Yong CHENG

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EDUCATION

Washington University in St. Louis St. Louis, MO, US

- Computer Science, M.S. 2021 - 2023
- Average GPA 3.9/4.0
- TA for CSE 332/504 Object-Oriented Software Development Laboratory

Shanghai Ocean University Shanghai, China

- (Mathematics) Information and Computing Science, B.S. 2016 - 2021
- Major GPA 3.9/4.0 (1^{st} / 58) Average GPA 3.5/4.0

WORK EXPERIENCE

NIO Inc. Shanghai, China

Algorithm Engineer | HD map, Autonomous Driving May 2024 - present

- Refactored code, fixed bugs and solved the challenges for HD map auto-construction, involving geometry processing and topology reconstruction.
- Designed and implemented an algorithm to automatically identify intersection ranges to decrease the occurrences of short link, redundancy, and road disconnection.

International Digital Economy Academy (IDEA) Shanghai, China

Algorithm Engineer, Geometry and Graphics | CAD/CAE Jun. 2023 – Mar. 2024

- Developed infrastructure libraries: curve and surface discretization, bounding box computation, quartic equation solver, and Quadtree implementation.
- Enhanced the loop search algorithm by caching intermediate results and integrating Quadtree structures, leading to a performance boost exceeding 100x.
- Rewrote and optimized "loop to face" algorithms, achieving over a thousandfold performance enhancement.
- Designed and implemented efficient analytic intersection algorithms for a line with a cylinder, a cone, and a torus, ensuring high-speed computation with distance tolerance considerations.
- Implemented a general geometric intersection algorithm to solve complex curve and surface intersection problems, whose precision surpasses industry standards like Parasolid even in extreme scenarios.

Elekta Inc. St. Louis, MO

Software Engineering Intern | Medical Image Management May 2022 – Aug. 2022

- Developed a web-based software for managing DICOM files in radiation therapy. Enhanced software capabilities by adding visualization, parsing, recursive indexing, querying, and file upload/download functionalities. Integrated a database and blob storage.

RESEARCH & PROJECT EXPERIENCE

Inheritance analysis based on 3D skeletonization | Mathematica, Python St. Louis, MO

Guided by Professor Tao Ju, Washington University in St. Louis Dec. 2022 – May 2023

- **Feature Extraction:** Analyzed 3D spatial density data of chromosomes and extracted skeletal features such as chromosome length, inter-chromosomal angles, and dimensions along three PCA directions.
- **Threshold Optimization:** Computed skeletal topological change curves for each sample across different density thresholds, by which I implemented an algorithm to automatically determine the optimal thresholds for binarization and skeletonization.
- **Dimensional Reduction & Data Analysis:** Calculated over 50 features from each sample's skeleton, performed dimensionality reduction method (PCA, UMAP, and LDA), and identified patterns and trends to locate affected genes.

Enhanced Microtubule Segmentation and Tracking | Python, Napari St. Louis, MO
Final Project of CSE 554: Geometric Computing for Biomedicine Nov. 2022

- Developed a tool for biologists to track microtubule segmentations across frames based on initial positions.
- Applied image blurring and Contrast Limited Adaptive Histogram Equalization (CLAHE) for global contrast adjustment. Designed algorithms for generating accurate binary images with dynamic thresholds, surpassing OpenCV's built-in functions.
- Used opening, closing, and Hough transformation techniques, and created a custom loss function to locate target microtubules, addressing challenges like stretching, shrinking, movement, rotation, and crossing.

Geometry Processing Algorithm Implementation | Mathematica St. Louis, MO
CSE 554: Geometric Computing for Biomedicine Aug. 2022 – Nov. 2022
Implemented geometric algorithms and **all** advanced extra parts. Including:

- 3D Skeletonization, Isosurface Extraction, Surface Simplification with QEM, PCA/SVD Registration, and Laplacian-Deformation.
- Extra parts: Isosurface extraction by 2 different methods, Marching Cubes and Dual Contouring, then implemented Interval tree to accelerate the algorithm. Implemented QEM in both 2D and 3D. Enhanced Laplacian-Deformation by optimizing the transform matrix to generate a better shape.

Pedagogical Applet of Chan's Algorithm | Html/CSS, JavaScript, Vue Dec. 2021

- Developed a demo website to show the process of the world's fastest convex hull algorithm, Chan's algorithm with complexity of o(n log h) (h stands for output size) after the course Computational Geometry.

Mathematical Contest in Modeling (CUMCM) Sept. 2019

- Researched mathematical modeling to analyze ball-bouncing strategies on a drum under varying conditions of angles, forces, and frequencies.
- Proposed a mechanical model mainly based on space coordinates and used MATLAB to solve equations. Authored a thesis that won the national 2nd prize.

AWARDS & HONORS

Contemporary Undergraduate Mathematical Contest in Modelling Sept. 2019
The National 2nd Prize, Ranking: top 3.8%

The People's Scholarship in China 2018 & 2019 & 2020
The 1st Prize, Ranking: top 5%

SKILLS & INTERESTS

Programming	C/C++, Python, Mathematica, JavaScript, Html, CSS, C#, SQL, MATLAB, Git
Software	Unity, AutoCAD, QGIS, Photoshop
Academic Interests	Computer Graphics, Geometry Processing, Image Processing

My research interests lie in computer graphics and its applications. I hope to pioneer new methods for 3D reconstruction, geometric processing, and intelligent systems, with applications in autonomous driving, computer-aided-design, and biomedical technologies.