

# Combinatorics Seminar

Friday Nov 6th, 2015  
2:30 PM-3:20 PM in Hume 331

## Thickness and outerthickness of graphs embedded in surfaces



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### **ABSTRACT**

The *thickness*  $\theta(G)$  of a graph  $G$  is the minimum number of planar subgraphs whose union is  $G$ , and the *outerthickness*  $\theta_o(G)$  is obtained where the planar subgraphs in the definition of thickness are replaced by outer planar graphs. Dean and Hutchinson provided upper bounds for thickness of graphs in terms of their orientable genus. Concalves proved that the outerthickness of any planar graph is at most 2. We introduce the method of deleting spanning disks of embeddings to approximate the thickness and outerthickness of graphs. Connections are established between thickness/outerthickness and non-contractible loop systems of surfaces. We obtain better upper bounds for thickness and establish upper bounds for outerthickness of graphs in terms of their orientable and nonorientable genera. We show that the outerthickness of the torus is 3. We also show that all double torus embeddable graphs have thickness at most 3 and outerthickness at most 5.

This is joint work with Baogang Xu.