Lecture 5

- HW1 due in ≤ 1 week!

Office Hours:
Thurs - 2:00-4:15
Fri - 1:30-2:30

Show first as sparse, then convert to CSC?
Where/why is CSC in. ✓
Tridiagonal Solver?
When is A sparse? Grids?
IE Example
How to clean Julia? ✓
→ How to clean Julia in the!

Can we formalize "sparse"?
Mat-Mul of sparse so G-Gram. ✓
CSR in CSC
A is sparse B is dense
A·B: A·B etc.
Is MC how does the idea of a "sparse" input G.?

Worth Gershgorin as an hope for sparsity??
⇒ Why always it's needed
for efficient use cases. ✓

ML + "what is a matrix?"
⇒ Feature Engineering?
Now: first Kaggle of a class (learn ranking)
for Wins: Learned linear solvers as 1st step!

CSC
Entry Col lookup
Mat-vec (colMajor/rowMajor)

Indexed
Random Transd.

Both Col
Row lookup

Other Formats - Julia Docs
list of lists
hash table of lists.

What is a sparse matrix?

Sparsity of Entry: 0 is to Trade admin of is the algorithm:

Formally let $Alg(n)$ be the runtime/complexity of an algorithm on a dense dense matrix.

A matrix is sparse if there is an $Alg'(|Entries|)$ when
$Alg'(|Entries|) = o(Alg(n))$
So a matrix is sparse if $|Entries| = o(n^2)$.

for Sparse
$Alg'(n) = n^2$
$Alg'(|Entries|) = |Entries|$

A sparse
B dense

A·B = dense ⇒
Copy (B), update B_{ij} for Entries of A.
A·B = dense ⇒
Compute a column/Blocks at a time

$y = Ax$ $y = \sum x_i (A_{:i})$ (rows)

A·B B is sparse!

SpGEMM.

- Nice Article by Aydin Buluc on SpGemm (Recently on arXiv!).
- Read more in Tim Davis sparse matrix book too for algo.

Julia Sparse
- Sparse hash alternative?
- SpGemm perf.

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