# Jinen Setpal

+1 (765) 490-1435 | jinen@setpal.net | jinen.setpal.net | github.com/jinensetpal | dagshub.com/jinensetpal

## EDUCATION

**Purdue University**                                                                    Aug. 2024 – Present
*Doctor of Philosophy, Electrical & Computer Engineering*                   *West Lafayette, IN, USA*
**Relevant Coursework:** Optimization for Deep Learning, Machine Learning Theory, Computational Optimal Transport
& Deep Generative Models, Real Analysis & Measure Theory, Numerical Linear Algebra, Random Variables & Signals,
Trustworthy ML, Modern Differential Geometry

**Purdue University**                                                                    Aug. 2021 – May 2024
*Bachelor of Science in Data Science*                                               *West Lafayette, IN, USA*
**Relevant Coursework:**

- **Graduate Level:** Deep Learning, Advanced Topics in Reasoning with Large Language Models, Applied
  Regression Analysis, System Security

- **Undergraduate Level:** Data Mining & Machine Learning, Large Scale Data Analysis, Intro to AR/VR,
  Embedded Systems, Data Structures & Algorithms, Linear Algebra, Statistical Theory, Multivariate Calculus,
  Probability, Statistical Programming

## PUBLICATIONS

**Improving Feature Alignment in ConvNets using ContrastiveCAMs**
**and Core-Focused Cross-Entropy**                                               Sep. 2025
*Under peer review.*                                                                 *Purdue University, USA*

- Derived *ContrastiveCAMs*, an approach for computing feature attribution maps with strong theoretical correctness
  guarantees in convnets.
- Spurious Correlations observed with ContrastiveCAMs motivated an alignment-motivated constraint to ERM,
  called *Core-Constrained Risk Minimization* – this enforces only target-relevant regions (e.g., foreground from
  semantic segmentation) being used to inform predictions.
- Developed a classification-calibrated modification to cross-entropy as a surrogate for solving the constrained
  optimization objective, which learns to suppress non-target regions while extracting predictive performance.
- Reported state-of-the-art performance on robustness datasets: Hard-ImageNet, Spawrious; notable alignment
  improvements for general binary, multiclass & multilabel settings: Oxford IIIT-Pets, PASCAL VOC; as well as
  improvements as a pre-training backbone in downstream segmentation tasks.

**BoilerBot: A Reliable Task-Oriented Chatbot Enhanced**
**with Large Language Models**                                                   Oct. 2023
*2nd Proceedings of Alexa Prize TaskBot (Alexa Prize 2023). Hu, **Setpal**, et al.*      *Purdue University, USA*

- Fine-tuned 8-bit quantized large language models using LoRA for downstream tasks such as task title augmentation
  and patching failures within speech recognition.
- First-author on the grant proposal; earned $250,000 in funding and an AWS account with unrestricted compute.
- Extended Amazon's COBOT (Conversational Bot) Toolkit, integrating custom APLs and logic modules for
  constraint-based state management.

**CutLang V2: Advances in a runtime-interpreted analysis description**
**language for HEP data**                                                        Jul. 2021
*Frontiers in Big Data, 4, 27. Ünel, Sekmen et al.*                                 *CERN, Switzerland*

- Developed Interpreter Functions through lexical analysis using Flex & Bison (.cpp).
- Setup CI/CD Scripts w/ Automated Email Delivery using GitHub Actions & SendGrid.

**ArchiMeDe @ DankMemes: A New Model Architecture for Meme Detection**          Dec. 2020
*7th Evaluation Campaign, Final Workshop, EVALITA 2020. **Setpal**, Sarti*              *Turin, Italy*

- Achieved .7664 F1-Score on test dataset (+.2466 baseline) w/ Video Presentation during final workshop.
- Built a multimodal ensemble using transfer learning by fine-tuning AlexNet, DenseNet & ResNet.

