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**EXPERIENCE**

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- **Louisiana State University (LSU)** Baton Rouge, Louisiana State University, USA  
*Assistant Professor (Tenure-track)* *Since Aug. 2025*
  - **Research Keywords:** Computer vision; Visual representation learning with minimal supervision; Scene understanding; Video analysis; Multi-modality perception; Geometric inference.
- **University of California, Los Angeles (UCLA)** Los Angeles, California, USA  
*Postdoctoral Research Scholar* *July 2021 – July 2025*
  - **Academic Advisor:** Stefano Soatto.

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**EDUCATION**

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- **King Abdullah University of Science and Technology (KAUST)** Thuwal, Saudi Arabia  
*Ph.D. in Applied Mathematics and Computer Science* *Jun. 2017 – Jun. 2021*
  - **Academic Advisor:** Ganesh Sundaramoorthi.
  - **Dissertation:** Mathematical Modeling for Online Video Understanding.  
Approved by: Ganesh Sundaramoorthi, Peter Wonka, Helmut Pottmann, Wolfgang Heidrich, Stefano Soatto.
- **King Abdullah University of Science and Technology (KAUST)** Thuwal, Saudi Arabia  
*M.S. in Applied Mathematics and Computer Science* *Aug. 2015 – May 2017*
  - **Thesis:** Minimum Delay Moving Object Detection.
- **Shanghai Jiao Tong University (SJTU)** Shanghai, China  
*B.S. in Mathematics and Applied Mathematics, Honours Degree by Zhiyuan College* *Sept. 2011 – Jun. 2015*
  - **Thesis:** Complex and Coupled Complex Negative Order AKNS Equation.

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**RESEARCH**

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- **Fully Unsupervised Object Discovery from Videos by Motion** UCLA  
*Supervised by Professor Stefano Soatto*
  - A real-time unsupervised multi-object discovery scheme with slot attention and adversarial learning.
  - Breaking the constraint on object-centric data and binary segmentation from existing approaches.
- **Performance Boosting for Vision Transformers (ViTs) at Inference Time** UCLA  
*Supervised by Professor Stefano Soatto*
  - An efficient ensemble method enhancing ViT features leveraging group transformations (ICML 24).
- **Atmospheric Turbulence Mitigation for Computational Imaging** UCLA  
*Supervised by Professor Stefano Soatto*
  - An aggregation and registration scheme improving pre-image templates for turbulence removal (CVPR 24).
- **Geometric Inference as Generic Visual Representation Learning** UCLA  
*Supervised by Professor Stefano Soatto, in collaboration with Yale Vision Lab*
  - Investigating monocular depth estimation as pre-training for downstream semantic tasks (ECCV 24).
  - Incorporating language priors to improve monocular depth estimation accuracy (CVPR 24, NeurIPS 24).
  - A novel data augmentation pipeline for unsupervised depth completion (ECCV 24).
- **Channel-Directed Optimization for Convolutional Neural Networks** KAUST  
*Supervised by Professor Ganesh Sundaramoorthi and Professor Anthony Yezzi*
  - Channel-directed gradients based on Sobolev metrics for stable CNN training.
  - Extension to accelerated optimization and optimizer stability analysis (NeurIPS 22; JMLR 24).
- **Layered Segmentation and Representation for Videos** KAUST  
*Supervised by Professor Ganesh Sundaramoorthi*
  - A layered formulation for moving object segmentation modeling self-occlusions (ECCV 18).

- An optical-flow guided framework for video inpainting based on layered formulation (ICCV 21).

## • **Unsupervised Domain Adaptation for Semantic Segmentation**

UCLA & KAUST

*Supervised by Professor Stefano Soatto*

- Conditional Prior Network for scene-compatibility prior in semantic segmentation (CVPR 20).

## • **Minimum Latency Computer Vision in Videos**

KAUST

*Supervised by Professor Ganesh Sundaramoorthi*

- A multi-frame moving object detection and segmentation scheme minimizing detection delay (CVPR 17).
- A generic minimum latency framework compatible with major single-frame object detectors (ICCV 19).

## • **Solitary Solution Analysis for Nonlinear PDEs**

SJTU

*Supervised by Professor Guofu Yu*

- Derivation and analysis on the solitary solutions of complex AKNS(-1) equation (Commun Nonlinear Sci 16).

## PEER-REVIEWED PUBLICATIONS

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<sup>†</sup>: *corresponding author*; \*: *equally contributed*.

