



# CROCHET REPRESENTATIONS OF THE LOBACHEVSKIAN SURFACE

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Beginning the study of non-Euclidean geometries, physical models or representations, such as crochet ones, provide a tangible portrayal of these advanced mathematical concepts. However, their connection to local Euclidean surfaces still needs further investigation. This work aims to explore how the characteristics of crochet models relate to non-Euclidean concepts by providing a parameterization of such surfaces.

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## 1. Introduction

The Lobachevskian surface emerges as a field of study that deviates from Euclidean geometry, challenging our intuition and traditional geometric understanding. Fundamental concepts in this surface are often characterized by their non-intuitive properties, owing to the constant negative curvature, as posited in [1]. Physical models, known as *representation systems*, have proven to be effective resources enabling a tangible and manipulable representation of abstract ideas [2]. Crochet models (Fig. 1), in particular, have garnered attention due to their ability to transform mathematical elements into attractive and concrete three-dimensional objects. However, it remains to be investigated to what extent and how these crochet models can contribute to understanding the mathematical concepts inherent in non-Euclidean geometries.

This work aims to address the following issue: In what ways are the geometric characteristics of crochet models connected to the fundamental mathematical concepts of the Lobachevskian surface, and how can this relationship enhance understanding and intuition?

According to [3, Section 15], the *Lobachevskian surface* is the surface of one sheet of the two-sheeted hyperboloid in the pseudo-Euclidean space. Various models