## EMPLOYMENT

### Machine Learning Engineer
Jun. 2022 – Aug. 2024

*DagsHub*
*Tel Aviv, Israel*

- Built generalized auto-labelling workflows integrating Label Studio with MLflow, which automates inference from any model registered on DagsHub enabling easy setup of active-learning pipelines.
- Developed intelligent prefetching, automatic path-column and datatype detection, data streaming and automated tensorization to enable training on data indexed within the Data Engine.
- Developed and deployed DPT: a conversational agent that enables users to interact with DagsHub documentation, and debug machine learning projects incorporating tools integrated within the DagsHub stack.
- Developed a data streaming client by monkeypatching Python's `open()` and extending FUSE to lazily pull files from a specified remote using DagsHub's web APIs.
- Built trainer integrations (automatic data, model, experiment and artifact logging) with the PyCaret framework, HuggingFace's Transformers library, and YOLOv8, to simplify adding observability to training workflows.
- Implemented and deployed open-source data science projects reproducing and extending past research. Examples: CheXNet, Panoptic Deeplab, YOLOv6.

### Systems Developer
Sep. 2020 – Jul. 2021

*Teachiq AB / exam.net*
*Stockholm, Sweden*

- Packaged custom security implementations by forking open source xmodmap(.c) utility to a node.js module for exam.net's linux-based exam-delivery kiosk application.
- Reproducibly exploited the assessment kiosk on exam.net's web client and recommended mitigations.

## FUNDED RESEARCH

### Drone Video Object Recognition
Jan. 2022 – May 2023

*NSF Award 21204301 – PI: Prof. Yung-Hsiang Lu*
*Purdue University, USA*

- Team lead over the Spring 2023 Semester. Our team attempted to leverage Gazebo, ROS2 & the previous year's scoring function to develop a multi-agent reinforcement learning approach to the sample solution. Won 2nd Place for the **Undergraduate Research Expo Award** under Purdue College of Science.
- Developed an architecture for split-confidence resolution, achieving .9937 test accuracy as part of the reference solution made for the IEEE international autonomous UAV competition. Bootloader patching and setup for linux-based drones with OpenVINO accelerated IoT.

### A Systematic Study of Cryptographic Function Identification Approaches in Binaries
Aug. 2021 – Dec. 2022

*NSF Award 2047991 – PI: Prof. Christina Garman*
*Purdue University, USA*

- Employed rudimentary techniques within NLP to establish a baseline approach for reconstructing cryptographic functions from disassembler code used to generate corresponding binaries.
- Evaluated current state-of-art classification tools against rigorous benchmark scripts. Currently under peer-review.

## TRADE SECRETS

### Semi-Supervised Class Activation Mappings for Target Localization & Super-Resolution
Sep. 2021 – Apr. 2022

*Final Presentation, TE AI Cup 2022.* **Setpal**, *et al.*
*TE Corporate, UK*

- Won the **Best Innovation Award**, developing subclassed TensorFlow layers for accurate, efficient prediction over classes with minute differences.
- By evaluating feature vectors from the model's penultimate convolutional layer over a dynamic weight threshold, we generate a bounding box to localize the region of the image critical to the final classification.

### Leveraging Latent Features for Modular Multiclass Classification
Sep. 2021 – Apr. 2022

*Final Presentation, TE AI Cup 2022.* **Setpal**, *et al.*
*TE Corporate, UK*

- Designed & developed a novel modular, scalable architecture for classification achieving .99846 real-data classification accuracy over a +.2466 baseline.
- Implemented a latent feature aggregator network to enable minimal re-training for appending and removing target connectors from the multi-class classifer.

## Conference Presentations

### *The Machine Learning Angle for Open Source Science*
$25^{th}$ Oct. 2023
*The Linux Foundation Member Summit (LFMS) 2023*
*Monterey, CA, USA*

### *Interpretability Tools as Feedback Loops*
$30^{th}$ Nov. 2022
*Toronto Machine Learning Summit (TMLS) 2022*
*Toronto, Canada*

## Projects

### Optimized `torch.cdist` Kernel using Triton
Jun. 2025
*Independent*
*Lafayette, IN, USA*

- Developed a Triton Kernel with an identical API to `torch.cdist`, leveraging similiarities with matmul operation semantics to signficantly reduce both memory and runtime.
- Includes a backward kernel with correctness checks to facilitate training NNs; compatible with `torch.compile`.

