



# Week 8

## Rhinoceros 3D



This week we will be exploring Rhino the software. Some of you who might not have access to the software, there will be an alternative learning method.





# Outline

## 01

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### Introduction of Rhino 3D

Exploring what Rhino is for and who uses the software apart FOR architects. Also contextualising the software with the parametric design thinking.

Photo by Muhd Asyraaf on Unsplash

## 02

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### Links to tutorial

Due to the fact that face-to-face learning is not possible; suggested resources platforms and links to tutorial on YouTube will be presented.

## 03

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### Suggestions




Suggestion on how you can learn introductory part of the software. An alternative arrangements for those who do not have access to software will also be presented.

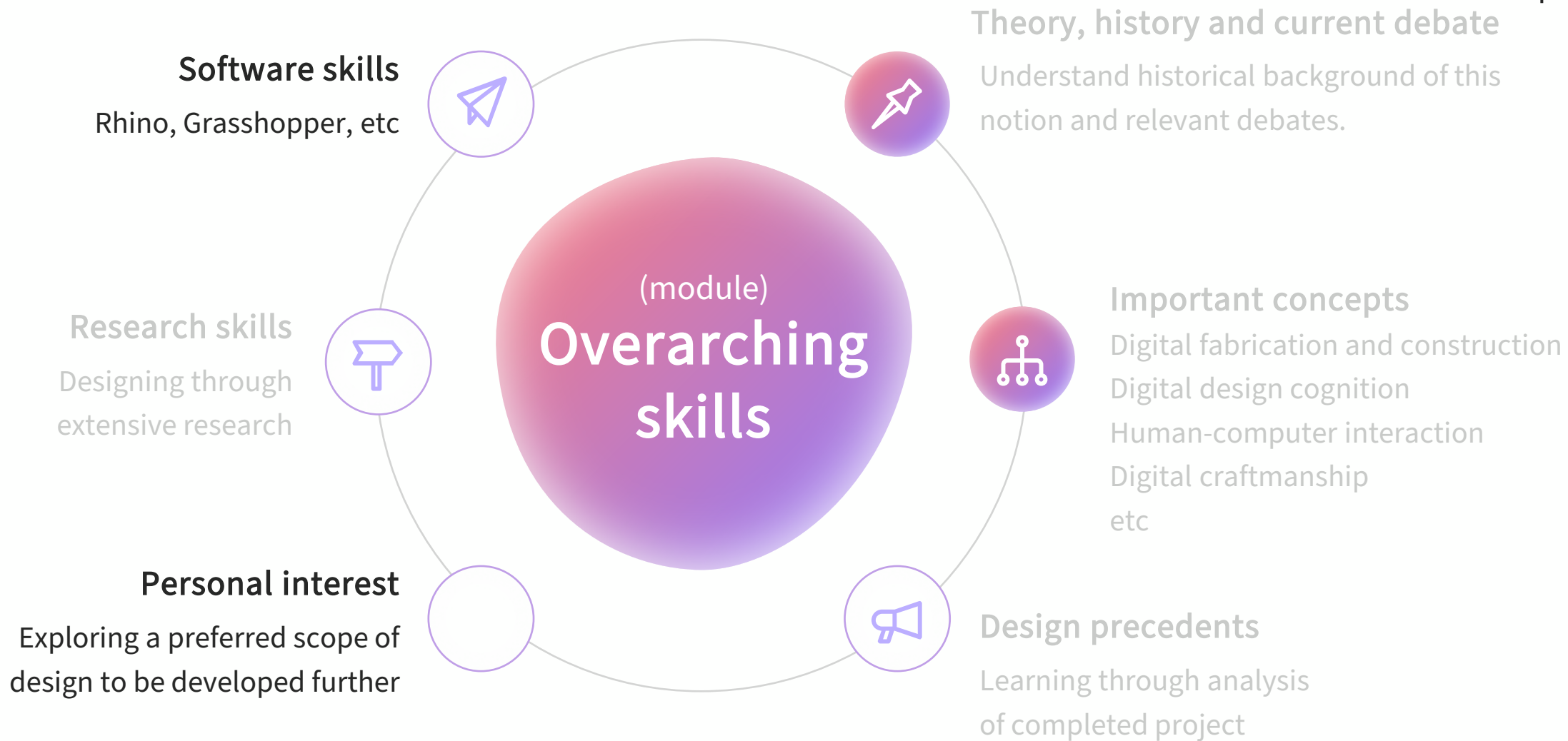
# Aims and objectives

- To relate Rhino 3D software to the **digital design thinking** we have built the last few weeks.
- To elicit **background knowledge** of Rhino 3D.
- To provide **alternative tutorials** by using available links from the video sharing platform.
- To suggest **ways to learn** the software.

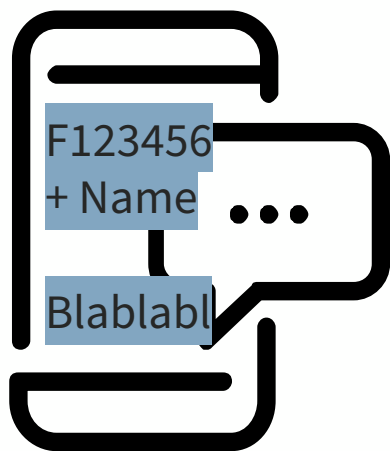
# Learning outcomes

*Students will be able to..*

- 01** Summarise what Rhino offers compare to other 3D software.  

- 02** Exercise basic Rhino commands.  

- 03** Be informed on where to find resources for further study.  




# Upload



There is no forum discussion post this week, but it is expected that you upload **one screenshot** of your Rhino exploration.

**Alternative 1:** Try to utilise free trial.

<https://www.rhino3d.com/download/rhino/6.0/evaluation>

**Alternative 2:** If you can't access the software, leave a 150 words of comment on the software based on tutorials, or your friends' uploaded try-outs.

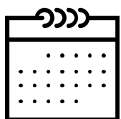
<https://miatedjosaputro.com/2022/04/02/dg-week-8-2/>

**Who has previous  
experience of  
Rhino?**

# Rhinoceros 3D

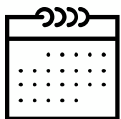
Developed by:  
Robert McNeel & Associates

<https://wiki.mcneel.com/rhino/rhinohistory>



## 1998

RHINO 1.0 RELEASED



## 2018

RHINO 6.0 FOR WINDOWS

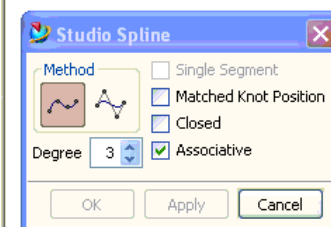




# Rhinoceros 3D

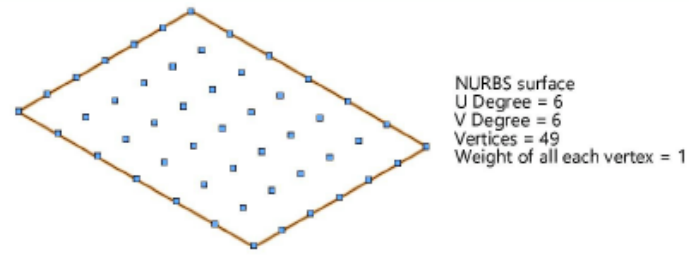
## NURBS Modeling

NURBS (non-uniform rational basis spline) is a mathematical representations of 3D geometry, for generating curves and surfaces. Rhinoceros allows designers to produce **freeform surfaces**.

