

Paper seminar #1



RILS LAB

Robot Intelligence Learning & System

원승우

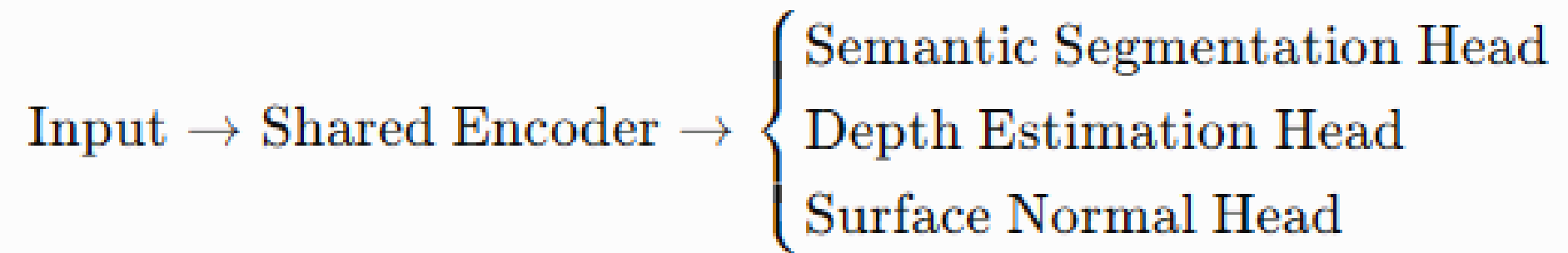
2026.07.17

Paper List

1. Stable MTL: Repurposing Latent Diffusion Models for Multi-task Learning from Partially Annotated Synthetic Datasets
2. Rep-MTL: Unleashing the Power of Representation-level Task Saliency for Multi-Task Learning
3. Ensemble Prediction of Task Affinity for Efficient Multi-Task Learning
4. Out-of-Distribution Detection with Relative Angles
5. Identifying and Mitigating Spurious Correlation in Multi-Task Learning

※ Multi-Task Learning 이란?

: 하나의 model이 여러 task를 동시에 학습하는 방법



- 특수한 경우

Partially Annotated Data MTL (PAD-MTL)

: Data에 일부 task의 label만 존재하는 상황에서 여러 task를 함께 학습하는 방법

Image	Segmentation	Depth	Normal
Image 1	✓	—	—
Image 2	—	✓	—
Image 3	✓	—	✓

01

StableMTL: Repurposing Latent Diffusion Models for Multi-Task Learning from Partially Annotated Synthetic Datasets

