

GPU acceleration of FEM solver with applications to Geotechnical Engineering

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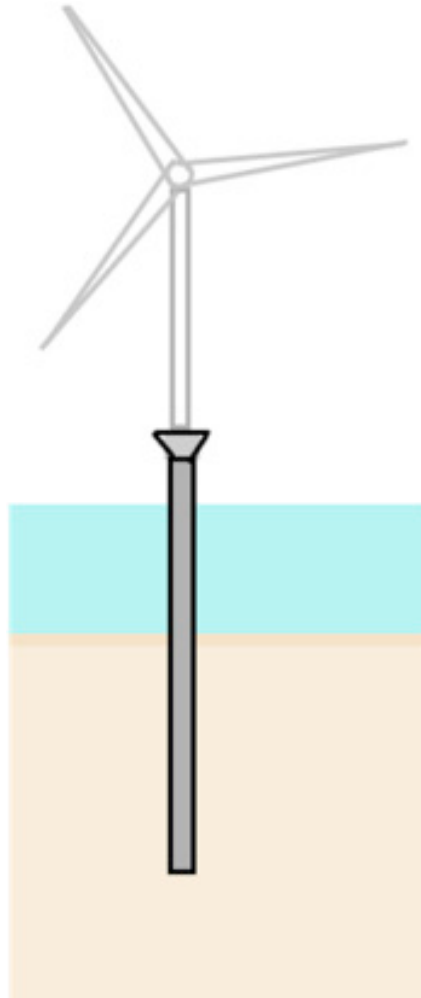
Outline

- Plaxis
- Iterative solvers
- Can it be faster?

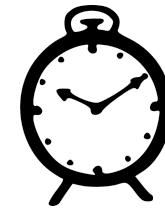
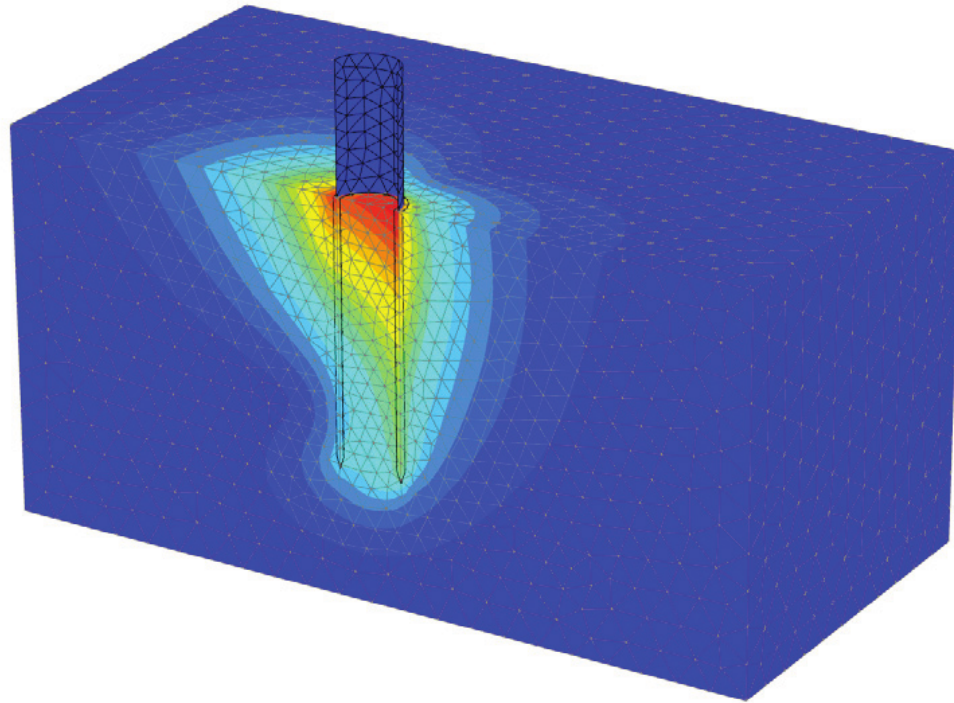
Why simulate?