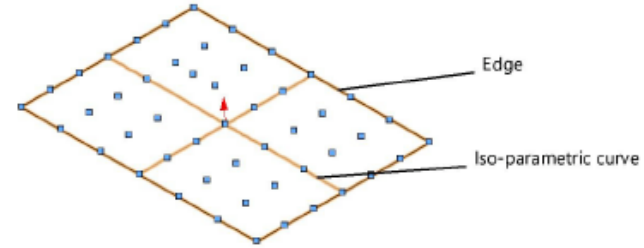


<https://en.wikipedia.org/wiki/File:Spline01.gif>

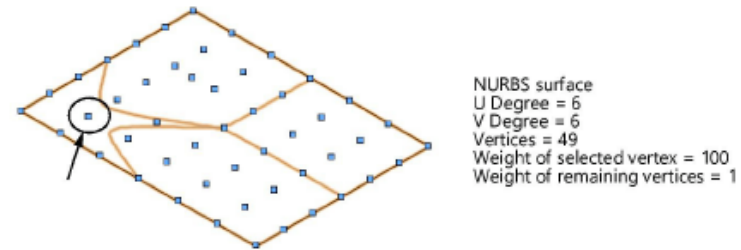
# NURBS surface



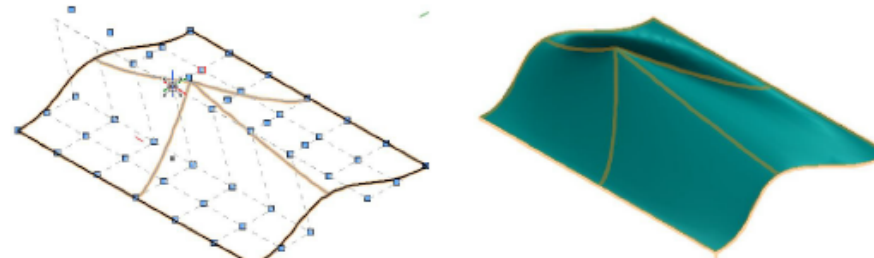
A NURBS surface also has a direction, or normal, which affects the outcome of certain operations, such as fillet surface creation. Iso-parametric curves indicate the U and V direction, and edge curves are drawn along the edges, helping to visualize the NURBS surface.



Each vertex on the surface can have a weight which "pulls" the surface towards the weighted vertices.



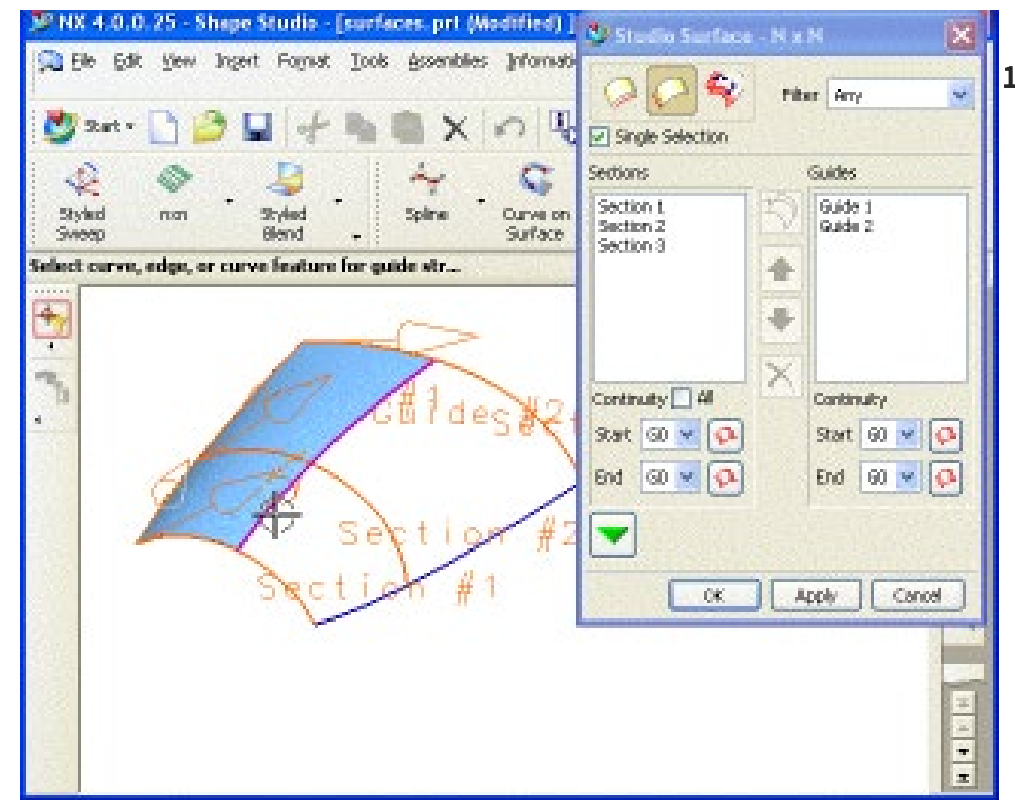
The **Reshape** tool can move a single vertex or a row of vertices, deforming the surface (see [Reshaping NURBS surfaces](#)).



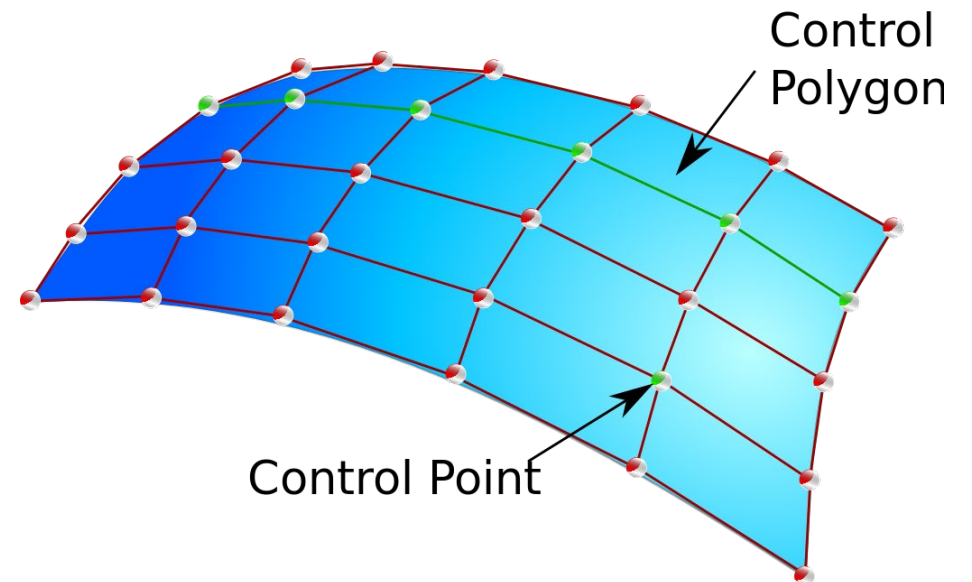
# Freeform surface modelling

Two ways of creating of surfaces:

1. Constructing curves or splines
2. Manipulation of surface poles or control points



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# Which disciplines use Rhino 3D?

**Jewellery design**

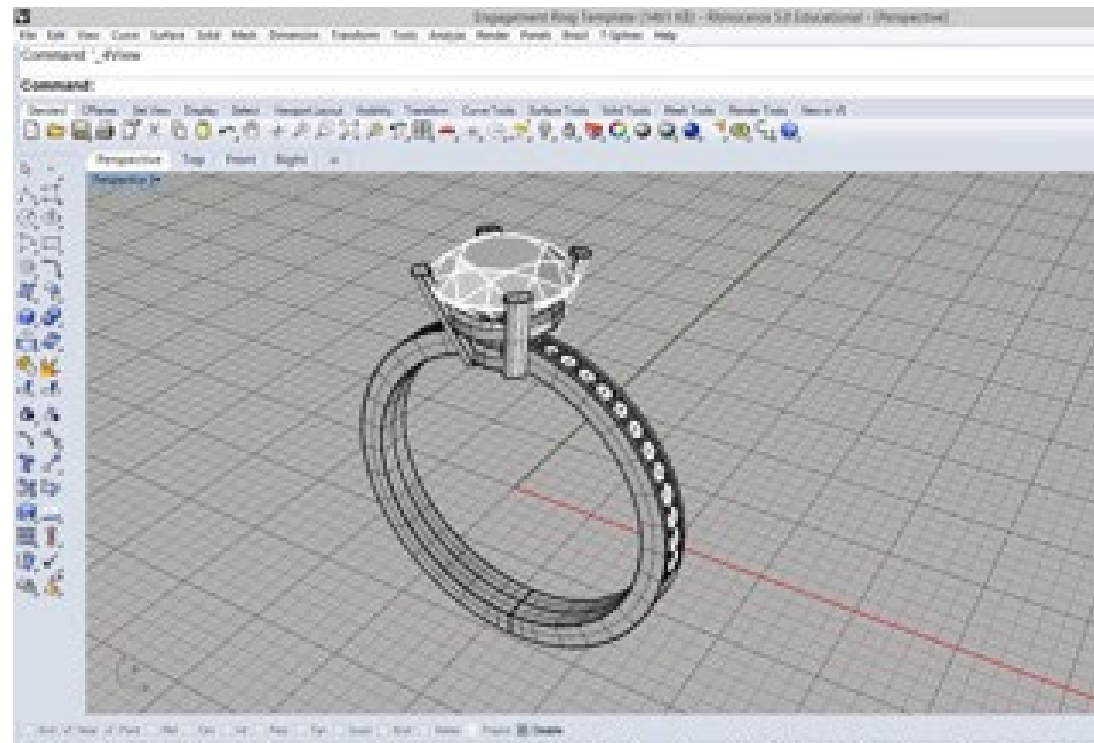
Industrial design

Marine design

Automobile

Architecture

*and many more..*



<http://blog.rhino3d.com/2016/04/rhino-for-jewelers-online-class.html>

# Which disciplines use Rhino 3D?

Jewellery design  
**Industrial design**  
Marine design  
Automobile  
Architecture  
*and many more..*

