

# Crane Chen

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## Education

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### The Johns Hopkins University

*Baltimore, MD*

PH.D. CANDIDATE IN COMPUTER GRAPHICS

*2018-2023*

Advisor: Misha Kazhdan

Topics: surface reconstruction, geometric data processing, geometric machine learning, 3D computer vision

Thesis: Feature-Preserving Neural Surface Reconstruction Using Dirichlet Energy of Gauss Map

### The Johns Hopkins University

*Baltimore, MD*

MASTER OF SCIENCE IN COMPUTER SCIENCE

*2023*

## Work Experience

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### The Johns Hopkins University

*Baltimore, MD*

GRADUATE STUDENT RESEARCHER

*Dec 2020 - ongoing*

Supervised by Misha Kazhdan.

Doing research in developing new tools for geometric data processing.

Doing research in feature preserving neural surface reconstruction.

Attended ICCV2021, Capital Graphics 2022, SGP 2022, SIGGRAPH 2022.

Member of Hopkins Computer Graphics Lab.

### Apple

*Cupertino, CA*

RESEARCH INTERN

*June 2021 - June 2022*

Supervised by Joerg Liebelt.

Worked with Ming Chuang, Feng Tang, Samson Huang.

Did applied research in neural surface reconstruction.

Worked on the ARKit API (RoomPlan), released at WWDC2022, check out ([Click here](#))

Co-organized an event with Leah Gum, the reading discussion session, "How Culture Takes Roots".

Member of Spatial Computer Vision Org.

### Honda Research Institute

*Mountain View, CA*

RESEARCH INTERN

*Feb 2021 - April 2021*

Supervised by Chiho Choi.

Did applied research in human activity prediction.

### The Johns Hopkins University

*Baltimore, MD*

GRADUATE STUDENT RESEARCHER

*July 2018 - Dec 2020*

Supervised by Greg Chirikjian.

Did research in 3D computer vision and machine learning.

Attended CVPR2019, ECCV2020.

Member of Hopkins Laboratory for Computational Sensing and Robotics (LCSR).

## Publications

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\* means equal contributors

### Estimating Discrete Total Curvature with Per Triangle Normal Variation

SIGGRAPH 2023

Crane Chen

(project supervised by Misha Kazhdan, funded by departmental fellowship)

## Towards Undoing Smoothness Bias for RGB Neural Surface Reconstruction

ICCV UNDER REVIEW, 2023

Crane Chen, Joerg Liebelt  
(project supervised by Misha Kazhdan, funded by Apple Inc.)

## Towards Efficient Graph Convolutional Networks for Point Cloud Handling

ICCV, 2021

Yawei Li\*, Crane Chen\*, Zhaopeng Cui, Radu Timofte, Marc Pollefeys, Gregory Chirikjian, Luc Van Gool

## Multi-person 3D Pose Estimation in Crowded Scenes Based on Multi-View Geometry

ECCV, 2020 (SPOTLIGHT)

Crane Chen\*, Pengfei Guo\*, Pengfei Li, Gim Hee Lee, Gregory Chirikjian

## Curvature: A Signature for Action Recognition in Video Sequences

CVPR 2020, WORKSHOP OF DIFFERENTIAL GEOMETRY IN CVML

Crane Chen, Gregory Chirikjian

## Software

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\* means waiting for approval of owners of the github repos

### \*libigl - A simple C++ geometry processing library

New feature estimating total curvature, for triangle mesh and point cloud.

### \*Open3D: A Modern Library for 3D Data Processing

New feature estimating total curvature, for triangle mesh and point cloud.

## Patents

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### Image Compression Techniques

Inventors: Samson Huang, Crane Chen  
Patent filed by Apple Inc.

## Skills

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**Programming** Python, C++

**Tools and Libraries (Python)** Pytorch, Pymeshlab, Open3D, OpenCV, Trimesh

**Tools and Libraries (C++)** Libigl, CGAL, PCL, Polyscope, Geometry Central, OpenMP, Trimesh2

**Languages** English (bilingual proficiency), Mandarin(bilingual proficiency)

## Invited Talks

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### Capital Graphics 2023

*College Park, MD*

*May 2023*

Invited by Yotam Gingold at George Mason University.

Gave a talk and presented a discrete total curvature estimation method using the Dirichlet energy of Gauss map.

### Shape Analysis Seminar

*Baltimore, MD*

*Dec 2022*

Invited by Laurent Younes at Hopkins Center for Imaging Sciences.

Gave a talk about using total curvature to handle the spectral bias in neural surface reconstruction.

### Graphics and Geometry Seminar

*Baltimore, MD*

*Dec 2022*

Invited by Alan Yuille at Hopkins CCVL.

Gave a talk about using total curvature to handle the spectral bias in neural surface reconstruction.

## **Amazon-WSE Research Festival**

*Baltimore, MD*

*Aug 2022*

Invited by Sanjeev Khudanpur at Hopkins CLSP.

