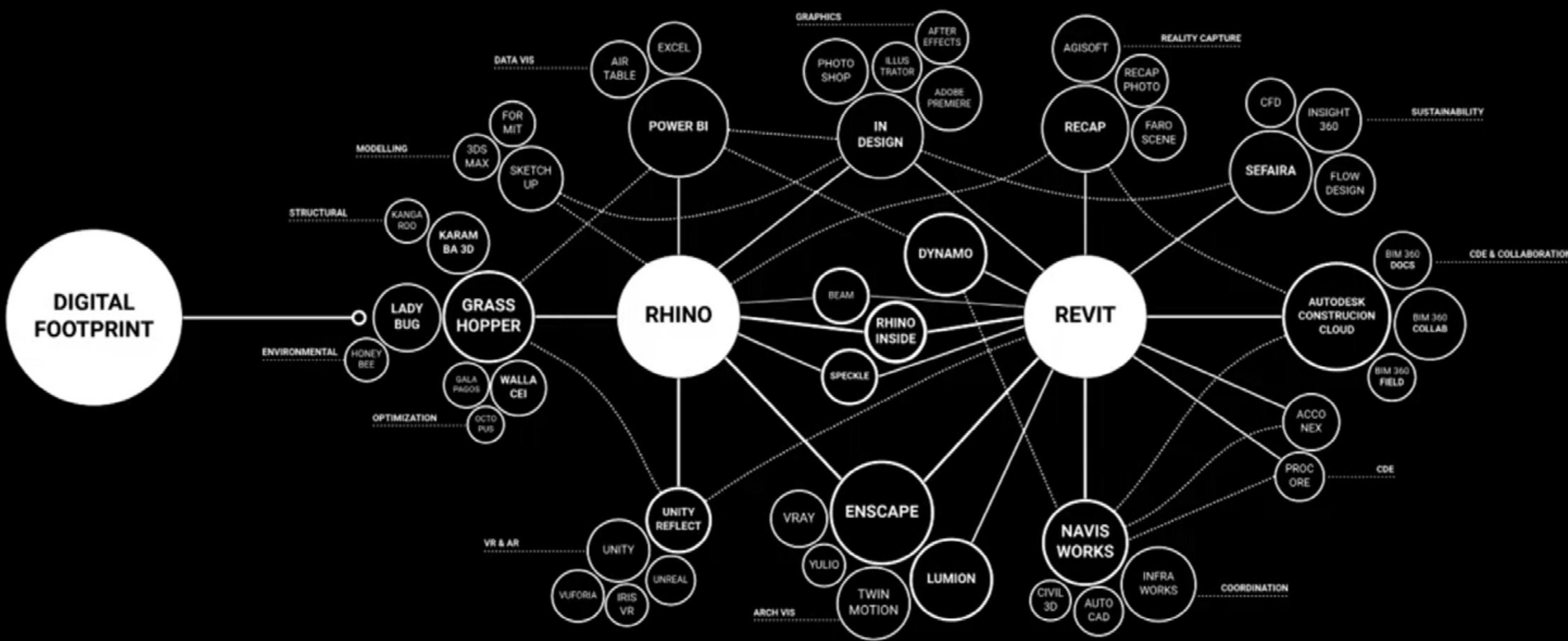

The **ever-expanding** digital ecosystem...

Screenshot from ATN / BIG




The **ever-expanding** digital ecosystem...

