

SHRIPAD V DESHMUKH

UMass Amherst | Adobe | IIT Madras

[Personal Page](#) [Google Scholar](#) [LinkedIn](#) [Email](#) [Mobile](#)

(Last update: Dec'23)

BACKGROUND

- Reinforcement Learning – *Human-centric decision making, Interpretability, Transformers, Inverse RL*
- Computer Vision – *Image recognition, Document analysis, Video segmentation, Multi-modal learning*

EDUCATION

University of Massachusetts Amherst

MS/PhD (Year-I) in Computer Science; Advisor: [Prof. Scott Niekum](#)

Sept'23 – Present

Indian Institute of Technology, Madras

BTech in Electrical Engineering, CGPA: 9.20/10

Aug'16 – Jul'20

RELEVANT COURSEWORK

Responsible AI	Research Methods for Empirical CS	Reinforcement Learning
Game Theory	Deep Learning for Computer Vision	Pattern Recognition & Machine Learning
Convex Optimization	Linear Algebra for Data Analysis	Probability, Statistics & Stochastic Process

CONFERENCE PUBLICATIONS

- S Singh, **S Deshmukh**, M Sarkar, B Krishnamurthy. "[LOCATE: Self-supervised Object Discovery via Flow-guided Graph-cut and Bootstrapped Self-training](#)". *Published at British Machine Vision Conference, 2023.*
- **S Deshmukh**, A Dasgupta, C Agarwal, N Jiang, B Krishnamurthy, G Theocharous, J Subramanian. "[Explaining RL Decisions with Trajectories](#)". *Published at International Conference on Learning Representations, 2023.*
- **S Deshmukh***, A Java*, M Aggarwal, S Jandial, M Sarkar, B Krishnamurthy. "[One-Shot Doc Snippet Detection: Powering Search in Document Beyond Text](#)". *Published at IEEE/CVF Winter Conference on Applications of Computer Vision, 2023.*
- P Gupta, N Puri, S Verma, D Kayastha, **S Deshmukh**, B Krishnamurthy, S Singh. "[Explain Your Move: Understanding Agent Actions Using Focused Feature Saliency](#)". *Published at International Conference on Learning Representations, 2020.*

WORKSHOP PUBLICATIONS

- **S Deshmukh**, Srivatsan R, S Vijay, J Subramanian, C Agarwal. "[Counterfactual Explanation Policies in RL](#)". *Published at ICML Workshop on Counterfactuals in Minds & Machines, 2023.*
- S Jandial, **S Deshmukh**, A Java, S Shahid, B Krishnamurthy. "[Gatha: Relational Loss for enhancing text-based style transfer](#)". *Published (Oral) at CVPR Workshop on Computer Vision for Fashion, Art, and Design, 2023.*
- S Singh, **S Deshmukh**, M Sarkar, R Jain, M Hemani, B Krishnamurthy. "[FODVid: Flow-guided Object Discovery in Videos](#)". *Published at CVPRW on Learning with Limited Labelled Data for Image & Video Understanding, 2023.*
- **S Deshmukh**, A Dasgupta, C Agarwal, N Jiang, B Krishnamurthy, G Theocharous, J Subramanian. "[Trajectory-based Explainability Framework for Offline RL](#)". *Published at NeurIPS Offline RL Workshop, 2022.*

PATENTS

- "Novel Self-supervised Object Discovery in Videos". *Attorney Docket No. P12351-US*
- "Account Executive Actionable Digest". *Attorney Docket No. P12314-US*
- "A Framework for Leveraging LLM Models and RL in Marketing Decision Making". *Attorney Docket No. P12223-US*
- "Video Object Segmentation through Flow-guided Graph-cut". *Attorney Docket No. P12170-US*
- "Novel method to propagate personalized error corrections across Forms corpus". *Attorney Docket No. P12004-US*
- "Novel Trajectory-based Explainability Framework for RL-based Decision Making". *Attorney Docket No. P11853-US*
- "Forms Similarity Matching Framework for Enhancing RnC tool in AEM Forms" *Attorney Docket No. P11882-US*
- "A Novel Multimodal One-Shot Detection Approach for Document Snippet Search". *Attorney Docket No. P11686-US*
- "Semantic Noise based Soft Label Regularization for Distilling Model Knowledge". *Attorney Docket No. P11539-US*
- "Novel method to simplify data points for easier understanding of neural networks". *Attorney Docket No. P11364-US*