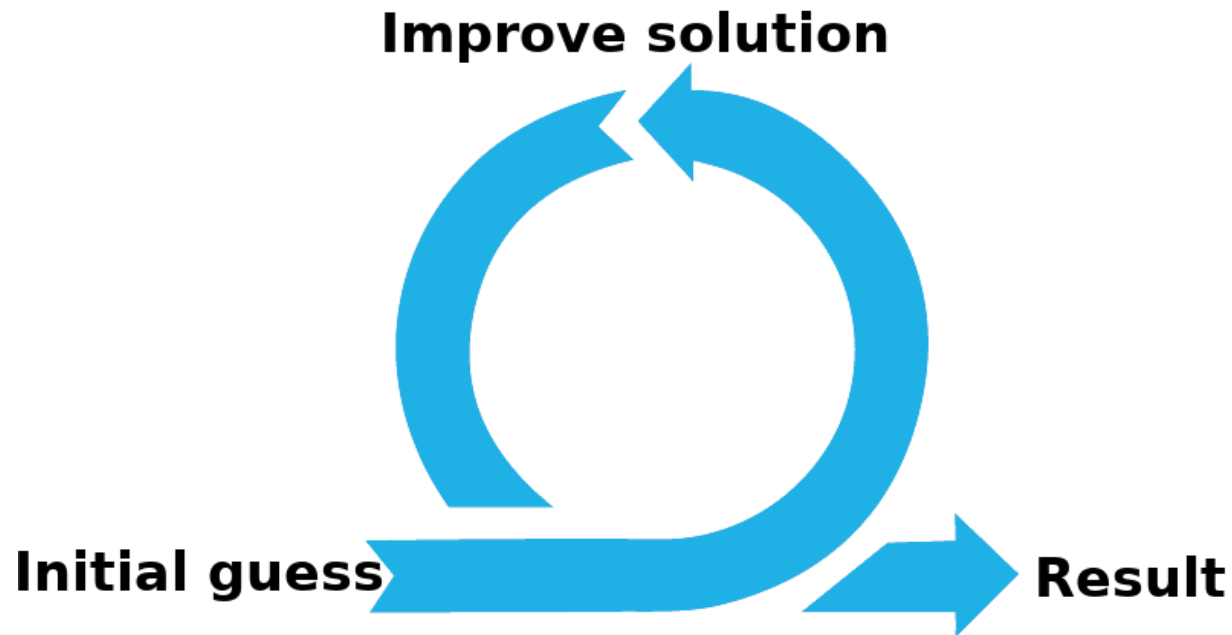
Model



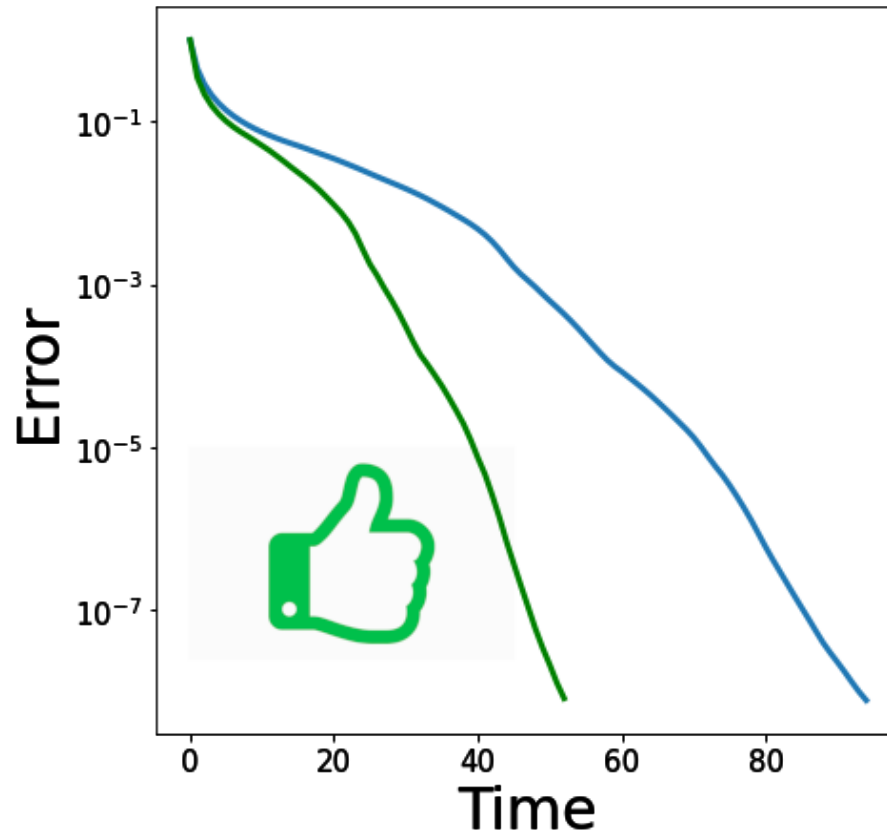
Simulate



Iterative solver



Convergence



How to improve speed?

