Ahmed Abdelkader

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ABOUT ME — My research tackles fundamental challenges in geometry acquisition and modeling, drawing upon deep theoretical insights to devise novel data representations with a track-record of top-tier publications. I thrive in fast-paced multidisciplinary teams, and have a passion for education and mentoring.

RESEARCH — Computational Geometry, 3D Modeling, Computational Photography, Machine Learning.

CURRENT APPOINTMENT

Google Research, Mountain View, CA — Jun 2022 - now

Research Scientist – Face Authentication

End-to-end ownership of geometry-based spoof detectors. Independently research and deliver novel ML models and critical analyses for next-gen devices. Lead data collection and tooling.

PROFESSIONAL EXPERIENCE (SELECTED)

University of Texas, Austin, TX — Sep 2020 - May 2022

Postdoctoral Fellow – The Oden Institute for Computational Engineering & Sciences

Independently researched and published in computational geometry and machine learning.

Sandia National Laboratories, Albuquerque, NM — 2015 $\sim$ 2019

Visiting Researcher – Computer Science Research Institute

Designed and delivered thorough theoretical analysis of a first-of-kind meshing algorithm: VoroCrust.

Nezal Entertainment, Alexandria, Egypt — 2011 $\sim$ 2012

Part-time Game Developer

Delivered i18n and physics effects for Crowds. Prototyped story-panel gaming with rich animations.

Google Inc., Mountain View, CA — Jun – Oct 2011

Intern Site Reliability Engineer – GMail SRE

Delivered advanced statistical monitoring of staging servers, and diurnal analyses for load balancing.

Google Switzerland GmbH, Zürich, Switzerland — Jul – Sep 2010

Intern Software Engineer – GMail Spam, Abuse and Delivery

Delivered core engine for advanced bot detection, which now serves billions of QpS across platforms.

Microsoft Corporation, Redmond, WA — Jun – Sep 2008

Intern Software Design Engineer in Test – Core Operating System Division

Prototyped physical key-press tests, and experimented with input parameter inference for fuzz testing.

EDUCATION

Ph.D. in Computer Science — Fall 2013 – Summer 2020

University of Maryland, College Park, MD

- Thesis: Adaptive Sampling for Geometric Approximation

M.Sc. in Engineering Mathematics — Spring 2010 – Summer 2013

Alexandria University, Alexandria, Egypt

- Thesis: Optimization Problems in Visual Surveillance

B.Sc. in Computer Engineering — Fall 2004 – Spring 2009

Alexandria University, Alexandria, Egypt

- Thesis: Device-free Passive Localization in Wi-Fi Networks

Publications (Selected)

Machine Learning

The Intrinsic Dimension of Images and Its Impact on Learning
Int. Conf. on Learning Representations (ICLR), 2021
Phillip Pope, Chen Zhu, A. A., Micah Goldblum, Tom Goldstein

Detection as Regression: Certified Object Detection by Median Smoothing
Advances in Neural Inf. Proc. Sys. (NeurIPS), 2020
Ping-yeh Chiang, Michael Curry, A. A., Aounon Kumar, John Dickerson, Tom Goldstein

Certified Defenses for Adversarial Patches
Int. Conf. on Learning Representations (ICLR), 2020
Ping-yeh Chiang*, Renkun Ni*, A. A., Chen Zhu, Chris Studor, Tom Goldstein

Headless Horseman: Adversarial Attacks on Transfer Learning Models
IEEE Conf. on Acoustics, Speech, and Signal Processing (ICASSP), 2020
A. A., M. Curry, L. Fowl, T. Goldstein, A. Schwarzschild, M. Shu, C. Studer, C. Zhu

Shape Modeling

VoroCrust: Voronoi Meshing without Clipping
ACM Trans. on Graphics (ToG) & SIGGRAPH 2020
A. A., C. Bajaj, M. Ebeida, A. Mahmoud, S. Mitchell, J. Owens, A. Rushdi

Sampling Conditions for Conforming Voronoi Meshing by the VoroCrust Algorithm
Symp. on Computational Geometry (SoCG), 2018
A. A., C. Bajaj, M. Ebeida, A. Mahmoud, S. Mitchell, J. Owens, A. Rushdi