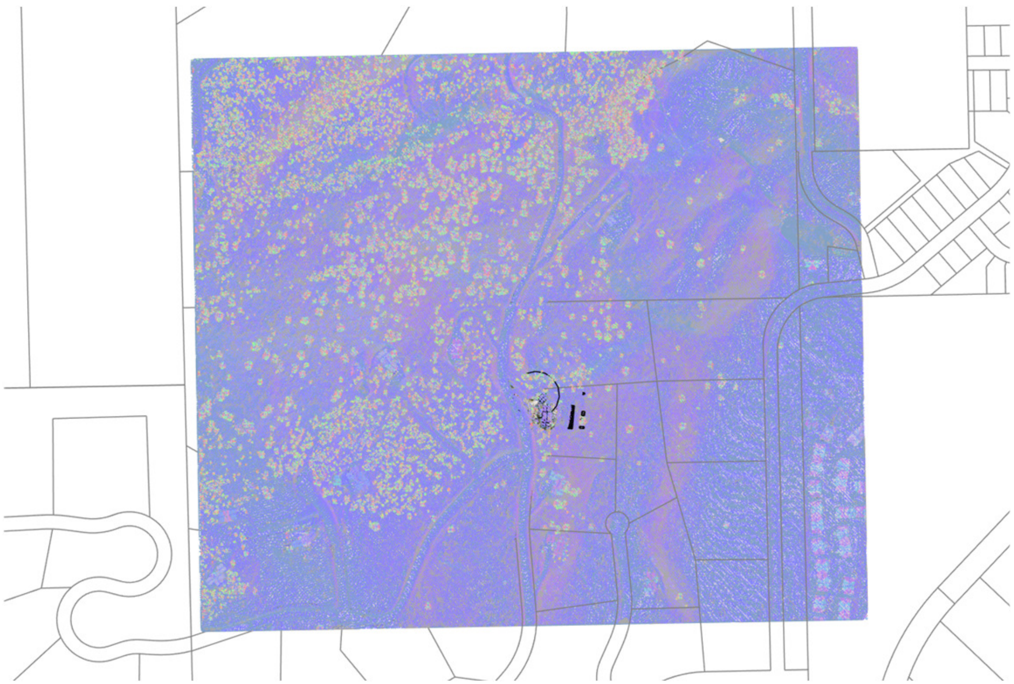
Screenshot from ATN / BIG

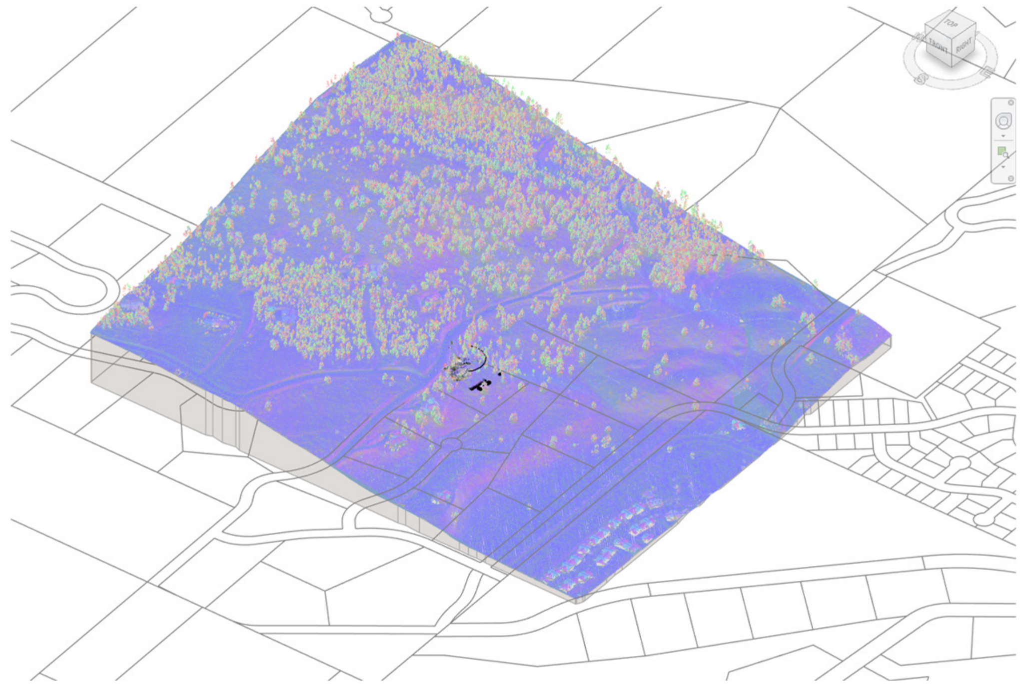


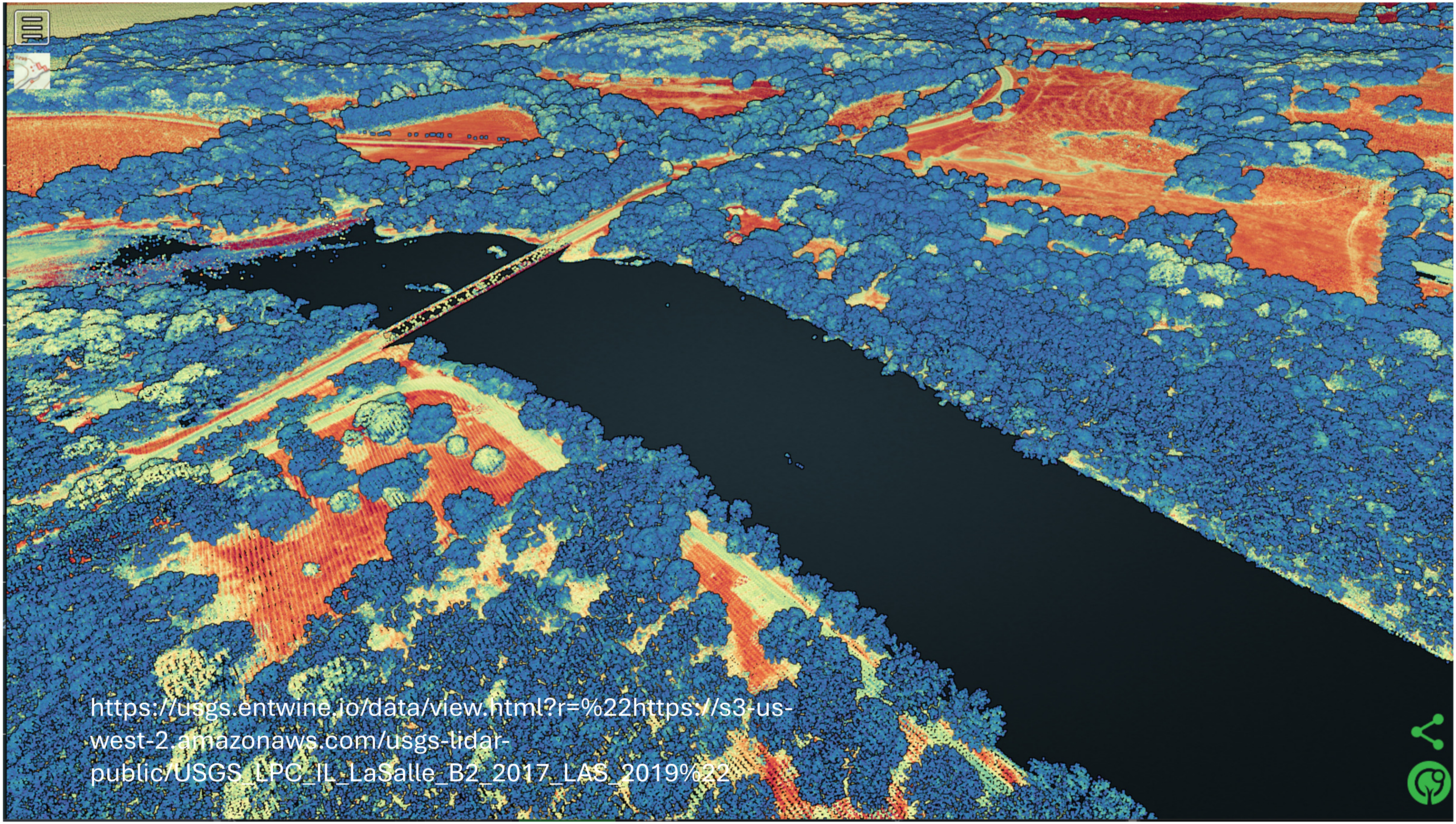

The **ever-expanding** digital ecosystem...

Screenshot from ATN / BIG

# Site analysis – LiDAR + Environment



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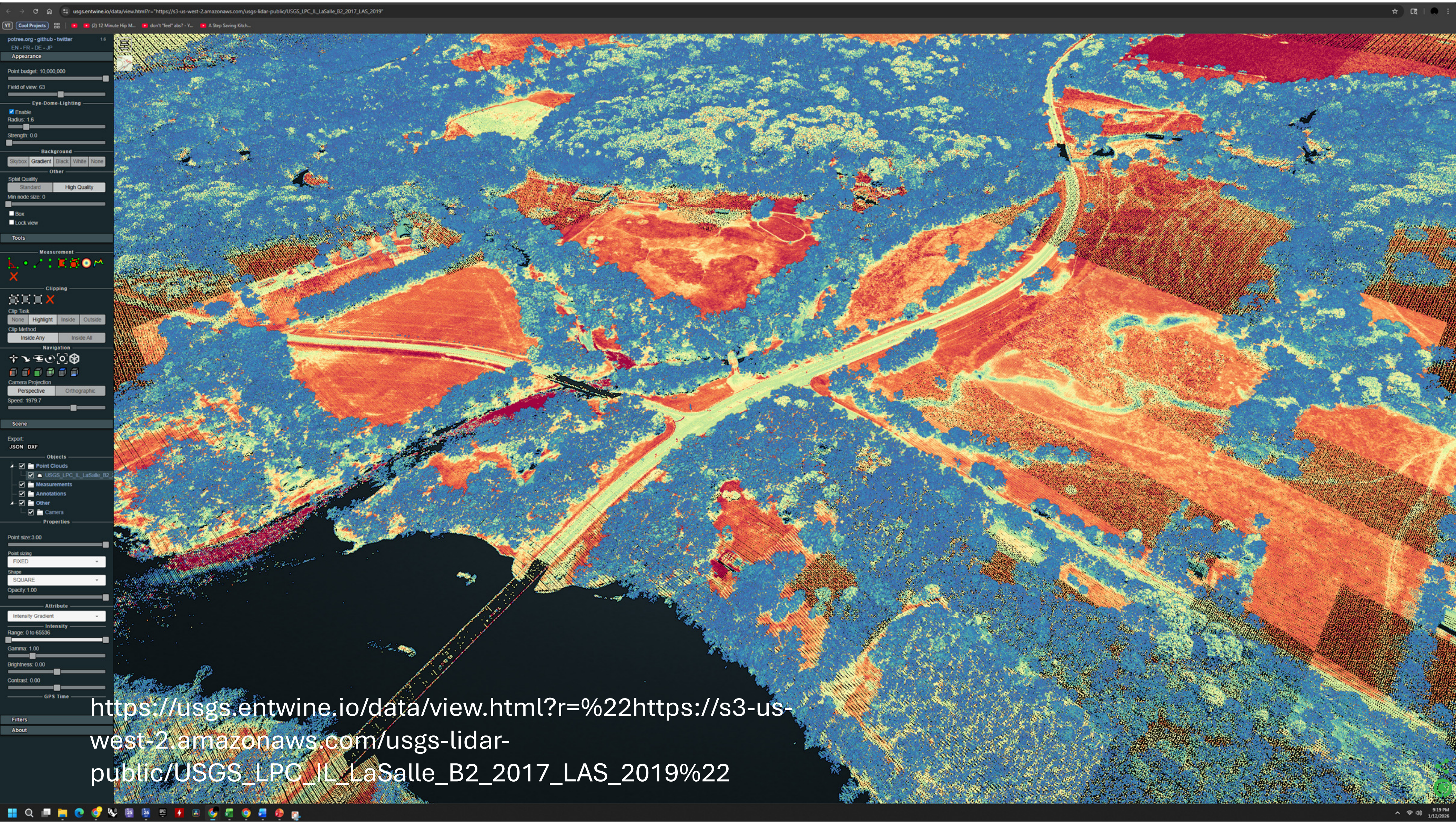