Method	#iteration	time/iter	setup
Parallelism	▲	▼	▲
Preconditioning	▼	▲	▲
Deflation	▼	▲	▲

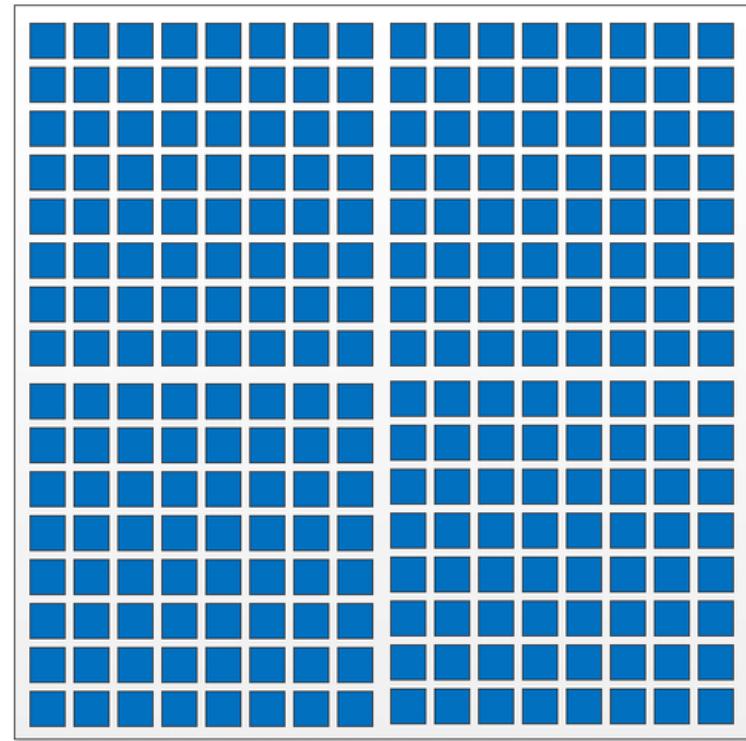
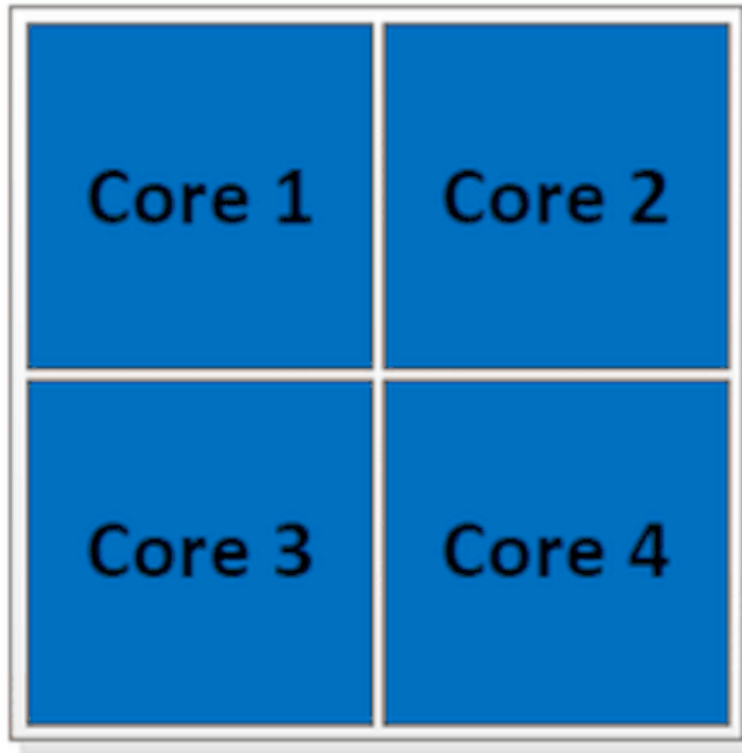
Parallelism

