

# Dong Hu

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## RESEARCH INTERESTS

Matrix Completion, Tensor decomposition, Low-rank Approximation, Sketching, Machine Learning, High-dimensional Statistics, Randomized Linear Algebra, Label Complexity Reduction.

## EDUCATION

### Rensselaer Polytechnic Institute

*Ph.D.* in Computer Science

GPA: 3.91/4.0

Fall 2019 – Spring 2024 (expected)

Advisor: *Prof. Alex Gittens*

### Rensselaer Polytechnic Institute

*Bachelor of Science* in Mathematics

*Bachelor of Science* in Computer Science

GPA: 3.86/4.0, *Dean's Honor List*

Spring 2016 – Spring 2019

Advisor: *Prof. Jeffery Banks*

Advisor: *Prof. Heng Ji*

## RESEARCH EXPERIENCE

### Rensselaer Polytechnic Institute

Summer 2019-present

*Graduate Research Assistant*, Computer Science Department

- Adapted a Polynomial Reject-Sampling Algorithm to nonlinear scenarios, specifically multi-layer neural networks, by linearizing the system. This adaptation maintained tight approximations with reduced label complexity in the  $\ell_2$ -regression case. Demonstrated its superior performance against alternatives, such as uniformly dropping the same number of rows.
- Proposed and investigated in a regression-based matrix completion algorithm (noisyCUR) for low budget matrix completion setting and experimentally verify the performance of our algorithm on both synthetic and real data, compared our algorithm with state-of-the-art Matrix completion algorithms. Paper accepted by ECML 2020.

### IBM, Yorktown Heights

Summer 2020-Spring 2023

*Artificial Intelligence Research Collaboration(AIRC) scholar, fellowship*

- Proposed a proximal regularized sketched alternating least squares (Tucker-ALS) algorithm for the low-rank Tucker decomposition of large tensors and proved that a sublinear rate of convergence of proximally regularized sketched CPD algorithms also holds for the proposed algorithm. Showed that the iterative nature of the Tucker-ALS approach can be algorithmically exploited to choose more performant sketching rates at different iterations. A journal paper submission to TMLR in 2023 is in preparation.
- Investigated sparse sketching matrices obtained from bipartite graphs, and explored two popular classes of them: expander graphs and magical graphs. Proved that for a subspace with arbitrary dimension, the minimum right vertices (the sketch size) that satisfies these two graphs for yielding a  $(1 \pm \epsilon)$   $\ell_2$ -subspace embedding. Empirically showed they work well in practice. Paper accepted by ICASSP 2021.

## PUBLICATIONS

D. Hu, S. Ubaru, A. Gittens, K. Clarkson, L. Horesh, and V. Kalantzis. "Sparse graph based sketching for fast numerical linear algebra." in *International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, 2021.

D. Hu, A. Gittens, and M. Magdon-Ismail, "NoisyCUR: An algorithm for two-cost budgeted matrix completion," in *Machine Learning and Knowledge Discovery in Databases - European Conference(ECML-PKDD)*, 2020