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Biography

I am an AI research engineer at NAVER and a Ph.D. student at the Graduate School of AI at KAIST, under the guidance of Professor Sung Ju Hwang in MLAI Lab. My primary research interests lie in advancing the field of comprehensive image recognition techniques in real-world scenarios, particularly focusing on image segmentation and object detection.

In my research journey, I am deeply involved in exploring cutting-edge technologies such as vision foundation models like SAM, as well as developing multi-modal vision models. Additionally, I am actively engaged in pioneering label-efficient segmentation methods, including weakly or semi-supervised image segmentation. Another area of my focus is continual learning in image segmentation, where I strive to push the boundaries of knowledge and innovation.

Through my work, I aspire to contribute significantly to the advancement of artificial intelligence and its applications in solving real-world challenges. I am driven by a passion for innovation and a relentless pursuit of excellence in research and development.

Employment History

- Jan 2021 – Current 📌 **NAVER CLOVA.** AI Research Engineer at Naver Clova Image-Vision team.
- Jul 2020 – Dec 2020 📌 **NAVER CLOVA.** Internship at Naver Clova Visual AI FACE team.
- Jul 2019 – Jul 2019 📌 **Hyundai Mobis.** Internship at Hyundai Mobis Autonomous Driving Advanced Development team.
- Jul 2018 – Dec 2018 📌 **NAVER CLOVA.** Internship at Naver Clova Vision OCR team.
- Feb 2014 – Jan 2016 📌 Military Service.

Education

- Sep 2022 – Current 📌 **Ph.D Student, KAIST.** Graduate School of AI (part-time).
Under the supervision of Prof.Sung Ju Hwang.
- Mar 2019 – Feb 2021 📌 **M.S., KAIST.** Electrical Engineering. Division of Future Vehicle.
Under the supervision of Prof.Junmo Kim.
- Mar 2013 – Feb 2019 📌 **B.S., Inha University.** Information and Communication Engineering.

Projects

2021 – 2023

Real-time Image Segmentation on Edge Devices.

- Developed real-time image matting models tailored for edge devices, achieving an impressive 3ms latency on Mobile CPUs in Galaxy or iPhone [2].
- Successfully balanced efficient inference with reasonable accuracy, enabling real-time human matting, human part segmentation, object segmentation, and salient object detection.

2023 – Current

Promptable Image Segmentation, SAM (Segment Anything).

- Enhanced the accuracy of SAM for robust zero-shot segmentation performance.
- Advanced the capabilities of SAM towards "Matting Anything" and efficient modeling.
- Expanded SAM's versatility by incorporating scribble and mask promptings, as well as enabling text-prompted (referring and reasoning) segmentation with Vision-Language Models.

Research Interest

Image Segmentation

- Weakly-Supervised Semantic Segmentation using Image-level Labels [1], [10].
- Weakly-Supervised Instance Segmentation using Image-level or Point Labels [7].
- Semi-Supervised Instance Segmentation [4].
- Class Incremental (Continual Learning) Semantic Segmentation [3], [8].
- Real-time Semantic Segmentation and Image Matting on Edge Devices [2].
- Promptable (Interactive) Image Segmentation.
- Multi-modal Image Segmentation, Vision Language Model.

Object Detection

- One-stage, Anchor-Free, Real-time Object Detection.
- Object Detection with Transformer, Vision Transformer.
- Oriented Object Detection (detecting rotated bounding boxes) [6].
- Open Vocabulary Object Detection.
- Lightweight Object Detection Network [5], [9].



Research Publications

- 1 **B. Kim**, D. Kim, and S. J. Hwang, "Rethinking saliency-guided weakly-supervised semantic segmentation," *arXiv preprint arXiv:2404.00918*, 2024.
- 2 **B. Kim**, M. Y. Yi, J. Yu, Y. J. Yoo, and S. J. Hwang, "Towards label-efficient human matting: A simple baseline for weakly semi-supervised trimap-free human matting," *arXiv preprint arXiv:2404.00921*, 2024.
- 3 **B. Kim**, J. Yu, and S. J. Hwang, "Eclipse: Efficient continual learning in panoptic segmentation with visual prompt tuning," in *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition*, 2024.

