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CURRENT AFFILIATION	May 2017–May 2019	Postdoctoral Fellow, Visual Computing Center, Division of Computer, Electrical and Mathematical Sciences & Engineering, <i>King Abdullah University of Science and Technology (KAUST), Saudi Arabia</i> . Host: Prof. Peter Richtarik, <i>KAUST, Saudi Arabia; The University of Edinburgh, Scotland; MIPT, Russia; The Alan Turing Institute, London</i> .
DEGREES	Fall 2016	Ph.D. in Mathematics, GPA 3.579, <i>University of Central Florida</i> . Dissertation: Weighted Low Rank Approximation of Matrices: Some Analytical and Numerical Aspects. Ph.D. Advisor- Prof. Xin Li, Co-Advisor- Prof. Qiyu Sun. <i>Winner of Outstanding Dissertation Award 2016 from the mathematics department.</i> <i>Winner of Lee H. Armstrong award for excellence in Graduate teaching, 2017.</i>
	Fall 2011	M.S. in Mathematical Science, GPA 3.528, <i>University of Central Florida</i> .
	2008	M.S. in Mathematics and Computing, GPA 7.22 (10 scale, First Class), <i>Indian Institute of Technology, Dhanbad</i> . Dissertation: Two Square and Two Cube Factorial Experiments. Advisor- Prof. G. N. Singh.
	2006	B.S. in Mathematics (Hons.), Minor in Physics and Statistics, <i>Presidency College, Calcutta University</i> .
RESEARCH INTERESTS	Weighted and Structured Low-Rank Matrix Approximation, Compressive Sensing, Convex Optimization, Stochastic Optimization, Numerical Analysis, Linear Algebra, Applications in Dimensionality Reduction of Big Data, Sparse Representation, Image and Video Analysis, Machine Learning, Deep Learning. RG Score: 7.46, ( <a href="https://www.researchgate.net/profile/Aritra_Dutta3">https://www.researchgate.net/profile/Aritra_Dutta3</a> ), Google Scholar: <a href="https://scholar.google.com/citations?user=vquoiHsAAAAJ&amp;hl=en">https://scholar.google.com/citations?user=vquoiHsAAAAJ&amp;hl=en</a> .	
RESEARCH ARTICLES	<p><i>On a Problem of Weighted Low Rank Approximation of Matrices</i>, ARITRA DUTTA AND XIN LI, SIAM Journal on Matrix Analysis and Applications, Vol. 38, No. 2, pp. 530–553, 2017. <a href="http://epubs.siam.org/doi/10.1137/15M1043145">http://epubs.siam.org/doi/10.1137/15M1043145</a></p> <p><i>Fast Detection of Compressively-Sensed IR Targets Using Stochastically Trained Least Squares and Compressed Quadratic Correlation Filter</i>, BRIAN MILLIKAN, ARITRA DUTTA, QIYU SUN, AND HASSAN FOROOSH, IEEE Transactions on Aerospace and Electronic Systems, Vol. 53, Issue 5, pp. 2449–2461, 2017. <a href="http://ieeexplore.ieee.org/document/7917343/?arnumber=7917343&amp;source=authoralert">http://ieeexplore.ieee.org/document/7917343/?arnumber=7917343&amp;source=authoralert</a></p> <p><i>A Fast Algorithm for a Special Weighted Low Rank Approximation</i>, ARITRA DUTTA AND XIN LI, 15th IAPR International Conference on Machine Vision Applications (MVA), IEEE Xplore,</p>	

pp. 93-96, 2017. <http://ieeexplore.ieee.org/document/7986798/>

*Shrinkage Function and Its Applications in Matrix Approximations*, TOBY BOAS, ARITRA DUTTA, XIN LI, KATIE MERCIER, AND ERIC NIDERMAN, *Electronic Journal of Linear Algebra*, Vol. 32, pp. 163–171, 2017. <http://repository.uwo.edu/cgi/viewcontent.cgi?article=3218&context=ela>

*Initialized Iterative Reweighted Least Squares for Automatic Target Recognition*, BRIAN MILLIKAN, ARITRA DUTTA, NAZANIN RAHNAVARD, QIYU SUN, AND HASSAN FOROOSH, In proceedings of IEEE Military Communications Conference 2015, pp. 506-510, 2015. <http://ieeexplore.ieee.org/document/7357493/>

*Weighted Low Rank Approximation for Background Estimation Problems*, ARITRA DUTTA AND XIN LI, In proceedings of IEEE International Conference on Computer Vision Workshops (ICCV), pp. 1853–1861, IEEE Xplore, 2017. <http://ieeexplore.ieee.org/document/8265429/>.

