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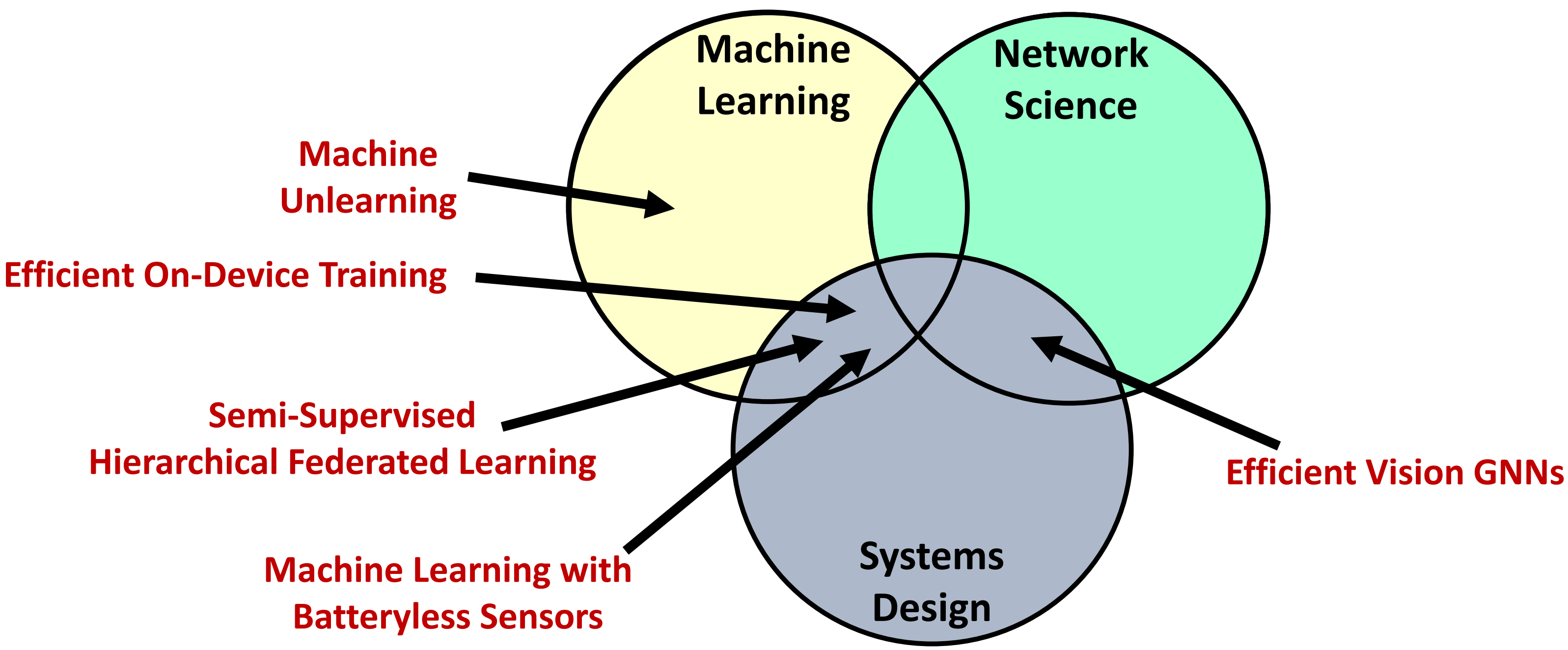
iMAGiNE
INTELLIGENT MACHINE ENGINEERING CONSORTIUM
Machine Learning, Reasoning, and Understanding from Cloud to Edge

SLD
SLD:: System Level Design

The University of Texas at Austin
Chandra Department of Electrical and Computer Engineering
Cockrell School of Engineering

