

Colloquium

University of Notre Dame
Department of Mathematics

Qing Han - University of Notre Dame

Speaker: Qing Han

University of Notre Dame



Will give a lecture entitled

The isometric embedding of abstract surfaces in Euclidean space

Date: Wednesday, August 30, 2023

Time: 4:00 PM

Location: 129 Hayes-Healy Hall

Zoom URL: NA

Departmental Tea: Tea in Room 257 (lounge in Hurley Hall) at 3:30 p.m.

Abstract:

The isometric embedding of abstract surfaces in the Euclidean space Abstract: A surface in the 3-dimensional Euclidean space can be viewed as the image of a map from a planar domain to the 3-dimensional Euclidean space, at least locally. The standard metric in Euclidean space induces a metric on the surface, which allows us to compute the lengths of curves on the surface and to compute the distance of any two points on the surface. The induced metric on the surface can be transformed into an abstract metric by the abovementioned map. Now, we consider the converse question. Given an abstract metric on a planar domain or on a closed surface, can we find a surface in the 3-dimensional Euclidean space whose induced metric is the given abstract metric? This is the isometric embedding problem. It started with a conjecture by Schlaefli in 1873 that this can always be achieved near any given point. This conjecture is widely open and there are only a few results under various conditions. The question can be reformulated in terms of partial differential equations. Despite the technical description, the underlying equation has a simple form but is hard to solve. In this talk, I will give a historical account of isometric embedding and present several open problems. If time permits, I will also discuss applications of isometric embedding in general relativity. The talk is aimed for a general audience.