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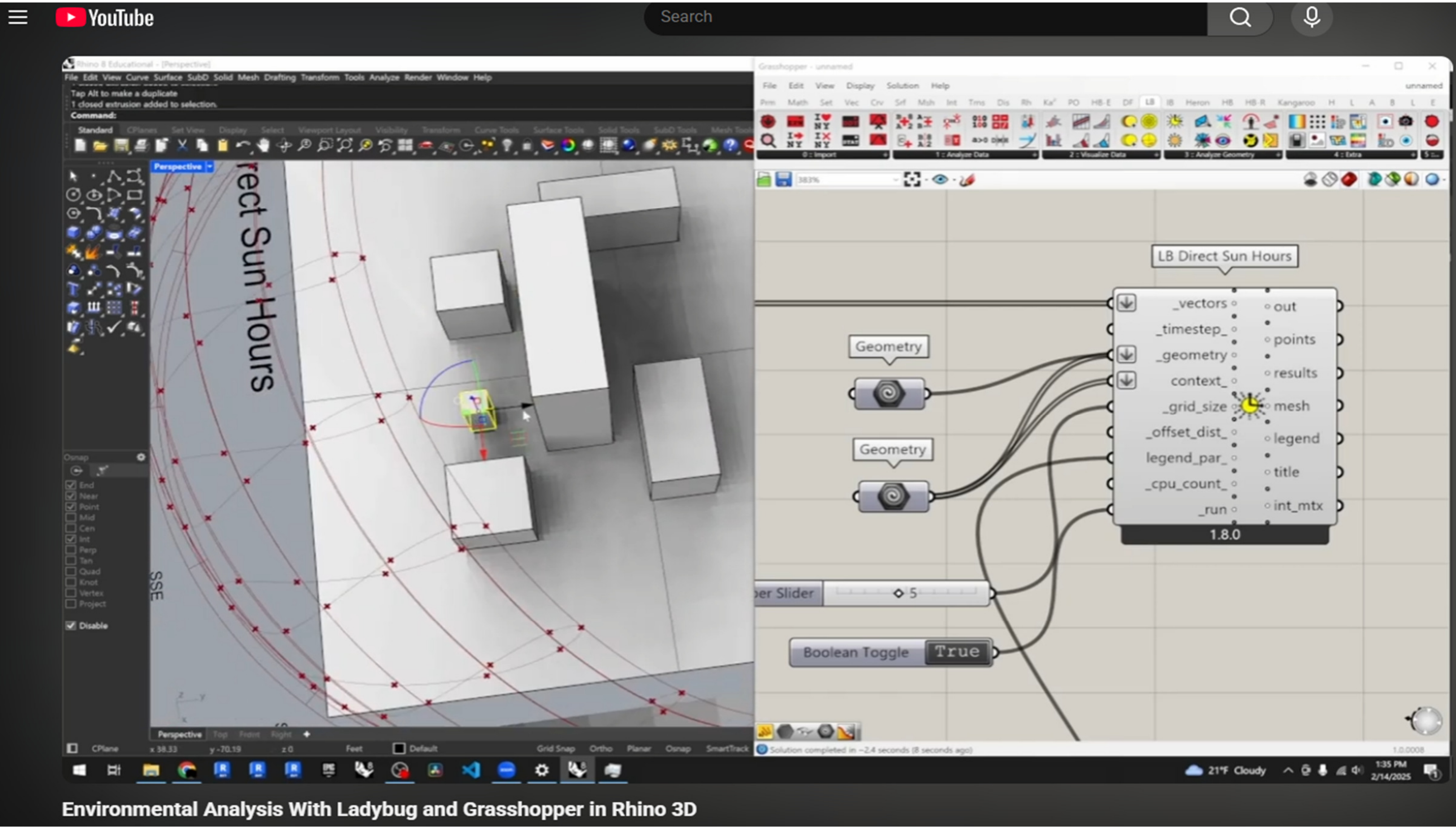
YouTube
Search
LB Direct Sun Hours
_vectors
_timestep_
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_offset_dist_
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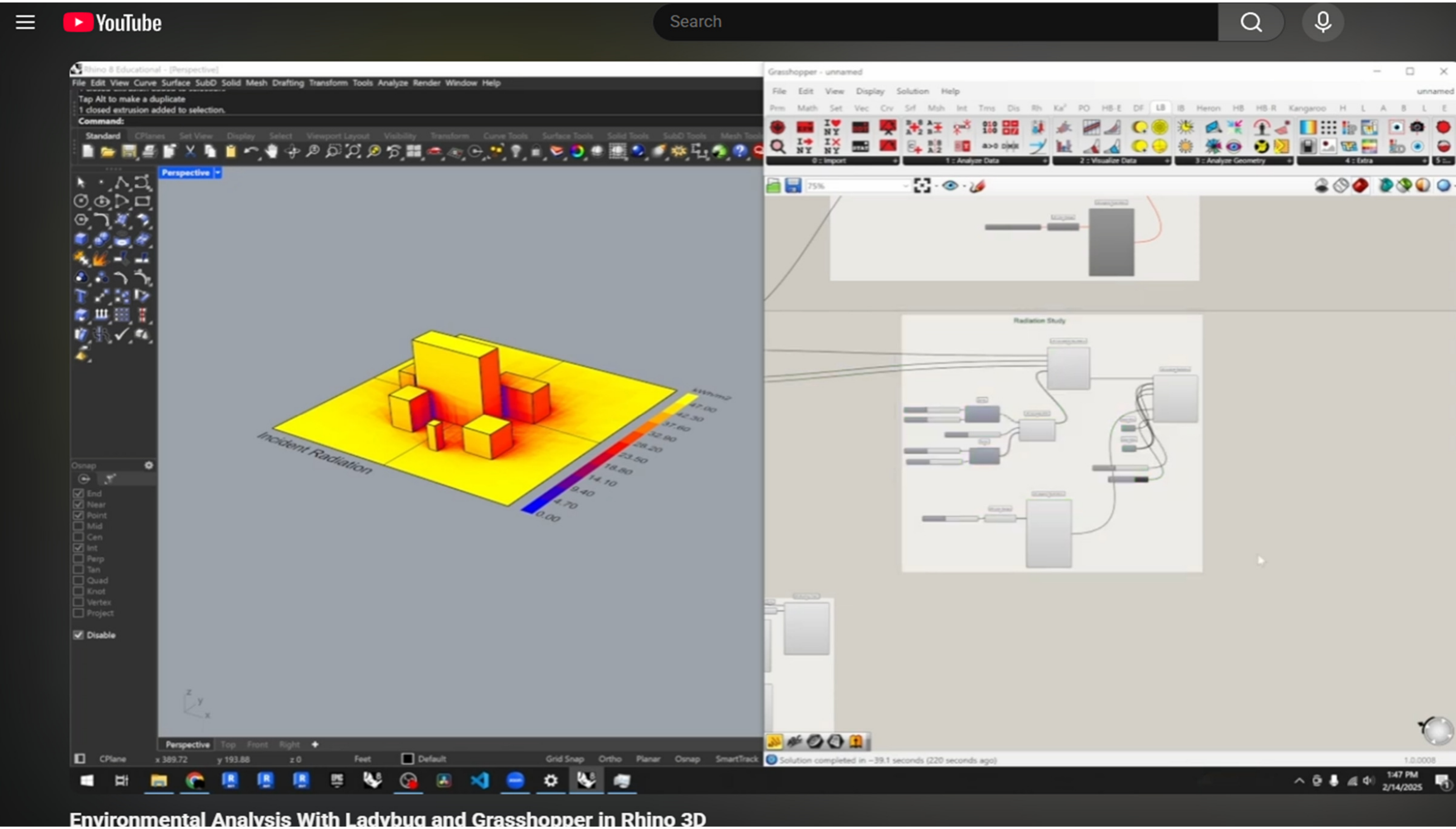
Perspective
Environmental Analysis With Ladybug and Grasshopper in Rhino 3D


YouTube
Search
File Edit View Curve Surface SubD Solid Mesh Drafting Transform Tools Analyze Render Window Help
Tap Alt to make a duplicate
1 closed extrusion added to selection.
Command:
Perspective
Incident Radiation
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42.30
37.60
32.90
28.20
23.50
18.80
14.10
9.40
4.70
0.00
Grasshopper - unnamed
File Edit View Display Solution Help
Disable
Environmental Analysis With Ladybug and Grasshopper in Rhino 3D

# Digital + Physical Simulation + Modeling

# Tensegrity Lattice

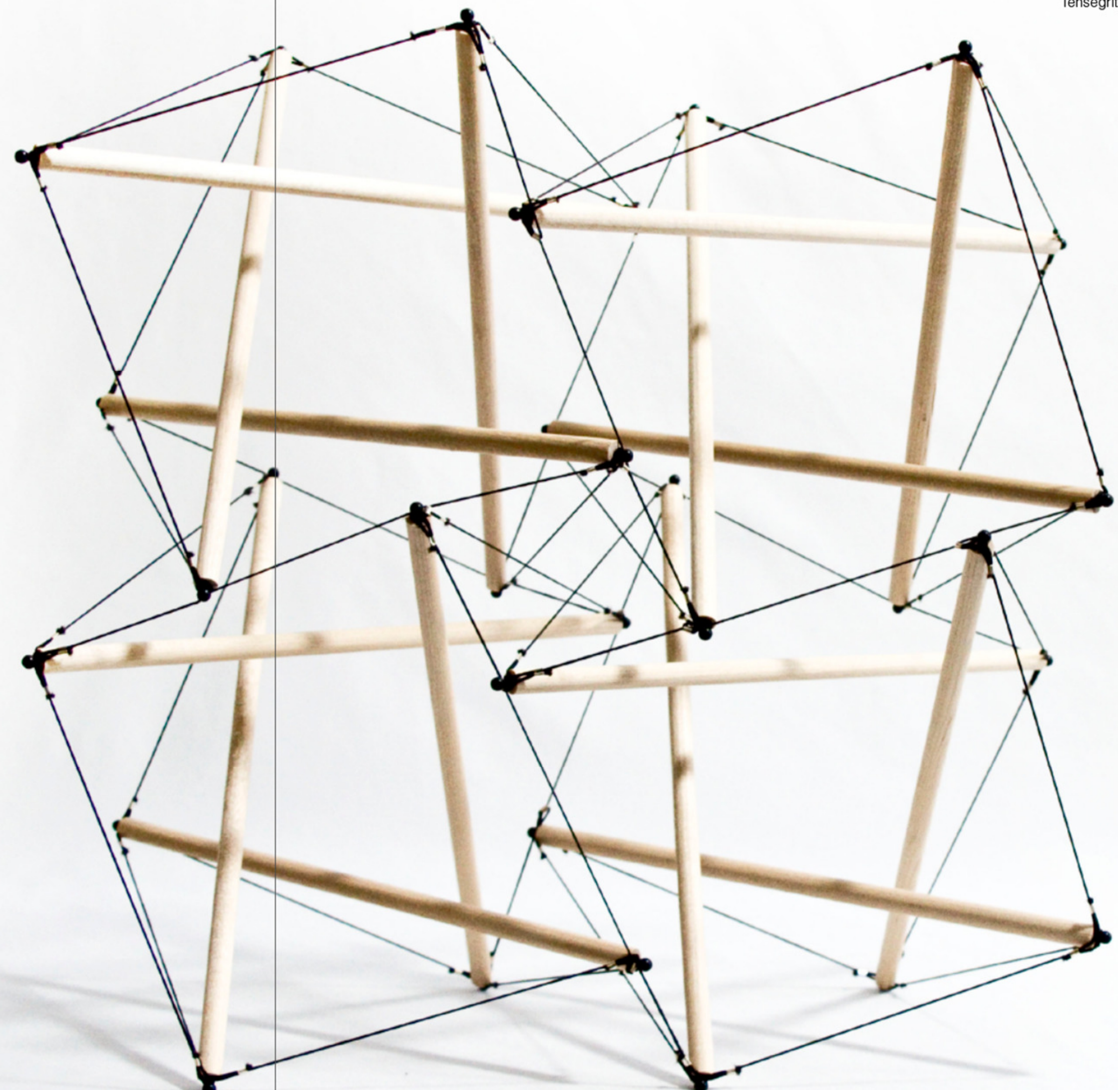
## Physics Based Modeling
## Grasshopper 3d + Kangaroo
## 2017

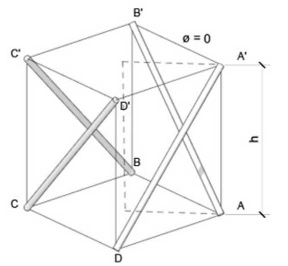
The tensegrity screen is part of an investigation into physics-based modeling. This investigation was developed using the Kangaroo plugin, produced by Daniel Piker for Grasshopper 3d, which adds physics-based modeling capabilities to the digital modeling software Rhino 3d. The investigation culminated in the creation of a screen produced through the development of a physics-based digital model and then testing the result with the creation of physical models.