### [Re] Graph R-CNN for Scene Graph Generation
Sep. 2023 – Nov. 2023
*DagsHub × ML@Purdue Hackathon Fall 2023*
*West Lafayette, IN, USA*

- Reproduced the Graph R-CNN for Scene Graph Generation paper as the template repository for the Scene Graph Generation Challenge in the beginner section of the DagsHub × ML@Purdue Hackathon.
- Included functions for model training, inference, registration and data processing for the VisualGenome dataset.

### Time-Series Modelling for Outbreak Prediction
Oct. 2021
*CERN's The Port Hackathon*
*West Lafayette, IN, USA*

- Predicted *oidium* outbreaks within vineyards in Germany.
- Achieved test accuracy of 0.995 ($\pm 0.0025$) when predicting outbreak risk, trained on daily data from 2013 - 2020.

### Embedded Realtime Semantic Segmentation
Feb. 2021 – Apr. 2021
*Independent*
*Mumbai, India*

- Embedded DeeplabV3+ with a MobileNetsv3 backbone to an android application.
- Established a data conversion pipeline (NV21 $\to$ YUV_420_888 $\to$ JPEG $\to$ Bitmap $\to$ TensorImage), with an inference framerate of $\approx 25 fps$ on a Qualcomm SM8150 Snapdragon 855 (7 nm) processor.

## Technical Skills

**Languages**: Python, C, C++, Triton, x86 Assembly, Java, Kotlin, Bash, JavaScript, MATLAB, R, SQL, ROS2
**Frameworks**: PyTorch, JAX, TensorFlow, Keras, Pandas, Pillow, ROOT, Matplotlib, FUSE, Node.js, Express.js
**Tools**: Git, MLFlow, DVC, Docker, Radare2, Ghidra, TravisCI, GitGuardian, Kubernetes, Gazebo
**Cloud Utilities**: Google Cloud Console (Compute, Networking, Storage), Amazon Web Services (Redshift, ECR, ECS, S3, Sagemaker, CodePipeline, CodeCommit, CloudWatch, CloudFormation, Lambda), Azure Pipeline, GitHub Actions

## Teaching

### Graduate Teaching Assistant
Aug. 2025 – May 2026
*ECE 57000 – Artificial Intelligence @ Purdue University*
*West Lafayette, IN, USA*

- Developed questions for the course midterms and final, as well as programming and presentation-based assignments. Held office hours. Enrollment: $\sim 300$ students.
- Developed a web application for LLM-based assignment grading, with a submission gallery and a ranking system.

### Course Instructor
Aug. 2022/2023 – Dec. 2022/2023
*CS 39000 – Web Application Development @ Purdue University*
*West Lafayette, IN, USA*

- Curriculum design and course instructor for a two-credit course. Net enrollment: 100 students.
- Covered HTML/CSS, JavaScript, React, Node.js, Express.js, MongoDB, Web Security & Cloud Hosting.

### Undergraduate Teaching Assistant
Feb. 2022 – May 2022
*STAT 190 – Topics in Statistics for Undergraduates @ Purdue University*
*West Lafayette, IN, USA*

- Lab instructor for Purdue's Corporate Partner MISO, developing industry solutions using Data Science.
- Graded assignments, held office hours, conducted code review. Taught classes on git, CI/CD & Data Mining.

## TECHNICAL PRESENTATIONS

**Sliced Wasserstein Distance, Wasserstein GANs** $17^{th}$ Apr. 2025
*ML@Purdue Reading Group* *West Lafayette, IN, US*

**Introduction to Optimal Transport** $10^{th}$ Apr. 2025
*ML@Purdue Reading Group* *West Lafayette, IN, US*

**Neural Tangent Kernel** $6^{th}$ Mar. 2025
*ML@Purdue Reading Group* *West Lafayette, IN, US*

**Sparse AutoEncoders** $13^{th}$ Feb. 2025
*ML@Purdue Reading Group* *West Lafayette, IN, US*

**Deepseek R1** $30^{th}$ Jan. 2025
*ML@Purdue Reading Group* *West Lafayette, IN, US*

**Average Gradient Outer Product as a Mechanism for Deep Neural Collapse** $24^{th}$ Oct. 2024
*ML@Purdue Reading Group* *West Lafayette, IN, US*

