Ahmed Khaled

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Homepage
Scholar Profile

Education

2015–2020 **B.Sc. Computer Engineering**, *Cairo University*, Egypt.
GPA: Distinction with Honors (91.3%). Rank: 3rd/64.

Research Experience

Jun–Oct 2020 **Research Intern**, *King Abdullah University of Science and Technology*, Saudi Arabia.
Remote research intern in the group of Professor Peter Richtárik. Worked on federated learning and convex composite optimization.

Jun–Sep 2019 **Research Intern**, *King Abdullah University of Science and Technology*, Saudi Arabia.
Worked in the group of Professor Peter Richtárik on stochastic optimization. Analyzed algorithms for federated learning and non-convex optimization.

Aug–Sep 2018 **Undergraduate Research Assistant**, *Cairo University*, Egypt.
Worked with Professor Amir Atiya and Professor Ahmed Abdel-Gawad on speeding up the training of neural networks using fast matrix multiplication algorithms. Wrote code in CUDA C.

Work Experience

Oct 2020 – Present **Egyptian Military**, *Conscript Soldier*.
Serving mandatory conscription for one year as a soldier in the Egyptian Armed Forces.

Jun–Aug 2016, Aug–Sep 2017 **Nafham**, *Intern*.
Wrote web pages in HTML, JavaScript, & CSS, and PHP with Bootstrap and Laravel. Recorded more than 40 educational videos on high school mathematics.

Awards

Oct 2020 **INFORMS Undergraduate Operations Research Prize Finalist**, *Institute for Operations Research and the Management Sciences (INFORMS)*.
One of ten finalists selected to give a presentation on outstanding research done as an undergraduate at the 2020 INFORMS annual meeting.

Oct 2020 **Top 10% of Reviewers**, *NeurIPS 2020*.
Awarded one free registration to NeurIPS 2020 for being one of the top 10% of high-scoring reviewers for the year.

Sep 2019 **Mentor Achievement Award**, *Learn IT, Girl 4th Edition*.
Awarded for successfully mentoring Natalia Grzywalska over March–June 2019 in programming.

Mathematics Self-Study

Self-studied to develop my mathematical maturity beyond class.

- Worked through a textbook on real analysis (Bloch, The Real Numbers and Real Analysis) and wrote a solutions manual for it (solutions link).
- Also worked through chapters of various other mathematical textbooks:
  - Hrbáček and Jech's Set Theory Ch.1-4 (solutions link).
  - Axler's Linear Algebra Done Right Ch. 1-3 (solutions link).
  - Bartle's Elements of Integration Ch. 1-4.

Course Projects

These projects involved implementing research papers from scratch.

- Image Processing: Implemented Elad and Milanfar's Style-Transfer via Texture-Synthesis (2016) in Python using OpenCV, scikit-learn and NumPy. Code, Report.
- Multimedia: Implemented a gated neural nets algorithm (PAQ7) for compression in C++. Won 1st place out of 15 teams over the department for the best compression ratio on an Arabic text dataset. Report.
- Pattern Recognition: Implemented Nashwan et al.'s A Holistic Technique for an Arabic OCR System paper in Python using OpenCV, scikit-learn, and NumPy, in addition to multiple other papers. Code, Report.

Talks

May 2020 **On the Convergence of Local SGD on Identical and Heterogeneous Data**, *Federated Learning One World Seminar*.
Gave an hour-long seminar talk on using local stochastic gradient descent for federated learning.

Papers

Conference Publications

(1) Konstantin Mishchenko, **A. Khaled**, and Peter Richtárik - Random Reshuffling: Simple Analysis with Vast Improvements - To appear in Neural Information Processing Systems (NeurIPS) 2020.

(2) **A. Khaled**, Konstantin Mishchenko, and Peter Richtárik - Tighter Theory for Local SGD on Identical and Heterogeneous Data - Artificial Intelligence and Statistics (AISTATS) 2020.

(3) **A. Khaled**, Amir Atiya, and Ahmed Abdel-Gawad - Applying Fast Matrix Multiplication to Neural Networks - 35th ACM/SIGAPP Symposium on Applied Computing (ACM SAC) 2020.

Preprints / In preparation

(4) **A. Khaled**, Othmane Sebbouh, Nicolas Loizou, Robert M. Gower, and Peter Richtárik - Unified Analysis of Stochastic Gradient Methods for Composite Convex and Smooth Optimization - preprint (2020).

(5) **A. Khaled** and Peter Richtárik - Better Theory for SGD in the Nonconvex World - preprint (2020).

(6) Sélim Chraibi, **A. Khaled**, Dmitry Kovalev, Peter Richtárik, Adil Salim, and Matrin Takáč - Distributed Fixed Points Methods with Compressed Iterates - preprint (2019).

Workshop Papers

(7) **A. Khaled**, Konstantin Mishchenko, and Peter Richtárik - Better Communication Complexity for Local SGD - *Oral presentation* at the NeurIPS 2019 Federated Learning Workshop.

(8) **A. Khaled** and Peter Richtárik - Gradient descent with Compressed Iterates - Poster at the NeurIPS 2019 Federated Learning Workshop.

(9) **A. Khaled**, Konstantin Mishchenko, and Peter Richtárik - First Analysis of Local GD on Heterogeneous Data - Poster at the NeurIPS 2019 Federated Learning Workshop.