

Samuel Chun-Pong Lau

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Research Interests

Image Restoration, Turbulence Mitigation, Face Recognition at Long Range, Adversarial Robustness, On-manifold Adversarial Training, Generative Model, Scientific Computing

Education

Johns Hopkins University	USA
<i>Ph.D. in Computer Science</i>	2020-Present
<ul style="list-style-type: none">○ Affiliation: Artificial Intelligence for Engineering and Medicine Lab, Mathematical Institute for Data Science○ Advisor: Prof. Rama Chellappa	
University of Maryland, College Park	USA
<i>M.S. in Applied Mathematics and Scientific Computation</i>	2018-2020
<ul style="list-style-type: none">○ Affiliation: University of Maryland Institute for Advanced Computer Studies○ Advisor: Prof. Rama Chellappa	
The Chinese University of Hong Kong	Hong Kong
<i>M.Phil. in Mathematics</i>	2016-2018
<ul style="list-style-type: none">○ Advisor: Prof. Ronald Lok Ming Lui○ Thesis: Deformation Processing for Image Restoration and Retargeting	
The Chinese University of Hong Kong	Hong Kong
<i>B.Sc. in Mathematics, Second Class Honors Upper Division</i>	2012-2016
<ul style="list-style-type: none">○ Streams: Enrichment Stream in Mathematics, Computational and Applied Mathematics Stream	

Research Experience

Research Assistant at Johns Hopkins University	2020.8 - present
<ul style="list-style-type: none">○ Advisor: Prof. Rama Chellappa○ Collaboration with: Prof. Soheil Feizi○ Project: DARPA Guaranteeing AI Robustness Against Deception (GARD)<ul style="list-style-type: none">• <i>On-manifold Adversarial Training with Exact Manifold Information using Normalizing Flow</i>• <i>Robust Object Detection</i>• <i>Identification of Attack-Specific Signatures in Adversarial Examples</i>• <i>Robust Interpolated On-Manifold Adversarial Training</i>• <i>Transferability of Robustness in Mutual Learning</i>• <i>Foundation Research on On-Manifold Adversarial Robustness</i>	
Research Assistant at University of Maryland, College Park	2018.12 - 2020.8
<ul style="list-style-type: none">○ Advisor: Prof. Rama Chellappa○ Collaboration with: Prof. Carlos Castillo○ Project: IARPA JANUS	

- *Single Face Restoration at Long Range*
- *Single Face Semantic-Aware Restoration and Recognition at Long Range*
- *Semi-Supervised Facial Landmark Localization and Restoration at Long Range*

Research Assistant at The Chinese University of Hong Kong

2016.8 - 2018.8

- Advisor: Prof. Ronald Lok Ming Lui
- Project: Mathematical Models for Deformation Analysis and Their Applications
 - *Restoration of Atmospheric Turbulence-Distorted Images via RPCA and Quasiconformal Maps*
 - *Real-Time Turbulence-Degraded Images Restoration in a Variational Framework*
 - *Data-Driven Turbulence-Degraded Images Restoration*

Research Internship at The Chinese University of Hong Kong

2015.9 - 2016.7

- Advisor: Prof. Ronald Lok Ming Lui
- Conducted research in Convolutional Neural Network with applications to computer vision
- Conducted research in Quasi-conformal Geometry with applications to motion frames interpolation

Book Chapter

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- [1] CP Lau and R Chellappa, Remote Face Recognition. *Encyclopedia of Cryptography, Security and Privacy*, Springer, (2021).

Publications and Preprints

Submitted

- J Liu, A Levine, CP Lau, R Chellappa, S Feizi, Segment and Complete: Defending Object Detectors against Patch Attacks with Robust Patch Detection. Under review
- CP Lau, J Liu, S Feizi, R Chellappa, Invertible Augmentation: Exact Manifold Adversarial Augmentation Using Normalizing Flows. Under review
- CP Lau, J Liu, H Souri, WA Lin, S Feizi, R Chellappa, Robust Interpolated Dual Manifold Adversarial Training. Under review
- J Liu, CP Lau, S Feizi, R Chellappa, Mutual Adversarial Training: Exploiting the Transferability of Robustness. Under review
- P Khorramshahi, H Souri, M Goldblum, CP Lau, R Chellappa, Identification of Attack-Specific Signatures in Adversarial Examples. Under review

Published/Accepted

- [10] PH MA, CP Lau, N Yu, A Li, JP Sheng, Application of Deep Learning for Image-based Chinese Food Nutrients Estimation. *Food Chemistry*. (2021)
- [9] CP Lau, C Castillo, R Chellappa, ATFaceGAN: Single Face Semantic Aware Image Restoration and Recognition from Atmospheric Turbulence. *IEEE Transactions on Biometrics, Behavior, and Identity Science (TBIOM)*. (2021)
- [8] PH MA, CP Lau, N Yu, A Li, JP Sheng, Q Wang, P Liu, Image-based Nutrient Estimation for Chinese Dishes Using Deep Learning, *Food Research International* (2021)
- [7] CP Lau, A Kumar, R Chellappa, AT-Key: Semi-Supervised Landmarks Guided Restoration of Atmospheric Turbulent Images, *IEEE Journal of Selected Topics in Signal Processing (JSTSP)*. (2021)