Anh-Quan Cao^{1,2} Ivan Lopes² Raoul de Charette²

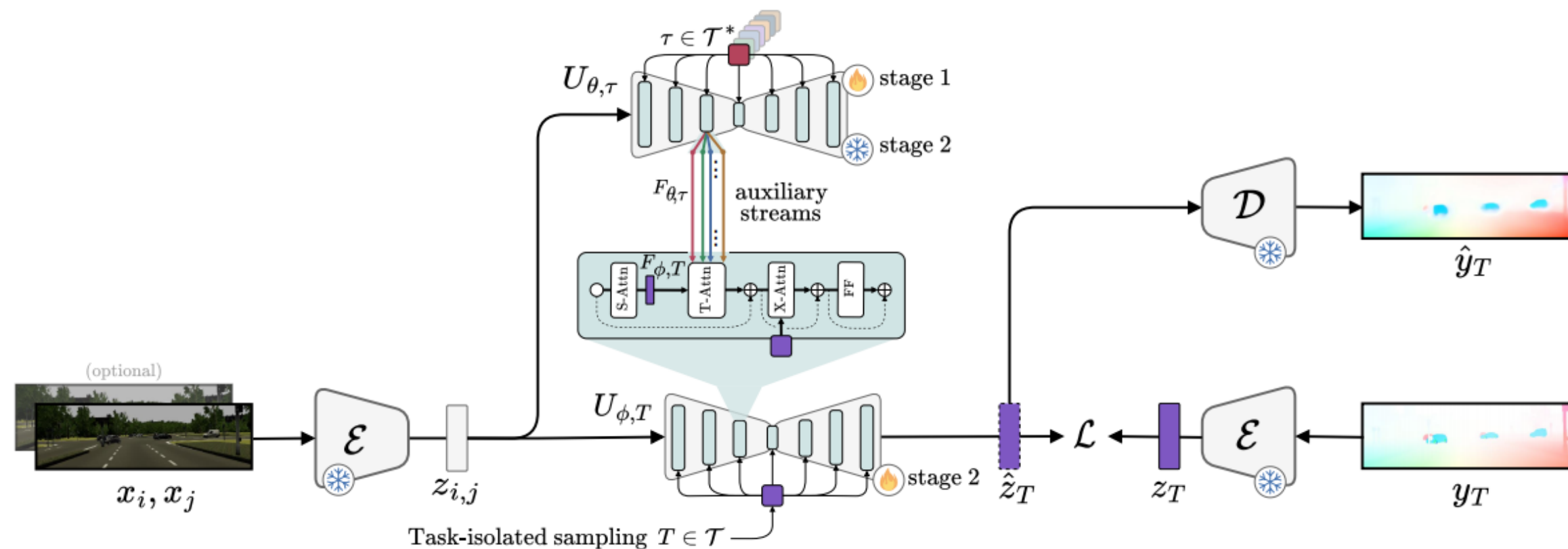
Publication	Citations
CVPR 2026	1

StableMTL: Repurposing Latent Diffusion Models for Multi-Task Learning from Partially Annotated Synthetic Datasets

Anh-Quan Cao^{1,2} Ivan Lopes² Raoul de Charette²

- 문제 설정

: 여러 dataset이 서로 다른 task label만 가지고 있을 때, 많은 task를 안정적으로 학습하기 어렵다.



StableMTL: Repurposing Latent Diffusion Models for Multi-Task Learning from Partially Annotated Synthetic Datasets

Anh-Quan Cao^{1,2} Ivan Lopes² Raoul de Charette²

• Contribution

- ① 여러 synthetic dataset의 partial label로 7개의 task를 함께 학습하는 새로운 PAD-MTL setting 제안
- ② 모든 task를 latent space의 **unified MSE loss**로 학습하여 task-specific loss balancing 문제 완화
- ③ Multi-stream task attention과 task-gradient isolation으로 task sharing과 안정적인 학습을 동시에 달성

Rep-MTL: Unleashing the Power of Representation-level Task Saliency for Multi-Task Learning

Zedong Wang¹ Siyuan Li² Dan Xu^{1,✉}

¹The Hong Kong University of Science and Technology ²Zhejiang University

Publication	Citations
ICCV 2026	6

Rep-MTL: Unleashing the Power of Representation-level Task Saliency for Multi-Task Learning

