WEIWEI SUN

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EDUCATION

- **University of British Columbia**– cont. from UVic   Vancouver, CA
  Ph.D. Computer Science   2020 Sept. – 2024 May
  - Advisors: Dr. Kwang Moo Yi, Dr. Andrea Tagliasacchi
  - Research Topics: Point clouds, 3D generative model, 3D computer vision

- **University of Victoria**   Victoria, CA
  Ph.D. Computer Science   2018 Sept. – 2020 Sept.
  - Advisor: Dr. Kwang Moo Yi

- **University of Calgary**   Calgary, CA
  M.Sc. Digital Imaging System   2016 Sept. – 2018 Jun.

- **Wuhan University**   Wuhan, CN
  B.Sc. Geographical Information System   2012 Sept. – 2016 Jun.

PUBLICATIONS

I have underlined the papers that I led.

- **Citations** (Updated 12/04/2023)
  - Total Citations: 662(H-Index: 10, I10-Index: 11).
  - Full List: *Google Scholar*

- **ArXiv or In submission**
  - PointNeRF++: A multi-scale, point-based Neural Radiance Field.
    W. Sun, E. Trulls, Y. Tseng, S. Sambandam, G. Sharma, A. Tagliasacchi, K. M. Yi. *ArXiv, 2023*

  - Densify Your Labels: Unsupervised Clustering with Bipartite Matching for Weakly Supervised Point Cloud Segmentation.
    S. Xia, J. Yue, K. Kania, L. Fang, A. Tagliasacchi, K. M. Yi, **W. Sun**. *ArXiv, 2023*

  - SSIF: Learning Continuous Image Representation for Spatial-Spectral Super-Resolution.
    G. Mai, N. Lao, **W. Sun**, Y. Ma, J. Song, C. Meng, H. Ma, J. Rao, Z. Li, S. Ermon. *ArXiv, 2023*

  - FAT3D: Monocular 3D Object Detection by Frequency-Aware Depth with 3D-Aware Features
    Z. Wu, X. Wang, J. Li, Y. Wu, Y. Gan, J. Wu, **W. Sun**. *In submission, 2023.*

  - SplHASH: Spatially adaptive HASHing for neural representations
    Z. Sambugaro, **W. Sun**, S. Govindarajan, T. Takikawa, D. Rebain, N. Conci, A. Tagliasacchi *In submission, 2023.*

- **Peer-Reviewed Conferences**
  - NeuralBF: Neural Bilateral Filtering for Top-down Instance Segmentation on Point Clouds.
    W. Sun, D. Rebain, R. Liao, V. Tankovich, S. Yazdani, K. M. Yi, A. Tagliasacchi. *WACV 2023.*

- Tusk: Task-agnostic Unsupervised Keypoints.
  Y. Jin, **W. Sun**, J. Hosang, E. Trulls, K. M. Yi *NeurIPS 2022*.

- Canonical Capsules: Unsupervised Capsules in Canonical Pose.
  W. Sun, A. Tagliasacchi, B. Deng, S. Sabour, S. Yazdani, G. E. Hinton, K. M. Yi. *NeurIPS 2021*.

- PSDet: Efficient and Universal Parking Slot Detection.
  Z. Wu, **W. Sun**, M. Wang, X. Wang, L. Ding, F. Wang. *IV.* 2020.

- Vehicle Re-ID for Surround-view Camera System.
  Z. Wu, M. Wang, L. Yin, **W. Sun**, J. Wang, H. Wu. *CVPRW.* 2020.

- ACNe: Attentive Context Normalization for Robust Permutation-Equivariant Learning.
  W. Sun, W. Jiang, , A. Tagliasacchi, E. Trulls, K. M. Yi. *CVPR.* 2020.

- Optimizing Through Learned Errors for Accurate Sports Field Registration.
  W. Jiang, J. Higuera, B. Angles, **W. Sun** , M. Javan, K. M. Yi. *WACV.* 2020.

- Linearized Multi-Sampling for Differentiable Image Transformation.
  W. Jiang, **W. Sun**, A. Tagliasacchi, E. Trulls, K. M. Yi. **Oral** *(Accept ratio [4.3%, 187/4303]).* *ICCV.* 2019.

