Dynamo: Generative Modeling with T-Splines

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Mode Lab

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Hi, I’m Ronnie

MODELAB

- Global design and strategy to iterate and create in new and unimagined ways. www.modelab.is

Dynamo Primer

- Ppen-source guide to share the fundamentals of visual programming in Autodesk Dynamo. www.dynamoprimer.com

Dynamo Dictionary

- Open-source searchable database for Dynamo functionality. http://dictionary.dynamobim.com/

Key learning objectives

Learn quick and efficient workflows, using Dynamo and T-Splines, to generate structures, textures, and forms for rapid prototyping.

At the end of this class, you will be able to:

- Create a parametric Dynamo Graph with T-Splines Nodes
- Extend Dynamo Functionality using the Package Manager
- Export a Dynamo T-Splines file for use in an External Application
- Create and Export a Dynamo T-Spline file for Rapid Prototyping

Lab Handout(s)

Lab handouts and datasets can be downloaded at:

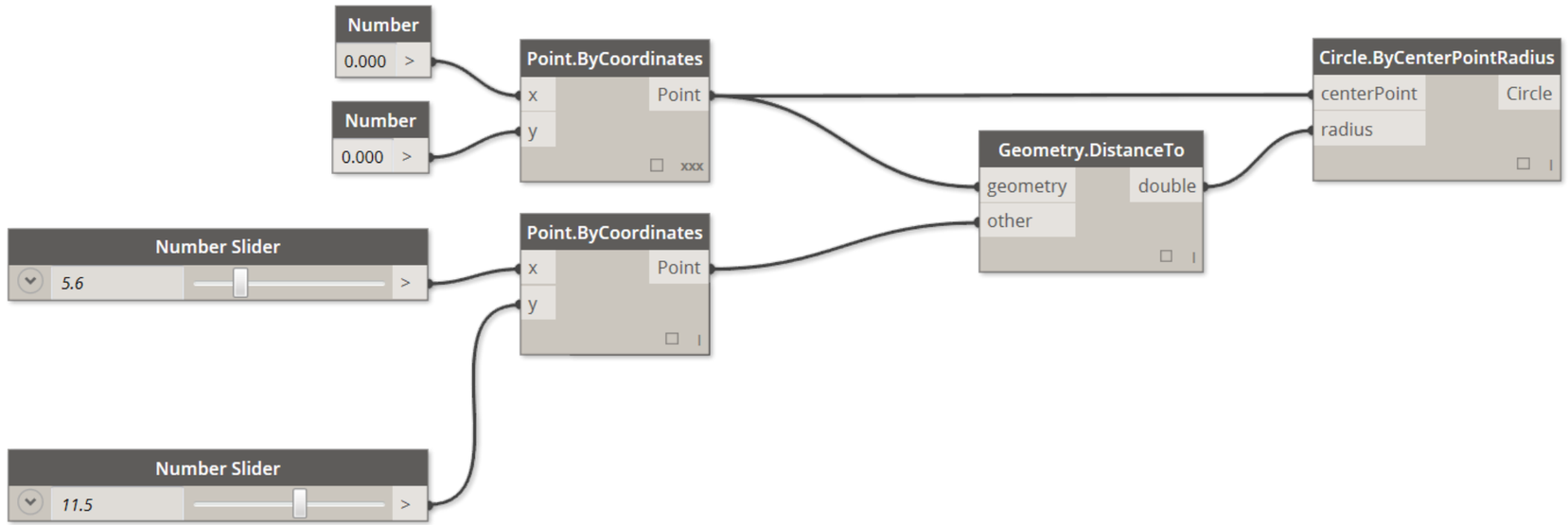
www.modelab.box.com/v/au2016

- Main class handout contains key information and workflows.
  - Compiled from multiple chapters of the Dynamo Primer
- Datasets (Annotated for in-context learning)
  - 00.Getting Started
  - 01.Advanced
  - 02.Going Further

Dynamo:
Open, Connected, Creative

What is Dynamo?

- Visual Programming Platform
- Compose Custom Algorithms
- Process Data and Generate Geometry

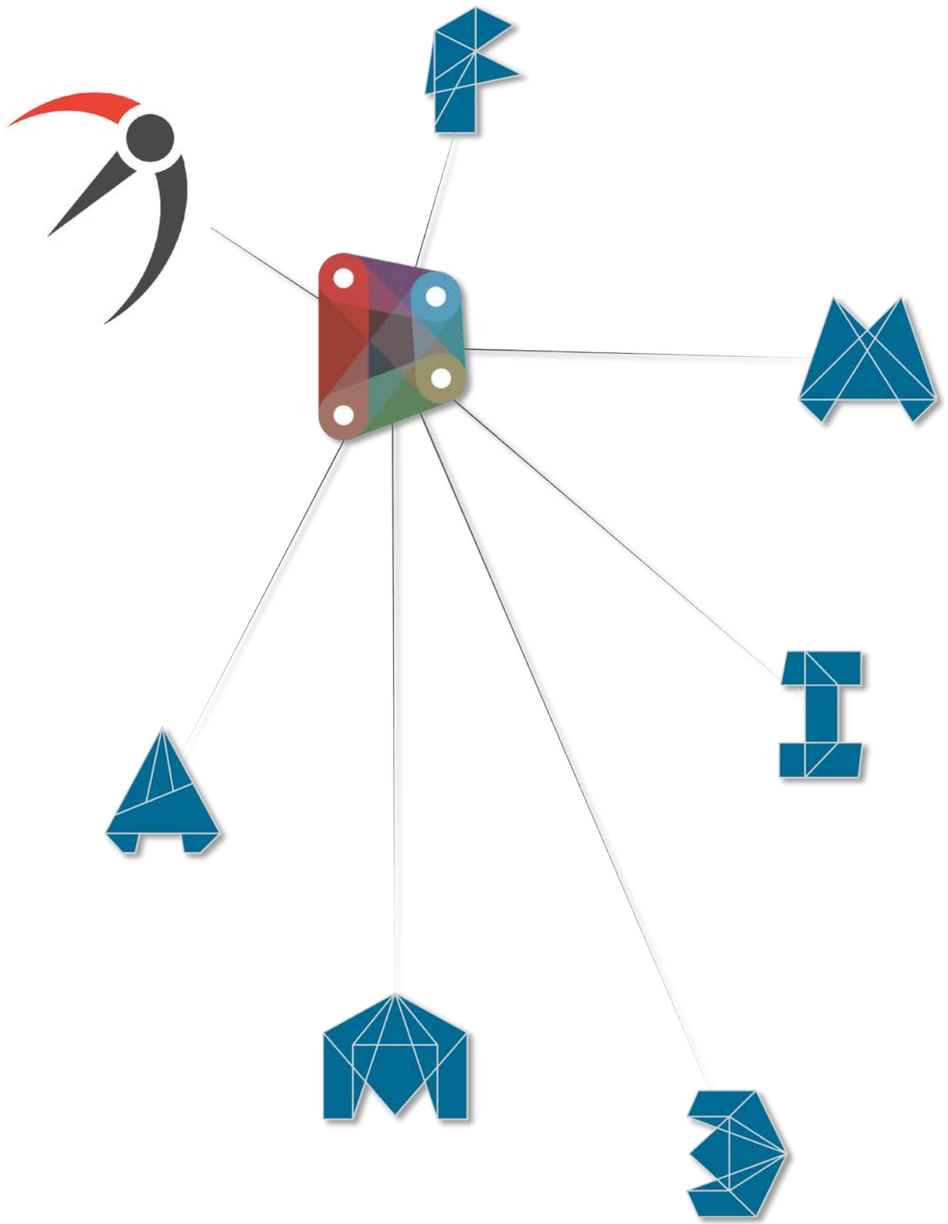


What is a T-Spline?

- Special kind of Geometry
- Combine many Surfaces as a Single Surface
- Mathematically Watertight
- Minimal Amounts of Control Points

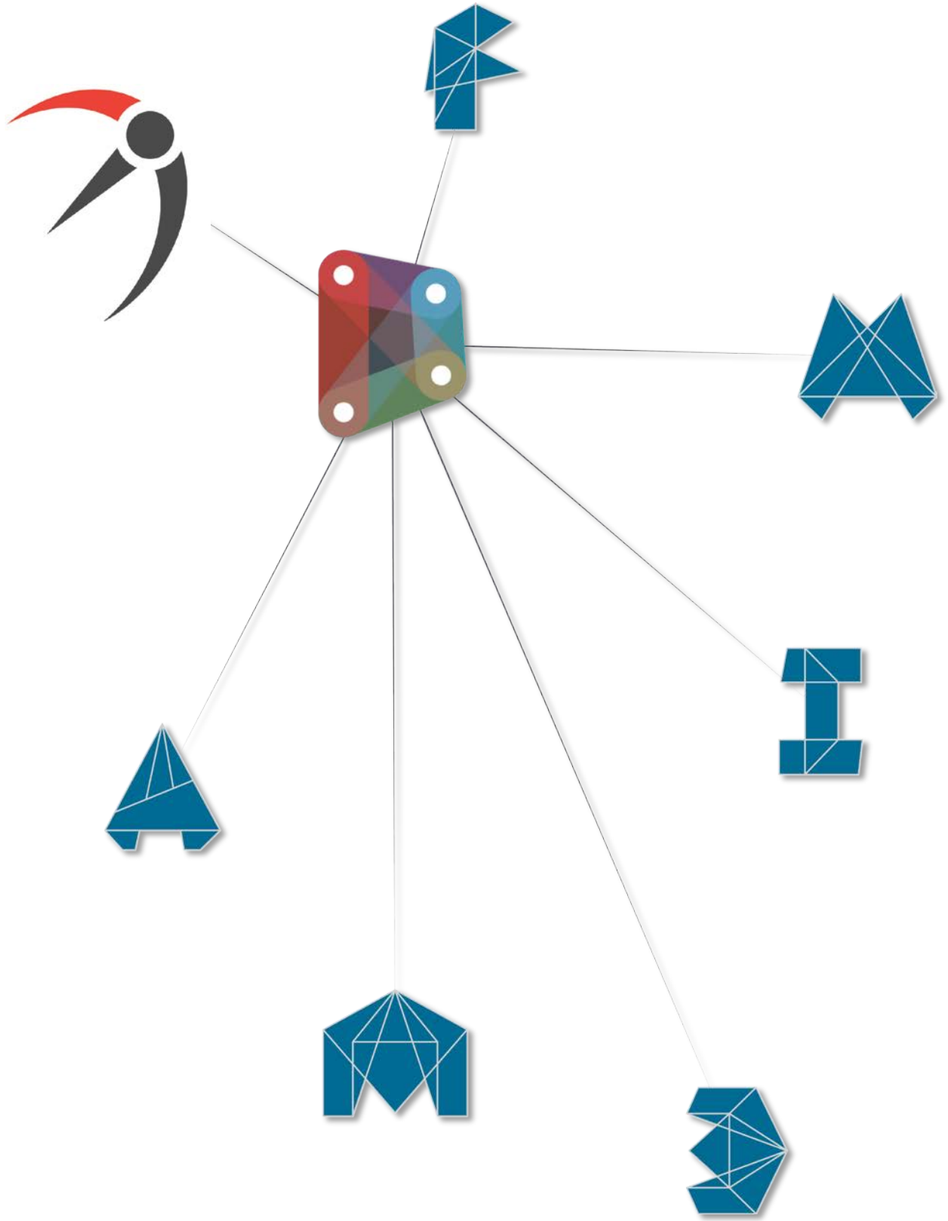
Why Dynamo and TSplines?