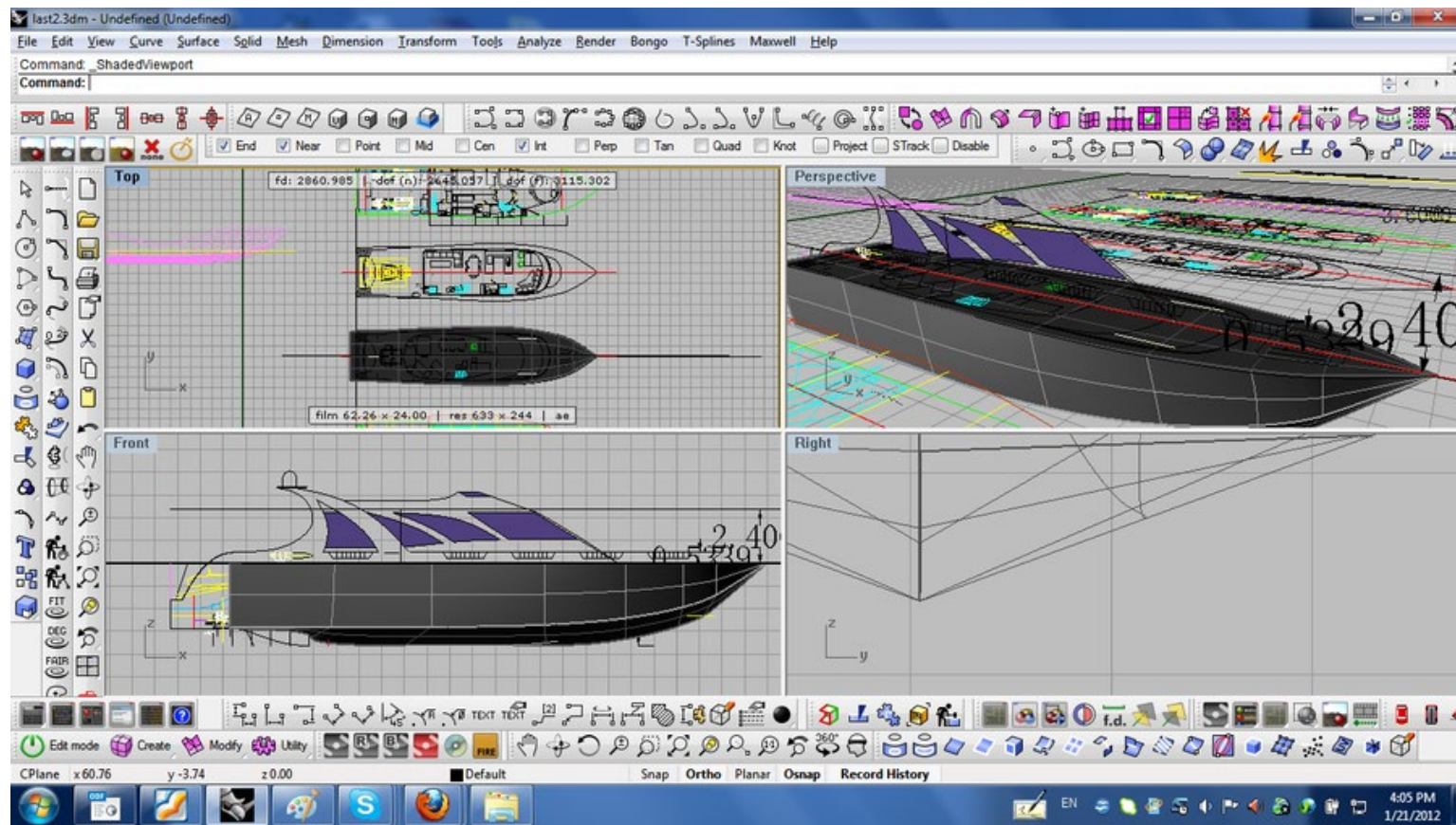


<https://www.rhino3d.com/gallery/1/54707>



# Which disciplines use Rhino 3D?

Jewellery design  
 Industrial design  
**Marine design**  
 Automobile  
 Architecture  
*and many more..*



<https://www.boatdesign.net/threads/automated-initial-ship-design-pipeline-excel-autocad-rhinoceros-maxsurf.44709/>

