



ISSN: 1889-3066

© 2019 Universidad de Jaén

Web site: [jja.ujaen.es](http://jja.ujaen.es)

Jaen J. Approx. 11(1-2) (2019), 151–167

Jaen Journal

on Approximation

# Hypercircle inequality for data error measured with $l^\infty$ norm<sup>†</sup>

Kamonrat Nammanee and Kannika Khompurngson

## Abstract

When it comes to Machine Learning, without a doubt one of the most important topics is the method for learning functions. Prior, one aspect of the hypercircle inequality ( $H_i$ ) in the context of kernel-based machine learning was introduced by Kannika Khompurngson and Charles A. Micchelli. However, the material on  $H_i$  only applies to the case of accurate data. Our previous work which was motivated by this limited said data has extended the hypercircle inequality to circumstances for which there is known data error. In this paper, our special interest is focused on a detailed analysis of the hypercircle inequality for data error ( $H_{ide}$ ) measured with  $l^\infty$  norm. Furthermore, the result is applied to a problem about the learning of the value of a function in the Hardy space of square-integrable function on the unit circle which is well-known in reproducing kernel Hilbert spaces.

**Keywords:** hypercircle inequality, convex optimization,  $l^\infty$  approximation.

**MSC:** Primary 46E22; Secondary 46C07, 74Pxx.

## §1. Introduction and preliminary results

As stated in the abstract, the method for learning function is one of the most important topics in Machine Learning [1, 9, 10]. One aspect of the hypercircle inequality ( $H_i$ ) in

---

<sup>†</sup>The second author is supported by the National Research Council of Thailand and the University of Phayao under Grant No. RD62041.

Communicated by

D. Leviatan

Received

May 22, 2019

Accepted

November 18, 2019