CPU vs GPU

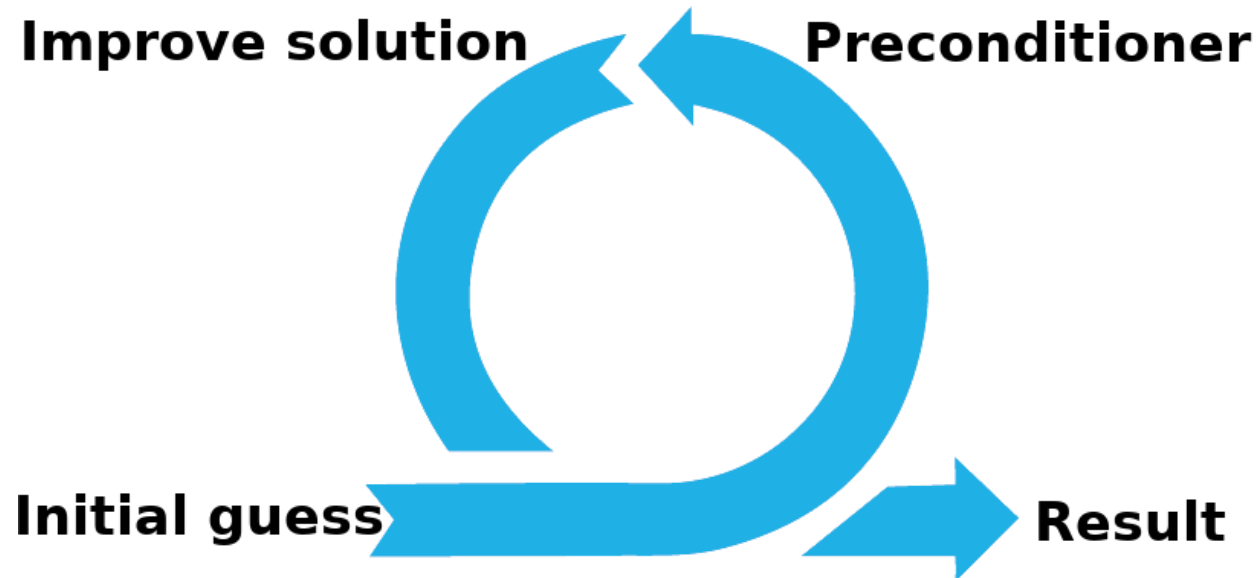


Parallelism

CPU vs GPU



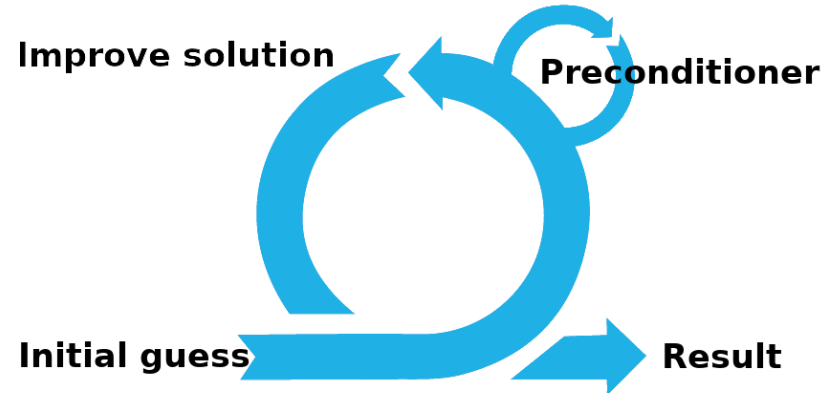
Preconditioning



Incomplete LU










Preconditioner	#iteration	time/iter	setup
ILU (current)			