- **RSA: Resolving Scale Ambiguities in Monocular Depth Estimators through Language Descriptions**  
Z Zeng, Y Wu, H Park, D Wang, F Yang, S Soatto, **D Lao**, BW Hong, A Wong<sup>†</sup>, 2024 NeurIPS.
- **On the Viability of Monocular Depth Pre-training for Semantic Segmentation**  
**D Lao**, F Yang, H Park, D Wang, S Lu, A Wong, S Soatto<sup>†</sup>, 2024 ECCV.
- **AugUndo: Scaling Up Augmentations for Monocular Depth Completion and Estimation**  
Y Wu, TY Liu, H Park, S Soatto, **D Lao**, A Wong<sup>†</sup>, 2024 ECCV.
- **Sub-token ViT Embedding via Stochastic Resonance Transformers**  
**D Lao**<sup>†</sup>, Y Wu, TY Liu, A Wong, S Soatto<sup>†</sup>, 2024, ICML.
- **Diffeomorphic Template Registration for Atmospheric Turbulence Mitigation**  
**D Lao**<sup>†</sup>, C Wang, A Wong, S Soatto<sup>†</sup>, 2024, CVPR (highlight).
- **WorDepth: Variational Language Prior for Monocular Depth Estimation**  
Z Zeng, D Wang, H Park, F Yang, S Soatto, **D Lao**, A Wong<sup>†</sup>, 2024, CVPR.
- **A PDE-based Explanation of Extreme Numerical Sensitivities and Edge of Stability in Training Neural Networks**  
Y Sun, **D Lao**, A Yezzi, G Sundaramoorthi<sup>†</sup> 2024, JMLR.
- **Surprising Instabilities in Training Deep Networks and a Theoretical Analysis**  
Y Sun, **D Lao**, G Sundaramoorthi, A Yezzi<sup>†</sup>, 2022, NeurIPS.
- **Accelerated PDEs for Construction and Theoretical Analysis of an SGD Extension**  
Y Sun, **D Lao**, G Sundaramoorthi, A Yezzi<sup>†</sup>, 2021, The Symbiosis of Deep Learning and Differential Equations.
- **Flow-Guided Video Inpainting with Scene Templates**  
**D Lao**<sup>†</sup>, P Zhu, P Wonka, G Sundaramoorthi, 2021, ICCV.
- **Phase Consistent Ecological Domain Adaptation**  
Y Yang\*, **D Lao**\*, G Sundaramoorthi, S Soatto<sup>†</sup>, 2020, CVPR.
- **Minimum Delay Object Detection in Videos**  
**D Lao**<sup>†</sup>, G Sundaramoorthi, 2019, ICCV.
- **Extending Layered Models to 3D Motion**  
**D Lao**<sup>†</sup>, G Sundaramoorthi, 2018, ECCV.
- **Minimum Delay Moving Object Detection**  
**D Lao**, G Sundaramoorthi<sup>†</sup>, 2017, CVPR.
- **Complex and Coupled Complex Negative Order AKNS Equation**  
GF Yu<sup>†</sup>, **D Lao**, 2016, Communications in Nonlinear Science and Numerical Simulation 30 (1-3).

## PREPRINTS, UNDER REVIEW & ONGOING

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- **Divided attention: Unsupervised Multi-Object Discovery with Contextually Separated Slots**  
**D Lao**, Z Hu, F Locatello, Y Yang, S Soatto.
- **Channel-Directed Gradients for Optimization of Convolutional Neural Networks**  
**D Lao**, P Zhu, P Wonka, G Sundaramoorthi.
- **Occom's Razor: Unsupervised Depth Completion by Learning from Occlusions**  
H Park, R Chen, P Rim, S Soatto, **D Lao**, A Wong.
- **Efficient Self-supervised Visual Representation Learning from Videos through Local-Global Occlusion Prediction.**  
**D Lao**, R Duan, A Wong, S Soatto.

## MISCELLANEOUS

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- Since 2017, reviewer of major computer vision and artificial intelligence conferences and journals, including TPAMI, IJCV, CVPR, ICCV, ECCV, NeurIPS, ICML, ICLR, AAAI, BMVC, WACV, ACCV, etc.
- 2023, Runner-up of 6th CVPR UG2<sup>+</sup> challenge (Atmospheric Turbulence Mitigation track).
- Since 2023, coordinator of UCLA Vision Seminar.
- 2017, teaching assistant of AMCS241 (Probability and Random Process).
- 2012, 2013, third prize scholarship; 2013, Merit Student.
- Part-time co-founder of LOCOMO Coaching & Consulting, focusing algorithm design for endurance sports.
- Former president and racing team captain of SJTU cycling club.
- Half Ironman finisher; Scuba diving (hypoxic Trimix and cave certified); Free diving (assistant instructor).