- Open
  - Open-source design Tool



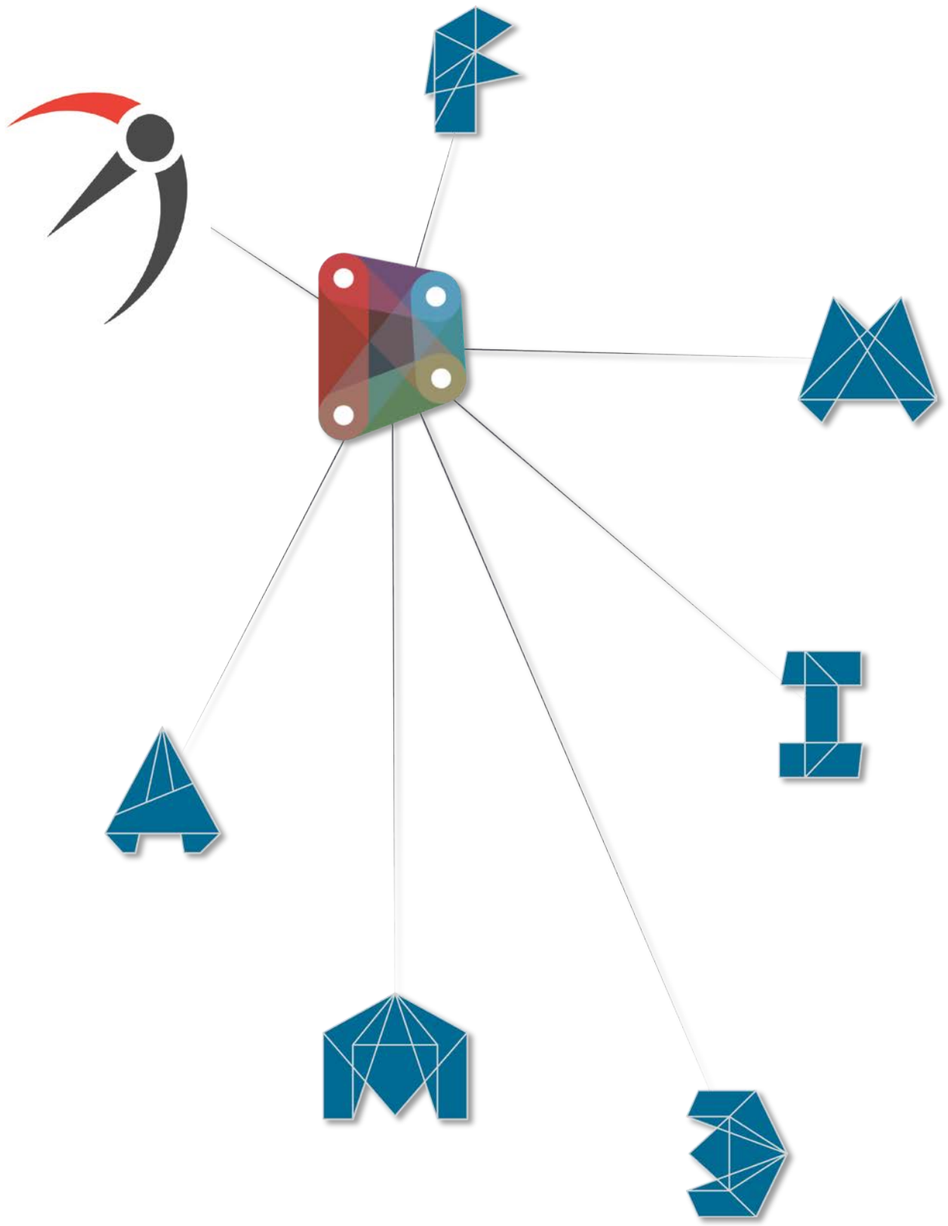
Why Dynamo and TSplines?

- Open
  - Open-source design Tool
- Connected
  - Stand-alone or Add-on



Why Dynamo and TSplines?

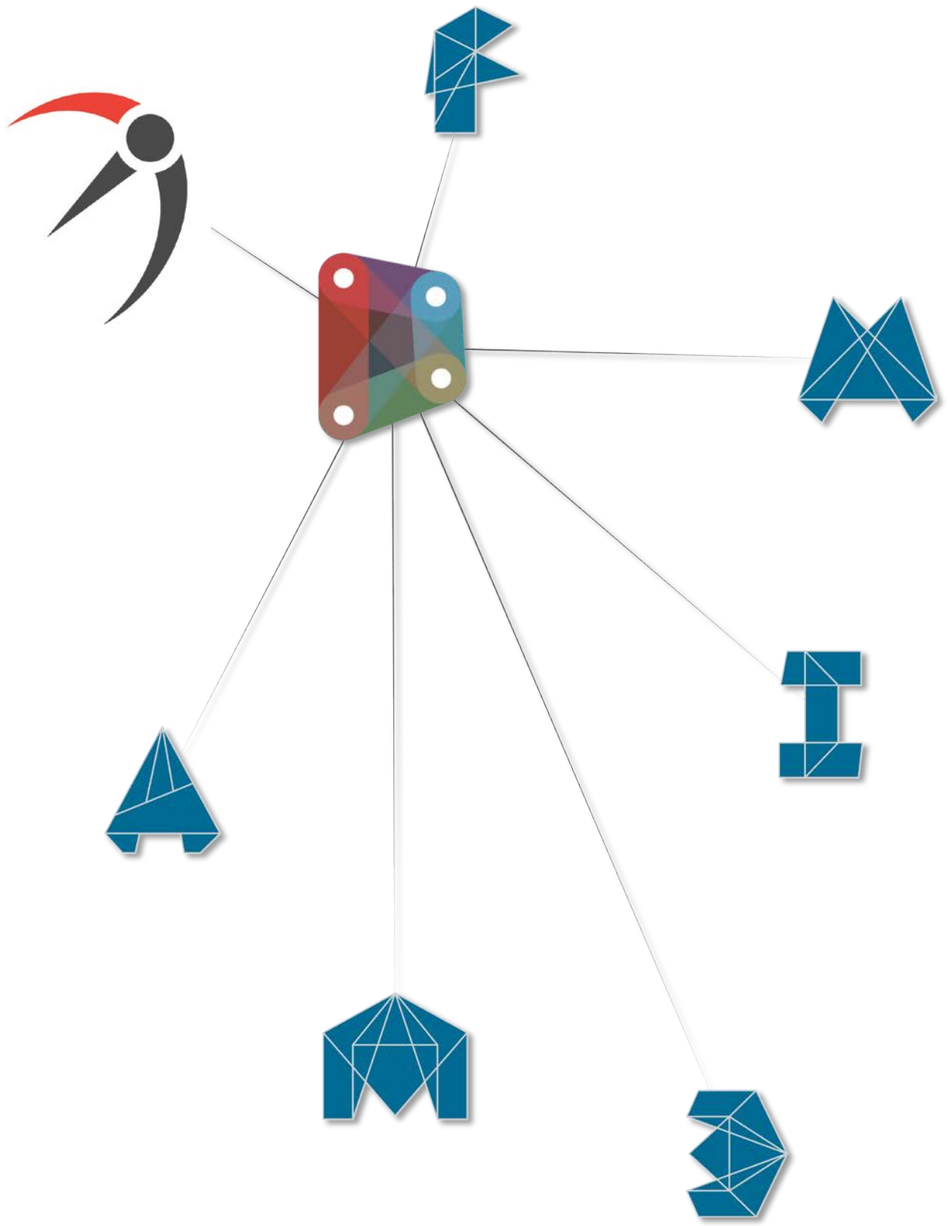
- Open
  - Open-source design Tool
- Connected
  - Stand-alone or Add-on
- Creative
  - Visual Programming
  - Low-Poly Modeling
  - NURBS Compatability



Why Dynamo and TSplines?