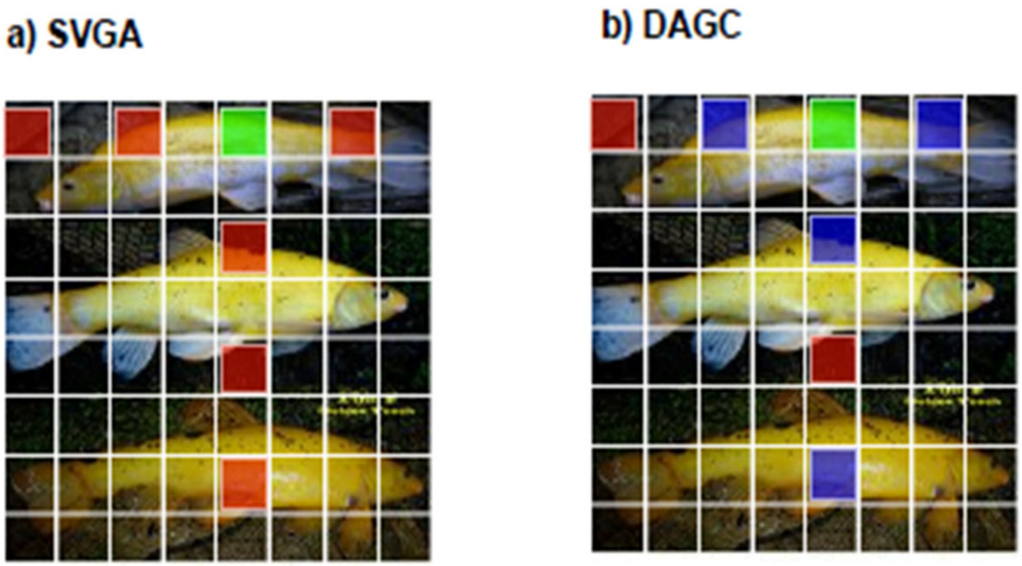
SLD Group @UT



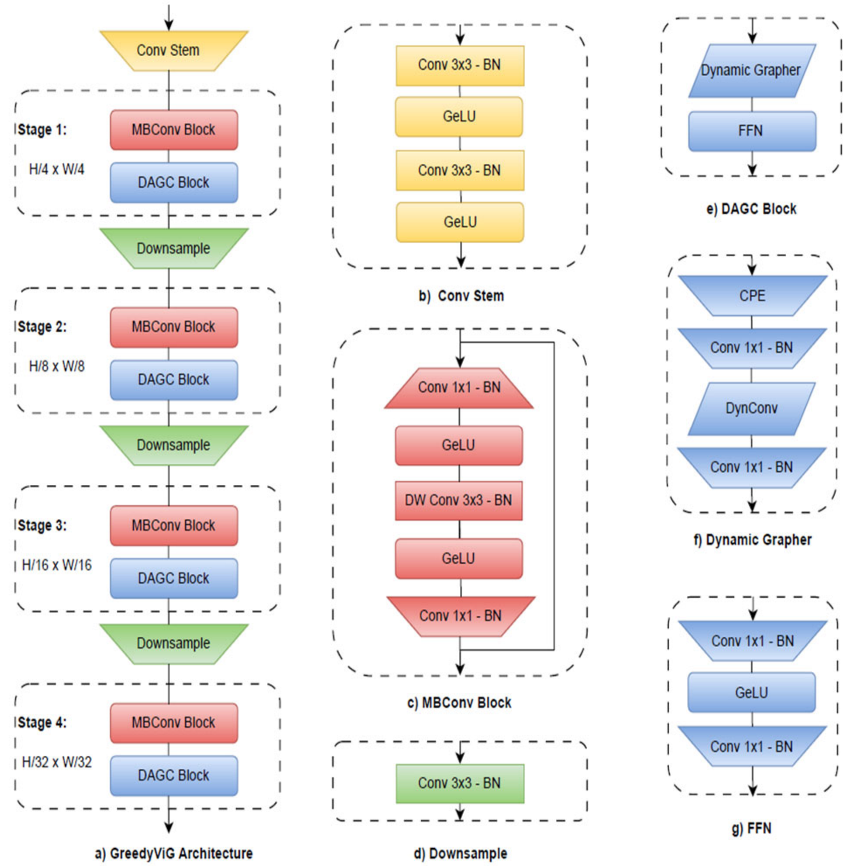
Algorithms + Simulation + Prototyping

Vision Graph Neural Networks

Dynamic Axial Graph Construction (DAGC) and GreedyViG Architecture

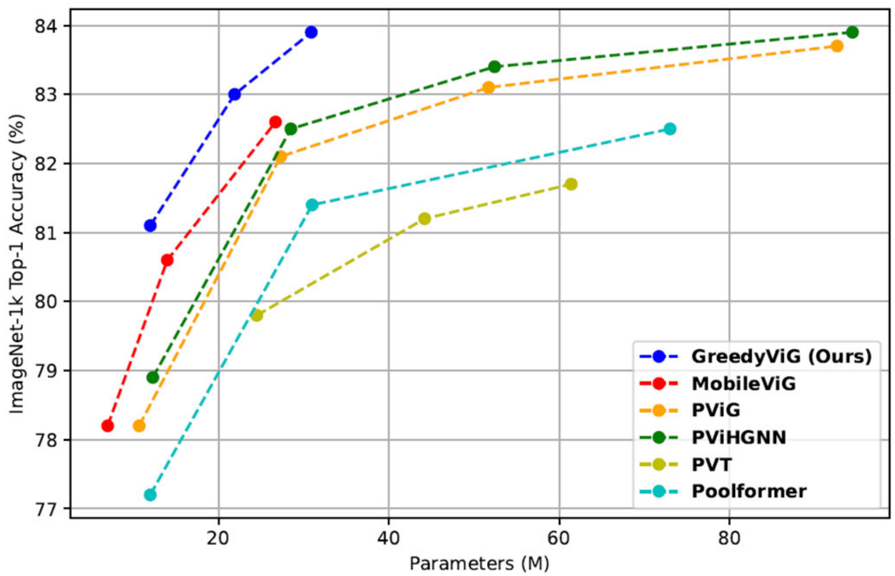


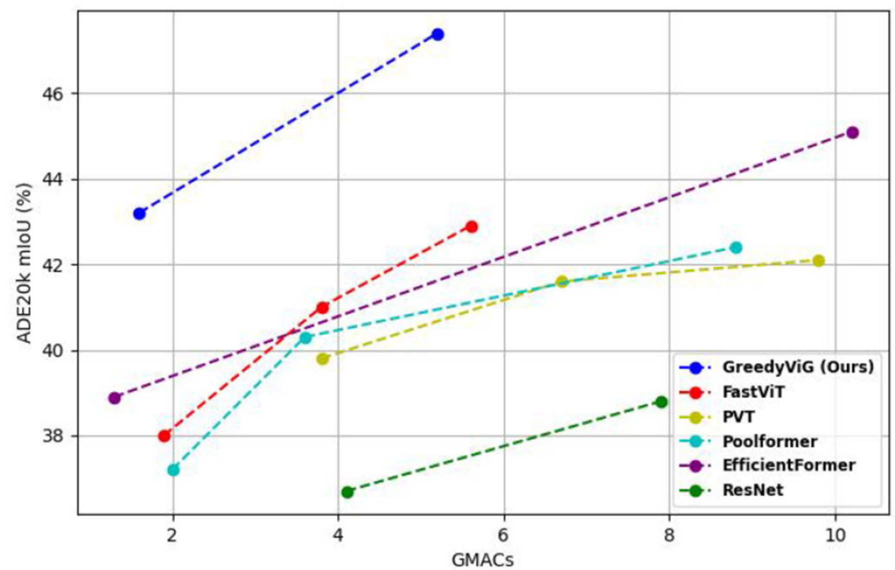
DAGC dynamically constructs a graph along the axes, through applying a mask (the blue patches) to only connect similar patches in terms of Euclidean distance.



Proposed architecture of GreedyViG using Dynamic Axial Graph Construction.

Experimental Results on Classification and Segmentation