- Optic Disc Segmentation: Level Set Methods and Blood Vessels Inpainting.
  A Almazroa, **W. Sun**, S. Alodhayb, K. Raahemifar, V. Lakshminarayanan. *Medical Imaging.* 2017.

- Optic Cup Segmentation based on Extracting Blood Vessel Kinks and Cup Thresholding Using Type-II Fuzzy Approach.
  A. Almazroa, S. Alodhayb, R. Burman, **W. Sun**, K. Raahemifar, V. Lakshminarayanan. *IEEE IEM OPTRONIX.* 2015.

- **Peer-Reviewed Journals**

  - CAT: Learning to Collaborate Channel and Spatial Attention from Multi-Information Fusion.
    Z. Wu, M. Wang, **W. Sun**, Y. Li, M. Fang, Y. Wu. *IET Computer vision, 2022.*

  - Representation Learning for Complex Polygonal Geometries in the Spectral Domain based on Non-Uniform Fourier Transformation.
    G. Mai, C. M. Jiang, **W. Sun**, R. Zhu, Y. Xuan, L. Cai, K. Janowicz, S. Ermon, N. Lao *GeoInformatics, 2022.* (**AAG 2023 J. Warren Nystrom Award, 1 award recipient every year**)

  - Fully Convolutional Networks for Semantic Segmentation of Very High Resolution Remotely Sensed Images Combined with DSM.
    W. Sun, R. Wang. *IEEE RGSL.* 2018.

  - Optic Disc Segmentation for Glaucoma Screening System Using Fundus Images.
    A. Almazroa, **W. Sun**, S. Alodhayb, K. Raahemifar, V. Lakshminarayanan. *Clinical Ophthalmology.* 2017.

RESEARCH EXPERIENCE

I have underlined the projects that are ongoing.

- **3D Point Cloud Processing** 2018 – now

  - ACNe (CVPR2020): A point cloud network that is robust to outliers in point cloud.

  - Canonical capsule (NeurIPS 2021): A self-supervised part-decomposition and canonicalization on the point cloud. **A paper with Geoffrey Hinton**.

- NeuralBF (WACV2023): Neural bilateral filtering for instance segmentation.

- PointNeRF++ (ArXiv): A SOTA point-based representation for NeRF.

- Densify your labels (ArXiv): A SOTA weakly-supervised point cloud segmentation method.

- <u>Mentoring an undergraduate project on point cloud reconstruction.</u>

- **3D Generative Model** 2022 – 2023

  - I developed a system internally in NVIDIA that harvests 3D car assets from the Waymo Open dataset.

  - I developed a method internally in NVIDIA for image-to-3D by inverting a pre-trained 3D-GAN.

  - <u>An ongoing patent together with the NVIDIA team about a new rendering method for generative model.</u>

- **Deep Visual Geometry** 2018 – now

  - My paper ACNe achieved SOTA performance on wide-baseline stereo matching.

  - I co-organized the CVPR23 workshop on image matching.

  - <u>I'm now mentoring an undergraduate project on SLAM via Gaussian Splatting.</u>

- **Computer Vision System for Autonomous Vehicle** 2018–now

  - As an intern in a perception team, *I led the SOTA results in the drivable road segmentation in the KITTI benchmark.* I continued to collaborate with my manager and acted as an academic advisor with a focus on detection in parking lots. I thereby coauthored several papers with them.

  - In my recent work, we designed the PointNeRF++ that achieves the *SOTA rendering performance on KITTI360 benchmark* in the color-only track.

  - <u>I'm collaborating with a team from University of Georgia on a project about generative model of car trajectory.</u>

- **Remote Sensing Images Analysis** 2015 – 2018

  - *As an undergraduate student*, I designed a simple-yet-efficient Classifier based on sparse representation for the classification of hyperspectral pixels. Thereby, our team (I was the leader) won a prize of 10k RMB in a undergraduate academic competition.

  - I developed the practical framework based on fully convolutional networks for semantic segmentation of remote sensing images. *The paper has received more than 250 citations.*

  - I co-designed with *a Standford team* the spatial-spectral continuous field (SSIF) for super-resolution of multi/hyper-spectral remote sensing images.

