

## Education

2015–Present **B.Sc. Computer Engineering**, *Cairo University*, Egypt.  
GPA: Distinction (3.96/4.0). Expected Graduation Date: July 2020.  
Preparatory Year Rank: 8<sup>th</sup>/2200. First Year Rank: 3<sup>rd</sup>/64. Second Year Rank: 1<sup>st</sup>/64. Third Year Rank: 4<sup>th</sup>/64.

## Research Experience

June **Research Intern**, *King Abdullah University of Science and Technology*, Saudi Arabia.  
2020–Present Remote research intern in the group of Professor **Peter Richtárik**.  
June– **Research Intern**, *King Abdullah University of Science and Technology*, Saudi Arabia.  
September Worked in the group of Professor **Peter Richtárik** on Stochastic Optimization. Carried out novel mathematical analysis of optimization algorithms for federated learning, variance reduced methods and nonconvex stochastic gradient descent. Wrote experiments in Python with scikit-learn.  
2019  
August– **Undergraduate Research Assistant**, *Cairo University*, Egypt.  
September 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 and interfaced it to the TensorFlow library.  
2018

## Papers

**A. K.**, Othmane Sebbouh, Nicolas Loizou, Robert M. Gower, and Peter Richtárik - **Unified Analysis of Stochastic Gradient Methods for Composite Convex and Smooth Optimization** - preprint (2020).  
Konstantin Mishchenko, **A. K.**, and Peter Richtárik - **Random Reshuffling: Simple Analysis with Vast Improvements** - preprint (2020).  
**A. K.** and Peter Richtárik - **Better Theory for SGD in the Nonconvex World** - preprint (2020).  
Sélim Chraïbi, **A. K.**, Dmitry Kovalev, Peter Richtárik, Adil Salim, and Matrin Takáč - **Distributed Fixed Points Methods with Compressed Iterates** - preprint (2019).  
**A. K.**, Konstantin Mishchenko, and Peter Richtárik - **Tighter Theory for Local SGD on Identical and Heterogeneous Data** - Artificial Intelligence and Statistics (AISTATS) 2020.  
**A. K.**, Konstantin Mishchenko, and Peter Richtárik - **Better Communication Complexity for Local SGD** - oral presentation at the NeurIPS 2019 Federated Learning Workshop.  
**A. K.** and Peter Richtárik - **Gradient descent with Compressed Iterates** - NeurIPS 2019 Federated Learning Workshop.  
**A. K.**, Konstantin Mishchenko, and Peter Richtárik - **First Analysis of Local GD on Heterogeneous Data** - NeurIPS 2019 Federated Learning Workshop.  
**A. K.**, Amir Atiya, and Ahmed Abdel-Gawad - **Applying Fast Matrix Multiplication to Neural Networks** - 35th ACM/SIGAPP Symposium on Applied Computing (ACM SAC) 2020.

## Work Experience

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

## Relevant Projects

**Relevant Course Projects**, these projects involved implementing research papers from scratch.

- Image Processing: Implemented Elad and Milanfar's Style-Transfer via Texture-Synthesis paper in Python using OpenCV, scikit-learn and NumPy. [Code](#), [Report](#).
- Multimedia: Implemented a gated neural nets algorithm (PAQ7) for compression in C++. Won 1<sup>st</sup> 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](#).
- Machine Intelligence: Led a team of 16 students in developing a Monte Carlo Tree Search based Go playing agent with a GUI and network play in C++. Won 2<sup>nd</sup> place out of 6 teams in a department-wide competition. [Report](#).

**Mathematics Self-Study**, this was mainly to develop my mathematical maturity beyond class.

- Worked through a textbook on real analysis and wrote a solutions manual for it ([link](#)).
- Also worked through chapters of [Axler's Linear Algebra Done Right](#), Bartle's Elements of Integration, [Hrbacek and Jech's Set Theory](#), [Aluffi's Algebra Chapter 0](#) and others.

## Awards

Sep 2019 **Mentor Achievement Award**, *Learn IT, Girl 4th Edition*.

Awarded for successfully mentoring Natalia Grzywalska over March – June 2019 in programming in Java.

## Skills

Technical C/C++, Python, Java,  $\text{\LaTeX}$ , Git.  
Languages English (fluent) and Arabic (native).