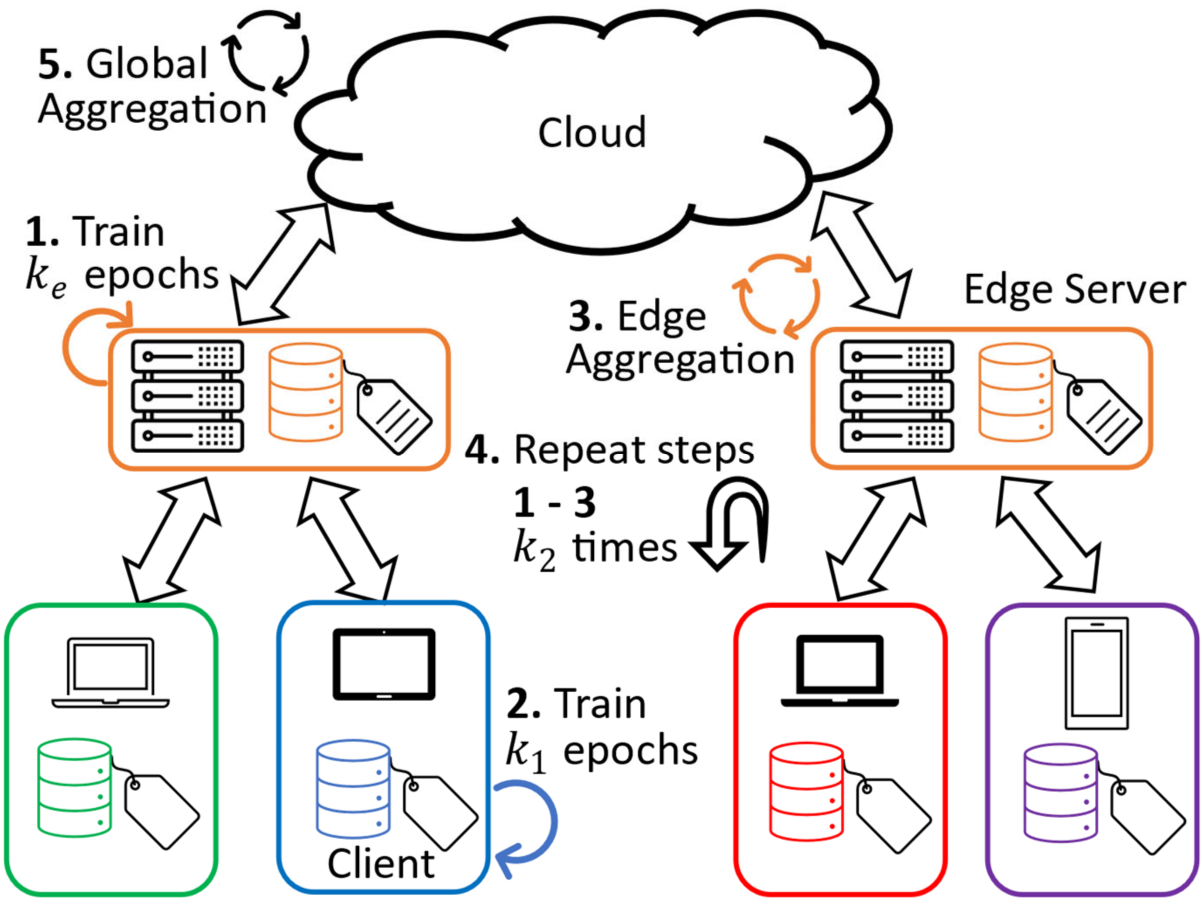
Backbone	Parameters (M)	AP^{box}	AP^{box}_{50}	AP^{box}_{75}	AP^{mask}	AP^{mask}_{50}	AP^{mask}_{75}	$mIoU$
ResNet18 [9]	11.7	34.0	54.0	36.7	31.2	51.0	32.7	32.9
EfficientFormer-L1 [23]	12.3	37.9	60.3	41.0	35.4	57.3	37.3	38.9
EfficientFormerV2-S2 [22]	12.6	43.4	65.4	47.5	39.5	62.4	42.2	42.4
PoolFormer-S12 [50]	12.0	37.3	59.0	40.1	34.6	55.8	36.9	37.2
FastViT-SA12 [41]	10.9	38.9	60.5	42.2	35.9	57.6	38.1	38.0
MobileViG-M [30]	14.0	41.3	62.8	45.1	38.1	60.1	40.8	-
GreedyViG-S (Ours)	**12.0**	**43.2**	**65.2**	**47.3**	**39.8**	**62.2**	**43.2**	**43.2**

