# McGill Computational Science and Engineering Seminar

Friday December 8th at 14:00 in Burnside Hall room 1205

## Factorized Sparse Approximate Inverses for Preconditioning of Sparse Matrices

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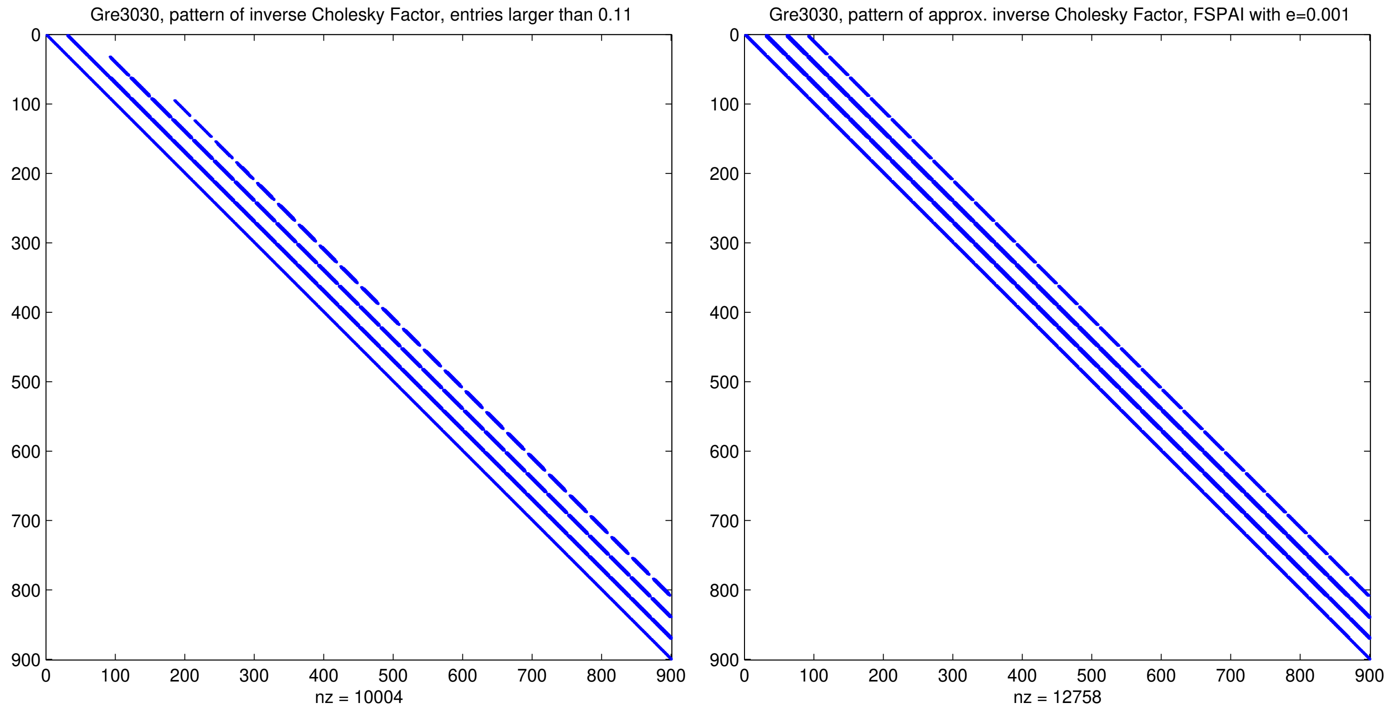
In recent papers the use of sparse approximate inverses for the preconditioning of linear equations $Ax = b$ is examined. The minimization of $||AM - I||$ in the Frobenius norm relative to a given sparsity pattern for $M$ generates good preconditioners. Furthermore, the method can be designed in such a way that it automatically captures a promising sparsity pattern for $M$. Such preconditioners are easy to parallelize and can work as black box methods in connection with iterative solvers.

Similarly for symmetric positive definite $A$ and a given a-priori pattern there exist methods for computing factorized sparse approximate inverses $L$ with $LL^T \approx A^{-1}$. Here, we want to modify these algorithms so that they are able to capture automatically a promising pattern for $L$. We use these approximate inverses for solving linear equations with the cg-method and compare it to other preconditioners like ILU, AINV, SPAI, and Gauss-Seidel.




*On the left largest entries of the exact $L$ for the matrix Gre3030 from the Matrix-Market and on the right $L$ from FSPAI. FSPAI clearly finds automatically the important entries. The condition number $cond(A) = 194.6$ ($A$ diagonally scaled) decreases to $cond(L^TAL) = 22.5$ with $L$ from FSPAI.*

**Coffee and desserts are served after the seminar at 15:00 in the lounge, Burnside Hall 1024**