- Open
- Connected
- Creative

- **Generative**
  - Inspire Creativity
  - Support Imagination

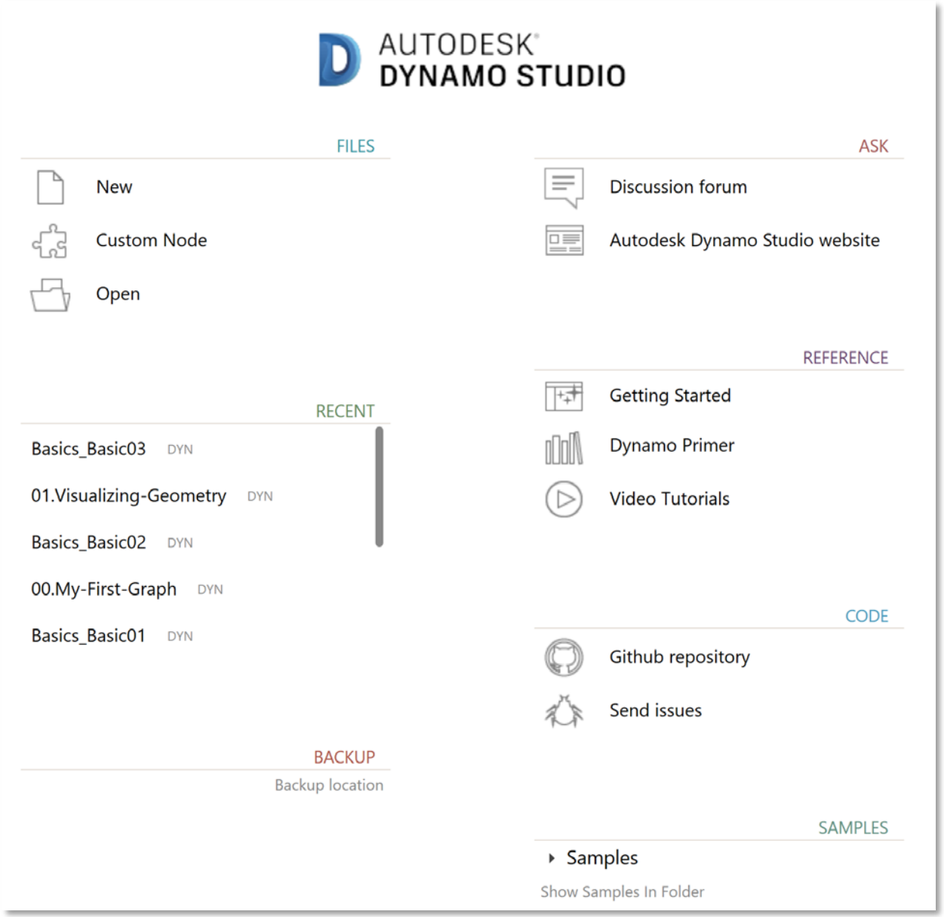


Getting Started with Dynamo

Launching Dynamo

- Ask
- Reference
- Code
- Samples

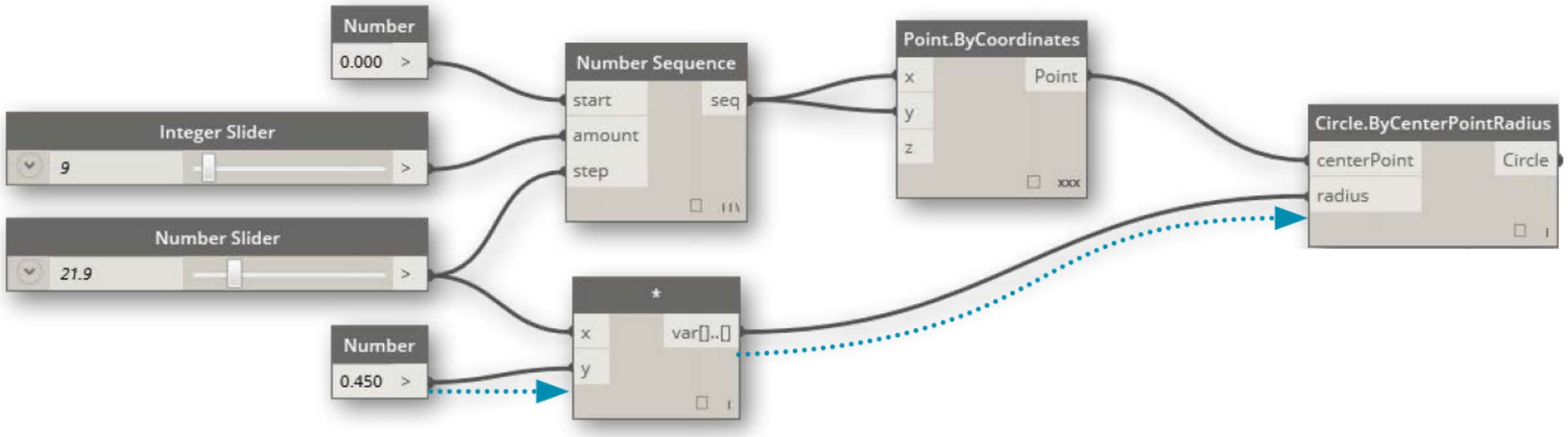
- **Files > New**



Dynamo Start Page

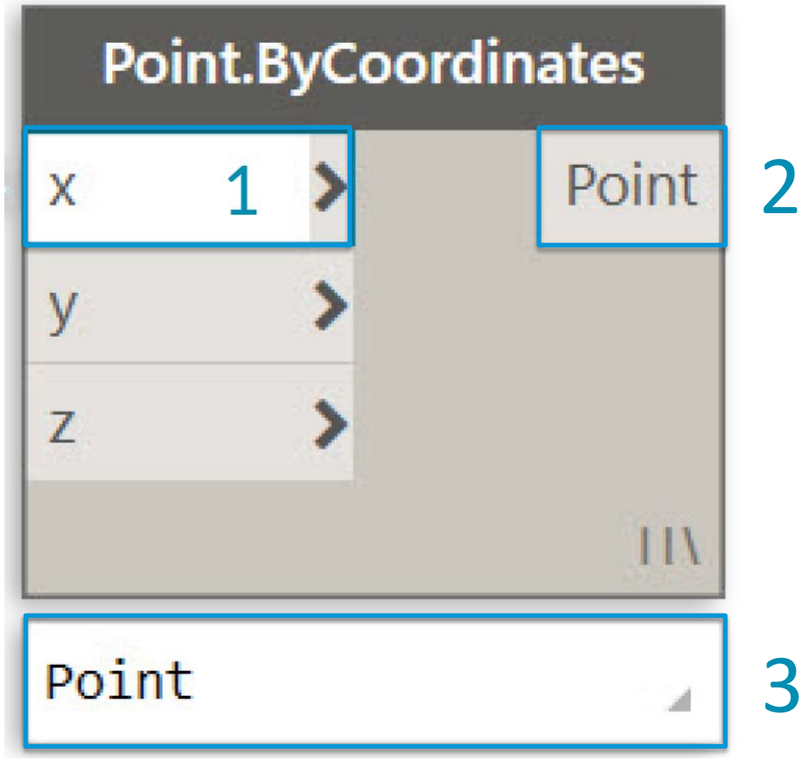
What's in a Dynamo Program?

- Collection of Nodes
- Wired Together
- to Define Modeling Instructions



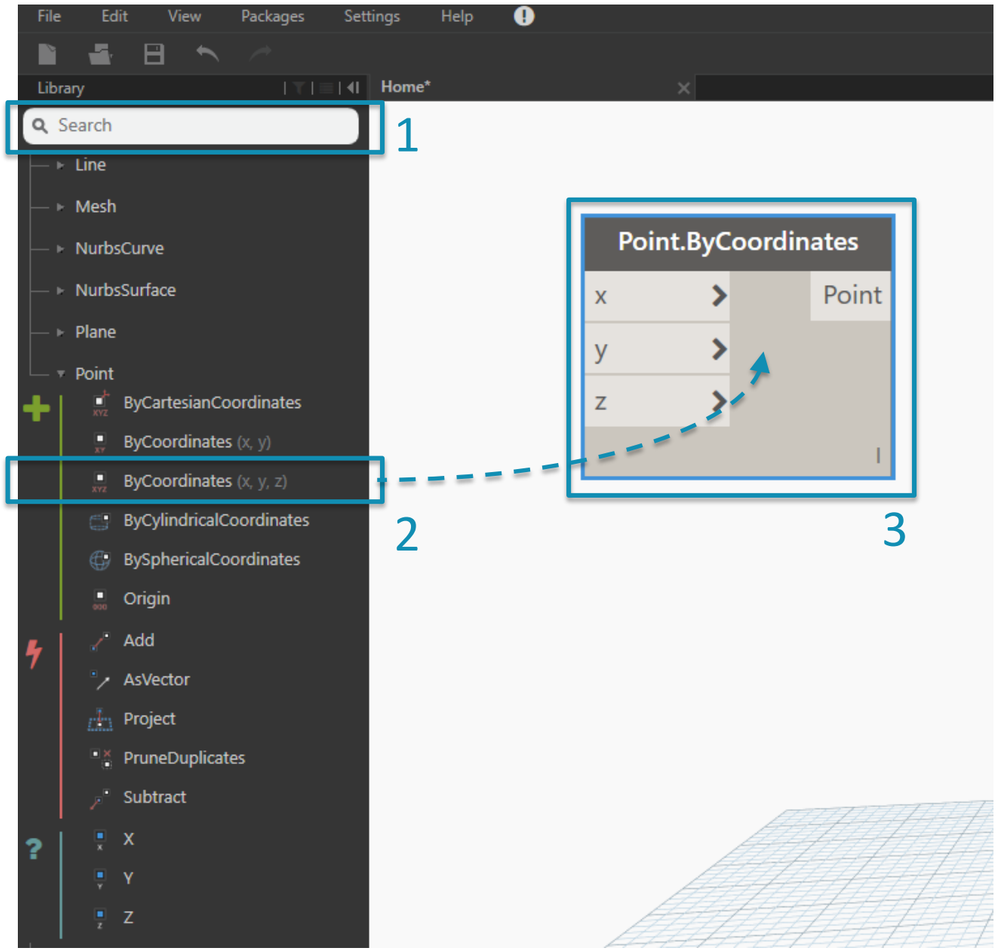
Anatomy of a Node

1. Input Port
2. Output Port
3. Preview Bubble



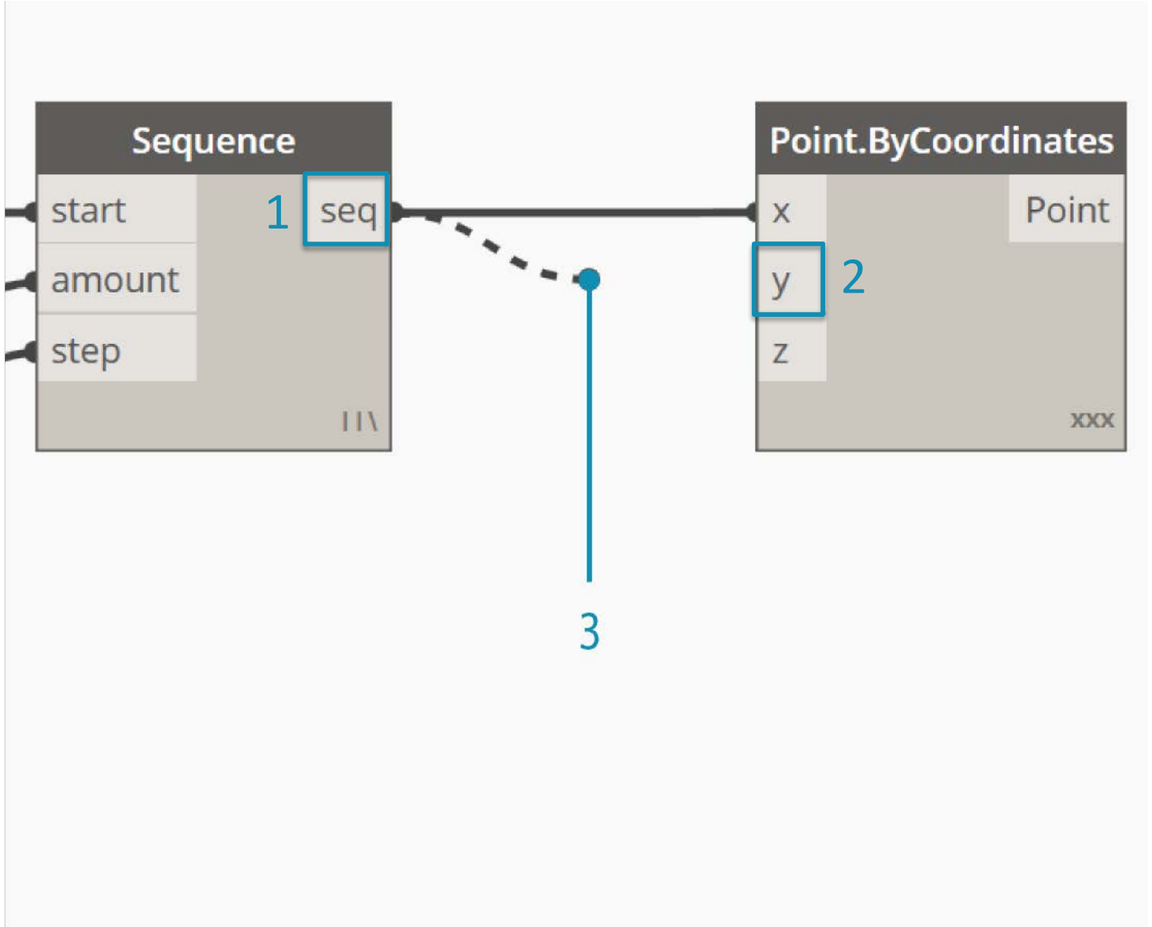
Finding and Placing Nodes

1. Search “Point”
   - Use the Library Search to find nodes
2. Browse for “Point”
   - Discover nodes in the Library Categories
3. Add **Point.ByCoordinates**
   - Click + Drag node to the Workspace



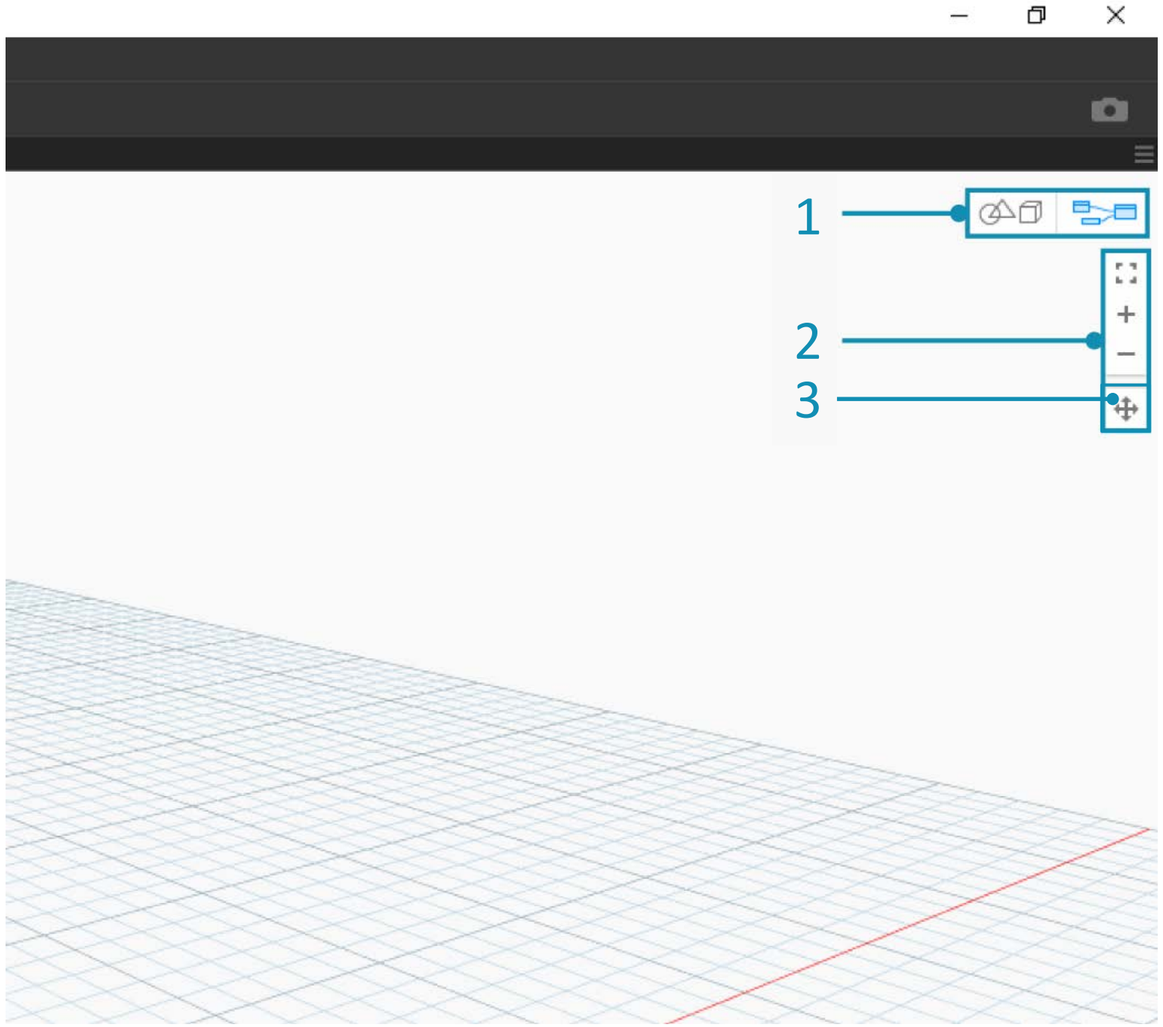
Wiring Nodes to Build an Algorithm

1. Click on Output Port
   - Node A
2. Drag Wire to Input Port
   - Node B
3. Deleting Wires
   - Click on Port and Drag Wire Away