The investigation was done by developing a digital model of a single tensegrity prism, testing it within the physics engine of Kangaroo, and then creating a physical model of the digital output as a proof. After the single prisim was solved, more complex systems of latticed tensegrity prisms were explored.

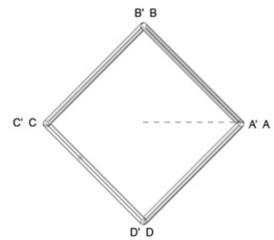
Tensegrity was chosen as the structural system for its purity of compressional and tensile forces acting within the complicated relationship of each element to all other parts. The axial forces of a tensegrity system allow the physical model to be built with cables working in tension, and struts acting in compression. The nature of the system made it easy to discover any errors in the equilibrium of both the physical and digital models.

**Photograph Opposite:**
4-strut t-prisim - x4 module lattice

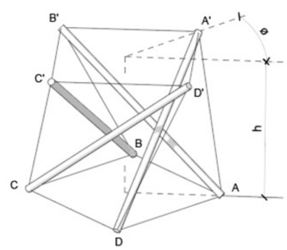




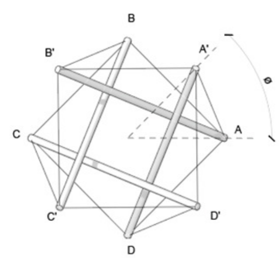

Pre-Solution Isometric View



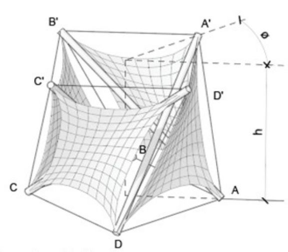

Pre-Solution Top View



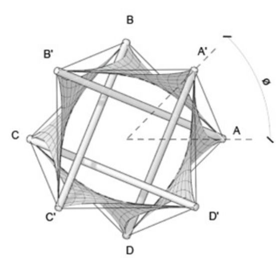

Post-SimulationIsometric View



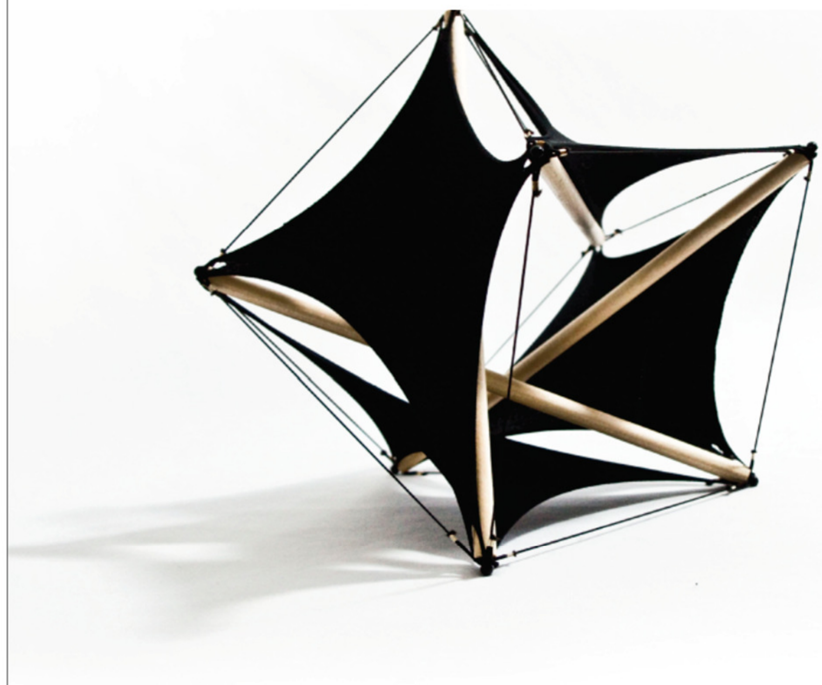

Post-Solution Top View




Redundancy Isometric View




Redundancy Top View



**Photograph Above:**
Physical Model of 4-Strut Prisim

**Render Opposite:**
Digital Model of 4-Strut Prisim

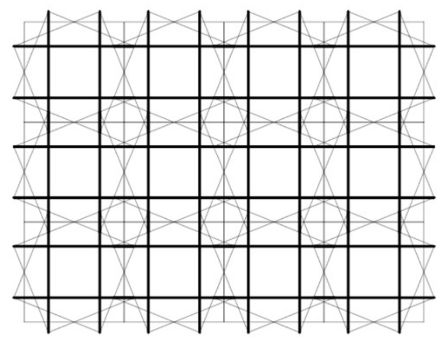


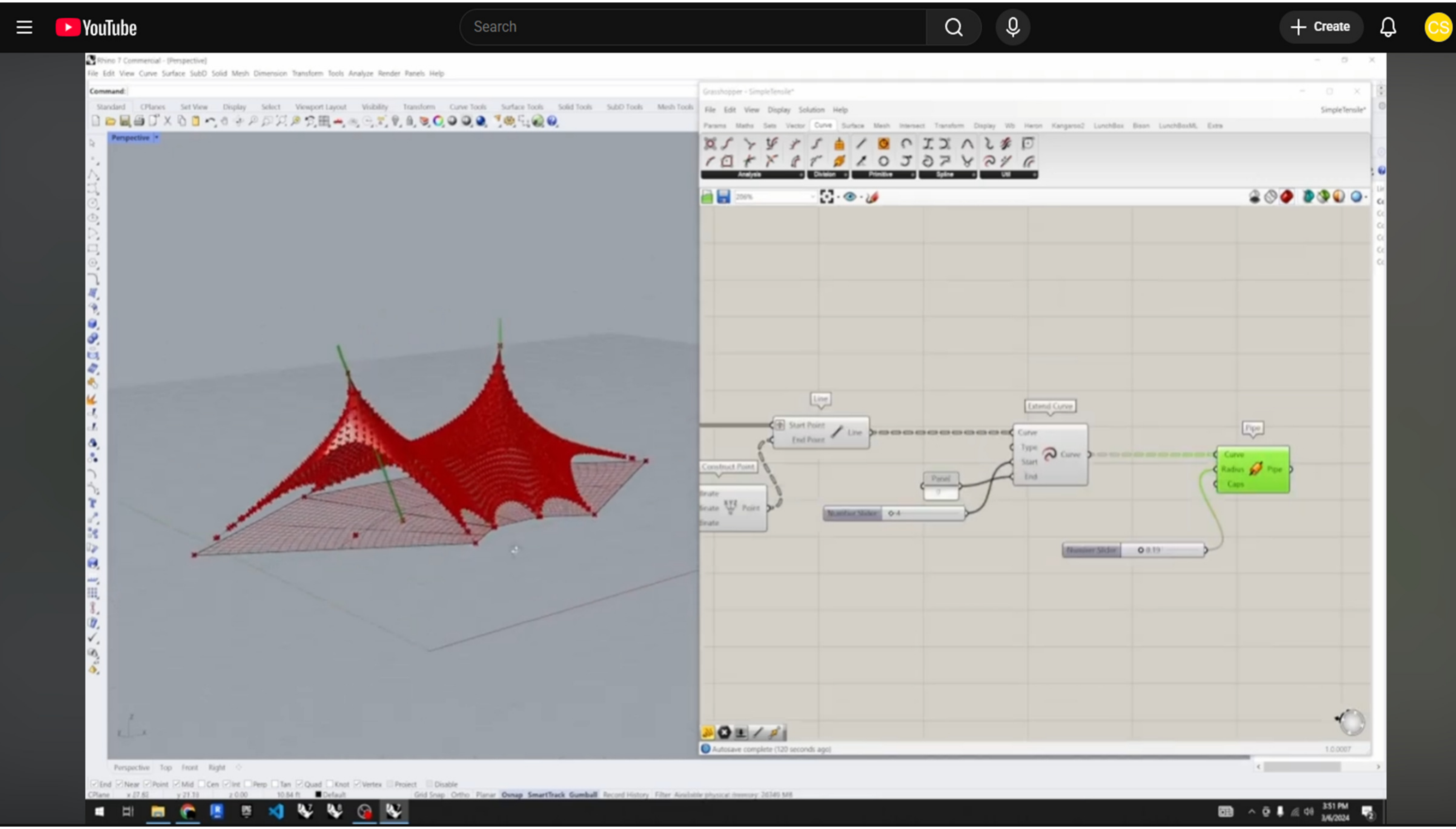


# Lattice

The tensegrity lattice is an array of single four strut tensegrity prisms configured within a reciprocal grid. This configuration was found by studying the tensegrity models of Kenneth Snelson and aligning the struts along the vertical and horizontal planes of the front elevation. The results were then analyzed with the same process as the individual tensegrity prism, and then physically modeled to test the outputs of the computer.

**Render Below:**
front view: 4-strut t-prisim tensegrity lattice
**Photograph Opposite:**
4-strut t-prisim - x4 module lattice




YouTube
Search
Create
CS
Perspective
Line
Extend Curve
Pipe
Construct Point

# Bending Study

## Structural Exploration
## Digital-Fabrication
## 2017

Form and forces are interconnected in the design of expressive structures. The force of bending was explored through a series of physical models that were tested to failure. These forms were later quantified and studied further with Kangaroo and Karamba plugins for Grasshopper.