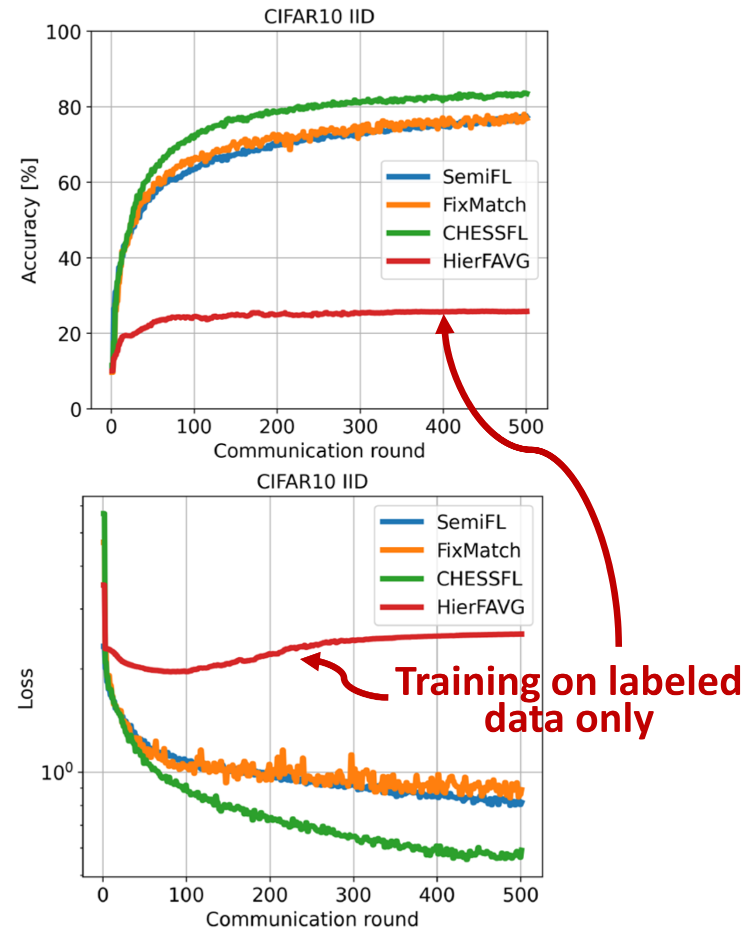
Method is *efficient* and beats SOTA across multiple CV tasks.

