

# On Maximum Packings of the $\lambda$ -fold Complete 3-Uniform Hypergraph with the Lines of the Pasch Configuration

Skyler Dodson<sup>1,\*</sup> Jacob Franzmeier<sup>2</sup> Dru Horne<sup>3,†,\*</sup>

<sup>1</sup>*Illinois State University, dodsonsk@u4sd.org;* <sup>2</sup>*St. Olaf College;* <sup>3</sup>*University of Georgia, dhorne8@uga.edu*

The  $\lambda$ -fold complete 3-uniform hypergraph of order  $v$ , denoted  ${}^\lambda K_v^{(3)}$ , has a set  $V$  of size  $v$  as its vertex set and the collection of all 3-element subsets of  $V$ , each subset repeated  $\lambda$  times, as its edge multiset. Let  $P$  denote the 3-uniform hypergraph with vertex set  $\{a, b, c, d, e, f\}$  and edge set  $\{\{a, b, c\}, \{c, d, e\}, \{a, e, f\}, \{b, d, f\}\}$ . Thus the edges of  $P$  are the lines of the Pasch configuration and  $P$  is 2-regular. It is known that there exists a  $P$ -decomposition of  $K_v^{(3)}$  if and only if  $v \equiv 1, 2, \text{ or } 6 \pmod{8}$ ,  $v \neq 6$ . In this work, we give a maximum  $P$ -packing of  ${}^\lambda K_v^{(3)}$  for all positive integers  $\lambda$  and  $v$ . This work was completed at the *Illinois State University REU for Pre-service and In-service Teachers* (National Science Foundation Grant Number A1950357) under the direction of Ryan Bunge and Saad El-Zanati.