Dan Zeng

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Personal Summary

PhD candidate with research interests in geometry, computer graphics, and imaging with applications in geometric modeling and biomedical and plant imaging.

Education

Ph.D. Candidate in Computer Science — August 2017-present
Washington University in St. Louis — Saint Louis, MO
Advisor: Prof. Tao Ju

Bachelor of Science in Computer Science — August 2013-May 2017
Washington University in St. Louis — Saint Louis, MO

Experience

PhD Candidate: WUSTL Dept. of Computer Sci. and Engineering (advisor: Tao Ju) 2017-present

- Developed a novel algorithm for maximally simplifying the topology of a 3D shape with minimal changes to its geometry. Our algorithm demonstrates significantly improved topological and geometric results compared to prior methods. Published to SIGGRAPH ASIA 2020
  - Project website (Paper, code, presentation): https://danzeng8.github.io/topo-simplifier/
- Developed a skeleton-based method to capture the architectures of sorghum panicles as part of a study which revealed continuous morphological variation across genetically diverse sorghum influorescences (Published in and on the cover of New Phytologist journal, May 2020).
  - Journal Cover: https://nph.onlinelibrary.wiley.com/toc/14698137/2020/226/6
  - Wash U Press Release: https://engineering.wustl.edu/news/2020/3D-images-allow-detailed-insight-into-grasses.html
  - Danforth Center Press Release: https://www.danforthcenter.org/news/looking-inside-grass-flowers/
- Currently developing TopoRoot: A topology-based pipeline for high-throughput computation of fine-grained root system architecture from 3D imaging
  - Github: https://github.com/danzeng8/TopoRoot

Research Internship: Facebook Reality Labs May-September 2020

- In the area of Computer Graphics in AR/VR: details of work performed are confidential.
- Mentored by Yajie Yan and Philippe Bouttefroy

PhD Intern: Donald Danforth Plant Science Center (Christopher Topp's Lab) May-August 2018

- Developed a skeleton-based method to capture the architectures of sorghum panicles as part of a study which revealed continuous morphological variation across genetically diverse sorghum influorescences (accepted for publication by New Phytologist journal, February 2020)
- Applied geometric computing techniques to create an image-to-architecture analysis pipeline for capturing plant root shape, branching hierarchy, and other traits for phenotyping. The pipeline, composed of a software suite, is now used by members of the Topp Lab.
- Generated virtual reality data sets of plant roots using Drishti, which are being presented in educational outreach programs at the Saint Louis Science Center and at other exhibitions.

Undergraduate Research Assistant: WUSTL Dept. of Computer Science and Engineering 2016-2017

- Implemented a C++ interface for pathwalking (algorithm for determining protein backbones in Cryo-EM density maps) in Gorgon, an open-source interactive molecular modeling software suite.
- Developed extremal curve skeletonization (method that uses local maxima to identify α-helices and β-sheets in high-resolution density maps) in Gorgon.

- Presented discoveries at Washington University's Fall Undergraduate Research Symposium.

Research Intern: Washington University in St. Louis Psychiatry Department 2015-2016

Performed a research study regarding the effects of residency restrictions on sex offenders in Missouri.

- Used Perl, Python, and JavaScript to extract demographic and address data from online sources.
- Cleaned address data for geocoding using AWK and Sed. Visualized it using GIS software.
- Performed regressions and statistical analyses to measure the effectiveness of the restrictions.

Graduate Teaching Assistant: CSE 554 Geometric Computing for Biomedicine Fall 2018

- Instructed students on geometric computing algorithms and image analysis techniques as applied to biomedical and plant images.

Head Teaching Assistant: CSE 530 Database Management Systems Fall 2016 and Spring 2017

- Instructed students on database design, optimization, applications, and query languages.
- Held office hours to help students on homeworks and projects.

Teaching Assistant: CSE 132 Intro to Computer Science II Spring 2015

- Instructed students in object-oriented programming, concurrency, and TCP/IP protocol.
- Held office hours and lab sessions.

Co-Founder: Washington University Phone Services 2013-2015

- Designed, developed, and maintained an application hosted on App Engine using Django and jQuery for managing repair requests.
- Repaired screens, backs, cameras, digitizers, and batteries of iPhone and Samsung phones.

Publications

- Dan Zeng, Erin Chambers, David Letscher, Tao Ju. 2020. To cut or to fill: A global optimization approach to topological simplification. ACM Transactions on Graphics (Proc. ACM Siggraph Asia 2020), 39(6): No. 201
- Mao Li, Mon-Ray Shao, Dan Zeng, Tao Ju, Elizabeth A. Kellogg, Christopher N. Topp. 2020. Comprehensive 3D Phenotyping reveals Continuous Morphological Variation across Genetically Diverse Sorghum Inflorescences. New Phytologist Journal.

Honors / Awards

- Imaging Sciences Pathway Fellowship (2019-2021), awarded by the Division of Biology and Biomedical Sciences at Washington University
- Dean's Select PhD Fellowship at Washington University (2017)
- Thomas H. Eliot Scholarship Award at Washington University (2013)

Skills and Programming Languages

- Computer Graphics, Imaging, Shape reconstruction and analysis, Computational Geometry, Computer Vision, Graph algorithms, Optimization, TensorFlow, Pytorch, UCSF Chimera
- C/C++, Python, Mathematica, Matlab, Java, R, HTML, CSS, Javascript

Extracurriculars

Career Development Officer, Association of Graduate Engineering Students 2018-2019

- Organized networking events to connect graduate students with industry. Responsible for inviting industry guests, scheduling, coordinating with student groups, and event promotion. The Spring Networking events of 2018 and 2019 were attended by nearly 100 students and representatives. Over 120 students and 34 representatives from 24 companies came to our Sep 26, 2019 event.