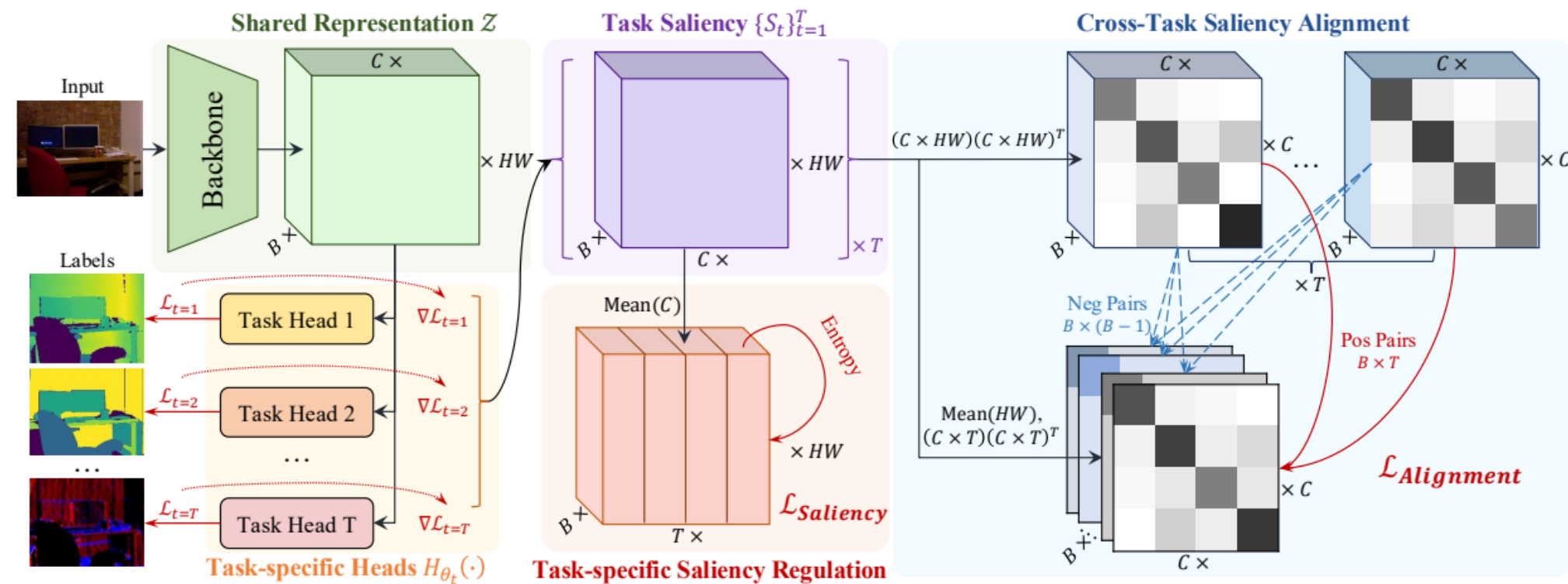


Zedong Wang¹ Siyuan Li² Dan Xu^{1,✉}

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- 문제 설정

: Multi-Task Optimization은 실제로 task interaction이 발생하는 shared representation을 충분히 활용하지 못한다.



Rep-MTL: Unleashing the Power of Representation-level Task Saliency for Multi-Task Learning



Zedong Wang¹ Siyuan Li² Dan Xu^{1,✉}

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03

Identifying and Mitigating Spurious Correlation in Multi-Task Learning

Junyi Chai, Shenyu Lu & Xiaoqian Wang*

Elmore Family School of Electrical and Computer Engineering, Purdue University
West Lafayette, IN, USA