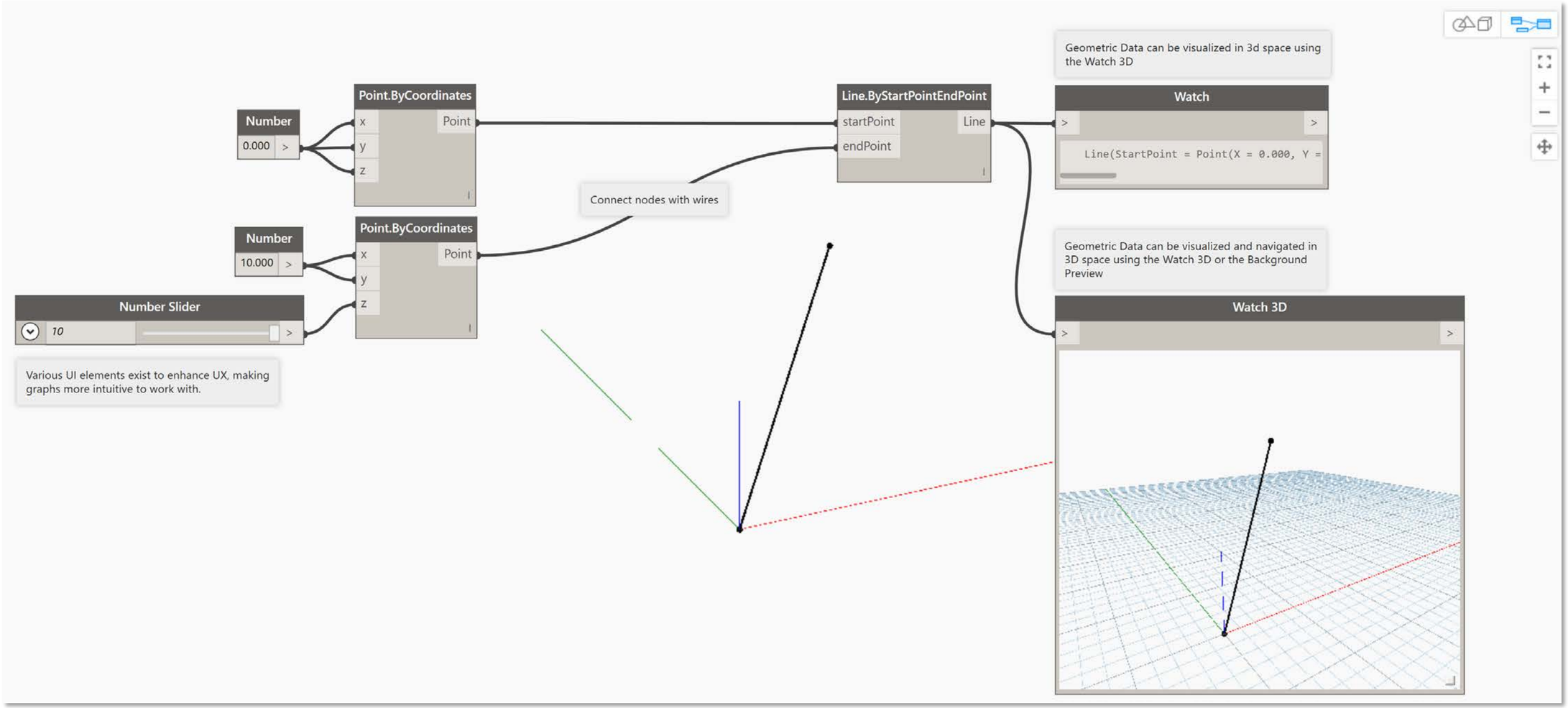


Graph View VS Background 3D Preview

1. Switch Views
   - Graph View
   - Background 3D Preview
2. Zoom Controls
   - Independent Zoom Control
3. Pan View
   - Click + Drag the Mouse

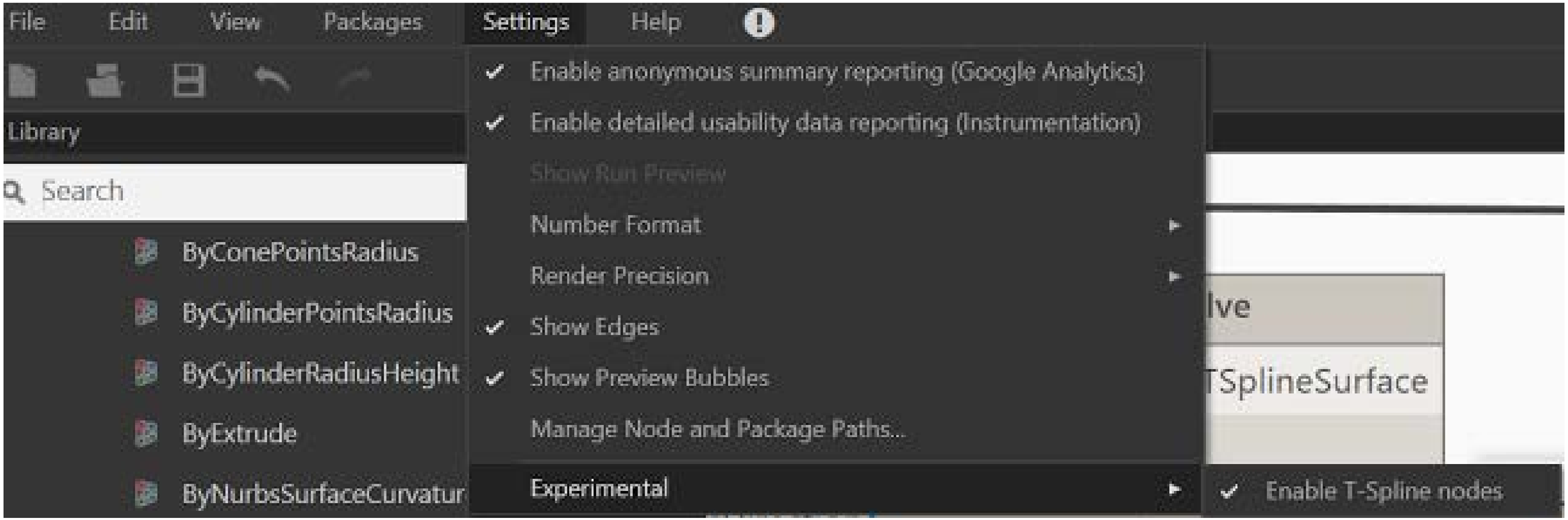


00.Introduction-To-Dynamo



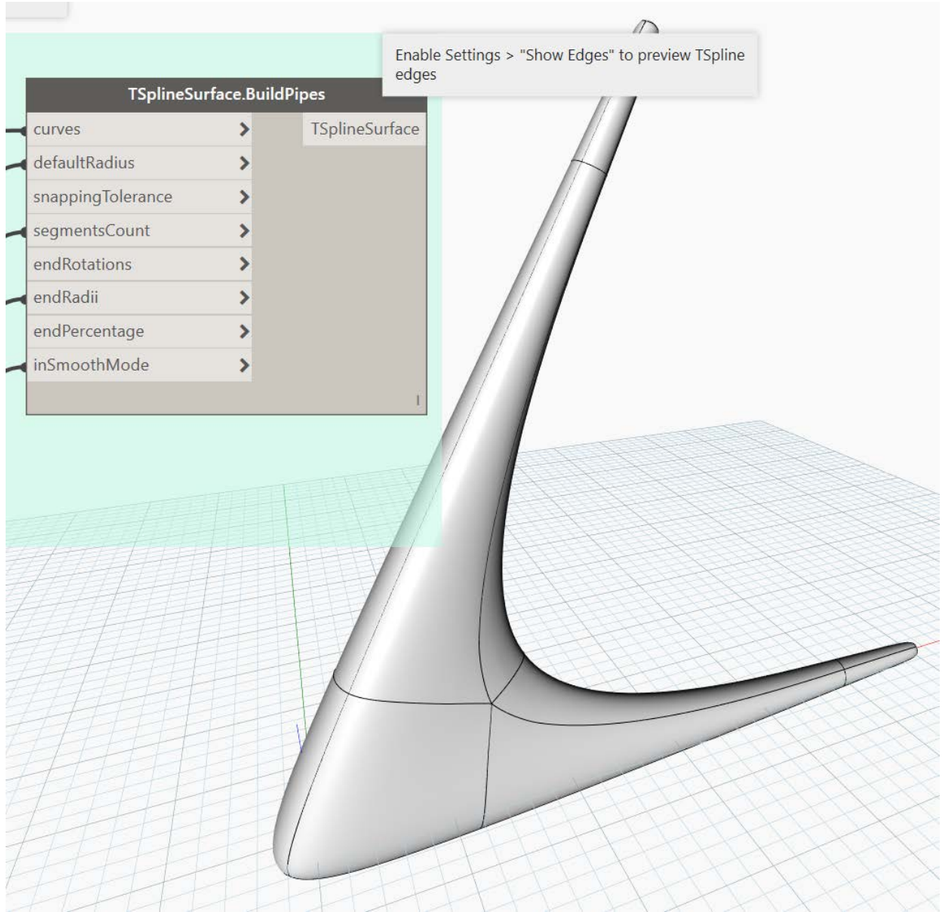
Building Dynamo Graphs with T-Splines

Why “Experimental” in Dynamo?



01.TSpline-Pipe-From-Lines

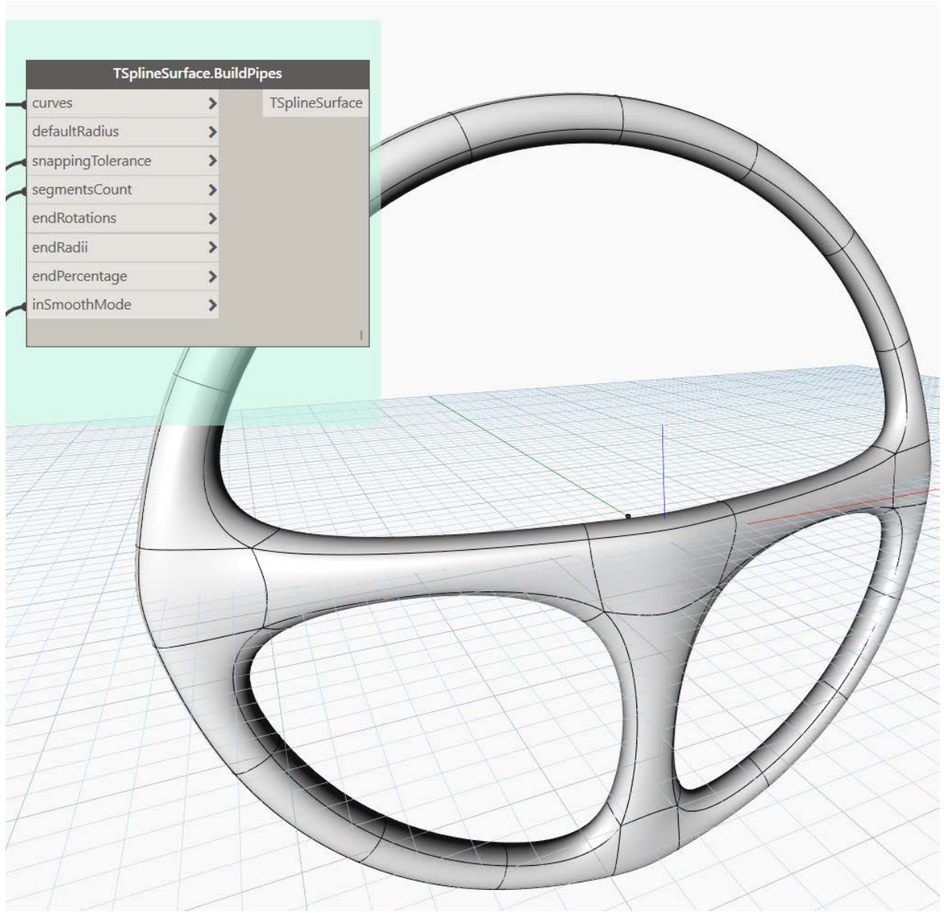
1. Create Two Lines
2. Build a TSpline Surface
   - TSplineSurface.BuildPipe



