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Robert Page and **Ruriko Yoshida*** (ryoshida@nps.edu), 1411 Cunningham Road, Naval Postgraduate School, Monterey, CA 93943, and **Leon Zhang**. *Tropical Principal Component Analysis*.

In 2004, Speyer and Sturmfels showed that a space of phylogenetic trees with fixed set of leaves is a tropical Grassmannian under the max-plus tropical semiring, i.e., a tropical linear space defined by the tropicalization of linear equations. Therefore it is natural to apply tropical arithmetics to conduct statistical analyses over a tree space under the tropical metric, such as principal component analysis (PCA). PCA is a widely-used method for the dimensionality reduction of a given data set in a high-dimensional Euclidean space. Here we define and analyze two analogues of PCA in the setting of tropical geometry. In one approach, we study the Stiefel tropical linear space of fixed dimension closest to the data points in the tropical projective torus; in the other approach, we consider the tropical polytope with a fixed number of vertices closest to the data points. In this talk we focus on tropical PCA as a tropical polytope. We end this talk with applications to empirical datasets: African coelacanth, Apicomplexa genomes, and Hemagglutinin (HA) sequences for influenza in the state of New York from 1993 to 2017. This is joint work with Mr. Leon Zhang, Ms. Xu Zhang, and Maj. Robert (Rory) Page. (Received February 21, 2020)