- 4 **B. Kim**, J. Jeong, D. Han, and S. J. Hwang, "The devil is in the points: Weakly semi-supervised instance segmentation via point-guided mask representation," in *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition*, 2023, pp. 11 360–11 370.
- 5 J. Jeong, **B. Kim**, J. Yu, and Y. Yoo, "Rediscovery of the effectiveness of standard convolution for lightweight face detection," *arXiv preprint arXiv:2204.01209*, 2022.
- 6 **B. Kim**, J. Lee, S. Lee, D. Kim, and J. Kim, "Tricubenet: 2d kernel-based object representation for weakly-occluded oriented object detection," in *Proceedings of the IEEE/CVF Winter Conference on Applications of Computer Vision*, 2022, pp. 167–176.
- 7 **B. Kim**, Y. Yoo, C. E. Rhee, and J. Kim, "Beyond semantic to instance segmentation: Weakly-supervised instance segmentation via semantic knowledge transfer and self-refinement," in *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition*, 2022, pp. 4278–4287.
- 8 S. Cha*, **B. Kim***, Y. Yoo, and T. Moon, "Ssul: Semantic segmentation with unknown label for exemplar-based class-incremental learning," *Advances in Neural Information Processing Systems*, vol. 34, pp. 10 919–10 930, 2021.
- 9 D. Han, Y. Yoo, **B. Kim**, and B. Heo, "Learning features with parameter-free layers," in *International Conference on Learning Representations*, 2021.
- 10 **B. Kim**, S. Han, and J. Kim, "Discriminative region suppression for weakly-supervised semantic segmentation," in *Proceedings of the AAAI Conference on Artificial Intelligence*, vol. 35, 2021, pp. 1754–1761.
- 11 **B. Kim**, S. Han, E. Yi, and J. Kim, "3d point cloud upsampling and colorization using gan," in *International Conference on Multi-disciplinary Trends in Artificial Intelligence*, Springer, 2021, pp. 1–13.
- 12 H. Ryu, **B. Kim**, H. Yoo, and J. Lee, "Fully automated valet parking system based on infrastructure sensing," in *RiTA 2020*, Springer, 2021, pp. 22–31.

Academic Activity

Conference Reviewer




- 2023  CVPR 2023, ICCV 2023, NeurIPS 2023, WACV 2023
- 2024  CVPR 2024, ICLR 2024, AAAI 2024, ECCV 2024

Skills

Coding  Python (Pytorch, Tensorflow), C/C++, Java, PHP, \LaTeX , ...

Miscellaneous Experience

Awards and Achievements

- 2018  2018 슈퍼챗런지 해커톤 대상. 중소기업청 주관/주최. 딥러닝 기반 야생 동물 탐지 시스템.
- 2017  과학기술정보통신부 장관상. 2017 한이음 공모전 금상 (장관상). 딥러닝 기반 자율 주행 버스 운행 시스템.
-  2017 IP 메이커톤 최우수상. 인하대학교 주관/주최

Miscellaneous Experience (continued)

- 2017 인하메이커톤 우수상. 인하대학교 주관/주최

Invited Talk

- 2022 **진학사 캐치 커리어콘.** AI 리서치 엔지니어 신입사원 취업 A to Z, 김범영 멘토 (네이버 글로벌 AI 리서치 엔지니어).
- Inha University.** Weakly-Supervised Instance Segmentation [7], invited by Prof. Rhee Chae Eun.
- 2021 **NeurIPS 2021 Social: ML in Republic of Korea.** SSUL: Semantic Segmentation with Unknown Label for Exemplar-based Class-Incremental Learning [8].