BuildPipes from lines

02.TSpline-Pipe-From-List

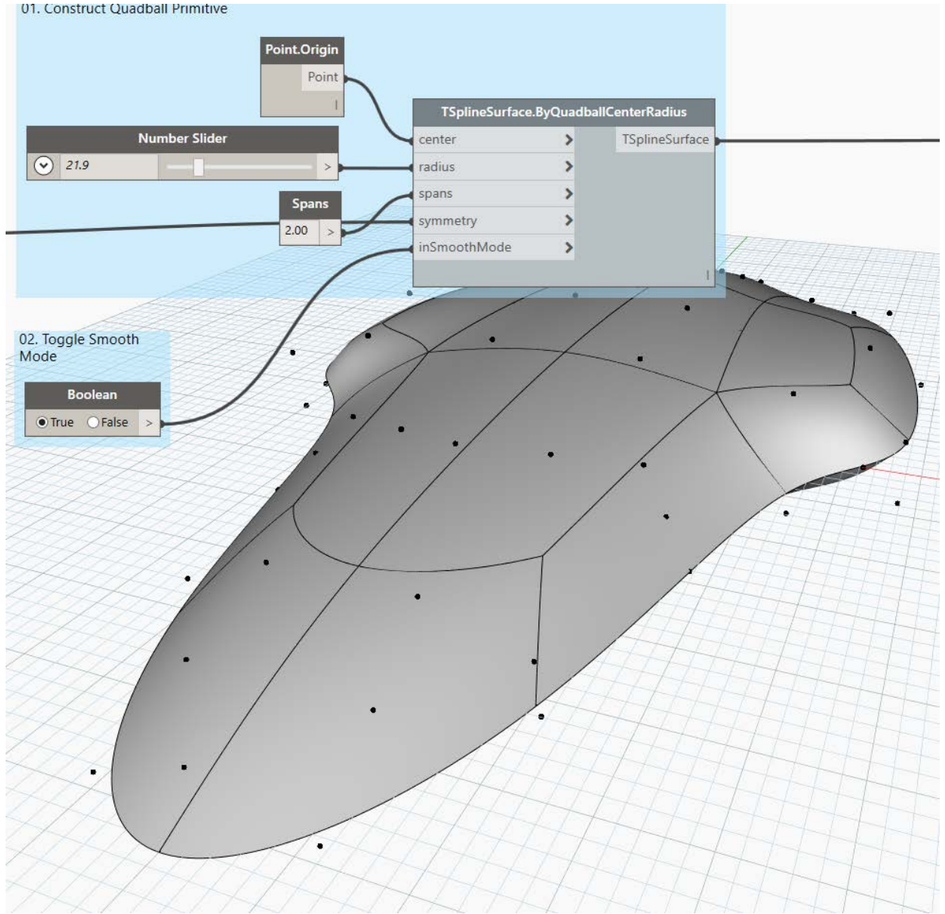
1. Create Three Lines
2. Create One Circle
3. Build a TSpline Surface
    - TSplineSurface.BuildPipe
- Convert to BRep
- Export Surface
    - TSM
    - SAT



BuildPipes from a list

03.TSpline-Primitive-Speedform

- Create Quadball
- Scale Quadball
- Display Topology Data
- Create Symmetry Axes
- Extrude Quadball Faces
- Crease Edges

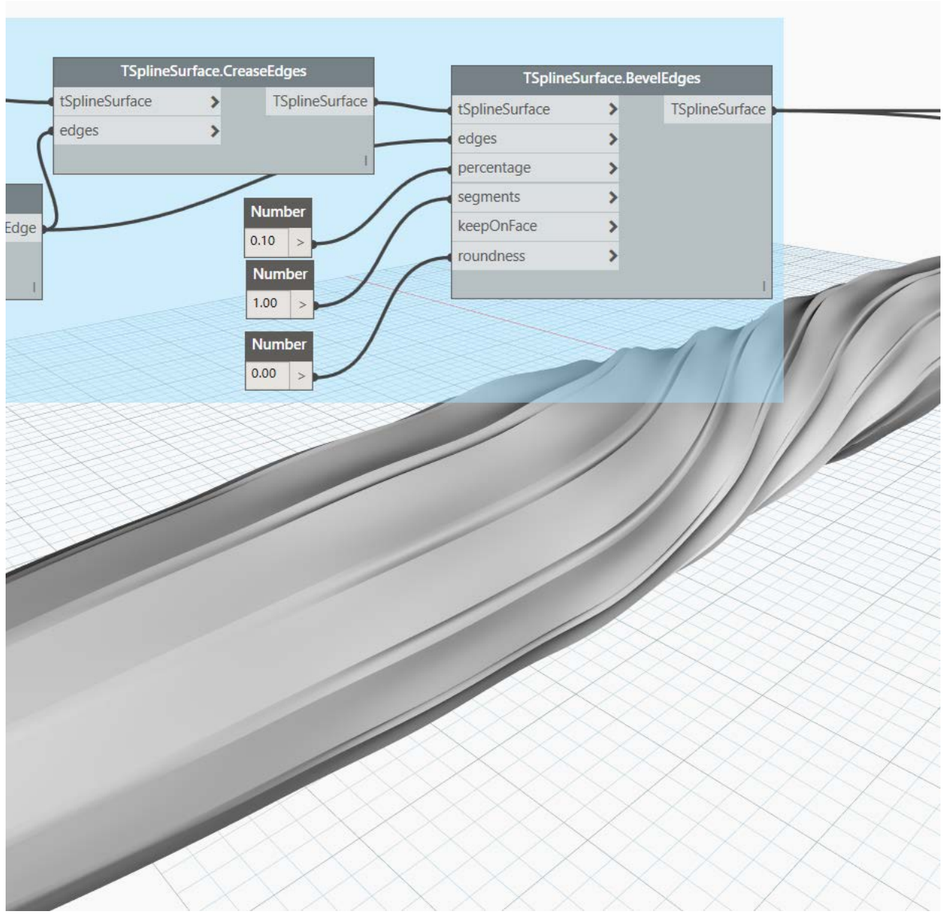


Scaled Quadball with Extrusions and Creased Edges

Advanced Workflows
Attractors, Image Sampling

04.TSpline-Crease-Bevel-Edges

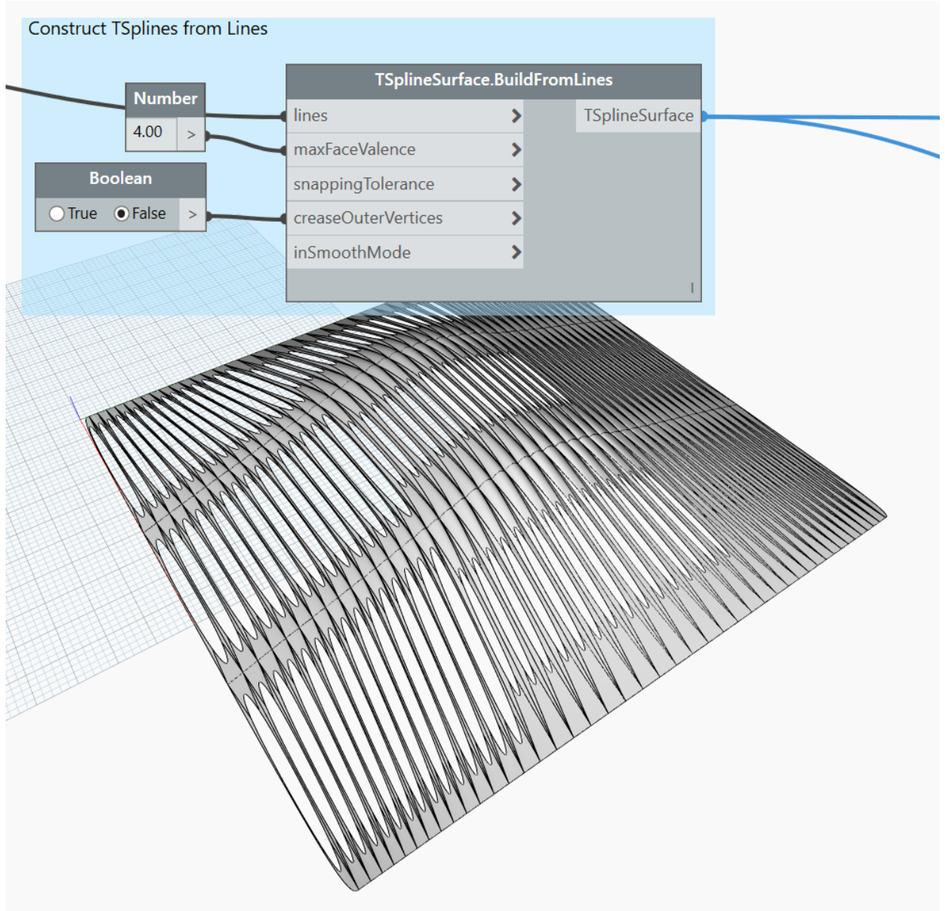
- Import SAT
- Convert NURBS to TSpline
- Crease Edges
- Bevel Edges
- Translate Vertices by Attractor



Creased and Beveled edges in one direction.

05.TSpline-Surface-From-Lines

- Import SAT Surface
- Import Image File
  - Use Brightness to Offset
- Create Quads on Surface
  - Scale Quads
  - Based on an Attractor
- Create Lines Between
- TSpline from Lines