Parallel Incomplete LU















Preconditioner	#iteration	time/iter	setup
ILU (current)	👍👍👍	👎👎👎	👎👎👎
ParILU	👍👍	👍 / 👎	👎

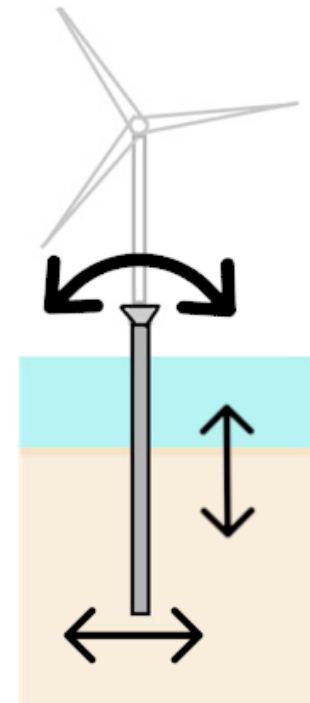
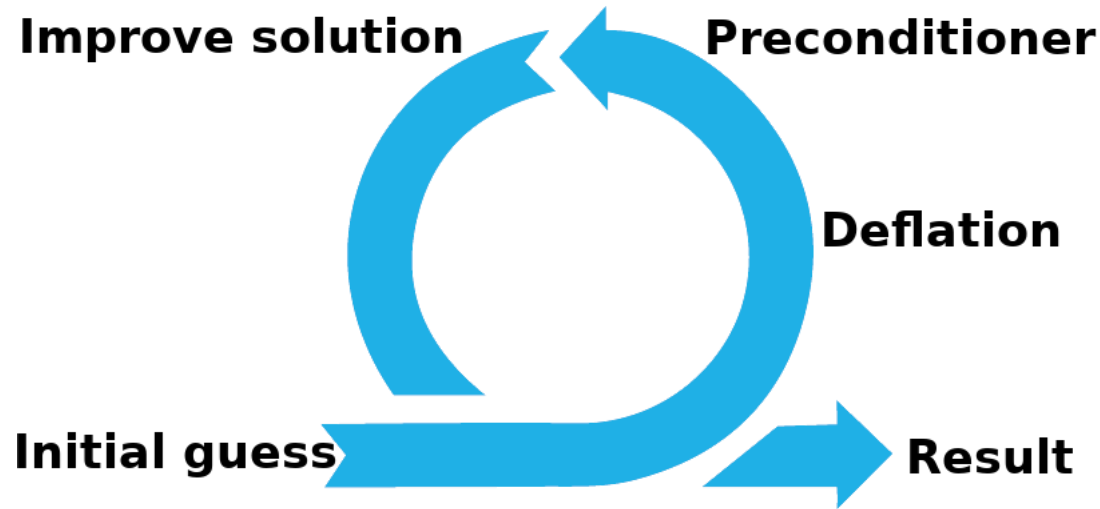
SParse Approximate Inverse

Preconditioner	#iteration	time/iter	setup
ILU (current)			
ParILU			
SPAI			

Jacobi

Preconditioner	#iteration	time/iter	setup
ILU (current)			
ParILU			
SPAI			
Jacobi			

Deflation



Balance

Method	#iteration	time/iter	setup
Parallelism	▲	▼	▲
Preconditioning	▼	▲	▲
Deflation	▼	▲	▲

Conclusion:

stay tuned for a (hopefully) blazing fast solver



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Preconditioning