# Which disciplines use Rhino 3D?

Jewellery design

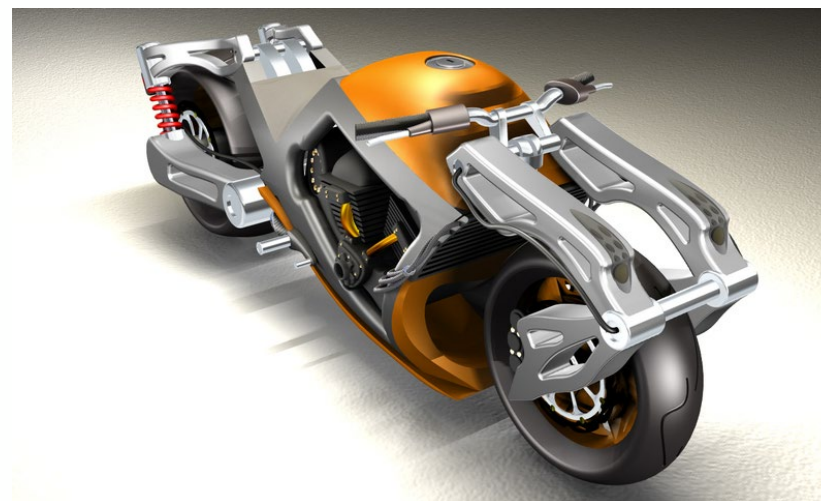
Industrial design

Marine design

**Automobile**

Architecture

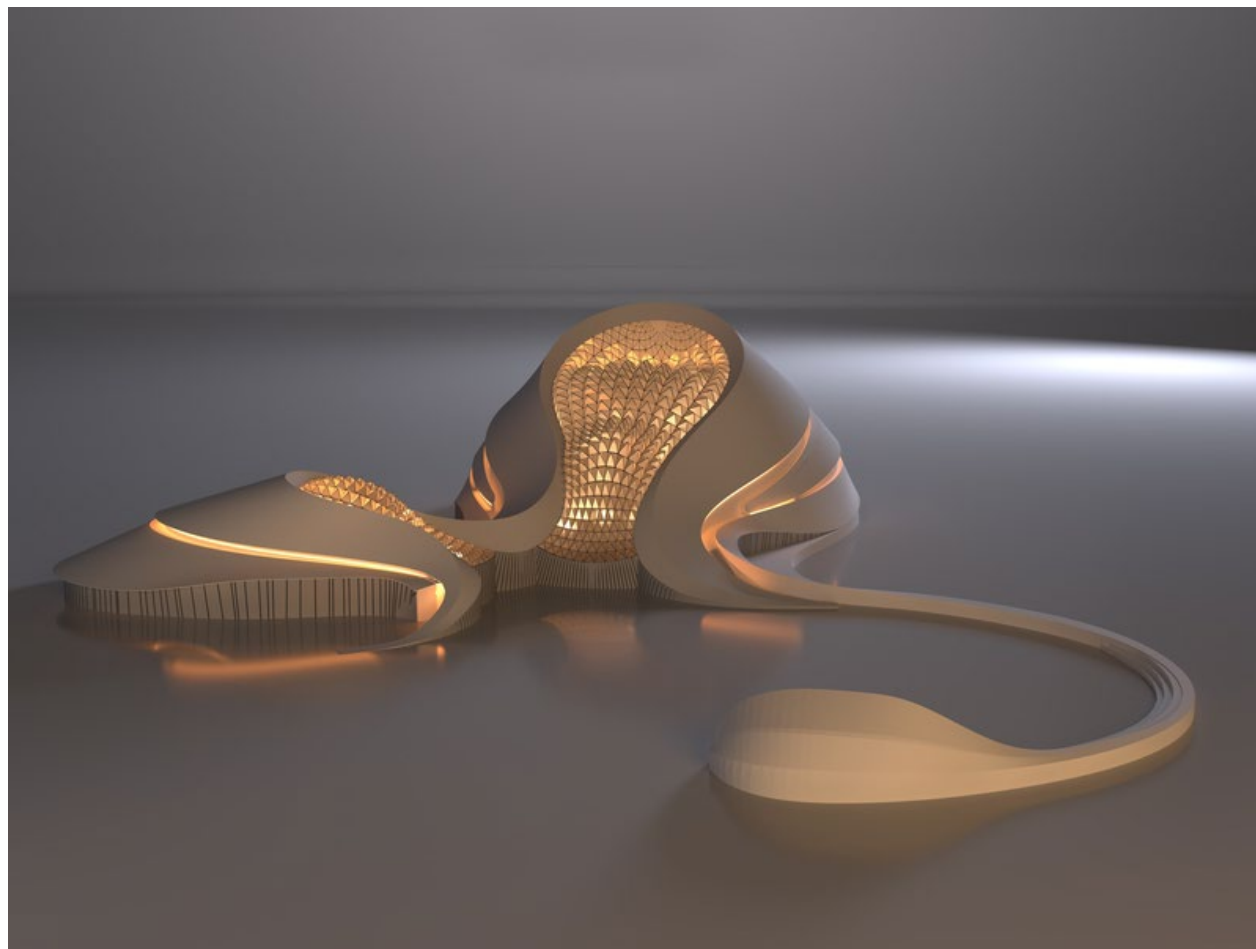
*and many more..*



<https://www.rhino3d.com/gallery/6/36726>

# Which disciplines use Rhino 3D?

Jewellery design  
Industrial design  
Marine design  
Automobile  
**Architecture**  
*and many more..*



<https://www.rhino3d.com/gallery/5/55268>





# Advantages and disadvantages



- Ability to model organic forms
- Accurately represents both standard geometric objects like lines, circles; and free-form geometry like car bodies.
- Provides design freedom with accuracy and quality
- Accuracy with adaptive mesh
- Compatible with 30 other CAD file formats, makes it a great translator
- Many plugins
- 90 days trial for educators and students

<https://www.sculpteo.com/blog/2019/07/10/battle-of-software-rhino-vs-sketchup/>  
<https://wiki.mcneel.com/rhino/nurbs>  
<https://www.trustradius.com/products/rhinoceros-3d/reviews>



- MAC version does not work as good as Windows version.
- Lack of backwards file compatibility
- Line weights and layouts are difficult to use
- It is not natively 3D parametric software, without a plug-in



**Direct  
modelling:  
On-the-fly  
design  
modification**

**RHINOCEROS 3D**

**VS**

**Parametric  
modelling:  
Associative  
relationship**

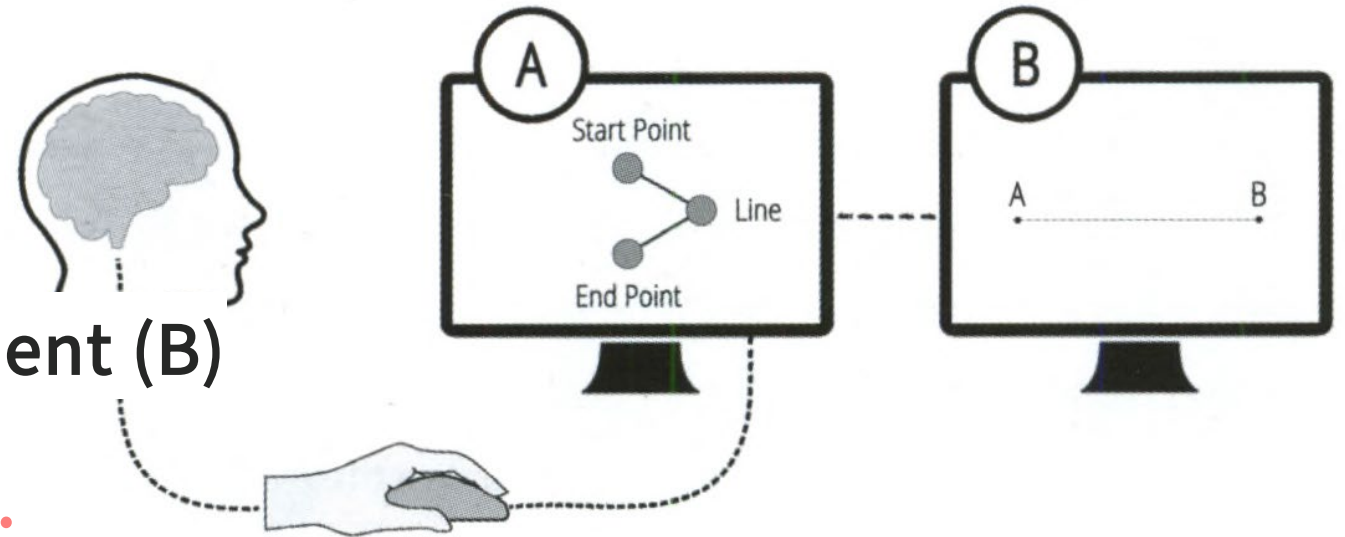
**PLUG-IN FOR RHINOCEROS 3D  
SUCH AS GRASSHOPPER**

# Visual scripting

Tedeschi, A. (2014). *AAD, Algorithms-aided design: parametric strategies using Grasshopper*, Le penseur publisher.

There are two  
**working environments:**  
Visual Editor (A)  
3D Modelling Environment (B)

Producing **two outputs:**  
Node diagram, called *parametric diagram*  
Output of *parametric diagram* constituted  
by parametric 3D or 2D geometry.

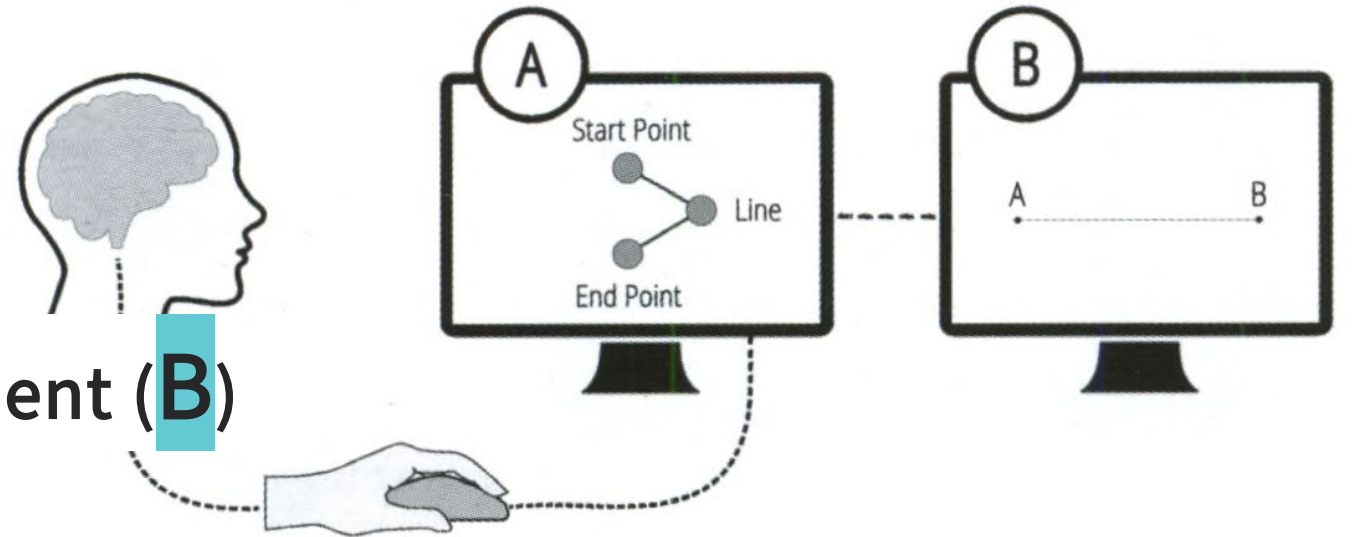


Previously in Week 5..