Presented at the festival, my research about surface reconstruction, and post processing of the reconstructed triangle meshes.

## **CS M.S.E. Orientation**

*Baltimore, MD*

*Aug 2022*

Invited by Revelie Niles and Scott Smith at Hopkins.

Gave a talk on behalf of GRACE about department's effort to advocate for a welcoming work atmosphere for female students.

## **Capital Graphics 2022**

*Washington DC*

*May 2022*

Invited by Yotam Gingold at George Mason University.

Gave a talk and presented a demo that incrementally reconstructs surface with data captured by the mobile phone.

## **Teaching Experience**

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### **Teaching Academy Fellow, JHU CTEI Teaching Academy Training**

*Baltimore, MD*

*summer 2023*

Supervised by Kelly Clark, Mike Reese, and Richard Shingles.

Learned theories of pedagogy in a three-day intensive training.

Designed from scratch my own version of "Intro to Computer Graphics" for first/second year undergrads at Hopkins. The course introduces both application and theory, centering on one important concept from computer graphics, "the Laplacian". The course itself is self-contained and friendly to students at all levels. It does not overlap but can serve as a motivation course for the 3-credit course Computer Graphics.

Wrote short essays to support my course about learning objectives, assessment strategies, learning activities, and learning environment.

Completed Phase II of Future Faculty Training.

### **Instructor, Python Programming (TReND in Africa, 30 students)**

*Baltimore, MD*

*summer 2022*

Supervised by Artemis Koumoundourou.

Gave a lecture.

Paired live coding and debugging homework with students in Africa through zoom.

### **Course Assistant, EN.601.661 Computer Vision (85 students)**

*Baltimore, MD*

*fall 2020*

Supervised by Greg Hager.

Graded coding homework and jupyter notebook exercise for the class.

Answered questions on Piazza and hosted weekly office hours.

### **Teaching Assistant, EN.530.646 Robot DKDC (89 students)**

*Baltimore, MD*

*fall 2019, spring 2020*

Supervised by Jin Seob Kim.

Graded written and coding homework for the class.

Answered questions on Piazza and hosted weekly office hours.

Mentored pre-designed labs and self-proposed projects for students using UR5 robot.

## **Side Projects**

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## Augmented Reality Suggestive Contours for Brain Surgery

Baltimore, MD

April 2019 - June 2019

Supervised by Nassir Navab, mentored by Sing Chun Lee.

Developed two apps for Microsoft Hololens with Unity, which involved features including gesture control, voice control, and gaze tracking.

Calculated suggestive contour of CAD models using OpenGL libraries. Applied the Vuforia marker to detect the 3D model position and overlay suggestive contours on a 3D printed model.

To see the demo, click here

## Occlusion R-CNN for Pedestrian Detection

Baltimore, MD

April 2019 - June 2019

Supervised by Mathias Unberath, mentored by Chenglin Yang.

Appeared on the news of CS department at JHU. (Click here)

Provided a solution for occlusion situation in pedestrian detection.

Generated heat-map masks representing the probability of occlusion using a multi-modal gaussian model.

## UR5 Robot Arm Playing Piano

Baltimore, MD

Nov 2018 - Dec 2018

Supervised by Jin Seob Kim, mentored by Minsung Chris Hong.

Developed an app with MATLAB and ROS, which enables UR5 automatically read-understand-play any encoded music score (i.e. a data set encoding notes).

To see the demo, click here.

## Service

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### GRACE (social chair)

Baltimore, MD

2022-ongoing

Led the student group together with Farnaz Yousefi, Alexandra Delucia, Kelly Marchisio, Gopika Ajaykumar.

Organized monthly social events and regular hangouts for female graduate students in CS and ECE (kayaking at Loch Raven Reservoir, picnic at Druid Hill Park, field trip to Maryland zoo, hiking at Merryman Trail, bookmark making session, weekly bring your own lunch, lunch with female faculty)

Encouraged females in tech to share their own research/career stories to inspire and support each other.

### WiCS (mentor)

Baltimore, MD

2023-ongoing

Mentees: Sophia Lovulo, Divya Ravindra.

Provide academic and career advice to female undergrads in CS.

### LCSR (lab tour guide)

Baltimore, MD

fall 2022

Supervised by Ashley Moriarty.

Demoed the repositioning of soft tissue using the da Vinci surgical robot.

Guided an informative robotics tour for undergraduate students in engineering school with undecided majors, showcasing potential opportunities in the field.

### Center for Initiatives in Jewish Education (judge)

Baltimore, MD

June 2022-July 2022

Supervised by Joseph Saltzman.

Provide feedback and advice for innovation day projects, where high schoolers research, build, demo, and commercialize their cool ideas (e.g. smart bike helmet, sunscreen reminder).

## Personal

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**Exercise** hot yoga, mountain biking, swimming, hiking

**Photography** photos of wildlife animals, check the photos: <http://cranehechen.com/photography.html>

**Painting** acrylic mini-portraits of pets