- [6] WA Lin¹, **CP Lau**¹, A Levine, R Chellappa, S Feizi, Dual Manifold Adversarial Robustness: Defense against Lp and non-Lp Adversarial Attacks, *Conference on Neural Information Processing Systems (NeurIPS)* (2020)
- [5] WH Chak, **CP Lau**, LM Lui, Subsampled Turbulence Removal Network. *Journal on Mathematics, Computation and Geometry of Data* (2020)
- [4] **CP Lau**, H Souri, R Chellappa, ATFaceGAN: Single Face Image Restoration and Recognition from Atmospheric Turbulence. *IEEE International Conference and Workshops on Automatic Face and Gesture Recognition* (2020) (**Oral**) (**Honorable Mention Award**)
- [3] **CP Lau**, YH Lai, LM Lui, Restoration of Atmospheric Turbulence-distorted Images via RPCA and Quasiconformal Maps. *Inverse Problem* (2019).
- [2] **CP Lau**, YH Lai, LM Lui, Variational models for joint subsampling and reconstruction of turbulence-degraded images. *Journal of Scientific Computing*, 1-38 (2018).
- [1] **CP Lau**, CP Yung, LM Lui, Image retargeting via Beltrami representation. *IEEE Transactions on Image Processing (TIP)*, 27(12), 5787-5801 (2018).

Selected Awards

IEEE International Conference and Workshops on Automatic Face and Gesture Recognition	USA
○ <i>Best Paper (Honorable Mention Award)</i>	2020
NeurIPS 2020	USA
○ <i>Travel Award</i>	2020
University of Maryland, College Park	USA
○ <i>Dean's Fellowship</i>	2018-2020
2017 Imaging Science Camp, VISSA	Shenzhen, China
○ <i>Presidential Prize for Best Presentation by Prof. Tony F. Chan</i>	2017
The Chinese University of Hong Kong	Hong Kong
○ <i>Postgraduate Studentship</i>	2016-2018

Talks

1. NeurIPS 2020, December 6-12, 2020, Virtual
Title: Dual Manifold Adversarial Robustness: Defense against Lp and non-Lp Adversarial Attacks ([Link](#))
2. 15th IEEE International Conference on Automatic Face and Gesture Recognition (FG), November 16-20, 2020, Virtual
Title: ATFaceGAN: Single Face Image Restoration and Recognition from Atmospheric Turbulence ([Link](#))
3. SIAM Conference on Imaging Science (IS18), June 5-8, 2018, Bologna, Italy
Title: Variational Models for Joint Subsampling and Reconstruction of Turbulence-degraded Images
4. (Invited talk) The International Conference on Image Processing: Theory, Method and Applications (ICIPTMA), May 19-21, 2017, Heilongjiang, China

¹ First two authors contributed equally

Title: Restoration of Atmospheric Turbulence-distorted images via RPCA and Quasiconformal Maps

5. 2017 Imaging Science Camp, March 10-12, 2017, Shenzhen, China

Title: Restoration of Atmospheric Turbulence-distorted images via RPCA and Quasiconformal Maps

Professional Service

Reviewer	2018-present
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- *IEEE Transactions on Neural Networks and Learning Systems*
- *IEEE Transactions on Pattern Analysis and Machine Intelligence*
- *IEEE Transactions on Multimedia*
- *IEEE Transactions on Computational Imaging*
- *The IEEE International Conference on Advanced Video and Signal-based Surveillance*
- *AAAI Conference on Artificial Intelligence*
- *Conference on Computer Vision and Pattern Recognition (CVPR)*

Teaching Experience

Department of Electrical and Computer Engineering, Johns Hopkins University

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| ○ <i>Teaching Assistant, Guest Lecturer</i> | <i>2020-2021</i> |
| • EN.520.665 Machine Perception. Fall 2021 | |
| • EN.520.650 Machine Intelligence. Spring 2021 | |
| • EN.520.665 Machine Perception. Fall 2020 | |

Department of Mathematics, University of Maryland, College Park

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| ○ <i>Teaching Assistant</i> | <i>2018-2019</i> |
| • MATH120 Elementary Calculus I. Spring 2019 | |
| • MATH141 Calculus II. Fall 2018 | |

Department of Mathematics, The Chinese University of Hong Kong

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| ○ <i>Teaching Assistant</i> | <i>2016-2018</i> |
| • MATH4250 Game Theory. Spring 2018 | |
| • MATH3360 Mathematical Imaging. Fall 2017. | |
| • MATH4250 Game Theory. Spring 2017. | |
| • MATH3360 Mathematical Imaging. Fall 2016. | |

References

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1. Prof. Rama Chellappa
Johns Hopkins University
Department of Electrical and Computer Engineering
Email: rchella4@jhu.edu
 2. Prof. Alan Yuille
Johns Hopkins University
Department of Computer Science

Email: ayuille1@jhu.edu

3. Prof. Ronald Lok Ming Lui
The Chinese University of Hong Kong
Department of Mathematics
Email: lmlui@math.cuhk.edu.hk

Last updated: September 20, 2021