Sangwoo Cho

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Research Interests

LLM, Multi-modal, Summarization: My research interests are centered on advancing artificial intelligence (AI) through fundamental research in various domains, encompassing Audio, Image, and Text. I am dedicated to developing AI systems, with a particular focus on Large Language Models (LLM), where I aim to push the boundaries of model architectures, training techniques, and inference methods. Furthermore, I am driven by the prospect of achieving meaningful real-world impact, especially through applications like summarization.

Experience

Tencent AI Lab
Seattle, WA, USA

Senior Research Scientist
Sep. 2021 - Present

- **Summarization**: Summarization research and support for technical transfer to development group
- **LLM**: Participate in developing Tencent ChatBot Foundation Model (HunyuanAide) - Data preparation and research on long context
- **LLM**: Continual pre-training with long context and evaluation on long document, Pre-training of Retention Network, Audio based LLM fine-tuning

Tencent AI Lab
Seattle, WA, USA

Research Intern, Mentor: Kaiqiang Song, Xiaoyang Wang
Jun. 2021 - Aug. 2021

- **Long Document Summarization**: Developed a summarization system that can take long input and select the important sentences using internal document structure and Determinantal Point Processes (DPP)

University of Central Florida
Orlando, FL, USA

Research Assistant
Aug. 2015 - May 2021

- **Text Summarization**: Researched summarization methods that utilize a mathematical optimization method and deep neural models for different types of documents, news, transcript, and book: Determinantal Point Processes (DPP), and Capsule Network or BERT are combined for better context information retrieval; XLNet is used to find sub-sentence segments; and VQVAE is employed for training a unsupervised model. (Pytorch, Keras, Tensorflow, Matlab)
- **Human Action Recognition**: Researched Temporal CNN and Self-Attention network to retrieve short and long term temporal context from videos. Different modalities (images, optical flows, and body joints) are used for different methods. (Pytorch, Keras, Tensorflow, Matlab)

Adobe Research
San Jose, CA, USA

Research Intern, Mentor: Franck Dernoncourt, Tim Ganter, Walter Chang
May. 2020 - Sep. 2020

- **Transcript Summarization**: Developed a unsupervised summarization system using a Vector Quantized Variational AutoEncoder (VQVAE) to summarize transcripts of live streaming videos, which contain many chit-chats and dialogues that may be unrelated to topics (Pytorch)

SRI International
Princeton, NJ, USA

Research Intern, Mentor: Giedrius Burachas, Yi Yao
Jun. 2019 - Aug. 2019

- **Visual Question Answering (VQA)**: Developed a VQA system using a hierarchical Transformer model for explaining relations of text and image. (Pytorch)

Google
Mountain View, CA, USA

Software Engineer Intern, Mentor: Haowei Liu, David Gossow
May. 2017 - Aug. 2017

- **Eye to Device Calibration System**: Developed a software that calibrates a stereo camera that mimics eyes to an AR/VR device to render proper images from the point of view of two eyes. (C++, Python, OpenCV, Bash, Eigen, Ceres, Tango)

University of North Carolina
Chapel Hill, NC, USA

Research Assistant
Aug. 2013 - Jul. 2014

- Camera orientation estimation based on cloud image tracking (C++, Android)
- FINDER: Query-based large scale image retrieval system based on image descriptor matching (C++, Python)

Samsung Electronics
Suwon, S. Korea

Research Engineer
Feb. 2007 – Jun. 2012

- Developed a stereo camera rectification software. (C++, OpenGL)
- Developed an intermediate viewpoint image generation software using stereo images for reducing stereo fatigue. (C++, MFC)
- Developed a stereoscopic image generation software based on 2D street-view image. (C++, MFC, Android)

Korea Institute of Science and Technology (KIST)
Seoul, S. Korea

Student Researcher
Feb. 2005 – Jan. 2007

- Developed an indoor 3D reconstruction system and designed an apparatus for data gathering consisting of a wide-view camera and a laser scanner. (C++, MFC)
- Developed an eye gaze tracking system. (C++, MFC)

Publications

Sangwoo Cho, Kaiqiang Song, Chao Zhao, Xiaoyang Wang, and Dong Yu. "SPECTRUM: Speaker-Enhanced Pre-Training for Long Dialogue Summarization" arXiv preprint arXiv:2401.17597.