# Visual scripting

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# Visual scripting

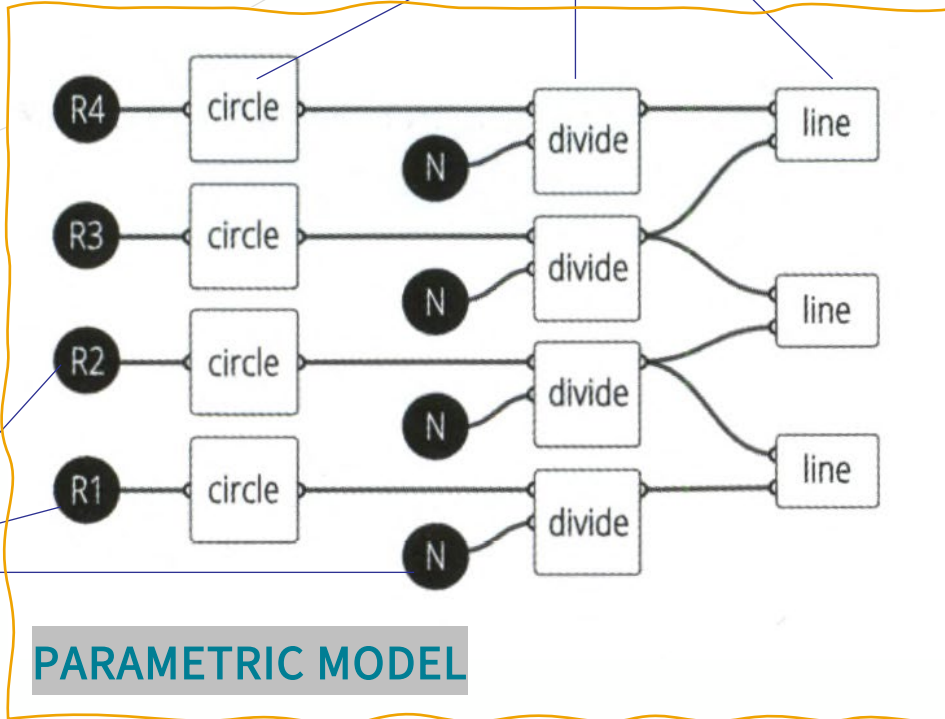
Tedeschi, A. (2014). *AAD, Algorithms-aided design: parametric strategies using Grasshopper*, Le penseur publisher.

- 0. Draw four circle
- 1. Subdivide the four circles into  $N$  parts, we get  $N$  points for each circle
- 2. Connect the corresponding points

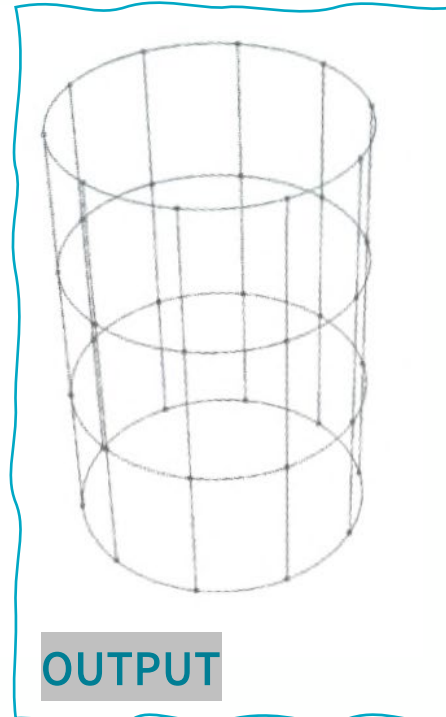
PARAMETERS

## A IS GRASSHOPPER PLUG-IN

### MAIN FUNCTIONS



## B IS RHINOCEROS 3D

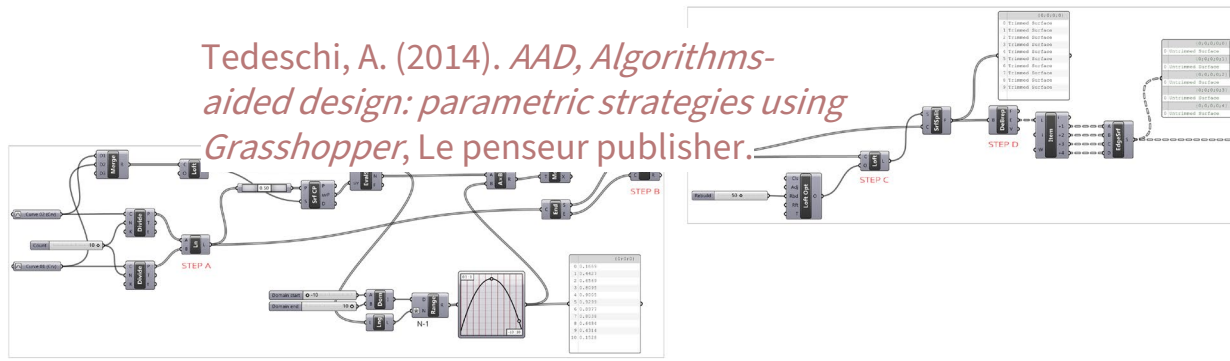


### VISUAL TRANSPOSITION OF THE ALGORITHM

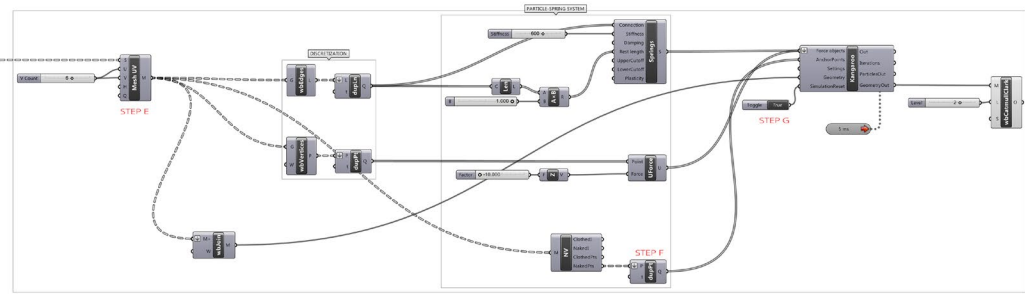
The advantage of the *parametric diagram* is in the intuitive logic, which allows designers to manipulate parameters.

# Example of Rhino and Grasshopper relation

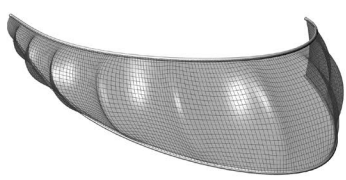
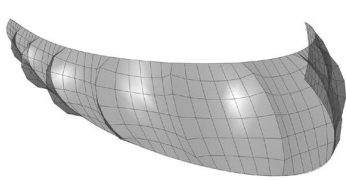
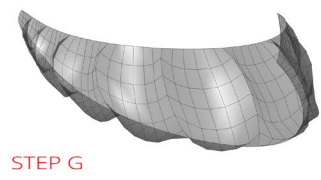
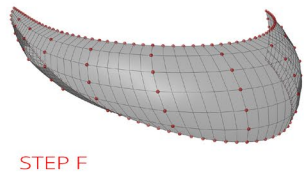
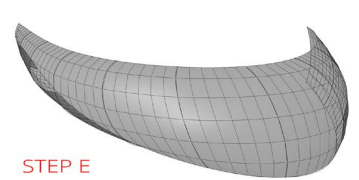
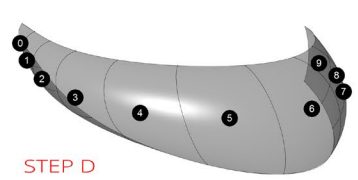
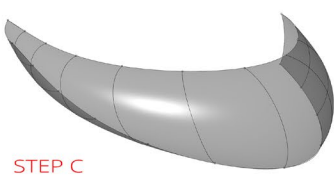
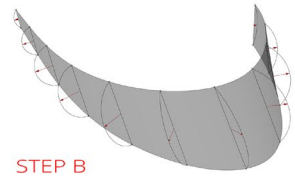
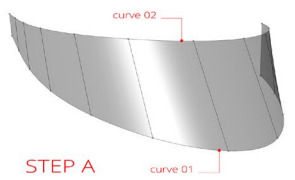
Tedeschi, A. (2014). *AAD, Algorithms-aided design: parametric strategies using Grasshopper*, Le penseur publisher.



