

### Introduction

The aim of this project was to experiment with crochet as a means to display different geometric surfaces. Our designs and models are crafted from public knowledge of crocheting techniques and geometric surfaces such as the sphere, the hyperbolic plane, the Poincare disk, and others. We also explored concepts of curvature and discrete modeling.

### Definitions

### <u>Curvature</u>

A geometric property that describes how much a surface deviates from a straight line, which has zero curvature. Circles with radius R have constant curvature, denoted as 1/R, and can used to approximate the curvature of other 2D and 3D surfaces.

### Hyperbolic Plane

This refers to a surface in 3-space that has constant negative curvature and extends indefinitely in all directions. We can describe every point in the hyperbolic plane as a saddle point.

### Poincare Disk Tiling

This property of surfaces refers to the map of the hyperbolic plane to a disk without changing the angles. Due to the nature of mapping, tiles closer the edge are much father apart than those closer to the center of the map.







# Geometry Through Crochet

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### **Future Projects**

# this project in the future:

- modeling
- regular polygons
- Monster Surface

## Acknowledgements

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### References

Popescu, M.-E., & Häberle, M. (2022, February 14). Tessellations of the Poincaré Disk. HEGL. Retrieved April 30, 2023, from https://hegl.mathi.uni-heidelberg.de/tesselation s-of-the-hyperbolic-disc/ Taimina Daina. (2019). Crocheting adventures with hyperbolic planes: Tactile Mathematics, art and craft for all to explore. CRC Press

## **QR Codes**

Ideal Sphere Pdf



Some potential explorations we could expect from

• Use of different sized yarn for Poincare disk

• Tiling the Poincare disk with triangles or other

• Exploring other crochet surfaces, like the Lochness

• Further collaboration with UVA team

Hyperbolic Flower Pdf