Yiwei Qin, Kaiqiang Song, Yebowen Hu, Wenlin Yao, **Sangwoo Cho**, Xiaoyang Wang, Xuansheng Wu, Fei Liu, Pengfei Liu, Dong Yu. "InFoBench: Evaluating Instruction Following Ability in Large Language Models" arXiv preprint arXiv:2401.03601.

Sangwoo Cho*, Kaiqiang Song*, Xiaoyang Wang*, Xiaoman Pan, and Dong Yu. "Zebra: Extending Context Window with Layerwise Grouped Local-Global Attention" arXiv preprint arXiv:2312.08618.

Yebowen Hu, Kaiqiang Song, **Sangwoo Cho**, Xiaoyang Wang, Hassan Foroosh, and Fei Liu. "DecipherPref: Analyzing Influential Factors in Human Preference Judgments via GPT-4" In Proceedings of the *2022 Empirical Methods in Natural Language Processing **(EMNLP)***, Singapore, 2023.

Fuxiao Liu, Xiaoyang Wang, Wenlin Yao, Jianshu Chen, Kaiqiang Song, **Sangwoo Cho**, Yaser Yacoob, and Dong Yu. "MMC: Advancing Multimodal Chart Understanding with Large-scale Instruction Tuning" arXiv preprint arXiv:2311.10774.

Haopeng Zhang, **Sangwoo Cho**, Kaiqiang Song, Xiaoyang Wang, Hongwei Wang, Jiawei Zhang, and Dong Yu. "Unsupervised Multi-document Summarization with Holistic Inference" arXiv preprint arXiv:2309.04087.

Pengshan Cai, Kaiqiang Song, **Sangwoo Cho**, Hongwei Wang, Xiaoyang Wang, Hong Yu, Fei Liu, and Dong Yu. "Generating User-Engaging News Headlines" In Proceedings of the *2023 Association for Computational Linguistics **(ACL)***, Toronto, Canada, 2023.

Xianjun Yang, Kaiqiang Song, **Sangwoo Cho**, Xiaoyang Wang, Xiaoman Pan, Linda Petzold, and Dong Yu. "OASum: Large-Scale Open Domain Aspect-based Summarization" In Proceedings of the *2023 Association for Computational Linguistics **(ACL)***, Toronto, Canada, 2023.

Yebowen Hu, Kaiqiang Song, **Sangwoo Cho**, Xiaoyang Wang, Hassan Foroosh, and Fei Liu. "Analyzing Influential Factors in Human Preference Judgments via GPT-4" arXiv preprint arXiv:2305.14702, 2023

Sangwoo Cho, Kaiqiang Song, Xiaoyang Wang, Fei Liu, and Dong Yu. "Toward Unifying Text Segmentation and Long Document Summarization" In Proceedings of the *2022 Empirical Methods in Natural Language Processing **(EMNLP)***, Abu Dhabi, UAE, 2022

Sangwoo Cho, Franck Dernoncourt, Tim Ganter, Trung Bui, Nedim Lipka, Walter Chang, Hailin Jin, Jonathan Brandt, Hassan Foroosh, and Fei Liu. "StreamHover: Livestream Transcript Summarization and Annotation" In Proceedings of the *2021 Empirical Methods in Natural Language Processing **(EMNLP)***, Punta Cana, Dominican Republic, 2021

Sangwoo Cho, Kaiqiang Song, Chen Li, Dong Yu, Hassan Foroosh, and Fei Liu. "Better Highlighting: Creating Sub-Sentence Summary Highlights" In Proceedings of the *2020 Empirical Methods in Natural Language Processing **(EMNLP)***, 2020