Publication	Citations
CVPR 2026	1

Identifying and Mitigating Spurious Correlation in Multi-Task Learning

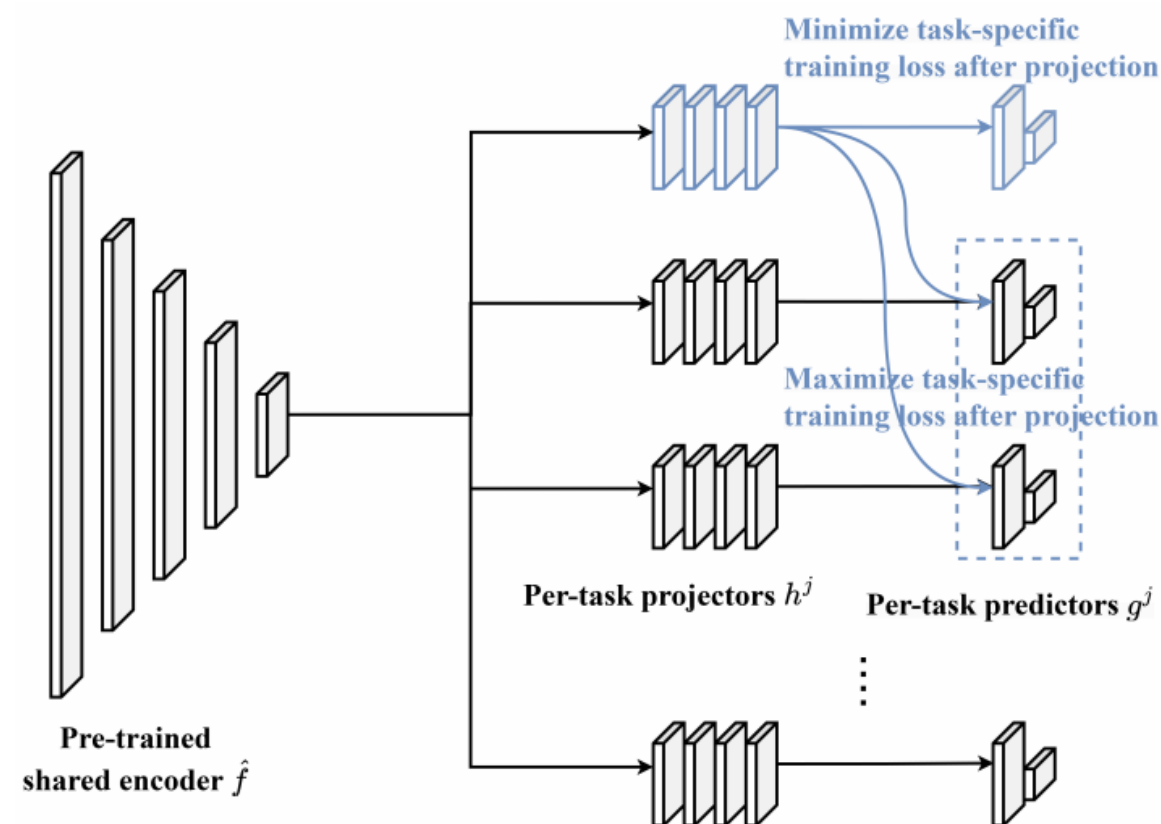


Junyi Chai, Shenyu Lu & Xiaoqian Wang*

Elmore Family School of Electrical and Computer Engineering, Purdue University
West Lafayette, IN, USA

- 문제 설정

: MTL에서는 실제로 관련 없는 task라도 training data에서 label이 자주 함께 나타나면, 모델이 이를 **잘못된 task correlation**으로 학습하여 generalization이 저하될 수 있다.



Identifying and Mitigating Spurious Correlation in Multi-Task Learning



Junyi Chai, Shenyu Lu & Xiaoqian Wang*

Elmore Family School of Electrical and Computer Engineering, Purdue University
West Lafayette, IN, USA

- Contribution

- ① Original data와 class-wise resampled data의 correlation 변화를 이용해 **spurious task relationship**을 직접 식별
- ② Spurious task 정보에 의존하지 않도록 debiased adversarial fine-tuning 제안
- ③ Task 간 진짜 관계와 우연한 label correlation을 구분하는 이론적 근거 제시

04

ENSEMBLE PREDICTION OF TASK AFFINITY FOR EFFICIENT MULTI-TASK LEARNING

Afiya Ayman
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Ayan Mukhopadhyay
College of William & Mary

Aron Laszka
Pennsylvania State University

Publication	Citations
ICLR 2026	0

ENSEMBLE PREDICTION OF TASK AFFINITY FOR EFFICIENT MULTI-TASK LEARNING

Afiya Ayman

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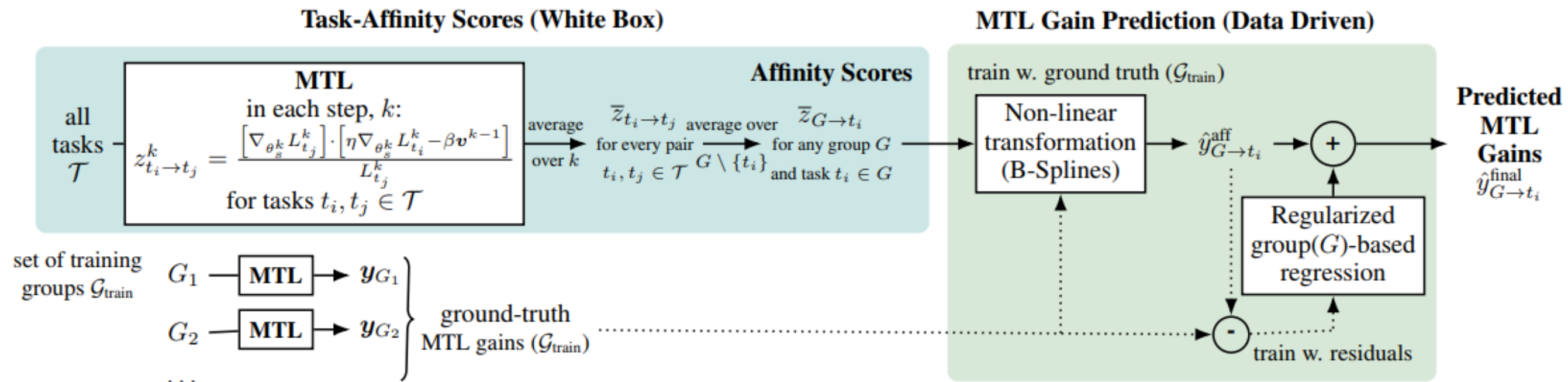
College of William & Mary

Aron Laszka

Pennsylvania State University

- 문제 설정

: 어떤 task를 함께 학습해야 성능이 좋아지는지 확인하려면 모든 task combination을 학습해야 하지만, task 수가 증가하면 가능한 조합이 기하급수적으로 증가한다.