*A Batch-Incremental Video Background Estimation Model using Weighted Low-Rank Approximation of Matrices*, ARITRA DUTTA, XIN LI, AND PETER RICHTÁRIK, In proceedings of IEEE International Conference on Computer Vision Workshops (ICCV), pp. 1835–1843, IEEE Xplore, 2017. <http://ieeexplore.ieee.org/document/8265427/>.

*Weighted Low-Rank Approximation for Background Modelling*, ARITRA DUTTA, XIN LI, AND PETER RICHTÁRIK, submitted, April 2018. <https://arxiv.org/abs/1804.06252>

*Online and Batch Supervised Background Estimation via L1 Regression*, ARITRA DUTTA AND PETER RICHTÁRIK, submitted, November 2017. <https://arxiv.org/abs/1712.02249>

*Weighted Singular Value Thresholding and its Applications in Computer Vision*, ARITRA DUTTA, BOQUING GONG, XIN LI, AND MUBARAK SHAH, submitted, January 2017. <https://arxiv.org/abs/1707.00133>.

#### PH.D. THESIS

*Weighted Low-Rank Approximation of Matrices: Some Analytical and Numerical Aspects*, ARITRA DUTTA, Ph.D. Dissertation, Department of Mathematics, University of Central Florida. Available at: <http://stars.library.ucf.edu/cgi/viewcontent.cgi?article=6631&context=etd>.

#### PAPERS IN PROGRESS

*Asynchronous Stochastic Gradient Descent*, ARITRA DUTTA, AASHUTOSH TIWARI, ATAL NARAYAN SAHU, AND PETER RICHTÁRIK.

#### TECHNICAL REPORTS

*Image Compression Using Simulated Annealing*, ARITRA DUTTA, GEONWOO KIM, MEIQIN LI, CARLOS ORTIZ MARRERO, MOHIT SINHA, COLE STIEGLERK, *Mathematical Modeling in Industry XIX*, Institute of Mathematics and its Applications, August 2015.

*Efficient and robust solution strategies for saddle-point systems*, JEREMY CHIU, LOLA DAVIDSON, ARITRA DUTTA, JIA GOU, KAK CHOON LOY, MARK THOM, DIMITAR TRENEV, *Mathematical Modeling in Industry XVIII*, Institute of Mathematics and its Applications Preprint Series 2440, October 2014.

#### ACADEMIC COLLABORATORS

Center for Research in Computer Vision (CRCV), UCF.

Computational Imaging Lab (CIL), UCF.

The University of Edinburgh, Scotland.

COLLABORATIVE  
INDUSTRY PROJECTS

Lockheed Martin Corporation Missiles and Fire Control, Orlando, FL 32819, on *Quadratic Correlation Filter*, since January 2015.

“Math Modeling in Industry XVIII” workshop for graduate students, organized by Institute for Mathematics and its Application (IMA), held in University of British Columbia, in August 2014, to work for EXXONMOBIL on project titled *Efficient and Robust Solution Strategies for Saddle-Point Systems*, under the supervision of Dr. Dimitar Trenev.

“Math Modeling in Industry XIX” workshop for graduate students, organized by IMA, held in University of Minnesota, in August 2015, to work for 1QB INFORMATION TECHNOLOGY on project titled *Sparse Recovery Using Quantum Annealing*, under the supervision of Pooya Ronagh and Prof. Michael Lamoureaux.

## EXPERIENCES

Spring 2017	Adjunct, Department of Mathematics, University of Central Florida (UCF).
Fall 2016	Graduate Research Assistant, Center for Research in Computer Vision (CRCV), UCF.
August 2010 - Fall 2016	Graduate Teaching Assistant and Associate, UCF.
January 2011 - December 2011, Summer 2012	Graduate Research Assistant, GAUSS Project, UCF.
June 2008 - August 2010	Assistant Professor of Mathematics, FIITJEE Limited, India.

SELECTED  
CONFERENCE AND  
INVITED TALKS

Invited talk at Minisymposium Computational methods for large-scale machine learning in imaging, at SIAM Conference on Imaging Science, Bologna, Italy, June 2018.

Invited talk *Online and Batch Supervised Background Estimation via L1 Regression* at KAUST workshop on Optimization and Big Data, February 2018.