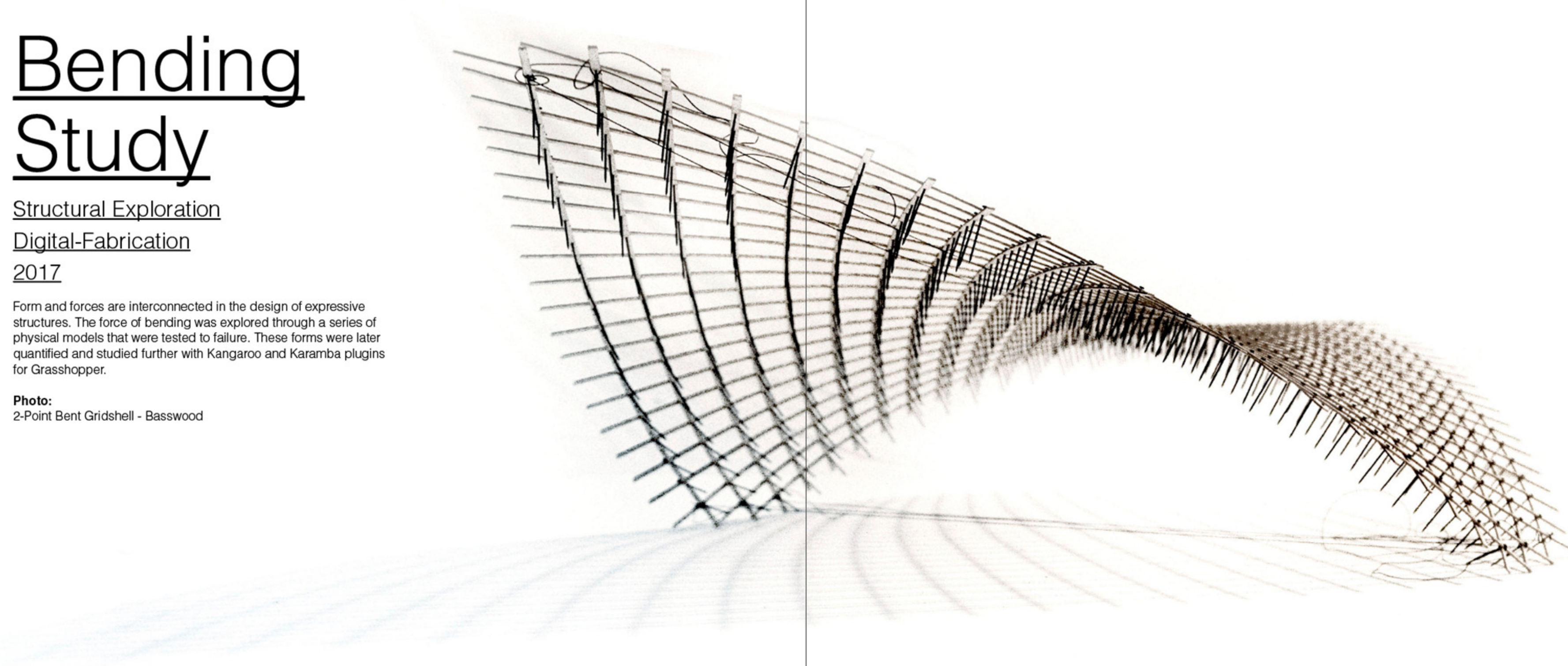
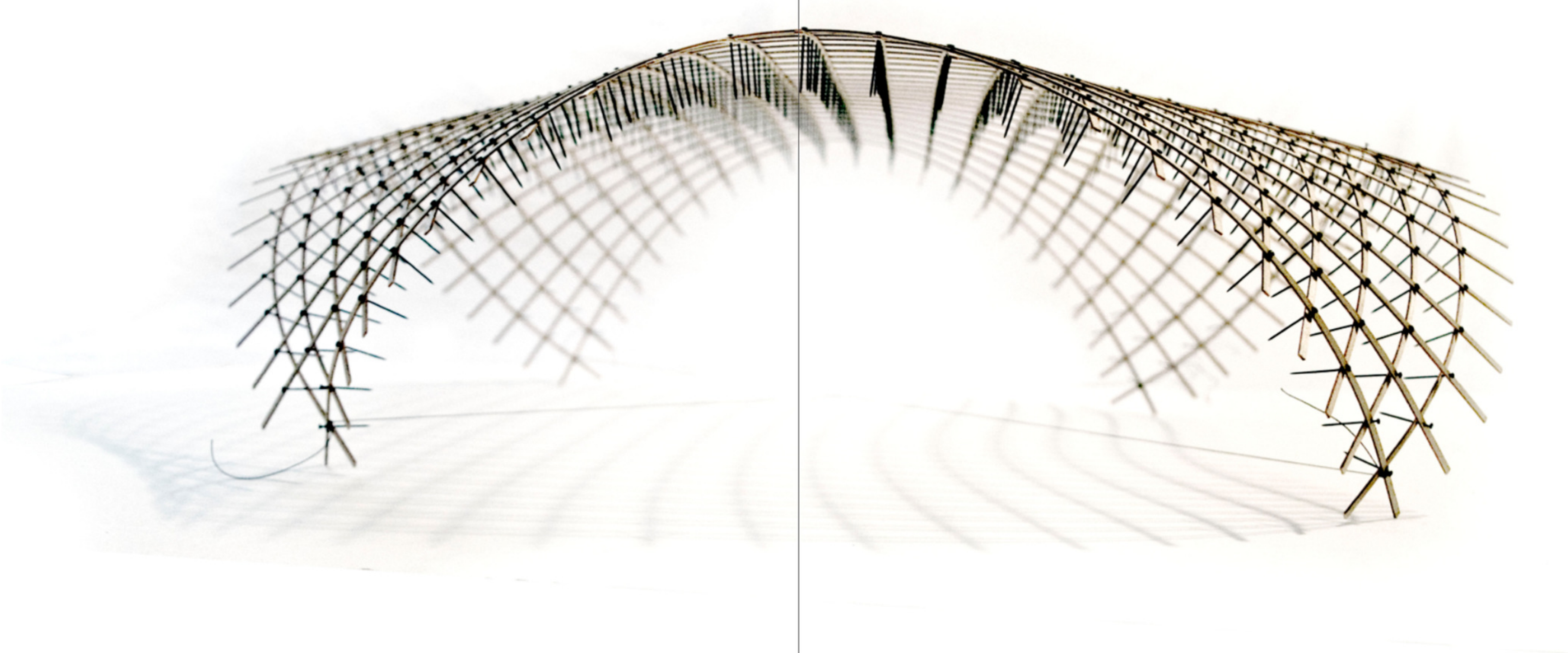
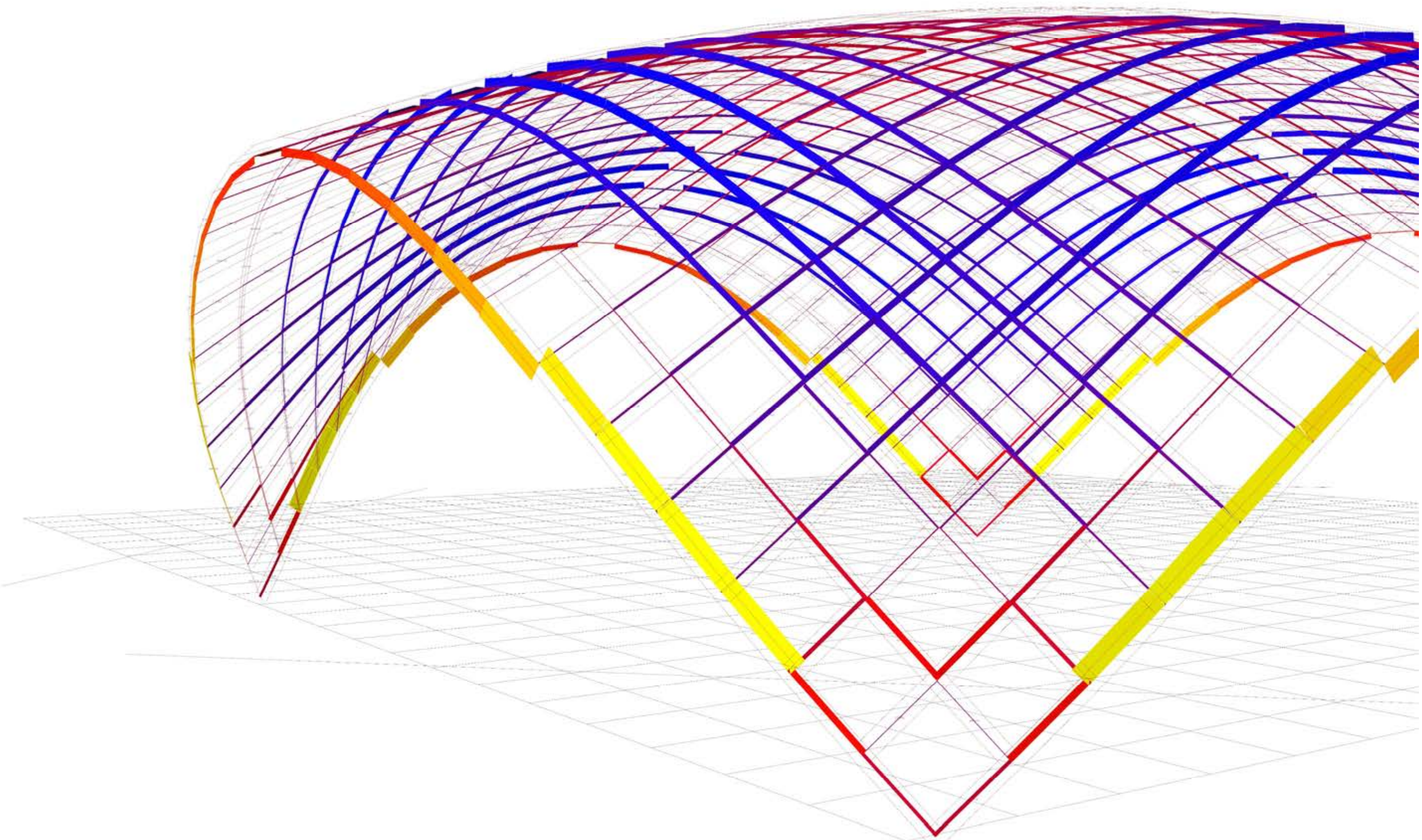