- “Novel Method and Apparatus to Control Diffusion Model Image Generation”. *Attorney Docket No. P11343 -US, 2022*
- “Refining Element Associations for Form Structure Extraction”. *Attorney Docket No. P10768-US*
- “Customer Journey Management Using Machine Learning”. *Attorney Docket No. P10405-US*

WORK EXPERIENCE

Machine Learning Research Associate, Adobe, Noida	Feb'22– Jul'23
Counterfactual Explanation Policies for RL. <i>In collaboration with C Agarwal</i>	Jan'23– May'23
<ul style="list-style-type: none"> o Taking motivation from counterfactuals in XAI, we investigated, what minimal change to RL agent's current policy would lead it to a certain desired outcome (in terms of the returns). o Proposed COUNTERPOL, a framework for extending XAI counterfactuals to RL policies. Built a generic optimization algorithm that works in diverse state and action spaces. o Showed theoretical connection between RL policy counterfactuals with trust-region optimization in RL. Work published at ICML'23 workshop on counterfactuals. 	
Explaining RL Decisions with Trajectories. <i>In collaboration w/ G Theocharous & Prof. N Jiang (UIUC)</i>	Feb'22– Sept'22
<ul style="list-style-type: none"> o Proposed data grounded explainability for RL – attributing the agent's action to the trajectory experiences in the past. o Formulated a Shapley value-based approach and proposed a scalable implementation based on state-of-the-art sequence modeling of trajectories. Applied the method to gridworlds, Atari games and MuJoCo simulations. o Supported by a human study on trajectory attribution published the work at ICLR'23. 	
Novel Snippet-based Document Search Paradigm. <i>In collaboration with M Sarkar</i>	Apr'22– Aug'22
<ul style="list-style-type: none"> o To cater to the growing need for advanced document search utilities, we proposed a novel one-shot document snippet detection task – a task to identify snippets similar to queried document snippet o Proposed visual similarity metric for documents that can programmatically generate huge query-target dataset required for training deep NNs. Metric helps resolve the issue of high subjectivity & cost of human annotations. o Co-designed multi-modal cross-attention-based architecture, <i>MONOMER</i>, which beats state-of-the-art one-shot object detection & document analysis models (+ data generation heuristic). Published at WACV'23. 	
Deep Agent-Based Models for Simulating Market. <i>In collaboration w/ J Subramanian</i>	Mar'22– Jun'22
<ul style="list-style-type: none"> o Implemented a simulation of the document-sign market to capture multi-agent interactions among the product competitors & consumers. Programmed the simulation from scratch, referring to Deep ABM proposed in this paper. 	
Machine Learning Engineer, Adobe, Noida (Work from Home)	Jun'21 – Jan'22
Shipment of 'List' and 'Section' detection models to Adobe's Automated Forms Conversion Service	Dec'21 – Jan'22
<ul style="list-style-type: none"> o Deployed <i>Deformable DETR</i>-based list & section extraction with around 11% gain in class conversion quality 	
Conversion of Flamingo Forms Dataset to MS-COCO format	Sept'21 – Nov'21
<ul style="list-style-type: none"> o Came up with an idea to convert <i>Flamingo Forms</i>, an Adobe proprietary document dataset, to standard MS-COCO format to be able to leverage the latest models of the fast-growing image recognition field o Benchmarked performance of over 10 recent semantic segmentation + object detection approaches on 18 document classes. This exercise boosted the conversion quality of the entire service by 7%. 	
Detecting Table Bounds in Form Documents	May'21 – Jul'21
<ul style="list-style-type: none"> o Trained Semantic Segmentation models '<i>EfficientDet</i>', '<i>RetinaNet</i>', & Object Detection approaches '<i>YOLOv3</i>' & '<i>YOLOv5</i>' to capture bounds of tables within <i>blank</i> forms. Shipped the best model with 9.5% better table detection. 	
Member of Technical Staff, Adobe, Noida (Work from Home)	Aug'20 – May'21
Risk minimization in Customer Journey Management using Inverse RL	Oct'20 – Dec'20
<ul style="list-style-type: none"> o Ideated use of trajectory-based inverse RL methods for minimizing risk involved in customer journey interventions. o Achieved more than 20% reduction in customer churn rate for batch RL settings. Filed patent for the idea. 	
Multimodal Element Association	Oct'20 – Feb'21
<ul style="list-style-type: none"> o Debugged & deployed <i>TensorFlow 1.x</i> codebase for using segmentation masks as prior in a multi-modal element association pipeline. This resulted in 15% precision & 4% recall gain in extracting higher-order document structures. o Drafted patent-idea for prior inclusion, '<i>Refining form structures...</i>' which is now part of exemplary drafts on <i>Adobe Brightidea</i> (the only addition of year 2021). 	