ENSEMBLE PREDICTION OF TASK AFFINITY FOR EFFICIENT MULTI-TASK LEARNING



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- Contribution

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Out-of-Distribution Detection with Relative Angles

05

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Publication	Citations
NIPS 2025	1

Out-of-Distribution Detection with Relative Angles



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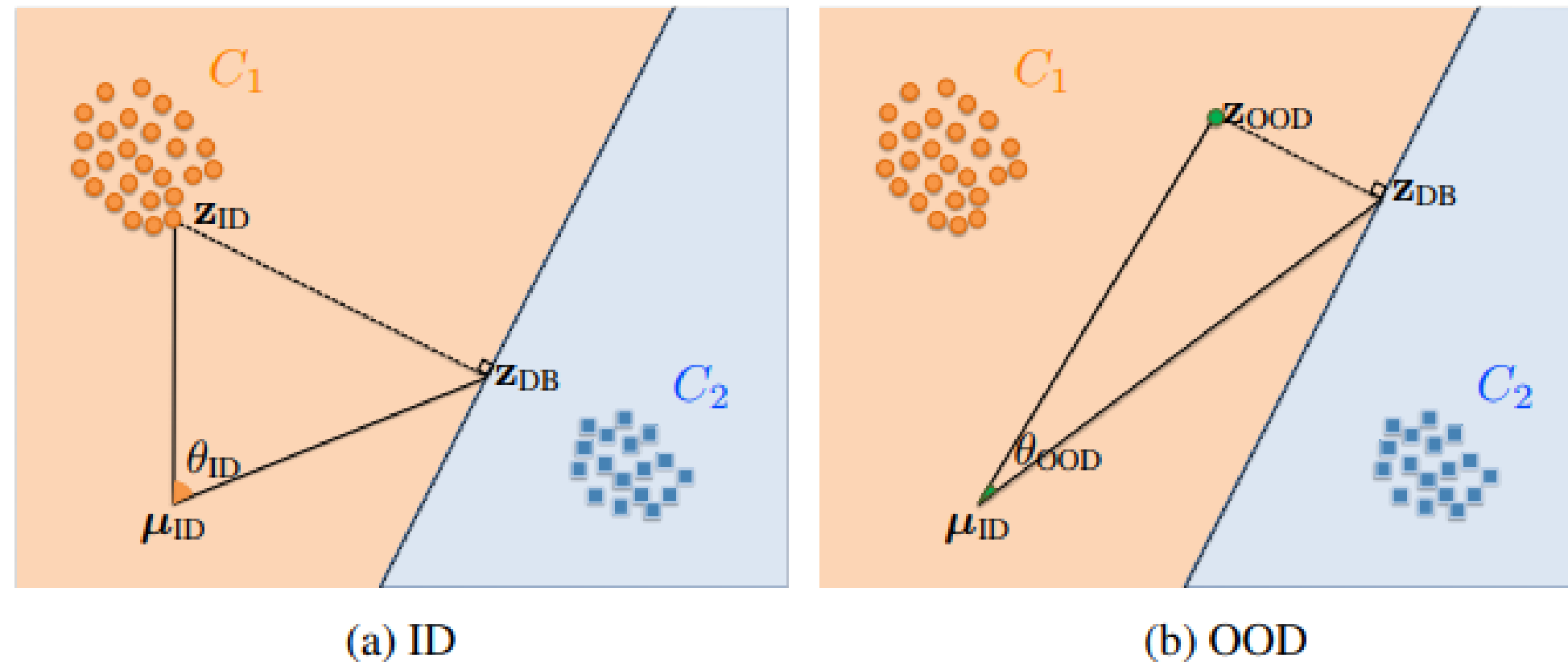
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- 문제 설정

: 기존 OOD detection 방법은 **feature의 절대 거리**나 **model confidence**에 의존하여, In-Distribution의 전체적인 구조를 충분히 반영하지 못한다.



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• Contribution

- ① ID feature 평균을 기준으로 **feature와 decision boundary** 사이의 상대 각도를 측정하는 ORA score 제안
- ② 재학습 없이 다양한 pretrained model에 적용 가능한 **post-hoc OOD detection** 제공
- ③ Scale-invariant 특성을 활용해 여러 model의 score를 쉽게 ensemble 가능

Thank you

Question & Discussion



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