High Intensity Matrix Polynomial Solvers for the Heat and Poisson Equations

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Heat equation and Poisson equations are basic blocks of many numerical methods for partial differential equations (PDE). These two equations, which could be considered as simple are actually numerical bottlenecks in many applications like fluid mechanics, plasma physics and so on, as obtaining fast solvers is always challenging, at least in dimension 3.

I will show that fast and precise parallel solvers are obtained when two conditions are fulfilled: 1) for the heat equation, use explicit high order stabilized methods, 2) perform arithmetic intensive matrix vector products obtained from high order discretizations.