## TOP: GRASSHOPPER PLUG-IN



## BOTTOM: RHINOCEROS 3D



# Rhinoceros 3D online resources



<https://www.rhino3d.com/tutorials>

Including manual books, master classes, live classes, etc.

**You**  **Tube**

**RHINO  
TUTORIALS**

**HOW TO RHINO**

**RHINO4ARCH**

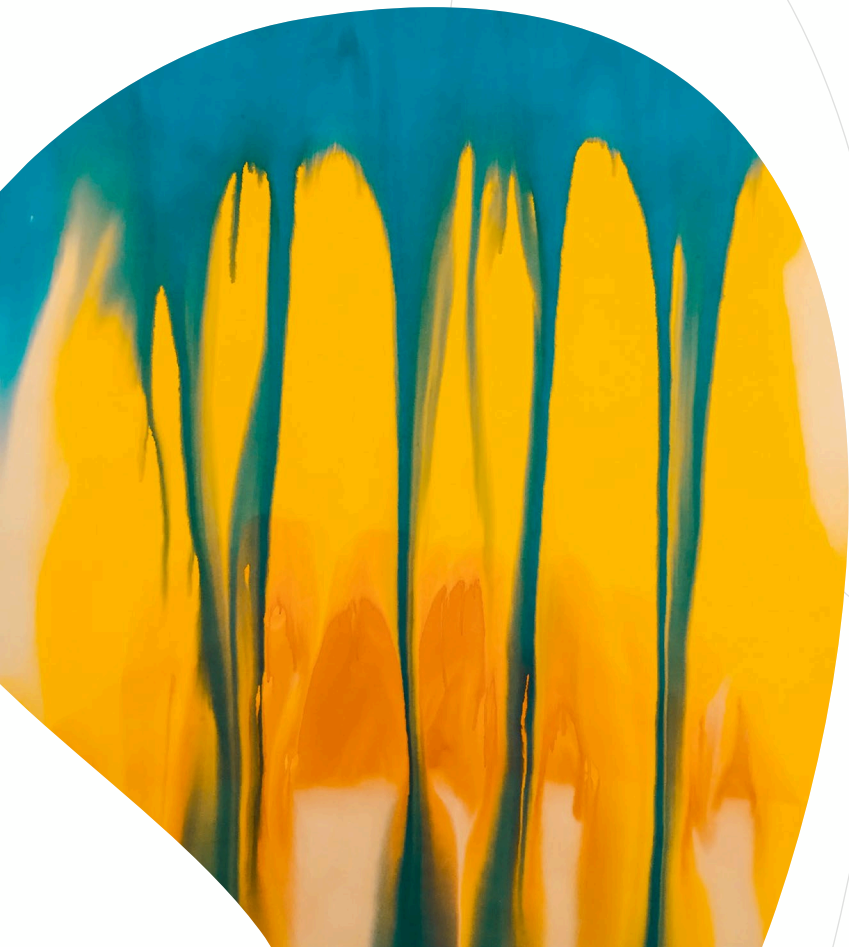
<https://flyingarchitecture.com/>

3D models, tutorials and materials for V-ray for Rhino

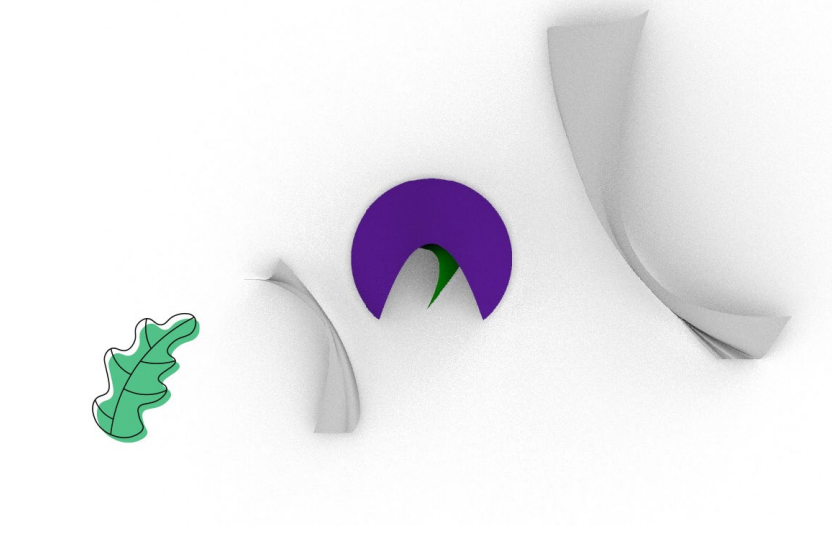
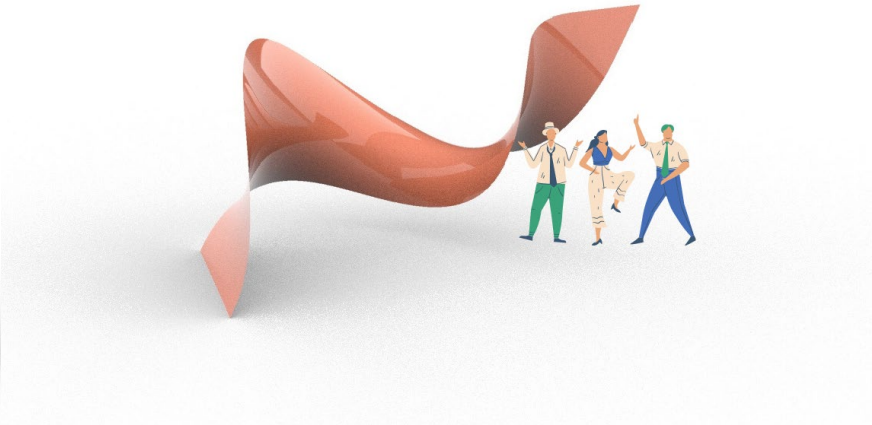


# How do you get started?

- Try to download the **90 days trial**. Or if you already have the software, please go ahead.
- If you absolutely **cannot gain access** to software, take notes and submit the reflections.





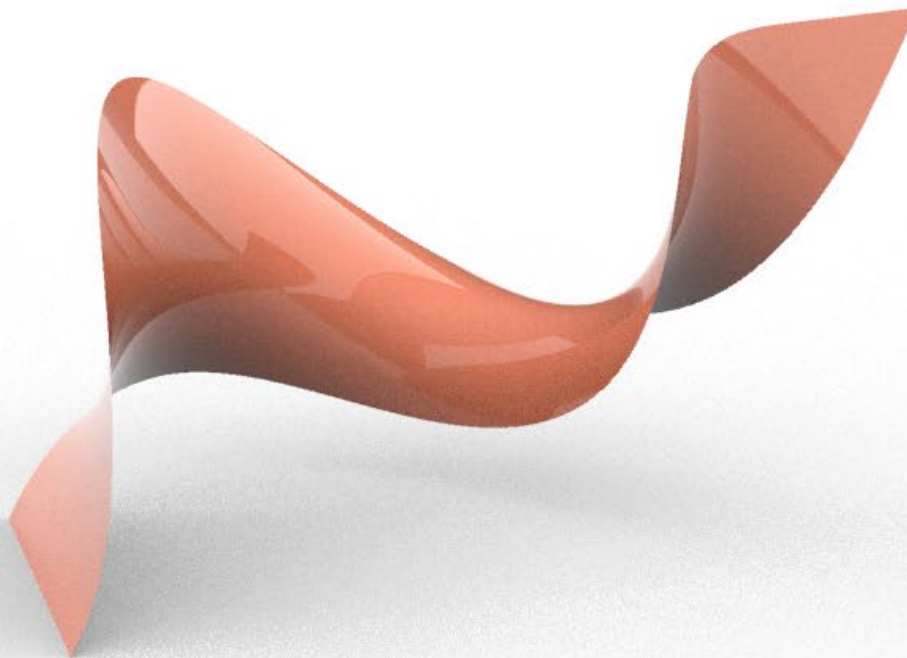


# Exploration 1: Twist and pipe



[\(1\) Shuhei Endo Architecture | Facebook](#)