A Constrained Resampling Strategy for Mesh Improvement
Symp. on Geometry Processing (SGP), 2017
A. A.*, Ahmed Mahmoud*, Ahmad Rushdi, Scott Mitchell, John Owens, Mohamed Ebeida

Cyber-Physical Systems

Argus: Realistic Target Coverage by Drones
ACM/IEEE Int. Conf. on Information Processing in Sensor Networks (IPSN), 2017
Ahmed Saeed, A. A., Azin Neishaboori, Mouhyemen Khan, Khaled Harras, Amr Mohamed
– Full version in the ACM Trans. on Sensor Networks (TOSN), 2019

Visibility Induction for Discretized Pursuit-Evasion Games
AAAI Conf. on Artificial Intelligence (AAAI), 2012
A. A., Hazem El-Alfy

Analysis of a Device-free Passive Tracking System in Typical Wireless Environments
Int. Conf. on New Technologies, Mobility and Security (NTMS), 2009
Ahmed Kosba, A. A., Moustafa Youssef

Approximation Algorithms

Differentiable Approximations for Distance Queries
ACM-SIAM Symp. on Discrete Algorithms (SODA), 2025
A. A., David M. Mount

Convex Approximation and the Hilbert Geometry
SIAM Symp. on Simplicity in Algorithms (SOSA), 2024
A. A., David M. Mount

Approximate Nearest-Neighbor Search for Line Segments
Symp. on Computational Geometry (SoCG), 2021
A. A., David M. Mount

Approximate Nearest Neighbor Searching with Non-Euclidean and Weighted Distances
ACM-SIAM Symp. on Discrete Algorithms (SODA), 2019
A. A., Sunil Arya, Guilherme da Fonseca, David M. Mount

Honours & Awards

Peter O'Donnel, Jr. Postdoctoral Fellowship, University of Texas, Austin, 2020-2022.

Ann G. Wylie Dissertation Fellowship, University of Maryland, College Park, 2019.

Dean's Fellowship, University of Maryland, College Park, 2013-2014.

Honorable Mention, The ACM International Collegiate Programming Contest - World Finals, 2011.

Bronze medal, Egyptian Olympiad in Informatics, 2006.

Service (selected)

Conference Reviewer/Sub-reviewer

- Annual Conf. on Neural Info. Proc. Systems (NeurIPS)
- Int. Conf. on Learning Representations (ICLR)
- Int. Conf. on Machine Learning (ICML)
- Int. Conf. on Artificial Intelligence and Statistics (AISTATS)
- IEEE/RSJ Int. Conf. on Intelligent Robots and Systems (IROS)
- IEEE Int. Conf. on Robotics and Automation (ICRA)
- IEEE Int. Conf. on Advanced Robotics (ICAR)
- High-Performance Graphics (HPG)
- ACM-SIAM Symp. on Discrete Algorithms (SODA)
- Symp. on Computational Geometry (SoCG)
- Int. Symp. on Algorithms and Computation (ISAAC)

Journal Reviewer/Sub-reviewer

- Discrete & Computational Geometry (DCG)
- Trans. of Machine Learning Research (TMLR)
- Algorithmica (ALGO)
- Mathematics of Computation
- The Visual Computer (TVCJ)
- Computers & Graphics
- Language Resources and Evaluation (LREV)
- Robotics and Automation Letters (RA-L)
- Computational Geometry Theory and Applications (CGTA)

Teaching

University of Maryland, College Park, MD — Fall 2013 – Fall 2016
Teaching Assistant

CMSC 754: Computational Geometry (Fall 2016)
CMSC 351: Algorithms (Summer 2016)
CMSC 425: Game Programming (Spring 2016)
CMSC 451: Design and Analysis of Computer Algorithms (Fall 2015)
CMSC 250: Discrete Structures (Fall 2013, Spring 2014)

Alexandria University, Alexandria, Egypt — Fall 2009 – Spring 2013
Teaching Assistant

Calculus, Differential Equations, Numerical Methods, Probability, Linear Algebra, C Programming, Object Oriented Programming, Data Structures, Algorithms, Machine Learning, Automata Theory.

Misc

Course project for ugrad CG: a 3D extension of World of Goo; see the report and demo video.