**Deep Neural Collapse** $10^{th}$ Oct. 2024
*ML@Purdue Reading Group* *West Lafayette, IN, US*

**Group Transformation Invariance & Equivariance in CNNs & MLPs** $26^{th}$ Sep. 2024
*ML@Purdue Reading Group* *West Lafayette, IN, US*

**Attention is All You Need** $3^{rd}$ Sep. 2024
*ML@Purdue Reading Group* *West Lafayette, IN, US*

**Omnipredictors** $25^{th}$ Apr. 2024
*ECE ML Reading Group* *West Lafayette, IN, USA*

**Direct Preference Optimization** $28^{th}$ Mar. 2024
*ML@Purdue Reading Group* *West Lafayette, IN, USA*

**Towards Monosemanticity (SAEs)** $8^{th}$ Feb. 2024
*ML@Purdue Reading Group* *West Lafayette, IN, USA*

**A Mathematical Framework for Transformer Circuits** $1^{st}$ Feb. 2024
*ML@Purdue Reading Group* *West Lafayette, IN, USA*

**Deduplicating Training Data Makes Language Models Better** $2^{nd}$ Nov. 2023
*CS 592-LLM — Advanced Topics in Reasoning with Large Language Models* *West Lafayette, IN, USA*

**Groups, Rings & Fields** $25^{th}$ Oct. 2023
*ML@Purdue Reading Group* *West Lafayette, IN, USA*

**OOD Generalization via Risk Extrapolation** $28^{th}$ Mar. 2023
*ML@Purdue Reading Group* *West Lafayette, IN, USA*

**Enforcing Group-Transformation Invariance in MLPs** $24^{th}$ Feb. 2023
*ML@Purdue Reading Group* *West Lafayette, IN, USA*

**Interpretability Tools as Feedback Loops** $21^{st}$ Jan. 2023
*Boilermake X* *West Lafayette, IN, USA*

**AlphaTensor** $15^{th}$ Nov. 2022
*SIGAI Reading Group* *West Lafayette, IN, USA*

## WORKSHOPS

**BlueDot's AI Alignment Fundamentals** $13^{th}$ Sep. 2024 – $12^{th}$ Nov. 2024
*AI Safety Purdue* *West Lafayette, IN, USA*

**Utilizing HPC with SLURM** $31^{st}$ Mar. 2024
*Catapult Hacks* *West Lafayette, IN, USA*

**Parameter-Efficient LLM Fine-Tuning** $9^{th}$ Nov. 2023
*Purdue Hackers × ML@Purdue* *West Lafayette, IN, USA*

**Intro to Data Engine** $21^{st}$ Oct. 2023
*DagsHub × ML@Purdue Hackathon Fall 2023* *West Lafayette, IN, USA*

**Intro to DagsHub** $14^{th}$ Oct. 2023
*DagsHub × ML@Purdue Hackathon Fall 2023* *West Lafayette, IN, USA*

**Training Word Embeddings** 14$^{th}$ Sep. 2023

*Purdue Hackers × ML@Purdue* *West Lafayette, IN, USA*

**Model Registry and Deployment with MLFlow** 6$^{th}$ Apr. 2023

*DagsHub* *West Lafayette, IN, USA*

**Experiment Tracking for Machine Learning with MLFlow** 24$^{th}$ Mar. 2023

*DagsHub* *West Lafayette, IN, USA*

**Linear Regression** 8$^{th}$ Mar. 2023

*ML@Purdue Spring 2023 Workshops* *West Lafayette, IN, USA*

**MLOps for Research Reproducibility** 6$^{th}$ Oct. 2022

*SIGAI Fall 2022 Workshops* *West Lafayette, IN, USA*

## OUTREACH

**Peer Reviewer** Sep. 2025

*NeurReps Workshop @ NeurIPS 2025* *San Diego, CA, USA*

**Program Chair** Oct. 2023 – Nov. 2023

*DagsHub × Purdue Hackathon Fall 2023* *West Lafayette, IN, USA*

**Technical Advisor, Officer** Jan. 2022 – Present

*ML@Purdue / SIGAI* *West Lafayette, IN, USA*