# Exploration 1: Twist and pipe



# Exploration 2: Spiral and Sweep 1

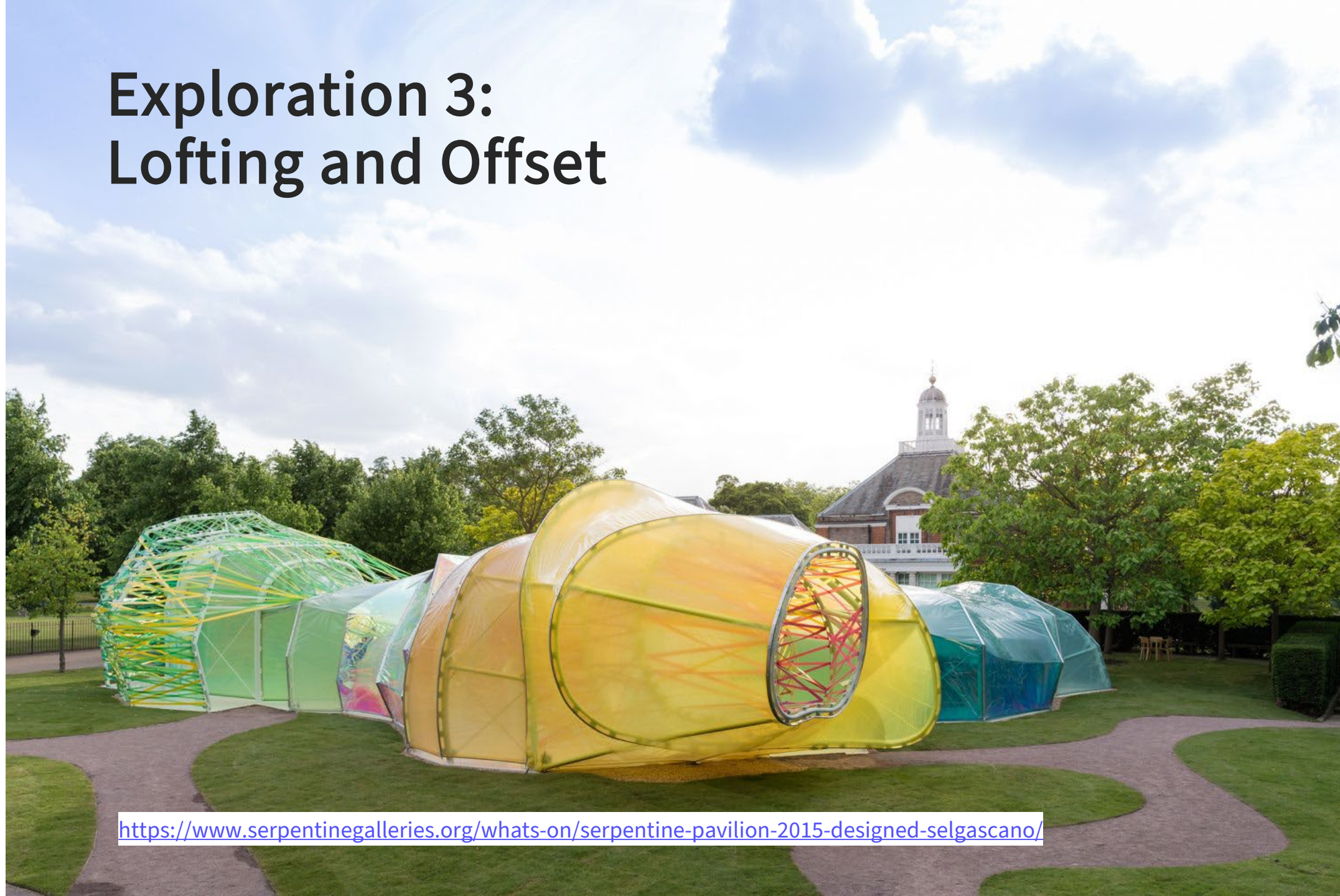


<httpswww.designboom.comarchitecturehiroshi-nakamura-nap-ribbon-chapel-spiral-hiroshima-japan-01-28-2015>