**Photo:**
2-Point Bent Gridshell - Basswood

**Photo:**
4-Point Bent Gridshell - Basswood





Connetion Detail

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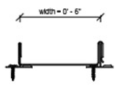
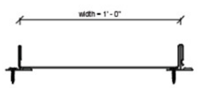
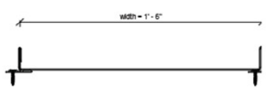



Panel Type : B

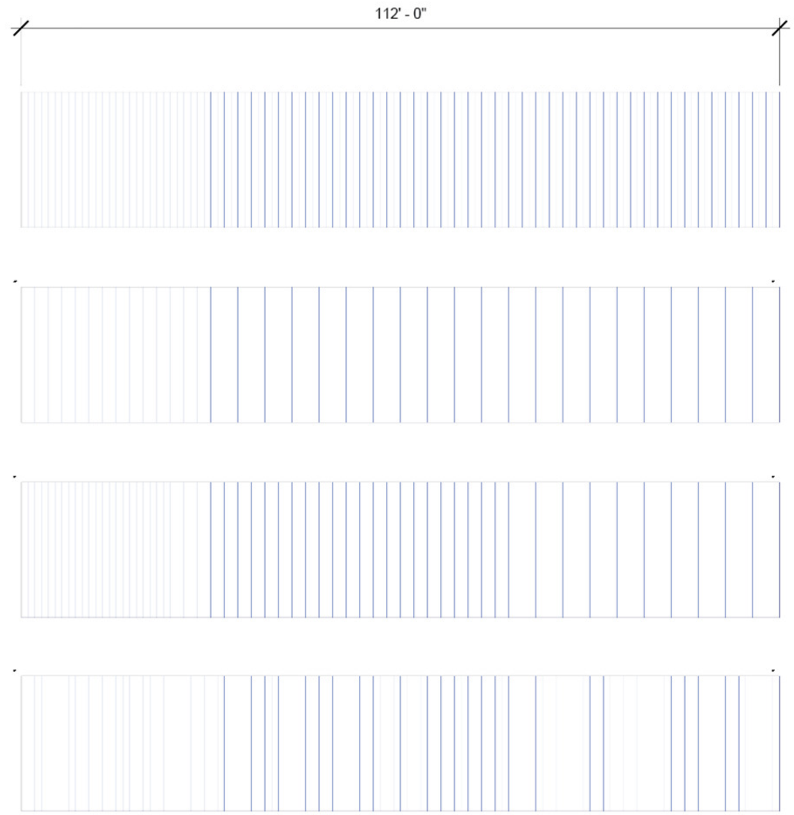



Panel Type : C







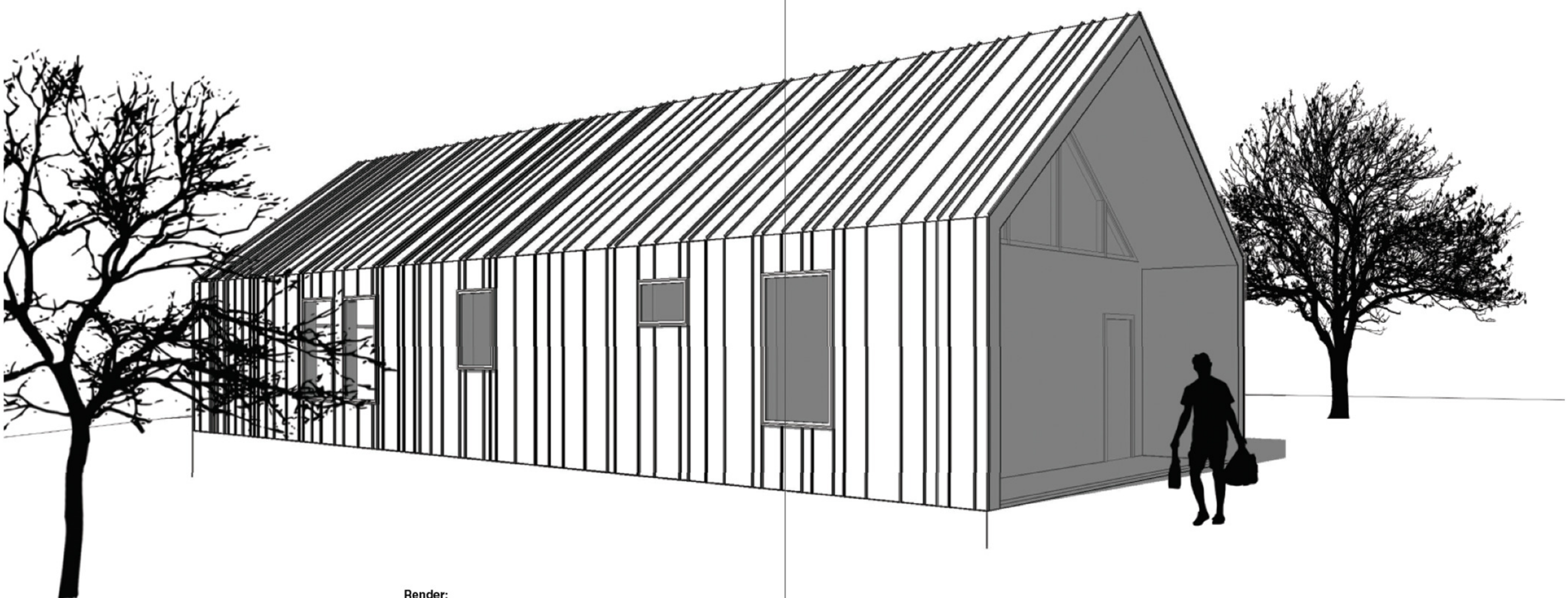

1

2

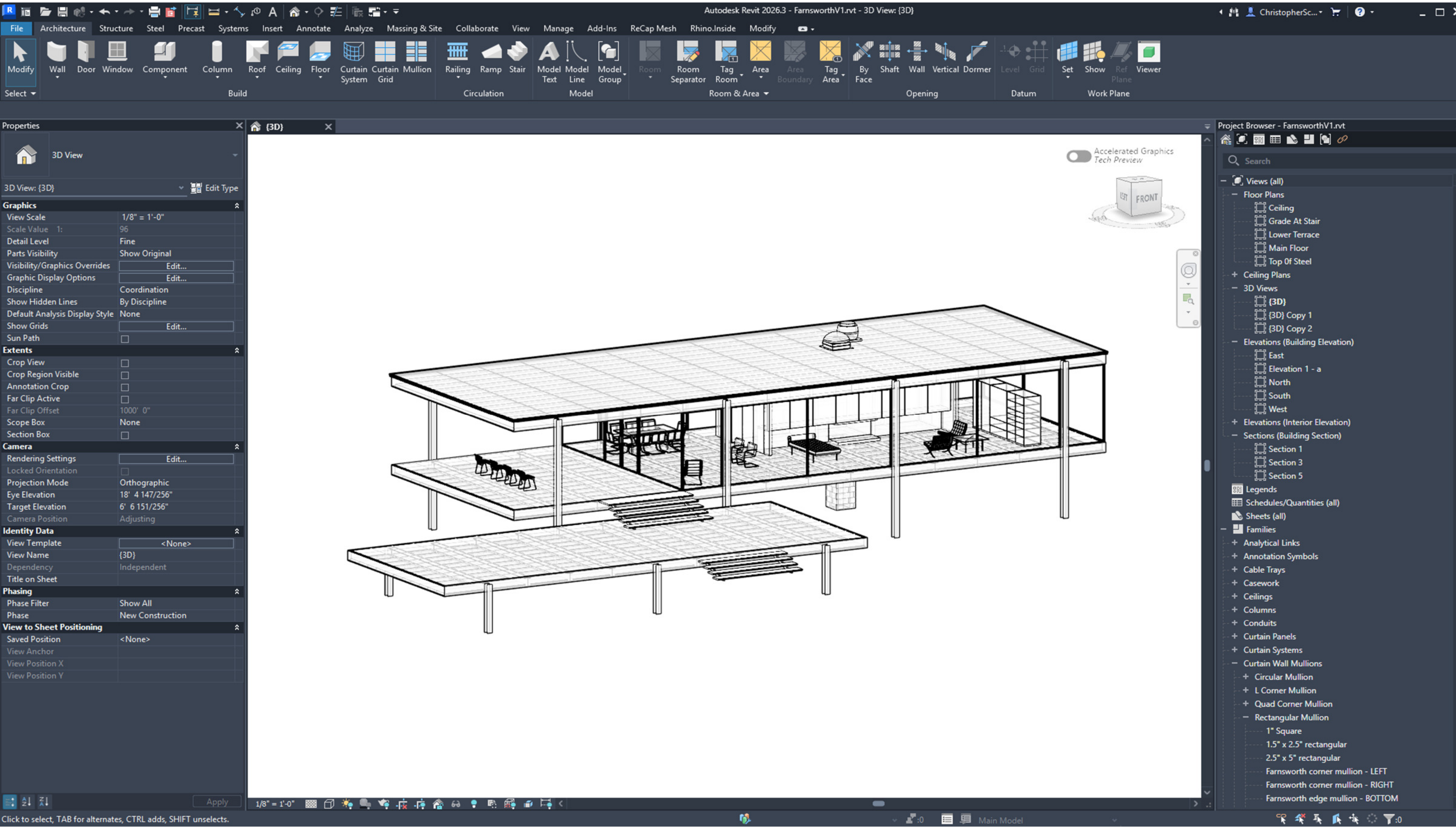
3

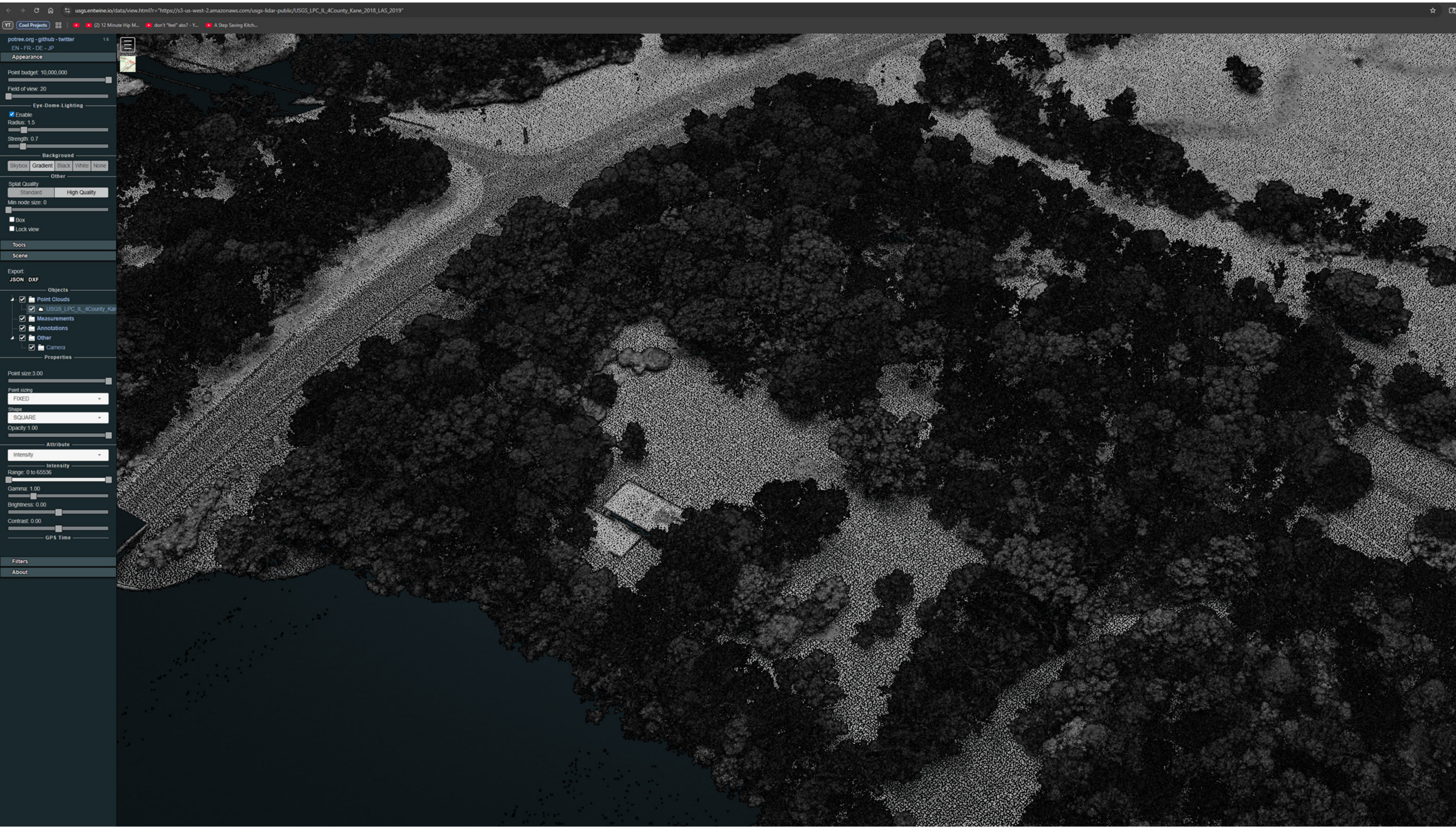
4

1. Find all possible solutions
2. Creae a range between the most and least elements
3. Iterate through all possible solutions in range
4. Randomize the selected solution elements.



**Render:**
Art-Law Residence


Autodesk Revit 2026.3 - FarnsworthV1.rvt - 3D View: {3D}
File
Architecture
Structure
Steel
Precast
Systems
Insert
Annotate
Analyze
Massing & Site
Collaborate
View
Manage
Add-Ins
ReCap Mesh
Rhino.Inside
Modify
Modify
Wall
Door
Window
Component
Column
Roof
Ceiling
Floor
Curtain System
Curtain Grid
Mullion
Railing
Ramp
Stair
Model Text
Model Line
Model Group
Room
Room Separator
Tag Room
Area
Area Boundary
Tag Area
By Face
Shaft
Wall
Vertical
Dormer
Level
Grid
Set
Show
Ref Plane
Viewer
Select
Build
Circulation
Model
Room & Area
Opening
Datum
Work Plane
Properties
3D View
3D View: {3D}
Edit Type
Graphics
View Scale 1/8" = 1'-0"
Scale Value 1: 96
Detail Level Fine
Parts Visibility Show Original
Visibility/Graphics Overrides Edit...
Graphic Display Options Edit...
Discipline Coordination
Show Hidden Lines By Discipline
Default Analysis Display Style None
Show Grids Edit...
Sun Path
Extents
Crop View
Crop Region Visible
Annotation Crop
Far Clip Active
Far Clip Offset 1000' 0"
Scope Box None
Section Box
Camera
Rendering Settings Edit...
Locked Orientation
Projection Mode Orthographic
Eye Elevation 18' 4 147/256"
Target Elevation 6' 6 151/256"