Efficient On-Device Training

Semi-Supervised Hierarchical Federated Learning

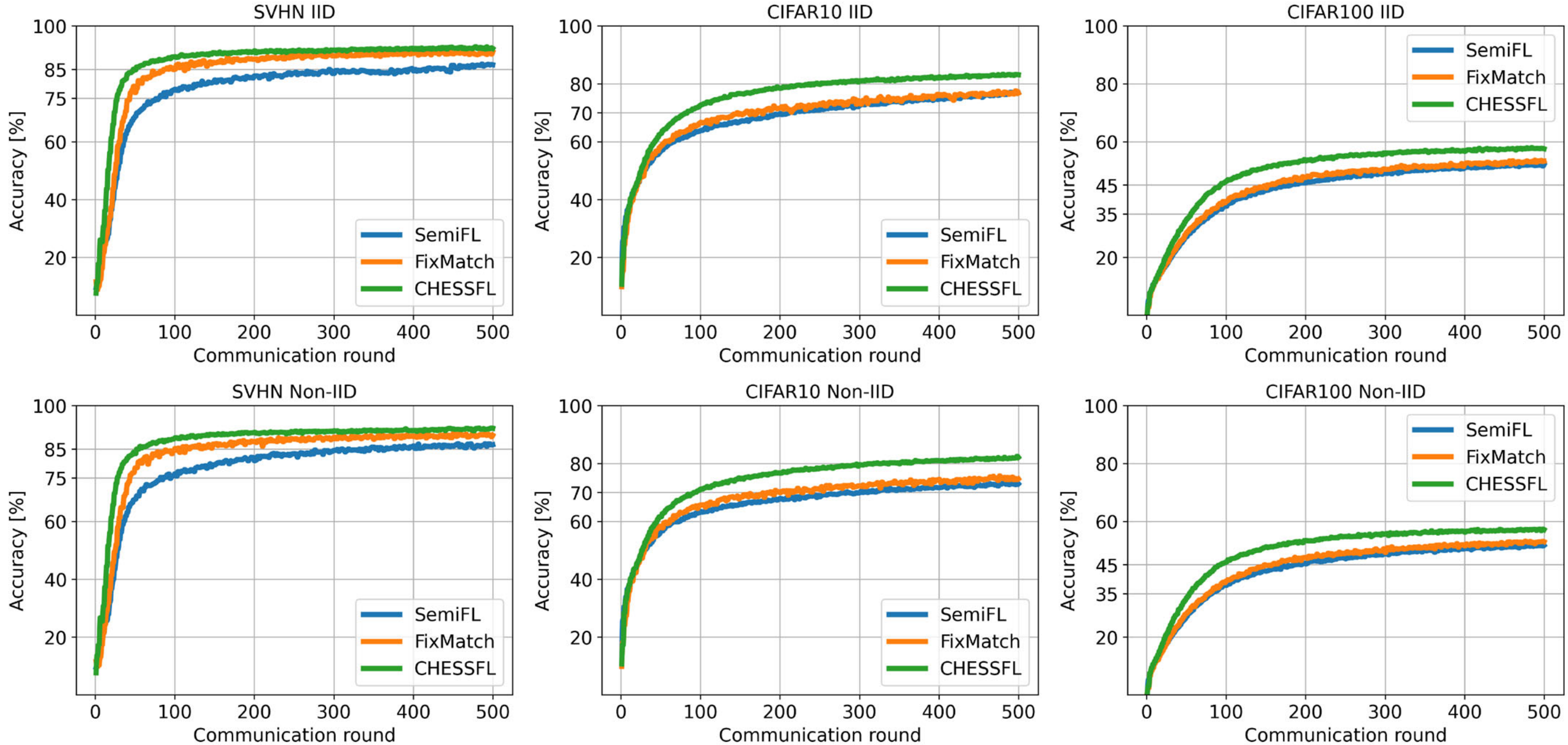
Semi-Supervised Hierarchical Federated Learning Overview





The goal is to minimize the global loss function with *limited labeled data* available at the edge servers and *lots of unlabeled* data available at the clients.