Oral presentation *A Batch-Incremental Video Background Estimation Model using Weighted Low-Rank Approximation of Matrices* at ICCV-Robust Subspace Learning workshop, Venice, Italy, October 2017 (joint work with Prof. Xin Li of UCF and Prof. Peter Richtárik of KAUST and University of Edinburgh).

Oral presentation *Weighted Low Rank Approximation for Background Estimation Problems* at ICCV-Robust Subspace Learning workshop, Venice, Italy, October 2017 (joint work with Prof. Xin Li of UCF).

Invited talk at American Mathematical Society’s Sectional Meeting, Orlando, Florida, September 2017 (joint work with Prof. Xin Li of UCF and Prof. Peter Richtárik of KAUST and University of Edinburgh).

Joint work with Prof. Xin Li for poster presentation *A Fast Algorithm for a Special Weighted Low Rank Approximation* at 15th IAPR International Conference on Machine Vision Applications, Nagoya, Japan, May 2017.

Invited talk *A problem of weighted low-rank approximation of matrices and its applications in machine learning* at American Mathematical Society’s annual meeting at Atlanta, Georgia, January 2017.

Joint work with Prof. Xin Li for his invited talk *On the asymptotic behavior of the solutions to the general weighted low-rank approximation as one block of the weights approach to infinity*, at

American Mathematical Society's annual meeting at Atlanta, Georgia, January 2017.

Selected for poster presentation, The Statistical and Applied Mathematical Sciences Institute (SAMSI), Conference on Distributed and Parallel Data Analysis, September 2016.

Selected for poster presentation, The Statistical and Applied Mathematical Sciences Institute (SAMSI) Optimization Summer School, August 2016.

Final presentation on *Sparse recovery using quantum annealing*, in *Math Modeling in Industry workshop for graduate students XIX* organized by Institute for Mathematics and its Application (IMA), Minnesota, August 2015. Technical report and presentation available at <https://www.ima.umn.edu/2014-2015/MM8.5-14.15/24035>.

Poster presentation, Graduate Research Forum, at UCF, March 2015.

Invited talk *An extension of a result of Golub, Hoffman and Stewart* at American Mathematical Society's annual meeting at San Antonio, Texas, January 2015.

Joint work with Prof. Xin Li for his invited talk *Weighted low-rank matrix approximation: a new algorithm based on optimization* at American Mathematical Society's annual meeting at San Antonio, Texas, January 2015.

Final presentation on *Efficient and robust solution strategies for saddle-point systems*, in *Math Modeling in Industry workshop for graduate students XVIII* at University of British Columbia, Vancouver, organized by Institute for Mathematics and its Application (IMA), August 2014. Technical report available at <https://www.ima.umn.edu/sites/default/files/2440.pdf>. <http://www.mathtube.org/lecture/video/math-modeling-industry-team-4-final-report>.

Talk on *Progress on low-rank matrix approximation* in International Conference on Mathematics and Computing (ICMC 2013), jointly organized by Defense Research and Development Organization of India (DRDO), Indian Institute of Technology KGP, and HIT, December 2013.

Talk on *A numerical method for weighted low-rank matrix approximation* in 79th annual conference of Indian Mathematically Society (IMS), December 2013.

Colloquium talk *Weighted low-rank matrix approximation*, Invited speaker at Tennessee Technological University, October 2013.

#### SPECIAL SESSIONS ORGANIZATION

Special session titled "Stochastic Methods and Approximation Theory for Optimization" at the INFORMS Annual Meeting 2018 to be held in Phoenix, Arizona, November 4-7, 2018, jointly with Dr El Houcine Bergou of INRA and KAUST.

#### SELECTED HONORS, FELLOWSHIPS, AWARDS

*Professor Lee H. Armstrong Award for Distinguished Teachers*, Department of Mathematics, UCF, 2017.

*Outstanding Dissertation Award*, Department of Mathematics, UCF, 2016.

Selected as one of 15 student recipients of UCF's Graduate *Dean's Dissertation Completion Fellowship*, Spring 2016.

*Graduate Research Assistantship, Fall 2016*, Center for Research in Computer Vision (CRCV), University of Central Florida (UCF).

Graduate Teaching Assistantship, University of Central Florida.

*Graduate Research Assistantship* 2011 and Summer 2012, for GAUSS PROJECT, a *Computational Science Training for Undergraduates in Mathematical Sciences* funded by NSF.

*Merit scholarship for graduate studies*, Indian Institute of Technology, Dhanbad, 2007-08.