INTERNSHIPS

Summer Research Intern, Adobe, Noida	May'19 – Aug'19
Explaining RL Agents with Saliency Attribution. <i>Mentors: N Puri, S Verma, P Gupta</i>	
<ul style="list-style-type: none"> o Collaboratively proposed a new saliency metric for visual explanations of RL policy, significantly outperforming prior art in terms of specificity and relevance of the generated saliency maps. 	

- o Co-Produced explanations for *Stockfish* chess engine. Extended the idea to *LeelaChess-0*, *Minigo* Go agent, and Atari games agents trained for *Pong*, *Breakout*, and *Space-Invaders*. The research is **published at ICLR 2020**.

Research & Development (R&D) Intern, Center for Development of Advanced Computing, Pune Dec'18 – Jan '19

Matrix and Graph Computations in High-Performance Computing. *Mentors: Prof. N Karmarkar, Dr. VCV Rao*

- o Part of [National Supercomputing Mission](#), a project aimed at creating a supercomputer cluster to empower Indian R&D
- o Developed FORTRAN libraries to test & extract the performance of Intel Linear Algebra Kernels for matrices
- o Successfully integrated all the existent modules developed for the project under one Unified Object-Oriented Interface, along with complete documentation. Additionally, I worked on algorithms for generating hyper-graphs.

SCHOLASTIC AWARDS & ACHIEVEMENTS

- National Prize Certificate holder for top students at IIT Madras (<7%) 2017
- Secured All India Rank (AIR) 323 in [JEE Advanced](#) (top 0.16%) and AIR 491 in [JEE Mains](#) (top 0.03%) 2016
- Selected for [Kishore Vaigyanik Protsahan Yojana](#) Fellowship with overall national rank of 621 2015
- Ranked among the top 1% in [National Chemistry Olympiad](#) 2015
- Recipient of [National Talent Search Exam \(NTSE\)](#) Scholarship (Stage II - AIR 516, Stage I – State Topper) 2012

VOLUNTEERING & MENTORSHIP

Reviewer

- o ICLR'24, NeurIPS'23

Member of organizing committee, DX Coding Competition for at Adobe, Noida Mar'23

- o Organized a grand ML contest for UGs where I was one of the designers of problem statement & evaluation setup

Mentor at Adobe, Noida Summers – 21, 22, 23

- o Mentored 5 research interns working on various problems in the field of RL and multimodal learning

Moderator at Liberty, Equality, and Fraternity (LEAF) Society, IIT Madras Jan'20 – May'20

- o LEAF is a society of 20+ students established to instill a culture of healthy discussions on diverse socio-economic issues faced by the world, and India in particular. Joined as a member in August 2019.
- o Got elected as a moderator for Jan-May'20 semester. Conducted 8 discussion sessions during my tenure. Sessions included discussion on topics such as agrarian distress, the COVID-19 situation, deep dive on human rights, etc.

Coordinator at Extra Mural Lectures (EML), IIT Madras Jun'17 – May'18

- o EML is an official IIT Madras student body that organizes lectures on various topics: Arts, Technology, Culture, etc.
- o As a part of EML, got an opportunity to organize lectures by luminaries such as Orkut Büyükkökten, Nirmala Sitharaman (then Defence Minister), Dr. Prakash Amte (Magsaysay Award Winner), D. Subbarao (Ex. RBI Governor).
- o I took responsibility of organizing a lecture at SRM university, outside IITM, as an initiative to expand EML.