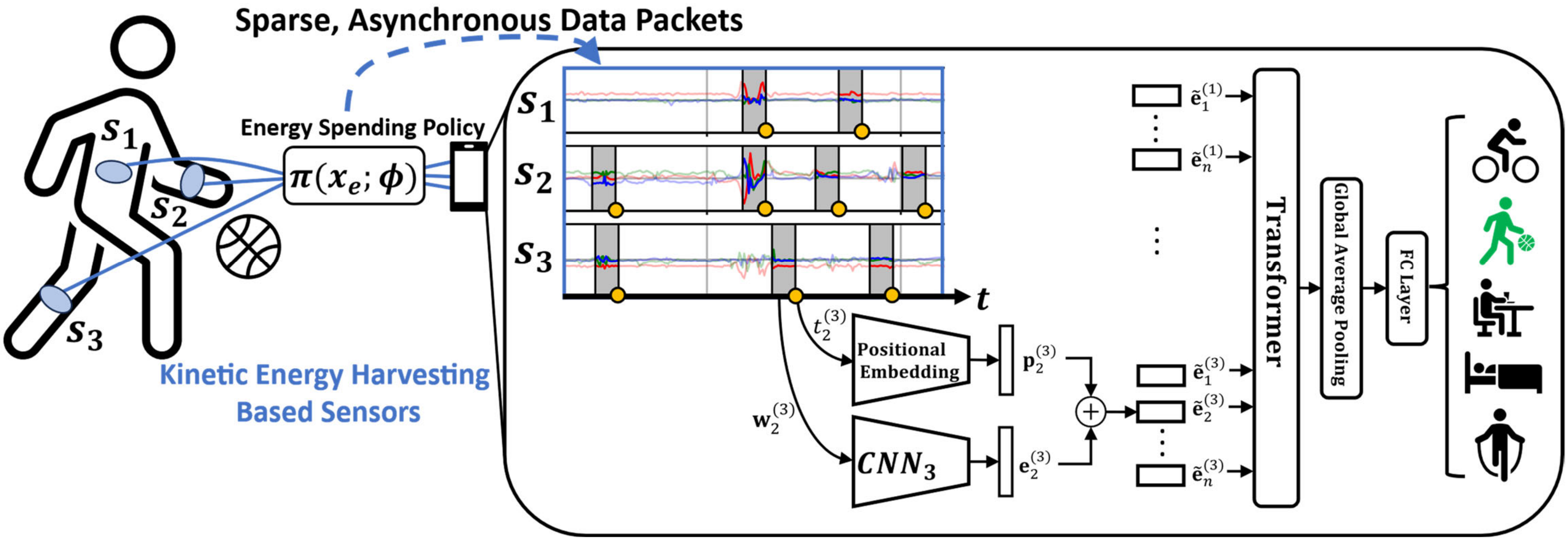
CHESSFL: Clustering Hierarchical Embeddings for Semi-Supervised Federated Learning



CHESSFL ***converges up to 5.11× faster*** **and** ***achieves higher accuracy*** **than state-of-the-art SSFL solutions on multiple datasets, with** ***negligible communication overhead*** **and** ***enhanced robustness to non-IID data.***

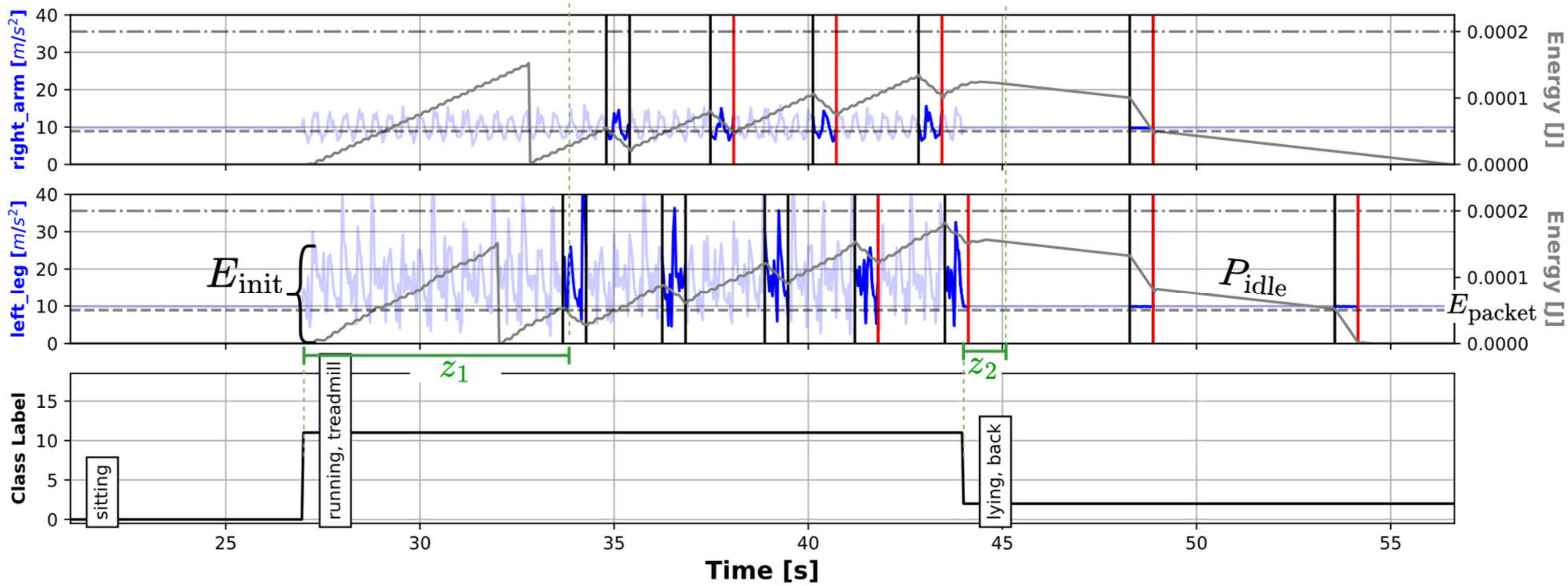
Machine Learning with Batteryless Sensors

