

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

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| 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

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| 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

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| 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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| <ul style="list-style-type: none">○ <i>IEEE Transactions on Neural Networks and Learning Systems</i>○ <i>IEEE Transactions on Pattern Analysis and Machine Intelligence</i>○ <i>IEEE Transactions on Multimedia</i>○ <i>IEEE Transactions on Computational Imaging</i>○ <i>The IEEE International Conference on Advanced Video and Signal-based Surveillance</i>○ <i>AAAI Conference on Artificial Intelligence</i>○ <i>Conference on Computer Vision and Pattern Recognition (CVPR)</i> | |

Teaching Experience

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| Department of Electrical and Computer Engineering, Johns Hopkins University | |
| <ul style="list-style-type: none">○ <i>Teaching Assistant, Guest Lecturer</i><ul style="list-style-type: none">• EN.520.665 Machine Perception. Fall 2021• EN.520.650 Machine Intelligence. Spring 2021• EN.520.665 Machine Perception. Fall 2020 | 2020-2021 |
| Department of Mathematics, University of Maryland, College Park | |
| <ul style="list-style-type: none">○ <i>Teaching Assistant</i><ul style="list-style-type: none">• MATH120 Elementary Calculus I. Spring 2019• MATH141 Calculus II. Fall 2018 | 2018-2019 |
| Department of Mathematics, The Chinese University of Hong Kong | |
| <ul style="list-style-type: none">○ <i>Teaching Assistant</i><ul style="list-style-type: none">• MATH4250 Game Theory. Spring 2018• MATH3360 Mathematical Imaging. Fall 2017.• MATH4250 Game Theory. Spring 2017.• MATH3360 Mathematical Imaging. Fall 2016. | 2016-2018 |

Last updated: October 1, 2021