“Ila Mukhopadhyay Memorial Medal-2003” for *Best in Human Qualities*, Presidency College, 2003-04.

TRAVEL  
AWARDS/GRANTS

KAUST travel grant to attend SIAM Conference on Imaging Science, Bologna, Italy, June 2018.

IMA Travel Award (international airfare and ground transportation, lodging, food) for Integrating Machine Learning and Predictive Simulation: From Uncertainty Quantification to Digital Twins Workshop, March 2018.

KAUST travel grant to attend Applied Machine Learning Days workshop and conference, EPFL, Lausanne, Switzerland, January 2018.

KAUST travel grant to attend ICCV, Venice, Italy, October 2017.

KAUST travel grant to attend American Mathematical Society’s Sectional Meeting, Orlando, Florida, September 2017.

SAMSI Optimization Summer School travel and lodging award, August 2016, September 2016.

UCF Mathematics department’s conference registration and travel award, January 2015, November 2015, September 2016, January 2017.

IMA Travel Award (travel, lodging, food) for Math Modeling in Industry Workshop, August 2014 and August 2015.

Student Government Association’s conference registration and travel award, University of Central Florida, August 2014, August 2016.

*Graduate Travel Fellowship*, University of Central Florida, December 2013.

SCIENTIFIC  
REVIEWER

*Referee* of IEEE Journal of Special Topics in Signal Processing (2016/2017 Impact Factor: 5.301).

*Reviewer* of IEEE International Conference on Computer Vision (ICCV 2017).

*Referee* of SIAM Journal on Matrix Analysis and Applications (2015/2016 Impact Factor: 1.883).

*Referee* of SIAM Journal on Imaging Sciences (2015/2016 Impact Factor: 2.687).

*Referee* of Numerical Algorithms, Springer (2015/2016 Impact Factor: 1.367).

TEACHING  
EXPERIENCE

Instructor of record for CALCULUS II, CALCULUS III, MATRIX AND LINEAR ALGEBRA, PROBABILITY, RANDOM PROCESS AND APPLICATIONS. (Class capacity 49-55 students)  
Duties included designing syllabi, writing and grading quizzes and tests, lecturing, and holding office hours. Terms: Spring 2014, Summer 2014, Fall 2014 (two sections), Summer 2015, Summer 2016, Fall 2016, Spring 2017.

Teaching Assistant for large class (over 250 students) of CALCULUS I, ORDINARY DIFFERENTIAL EQUATION, COLLEGE ALGEBRA.

Duties included holding recitations, office hours, grading quizzes, group activities and tests, and holding review sessions. Terms: Fall 2012, Fall 2013, Spring 2015, Fall 2015. (Two sections in each term)

Mentor for PRE-CALCULUS, CALCULUS I, II, AND III.

Duties included holding problem solving sessions. Terms: Spring 2013, Summer 2013.

Grader for graduate class ADVANCED MATHEMATICS FOR ENGINEERS (MAP 5435).

Duties included grading quizzes and homework assignments. Term: Summer 2012.

#### MENTORING EXPERIENCE

Undergraduate interns, Atal Narayan Sahu and Aashutosh Tiwari from Indian Institute of Technology, Kanpur, in undergraduate research project at VCC, KAUST, May-July 2017.

#### SELECTED COURSEWORK

Analysis 1 and 2, Advanced Linear Algebra and Matrix Theory, Scientific Computing, Advanced Numerical Mathematics, Mathematical Statistics, Ordinary Differential Equations and Applications, Partial Differential Equations, Approximation Techniques, Functional Analysis, Wavelets and Their Applications, Numerical Solutions of PDE, Introduction to Differential Geometry, Computer Vision, Complex Variables, Measure and Topology, Analysis of Low Dimensional Structure in High Dimensional Data, Operator Theory (as Directed Research class), Compressive Sensing (as Directed Research class).

#### COMPUTER PROFICIENCY

MATLAB, Python, Julia, TensorFlow, Keras, L<sup>A</sup>T<sub>E</sub>X.

#### PROFESSIONAL RECOGNITION AND HONORS

American Mathematical Society - Graduate student member.

SIAM - Graduate student member.

Member of Computer Vision Foundation (CVF).

Graduated with Udacity Deep Learning Nanodegree. See certificate at <https://graduation.udacity.com/confirm/2LZ7MWWG>.

#### REFERENCES

Prof. Peter Richtárik  
EPSRC Fellow in Mathematical Sciences  
Associate Professor of Computer Science  
Associate Professor of Applied Maths  
and Computational Science  
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