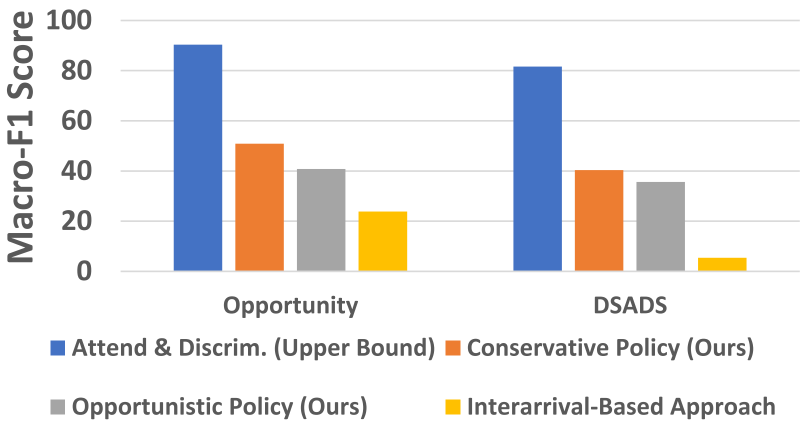
Energy Harvesting Based Sensors Produce Sparse, Asynchronous Data



The goal is to *optimize an energy spending policy* to provide the most informative data, *while simultaneously training a deep learning model* to process the unstructured stream of packets.

We Synergize Energy Spending Policies with Deep Learning Models





Our transformer model significantly outperforms the interarrival time-based approach and improves when learning from a *conservative* energy spending policy.

Unlearning for Image-to-Image Generative Models

Risks of Generative Models and Potential Solutions

Copyright Infringement

Porn/Violence

Training set **Retrieval**

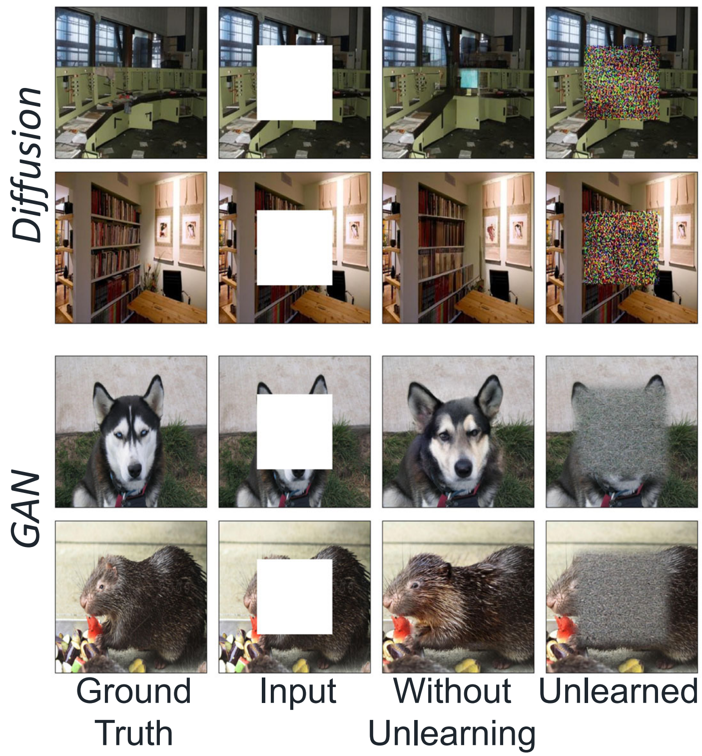
Caption: Living in the light with Ann Graham Lotz