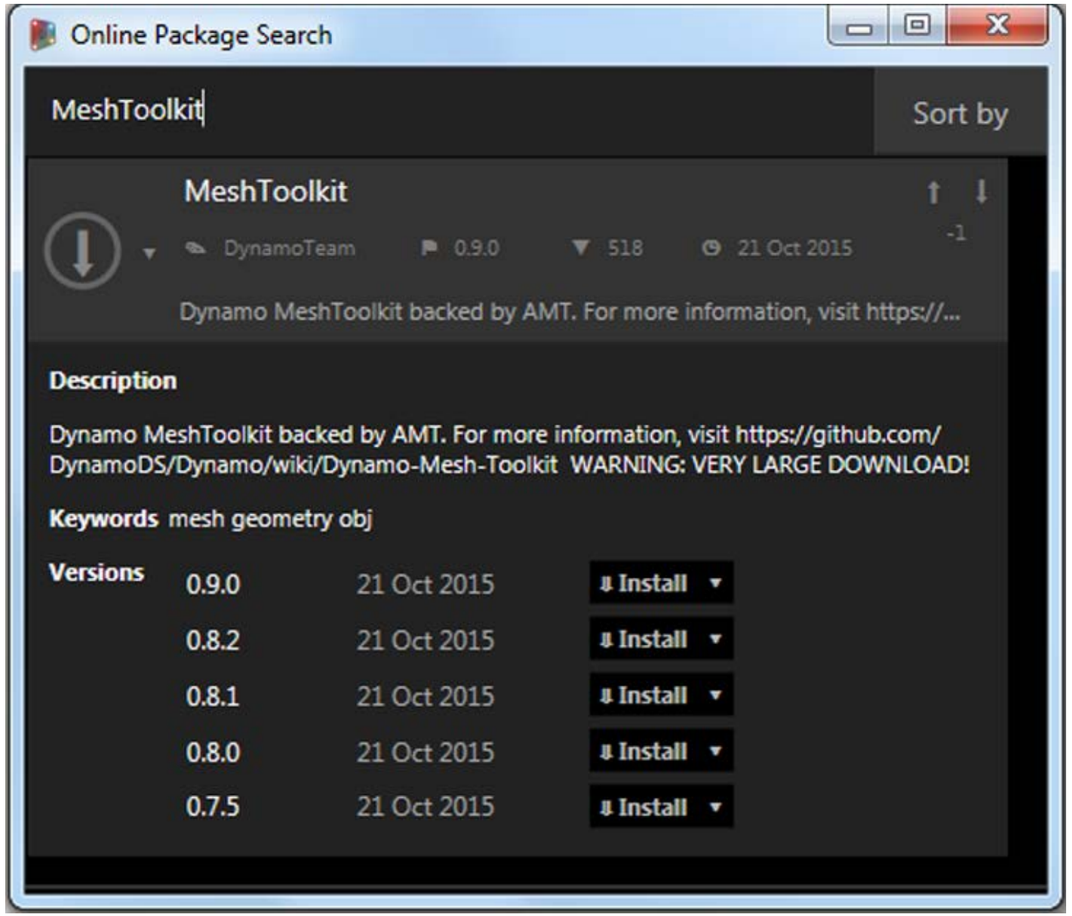


Build Tsplines from Lines

Extending Dynamo with Packages

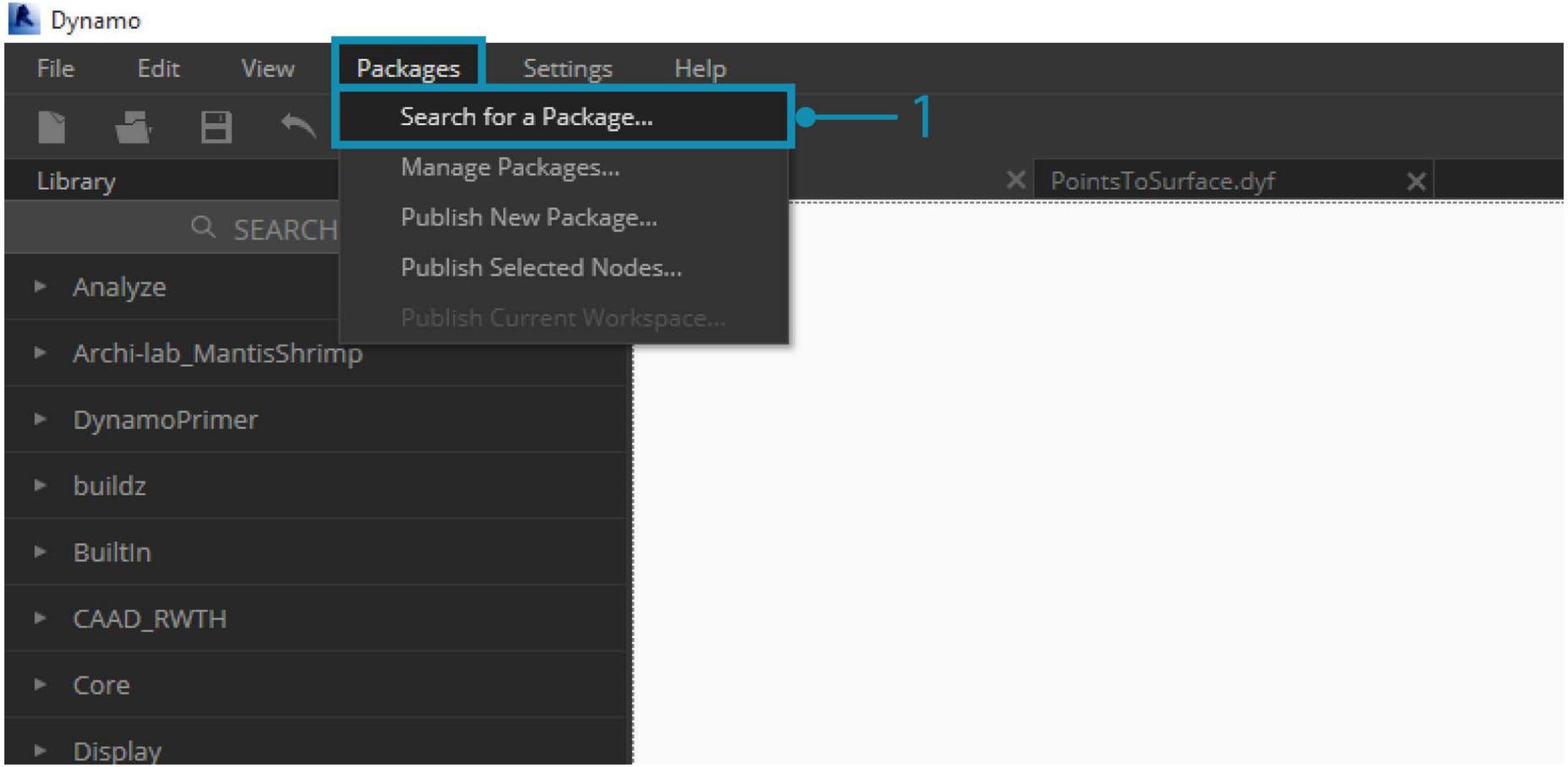
Dynamo Packages

- Search for a Package
- “MeshToolkit”
- “MapToSurface”
- Install Current Version