Sangwoo Cho, Muhammad Hasan Maqbool, Fei Liu, and Hassan Foroosh. "Self-Attention Network for Skeleton-based Human Action Recognition" In Proceedings of the *2020 IEEE Winter Applications of Computer Vision Conference **(WACV)***, Aspen, CO, USA, 2020

Sangwoo Cho, Chen Li, Dong Yu, Hassan Foroosh, and Fei Liu. "Multi-Document Summarization with Determinantal Point Processes and Contextualized Representations" In Proceedings of the *2019 Empirical Methods in Natural Language Processing **(EMNLP), Workshop***, Hong Kong, China, 2019

Sangwoo Cho, Logan Lebanoff, Hassan Foroosh, and Fei Liu. "Improving the Similarity Measure of Determinantal Point Processes for Extractive Multi-Document Summarization" In Proceedings of the *2019 Association for Computational Linguistics **(ACL)***, Florence, Italy, 2019. (Oral)

Sangwoo Cho and Hassan Foroosh. "Spatio-Temporal Fusion Networks for Action Recognition" In Proceedings of the *2018 Asian Conference on Computer Vision **(ACCV)***, Perth, Australia, 2018

Sangwoo Cho and Hassan Foroosh. "A Temporal Sequence Learning for Action Recognition and Prediction" In Proceedings of the *2018 IEEE Winter Applications of Computer Vision Conference **(WACV)***, Lake Tahoe, NV/CA, USA, 2018

Education

University of Central Florida   *Orlando, FL, USA*

PHD IN COMPUTER SCIENCE   *May 2021*

- Dissertation: Contextual Understanding of Sequential Data Cross Multi-Modalities
- Advisors: Fei Liu and Hassan Foroosh

University of North Carolina   *Chapel Hill, NC, USA*

M.S IN COMPUTER SCIENCE   *Dec. 2014*

- Advisor: Jan-Michael Frahm and Enrique Dunn

Korea University   *Seoul, S. Korea*

M.E IN ELECTRONICS AND COMPUTER ENGINEERING   *Feb. 2007*

- Thesis: Generating 2D and 3D indoor environment models for enabling interactive robot service
- Advisors: Yong-Moo Kwon and Hanseok Ko

Sogang University   *Seoul, S. Korea*

B.E in Electronic Engineering   *Feb. 2005*

- Thesis: Height measurement of arbitrary objects using a single image

Patents

Sangwoo Cho, et al., Topical Vector-Quantized Variational Autoencoders for Extractive Summarization of Video Transcripts, Patent No. US20220414338A1, 2021

Sangwoo Cho, Yong-Moo Kwon, Sung-Kyu Kim, Jeon Kyeong Won, Ki Jeongseok, "System And Method For 3-Dimensional Interaction Based On Gaze System And Method For Tracking 3-Dimensional Gaze.", Patent No. 1008206390000, 2008

Sangwoo Cho, Yong-Moo Kwon, "Apparatus And Method For Creating A Circumstance Map Of An Indoor Circumstance.", Patent No. 1007577510000, 2007

Sangwoo Cho, Yong-Moo Kwon, Sung-Kyu Kim, Jai Kyung Shul, Jinwoo Park, "Gaze-based Computer Interface Apparatus and Method of Using the Same.", Patent No. 100651104000, 2006

Awards

2019	**ACL Student Volunteer**	*Florence, Italy*
2019	**UCF Doctoral Research Support Award**	*Orlado, FL, USA*
2018, 2019	**UCF Graduate Presentation Fellowship**	*Orlado, FL, USA*

Computing Skills

Programming Language	C/C++, Python, Matlab, Git, Java, Android, ReactJS, LaTeX
ML Tools	Pytorch, Pytorch-lightning, Huggingface, Megatron, Deepspeed, Tensorflow, Keras, Spacy, NLTK
Etc	OpenCV, OpenGL, Eigen, Qt