Prompt: Ann Graham Lotz

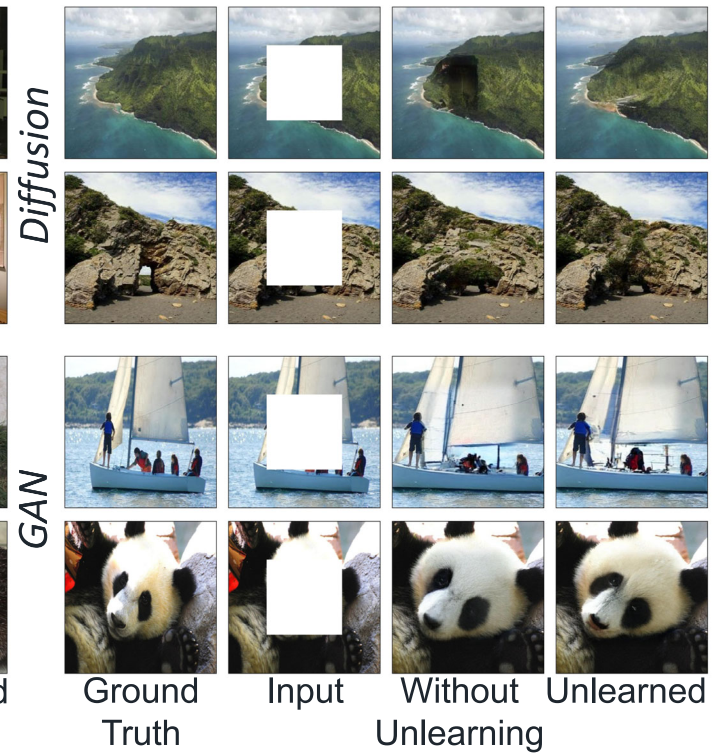
Privacy Leakage

Potential risks of image generative models

Unwanted Contents

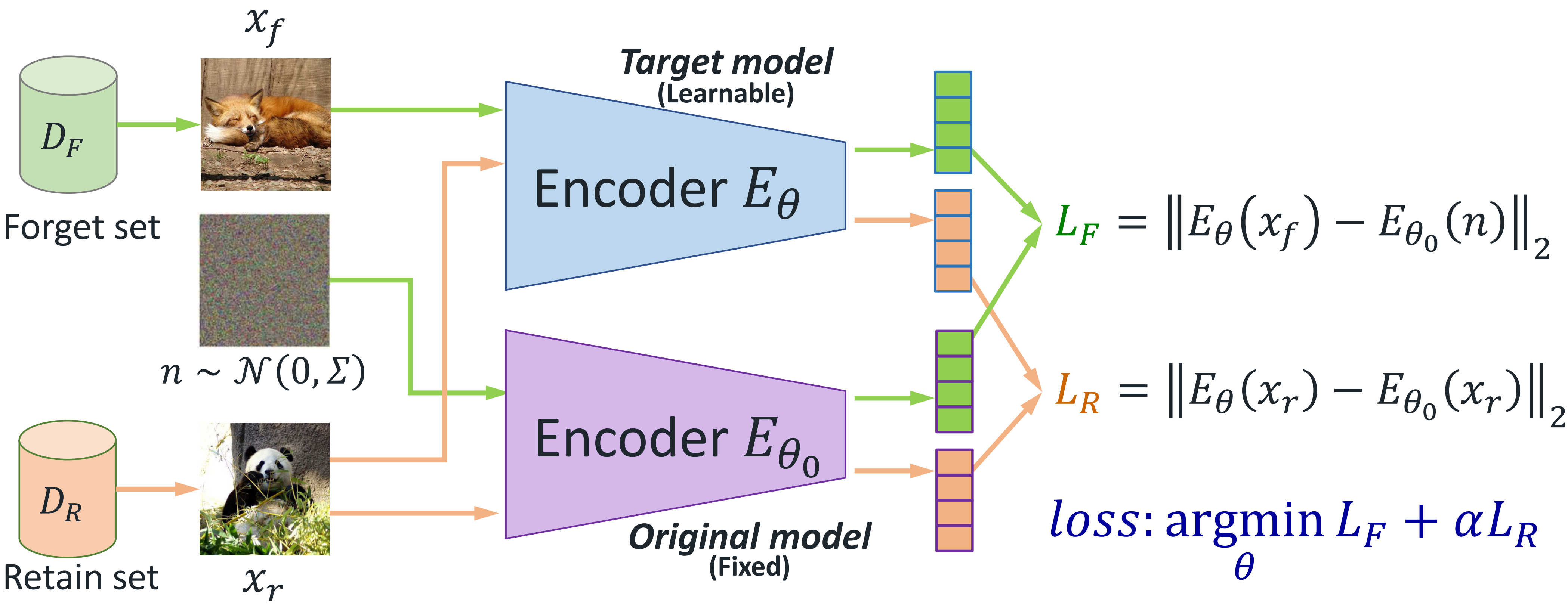


Preserved Contents



Machine unlearning **is a** ***promising*** **and** ***efficient technique*** **to resolve these issues yet relatively unexplored.**

Our Proposed Solution for Efficient Unlearning on Generative Models



- **Our method is appliable to *various* models, including GAN, diffusion model, and MAE**
- **Our method *reduce #tunable parameters by about half* and *speedup by up 4×***

Acknowledgements

- Contributors

Guihong Li
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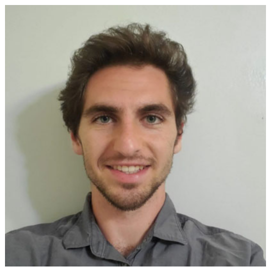

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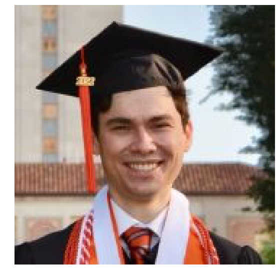

William Avery
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SCAN ME

Thank you!