Camera Position Adjusting
Identity Data
View Template <None>
View Name {3D}
Dependency Independent
Title on Sheet
Phasing
Phase Filter Show All
Phase New Construction
View to Sheet Positioning
Saved Position <None>
View Anchor
View Position X
View Position Y
Apply
{3D}
Accelerated Graphics
Tech Preview
FRONT
1/8" = 1'-0"
Project Browser - FarnsworthV1.rvt
Search
Views (all)
Floor Plans
Ceiling
Grade At Stair
Lower Terrace
Main Floor
Top Of Steel
Ceiling Plans
3D Views
{3D}
{3D} Copy 1
{3D} Copy 2
Elevations (Building Elevation)
East
Elevation 1 - a
North
South
West
Elevations (Interior Elevation)
Sections (Building Section)
Section 1
Section 3
Section 5
Legends
Schedules/Quantities (all)
Sheets (all)
Families
Analytical Links
Annotation Symbols
Cable Trays
Casework
Ceilings
Columns
Conduits
Curtain Panels
Curtain Systems
Curtain Wall Mullions
Circular Mullion
L Corner Mullion
Quad Corner Mullion
Rectangular Mullion
1" Square
1.5" x 2.5" rectangular
2.5" x 5" rectangular
Farnsworth corner mullion - LEFT
Farnsworth corner mullion - RIGHT
Farnsworth edge mullion - BOTTOM
Click to select, TAB for alternates, CTRL adds, SHIFT unselects.
Main Model



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YT
Cool Projects
(2) 12 Minute Hip M...
don't "feel" abs? - Y...
A Step Saving Kitch...
potree.org - github - twitter
1.6
EN - FR - DE - JP
Appearance
Point budget: 10,000,000
Field of view: 20
Eye-Dome-Lighting
Enable
Radius: 1.5
Strength: 0.7
Background
Skybox
Gradient
Black
White
None
Other
Splat Quality
Standard
High Quality
Min node size: 0
Box
Lock view
Tools
Scene
Export:
JSON
DXF
Objects
Point Clouds
USGS_LPC_IL_4County_Kan
Measurements
Annotations
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Opacity:1.00
Attribute
Intensity
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Brightness: 0.00
Contrast: 0.00
GPS Time
Filters
About


