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Heeralal Janwa* (hjanwa@uprrp.edu), Department of Mathematics, University of Puerto Rico, Rio Piedras, P.O. Box 23355, San Juan, PR 00931. *Ramanujan Graphs and Optimal Expander Graphs from Algebraic Geometric Codes.*

Ramanujan graph families are asymptotically optimal expanding graph families. Algebraic geometric (AG) codes yield asymptotically optimal linear error-control code families. We will present relationships and analogies between Ramanujan graphs and AG codes. Both research areas have analogous constructions, conjectures and open problems.

We will present constructions of graphs from codes and derive expressions and bounds on their eigenvalues, eigenvectors, diameter, and girth. We will prove results on their automorphism groups and connectivity. New constructions of Ramanujan graphs and optimal expander graphs from AG codes will be given. Among the applications, we will use these expanders with optimal eigenvalues as “seed graphs” in some iterative constructions to give new (explicit) constructions of asymptotic families of constant-degree expander graphs having constant degrees different from the ones constructed so far. Some of them provide alternative constructions that have the same degrees but with other expansion related parameters comparable to or better than those of some other recent constructions. Conversely, we will construct Tanner/expander codes from the optimal expander graphs constructed here and elsewhere, and will present bounds on their parameters. (Received September 20, 2007)