  - I designed a polygon network and co-authored the paper that won **the best paper award** in cartography domain.

- **Medical Retina Images Analysis** 2015

  - *As an undergraduate intern*, I designed the Double Level Set (DLS) for optic disc segmentation from Retina images. I also developed the edge optimization algorithm to smooth the result from level set with prior knowledge. Thereby, I co-authored three papers with the leading author *within 3 months*.

WORKING EXPERIENCE

- **Research scientist intern**   2022 Apr. – 2023 Mar.
  Toronto AI lab, NVIDIA, Canada.

- **Student Researcher**   2021 Jun. – 2021 Dec.
  Daydream, Google, Canada

- **Visiting Ph.D. Student**   2019 May. – 2019 Dec.
  With Dr. John Zelek, VIP Lab, University of Waterloo, Canada.

- **Perceptron Algorithm Intern**   2018 May. – 2018 Sept.
  With Mr. Zizhang Wu, Perceptron Algorithm Group, Zongmu Technology Co. Ltd., China

- **Mitacs Globalink Summer Intern**   2015 Jun. – 2015 Sept.
  With Prof. Vengu lakshminarayanan&Prof. Kaamran Raahemifar, University of Waterloo&Ryerson University, Canada.

PROFESSIONAL SERVICE

- **Co-Organizer of image matching workshop @ CVPR 2023**:
  https://image-matching-workshop.github.io

- **Outstanding reviewer**: CVPR 2021, CVPR 2023.

- **Reviewer for conferences**:
  Regular reviewer for CVPR, ECCV, ICCV, ICML, ICLR and NeurIPS.
  Reviewer for: AAAI 2021/2020, ACCV 2020, IJCAI 2020, GMDL 2019, BMVC 2020/2019, WACV 2021, SIGGRAPH2023.

- **Reviewer for Journal**:
  Land Use Policy, IJCV, IJCNN, TVCG, TPAMI.

- **Talks**:
  - "Explainable models for point cloud learning" at Semantic perception group of Google.
  - "Efficient messaging pass for point clouds learning" on SpaceML coffee at University of Victoria.
  - "Canonical Capsules" at NVIDIA, 2022 Mar.
  - "Canonical Capsules" at Wuhan University, China, 2021 Dec.

AWARDS

- **Mitacs Globalink Graduate Fellowship**   2016
  30K CAD in total.

- **Outstanding Graduate of WHU**   2016
  Top 10% among ∼300 students.

- **Mitacs Globalink Summer Undergraduate Internship Award**   2015
  1̃6K CAD in total. Note it's highly competitive. **Applicants are all undergraduates from 13 countries.**

- **National Motivational Scholarships**   2013, 2014
  10K RMB in total. For Top 2/33 students.

MENTEES

- **Xiaoquan Wang** (Engineer in Zongmu – an autonomous driving company)   2020-2021
  I mentored him as an academic advisor. And he published PSDet in IV 2020.

- **Yang-Che Tseng** (Undergraduate intern at UBC, Canada) 2023 Sept. – Now.
  And I'm mentoring him on Gaussian Splatting in SLAM. He already co-authored PointNeRF++.

- **Zhen (Colin) Li** (Undergraduate intern at SFU, Canada) 2023 May. – Now.
  I'm mentoring him on point cloud auto-encoding. We've already got very promising results. And we plan to submit it to ECCV2024.

- **Shaobo Xia** (Assistant Prof. at CUST) 2023 Mar. – Now.
  I'm mentoring him on point cloud learning. We've submitted a CVPR paper (densify-your-labels.github.io). And we're planning more.

TEACHING EXPERIENCE

- **Teaching Assistant** (Graduate course) 2021 Jan. – 2021 Apr., 2023 Sept. – 2023 Dec.
  Computer Graphics: Visual Geometry, University of British Columbia
  I led the design of assignments for this course.

- **Teaching Assistant** (Undergraduate/Graduate course) 2021 Jan. – 2020 Apr.
  Computational Optimization, University of British Columbia

- **Teaching Assistant** (Undergraduate course) 2020 May. – 2020 Aug.
  Operating System, University of Victoria

- **Teaching Assistant** (Undergraduate course) 2017 Sept. – 2017 Dec.
  Computing Engineering, University of Calgary