RENDERING

File
Edit
Window
Tools
Build
Platforms
Select
Actor
Help
SullivanHouse
Main
Selection Mode
Ultra Dynamic Sky
Perspective
Lit
Place Actors
Cesium
Add
Upload
Token
Learn
Help
Sign Out
Quick Add Basic Actors
Blank 3D Tiles Tileset
Cesium SunSky
Dynamic Pawn
Cesium Cartographic Polygon
Quick Add Cesium ion Assets
Cesium OSM Buildings
Google Photorealistic 3D Tiles
Cesium World Terrain + Bing Maps Aerial
Cesium World Terrain + Bing Maps Aerial with Labels
Cesium World Terrain + Bing Maps Road
Cesium World Terrain + Sentinel-2
Cesium World Terrain + Google Maps 2D Satellite
Cesium World Terrain + Google Maps 2D Satellite with Labels
Cesium World Terrain + Google Maps 2D Roadmap
Cesium World Terrain + Google Maps 2D Labels Only
Cesium World Terrain + Google Maps 2D Contour
CESIUM ion
Google Maps
Outliner
Item Label
Type
Main (Editor)
Atmosphere
PostProcessVolume
Ultra_Dynamic_Sky
Ultra_Dynamic_Weather
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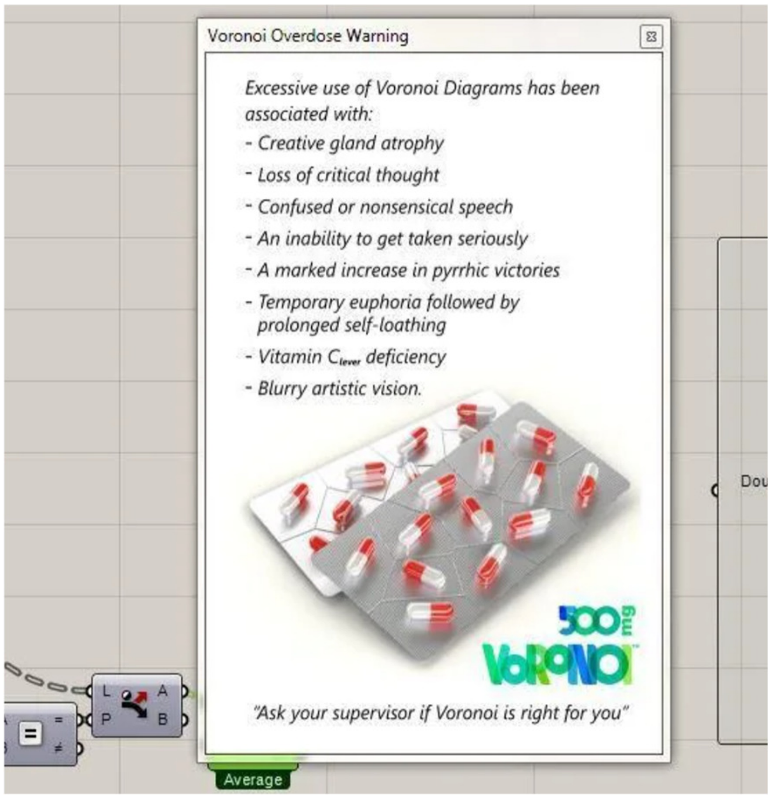
CesiumCreditSystemBP0
CesiumGeoreference0
Cesium OSM Buildings
Cesium World Terrain
Google Photorealistic 3D Tiles
Base_Point
CineCameraActor
CineCameraActor2
Floor
InstancedFoliageActor
PlayerStart
15 actors (1 selected)
Details
Cesium World Terrain
Cesium World Terrain (Instance)
Root (Tileset)
Bing Maps Aerial
General
Actor
Misc
Streaming
All
Transform
Location
Rotation
Scale
Mobility
Static
Stationary
Movable
RefreshTileset
TroubleshootToken
Georeference
Resolved Georeference
Credit System
Camera Manager
Show Credits on Screen
Source
From Cesium Ion
Ion Asset ID
Ion Access Token
Request Headers
Level Of Detail
Tile Loading
Preload Ancestors
Preload Siblings
Forbid Holes
Loading Descendant Limit
Tile Culling
Enable Frustum Culling
Enable Fog Culling
Tile Occlusion
Debug
Rendering
Content Browser
Cesium ion Assets
Favorites
SullivanHouse
Add
Import
Save All
Fab
All
Content
PN_interactiveSpruceForest
Textures
MasterTextures
ModelTextures
BlankDefault
CesiumSettings
Materials
Blueprints
ExampleContent
Map
Meshes
Imposter
CoverTextures
GroundTextures
PivotPainterTextures
UE4_Mannequin
Revit
UltraDynamicSky
DatasprepCore
Bark_A
Bark_AOSH
Bark_N
Branch_A
Branch_AOSH
Branch_N
Leaf_A_01
Leaf_A_02
Leaf_AOSM
Leaf_N
Leaf_O
Collections
11 items

# Ethics




GH Easter Egg!!! : Voronoi Overdose Warning - GH

*On two occasions I have been asked, "Pray, Mr. Babbage, if you put into the machine wrong figures, will the right answers come out?"… I am not able rightly to apprehend the kind of confusion of ideas that could provoke such a question.*
*Charles Babbage, 1864*

*Students ought to get instruction about algorithm design and computational geometry, but* ***equally important is that they are taught about the ethics of computational design***.

- ***What sort of problems warrant computation?***
- ***How should this be presented to an audience?***
- ***How reliable are the computed results?***
- ***What simplifying assumptions were part of the algorithm?***
- ***What will it require to get a better answer?***

*If these questions aren't asked in your curriculum, someone isn't doing their job.*

***In the end, designers must be able to justify what they are working on.***

*and every single sentence*
*and every single image*
*and every single statistical data-point*
*and every single line of code.*

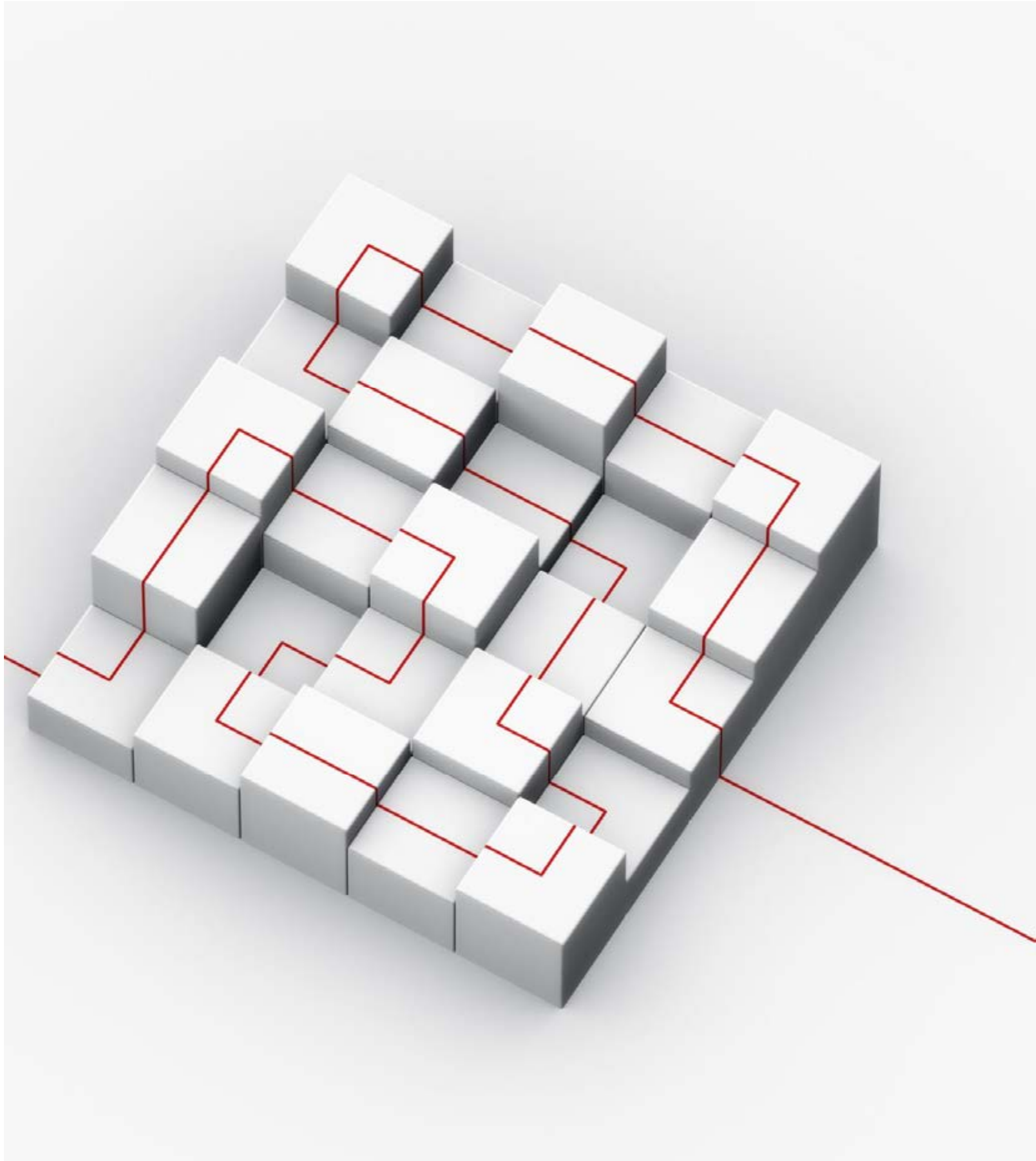
***If there is no justification, then nobody can be expected to take the results seriously.***

**- David Rutten**

[Worrisome trends in architecture education – Bugs for breakfast]

# A.I. in Architecture

- Employ AI-driven methods to augment traditional workflows.
- Critically assess AI-generated outputs in terms of quality, originality, and alignment with human-centered architectural values.
- Develop an informed position on the role of AI as collaborator versus tool in the design process.



# LET'S DO SOMETHING!