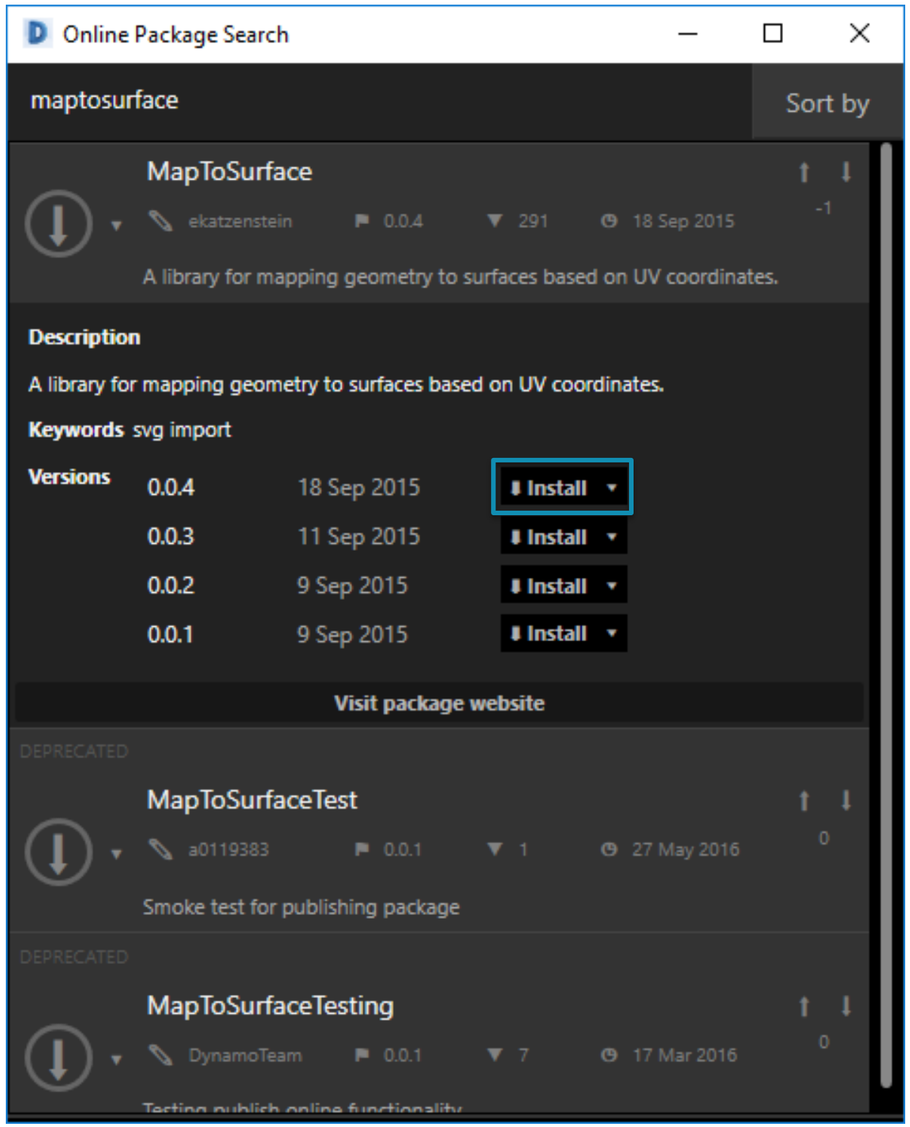
Online Package Search Window

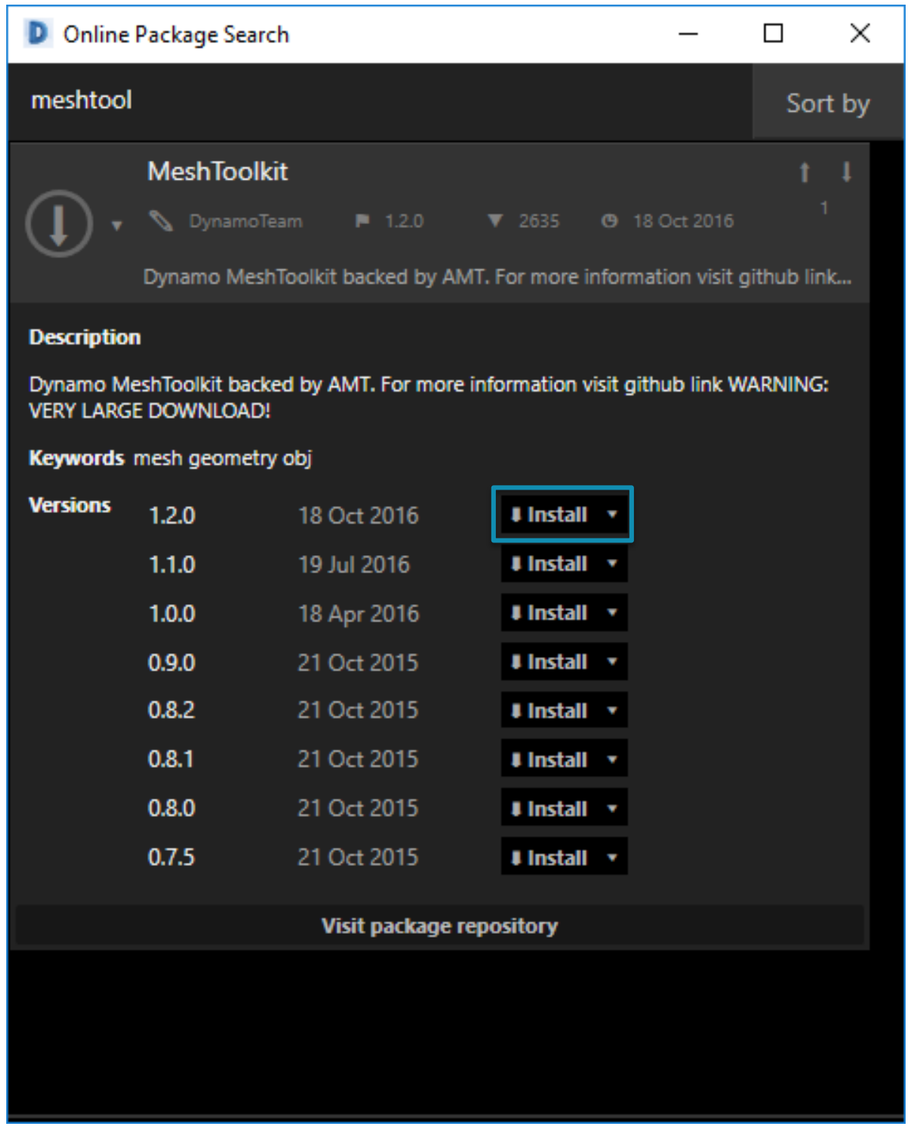
Dynamo Packages



Search for a Package…

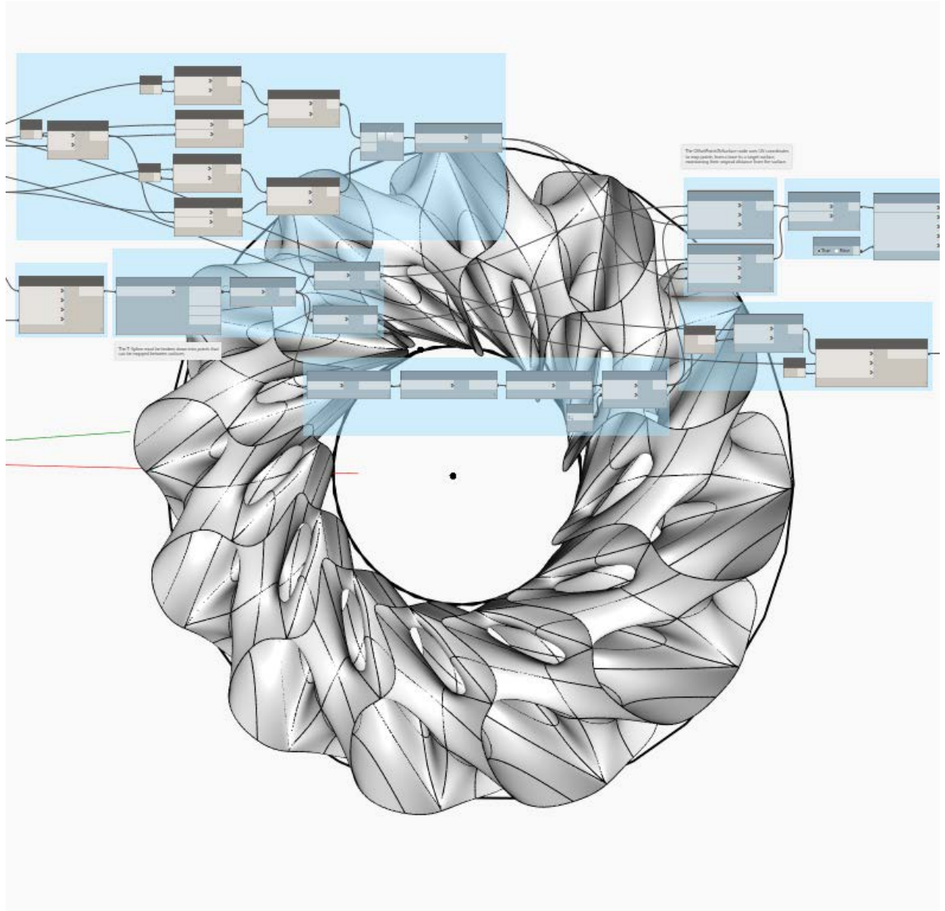
Dynamo Packages





07.TSpline-Geometry-Replicator-Mapping

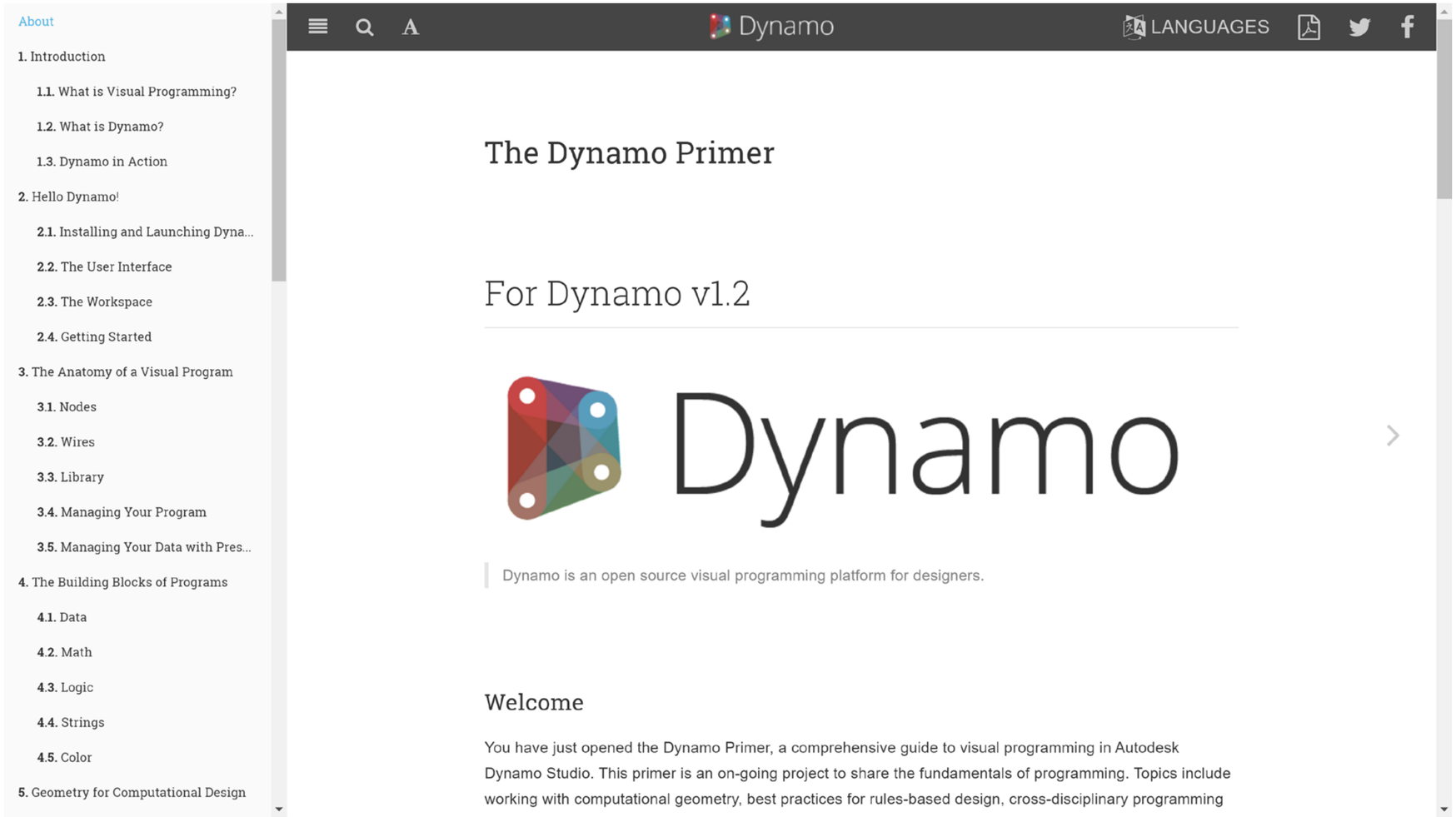
- Dynamo Packages
  - MapToSurface
  - MeshToolkit
- Exporting TSpline Files
  - TSM (Mesh File)
    - Single TSpline Object



Next Steps

The Dynamo Primer

http://dynamoprimer.com



Dynamo Dictionary

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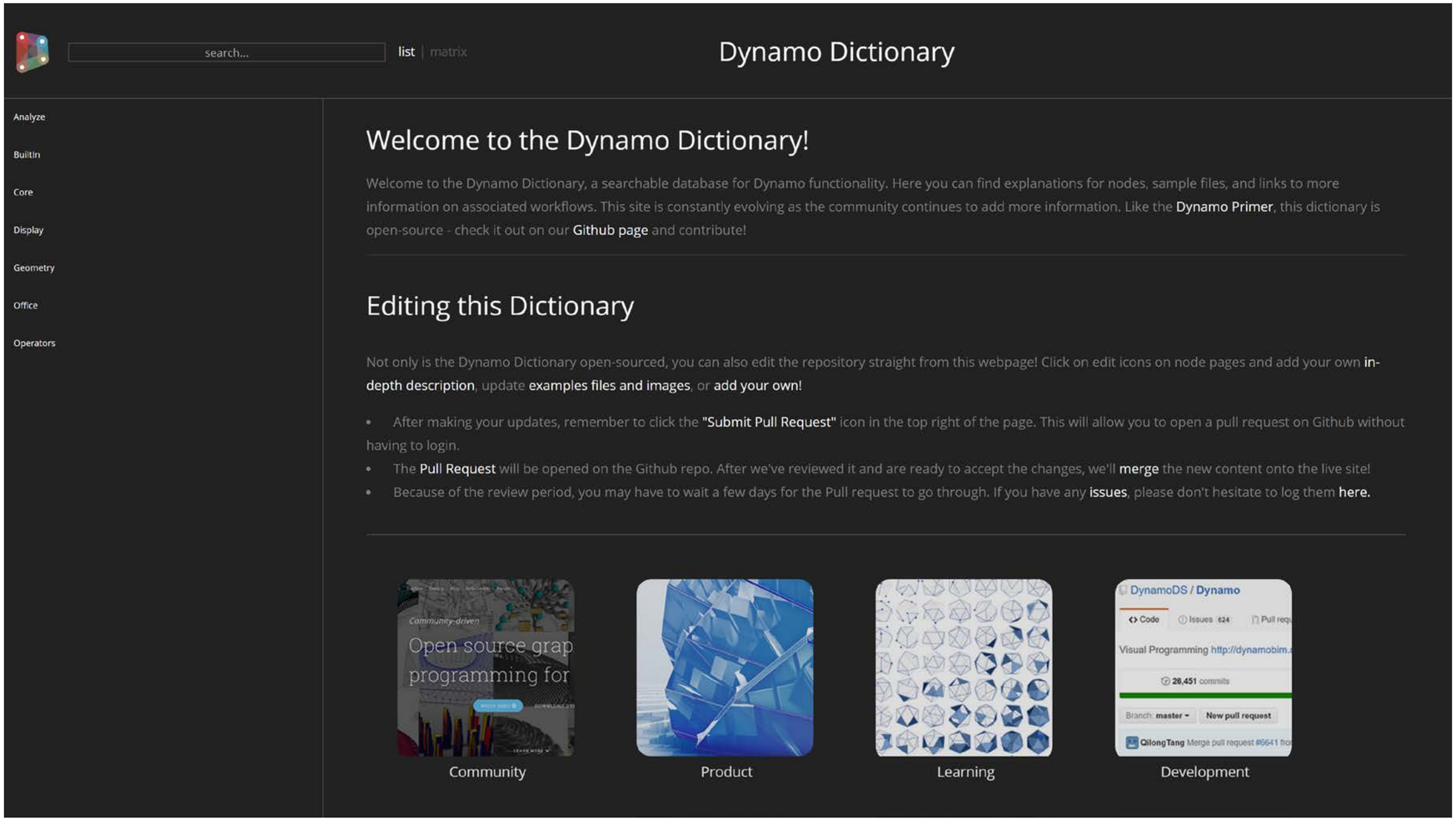

How did I do?