# Exploration 2: Spiral and Sweep 1



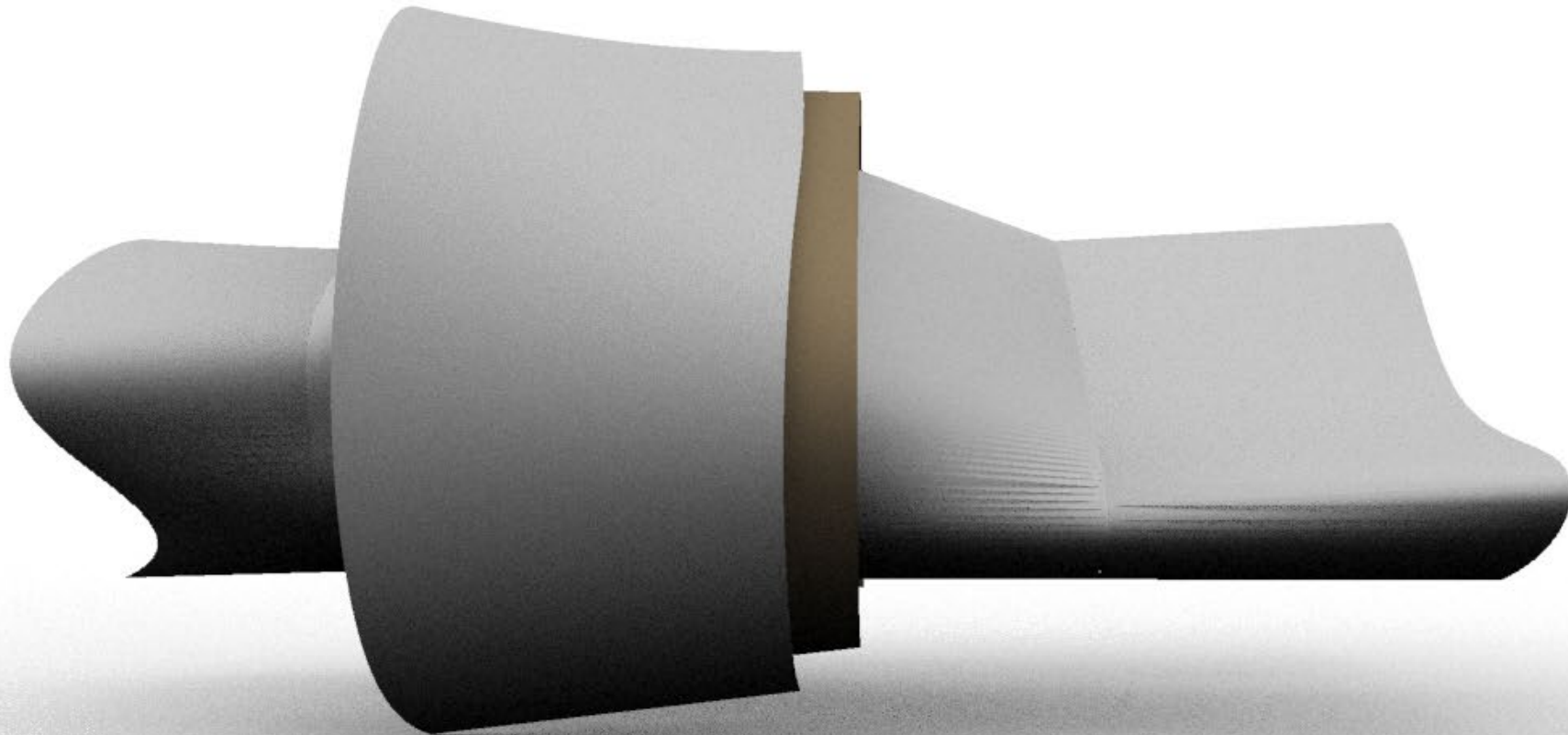
# Exploration 3: Lofting and Offset



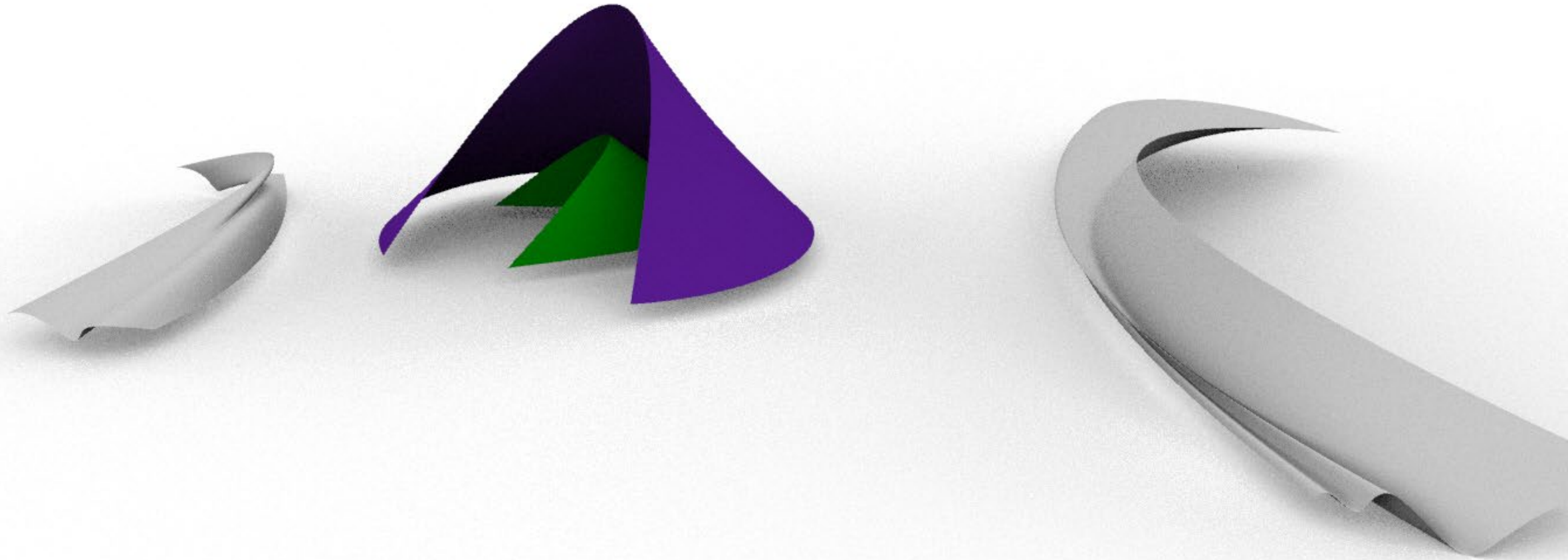
<https://www.serpentinegalleries.org/whats-on/serpentine-pavilion-2015-designed-selgascano/>



# Exploration 3: Lofting and Offset



# Exploration 4: Sweep 2 rail

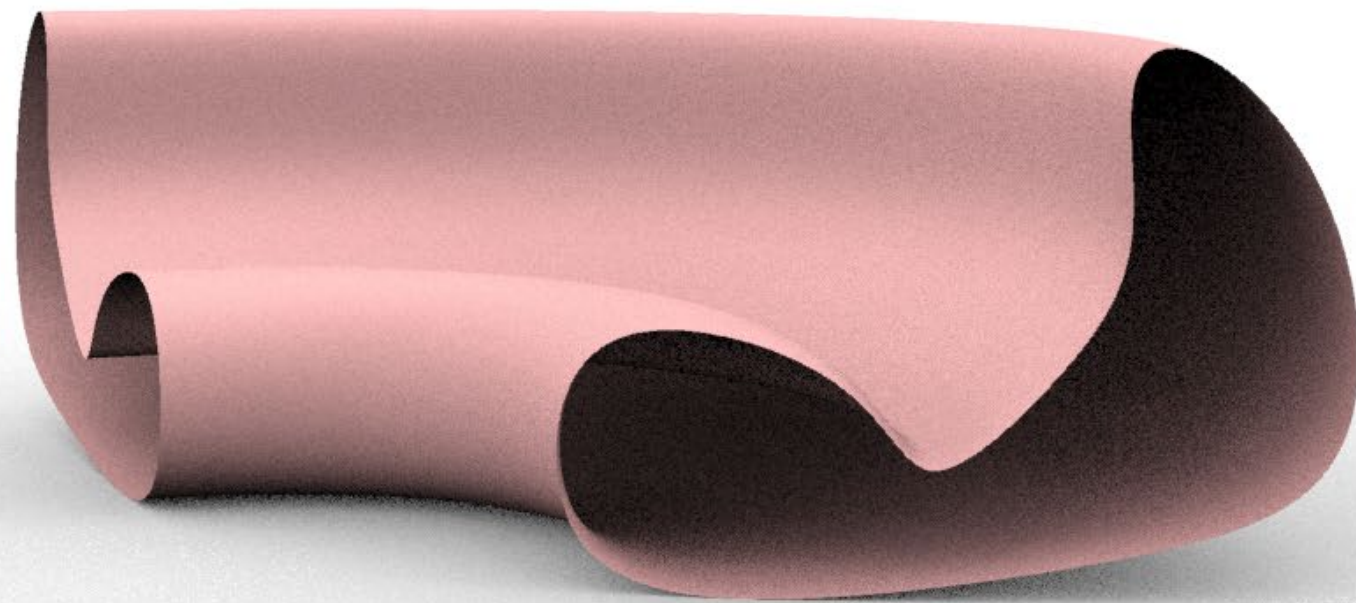




# Exploration 4: Sweep 2 rail



# Exploration 5: Revolving



# Rhino 3D tutorials by Nate McKewon

As additional learning, you can go through this tutorial video



**NATE McKEWON**



**YOUTUBE**

CLICK [HERE](#)

## RHINO FOR ARCHITECTURE INTRODUCTION & BASICS

<https://youtu.be/vkDxA5aSfhE>

Duration: 28 minutes

With the plethora of online resources, the challenge is to find a suitable one to start with. Here is my personal suggestion to gain basic knowledge on Rhino 3D. This will allow you to learn on your own time and pace, and not too ambitious for your timeline. Once you are done with this, I suggest you do at least one of his 4 modules (next slide).

# Rhino 3D tutorials by Nate McKewon

Do **at least one** of these **four**



**NATE McKEWON**



**YOUTUBE**

CLICK [HERE](#)

## **MODULE 1: CURVE DRAWING & ARRAY**

<https://youtu.be/yC-MzGtV6w0>

Duration: 15 minutes

## **MODULE 2: SURFACE CREATION & EDITING**

[https://youtu.be/2BnrvyQ\\_VXM](https://youtu.be/2BnrvyQ_VXM)

Duration: 10 minutes

## **MODULE 3: LOFTING CURVES TO CREATE SURFACES**

[https://youtu.be/lmrf\\_VqTn0Y](https://youtu.be/lmrf_VqTn0Y)

Duration: 9 minutes

## **MODULE 4: SOLIDS & BOOLEAN TOOL**

[https://youtu.be/TmQI\\_jEIUnc](https://youtu.be/TmQI_jEIUnc)

Duration: 11 minutes



# Design fixation due to software skill



Please remember that you can have the whole summer to learn more about Rhino and Grasshopper. This module is just a point of departure of your learning. To equip your skills to exercise computational design thinking, software skill is essential but should not become a **creativity block**.

It takes years to master a software ( I am no where near an expert!). Sometimes it gets frustrating, but what I would like to illustrate in your assignment is that: **understanding of the digital design thinking through research and reflections**, and how to work in **collaboration with your group members**. NOT your ability to master a software in a short period of time or producing the best design as this is not your studio module.

# Re-iterating aims and objectives

- To relate Rhino 3D software to the digital design thinking we have built the last few weeks.
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- To suggest ways to learn the software.