- Your class feedback is critical. Fill out a **class survey** now.
- Use the AU mobile app or fill out a class survey online.
- Give feedback after each session.
- AU speakers will get feedback in real-time.
- **Your feedback results in better classes and a better AU experience.**

In case you missed them

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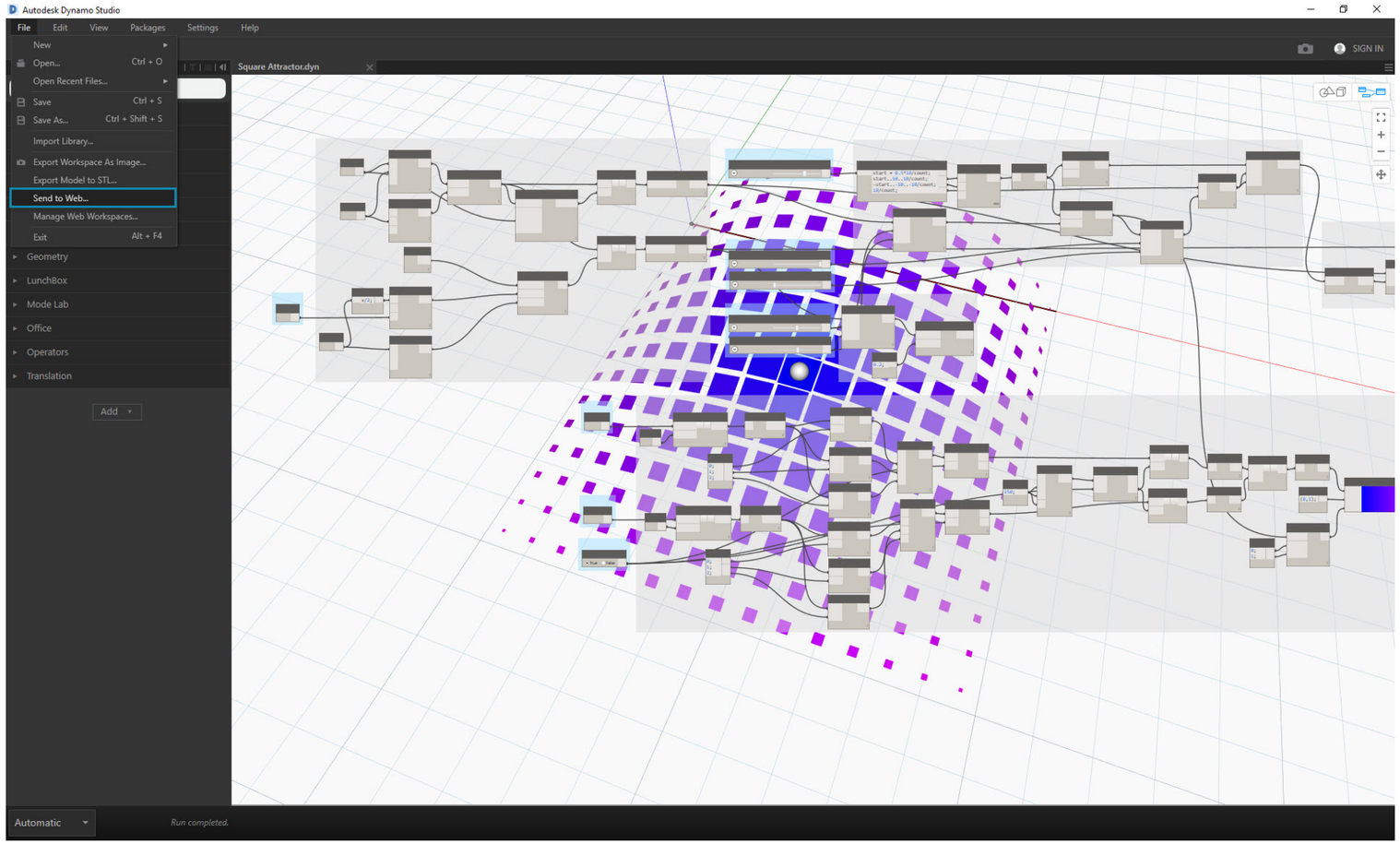
MODELAB

http://modelab.is/

Dynamo Web Experience

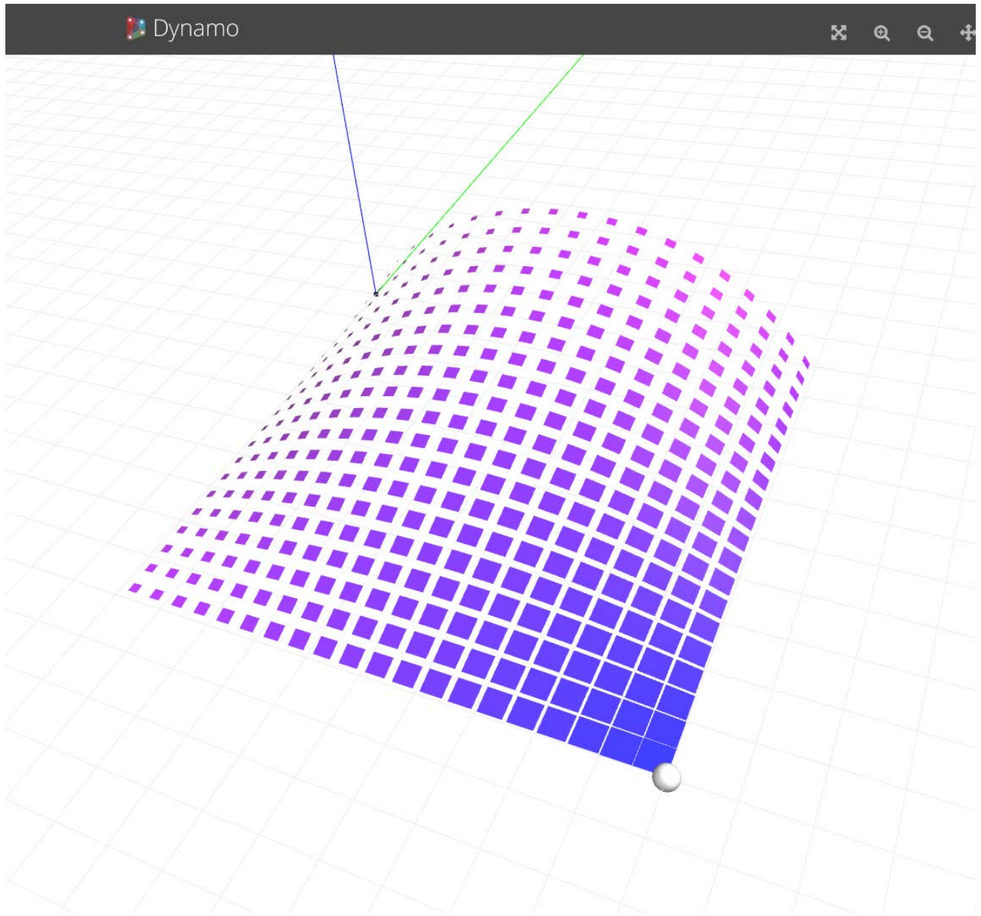
Send to Web (Dynamo Studio)



Dynamo Graph, formatted for “Send to Web”

Send to Web (Dynamo Studio)

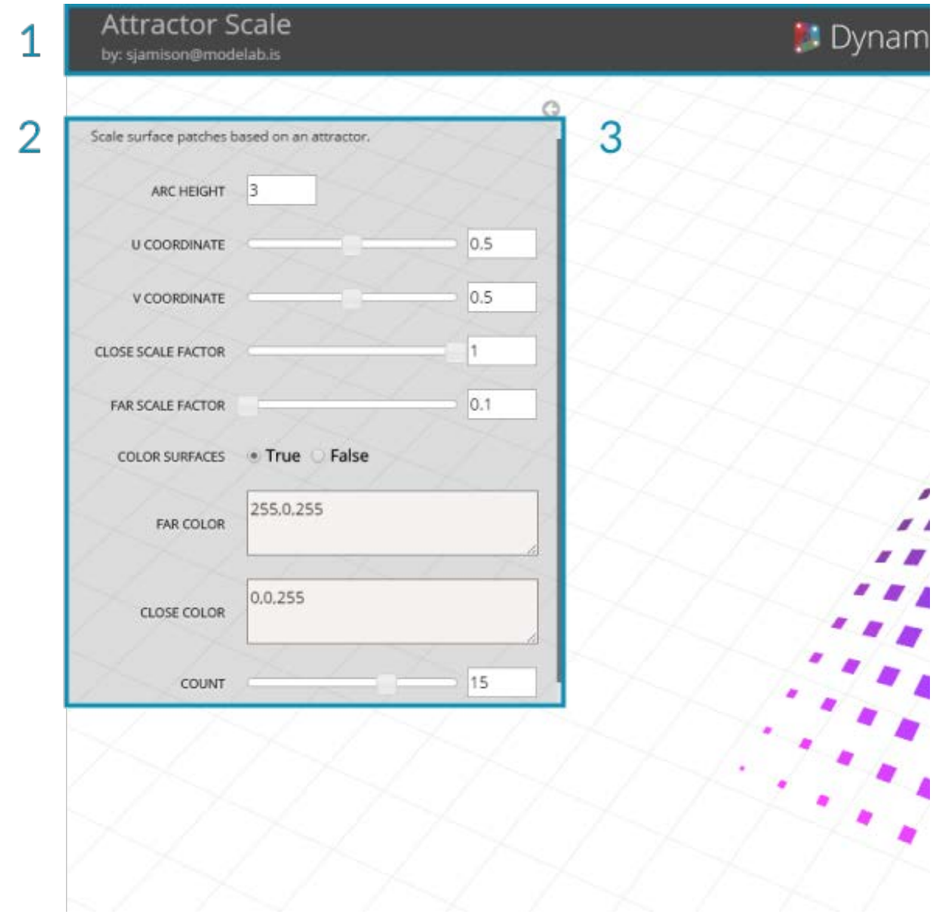
- Allows you to publish a curated version of your work that is web accessible through an online link.



Customizer View

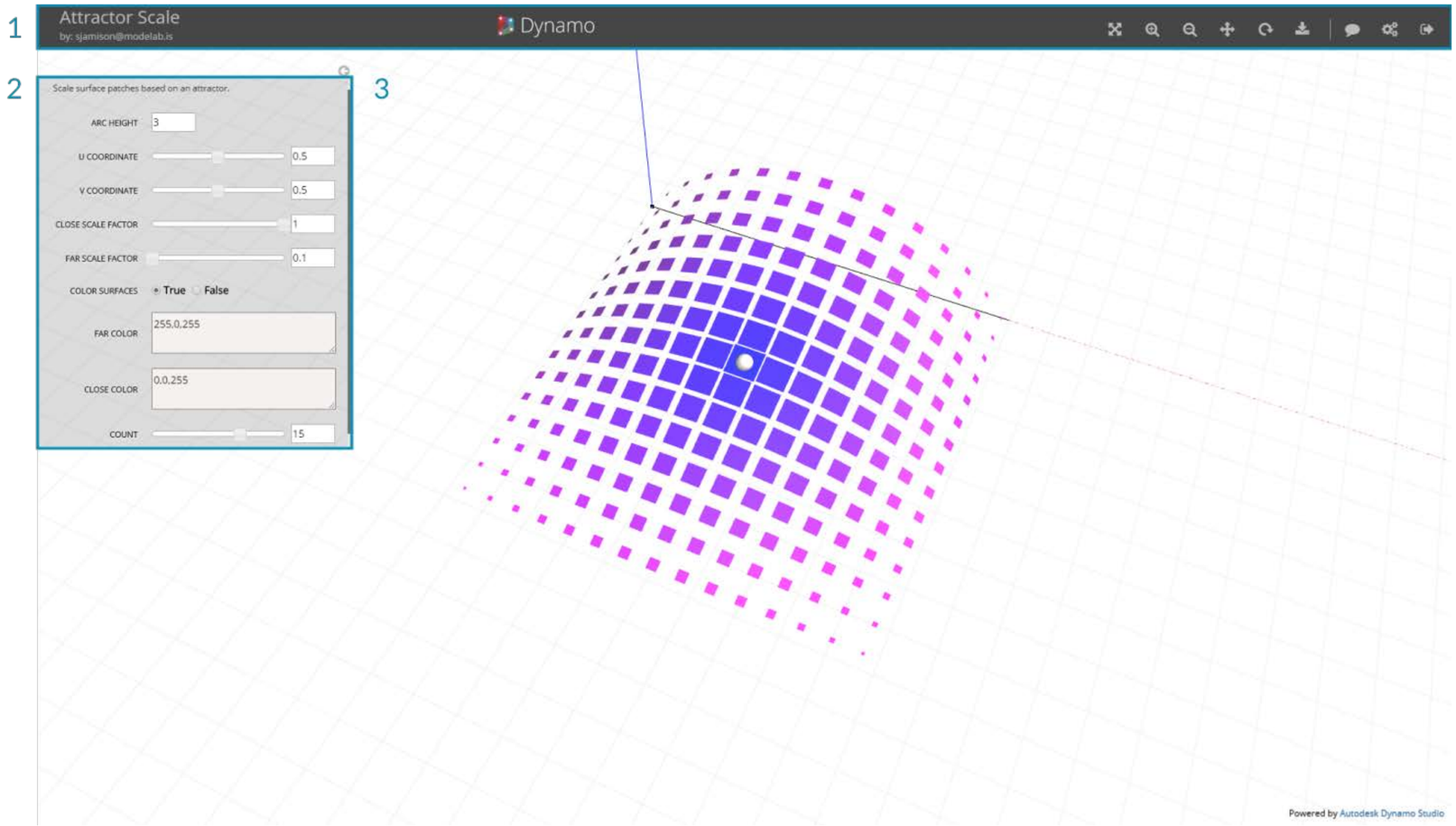
Send to Web (Dynamo Studio)

1. Menu Bar
2. Controls
3. 3D Preview



Customizer View

Send to Web (Dynamo Studio)



Customizer View