Daniel Orban

Computer Scientist ++

Highly motivated technical professional with over **20+ years** of **professional**, **research**, and **teaching** experience. I have a **diverse background** that has fostered strong verbal, listening, and writing skills. My research interests include **simulation**, **scientific visualization** and **high-dimensional analysis**. I am able to negotiate and problem solve quickly, accurately, and efficiently. I am also a quick learner with a strong desire to teach others.

Personal Info

Address

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Minneapolis, MN 55404

Phone

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Website

https://dtorban.github.io/

Skills

Software Engineering

High-Dimensional Visualization

Scientific Visualization

Computer Graphics / Virtual Reality

High-Performance Computing

Teaching Mathematics and Computer Science

Network Programming

Technical Skills

Languages:
C/C++, C#, Java, Javascript, Python, JSP, Ruby on Rails, ML.

Graphics / Rendering:
Vulkan, OpenGL, WebGL, GLSL/HLSL, GPU Architecture, Shaders, Graphics Pipeline, Textures, Deferred Rendering, MinVR, GLFW, VRPN. Blender

Technologies:, NetCDF,

Education

2015-01 - 2021-09

PhD. in Computer Science

University of Minnesota, MN

- Member of the Interactive Visualization Lab (ivlab.cs.umn.edu).
- Research focused on interactive computer graphics and high-dimensional data visualization for scientific applications.

2015-01 - 2019-09

Masters of Computer Science

University of Minnesota, MN

1998-08 - 2002-05

Bachelors of Computer Science and Mathematics

Oklahoma State University, OK

- Minor in philosophy.
- General Honors Award.

Research / Open Source Projects

2020-05 - 2022-09

In-Situ Visualization and Analysis of Cancer Cell Migration Simulations

University of Minnesota, MN

- Designed and created a visualization tool for analyzing in-situ simulations across nodes and processes on a supercomputer.
- Used a C++ networked backend to synchronize and relay active simulation results through web sockets to a javascript / jquery / D3.js front end (https://github.com/dtorban/VirtualLab).
- Used web based interaction to start and communicate with simulations running on the supercomputer.
- Built an ensemble visualization that includes dynamic graphs and multiple 2D spatial representations for comparison and high-dimensional analysis.

2020-01 - 2020-05

Planetarium Dome Unity Integration

Bell Museum, University of Minnesota, MN

- Integrated IVLab assets written in Unity to work with the planetarium dome by interfacing with OpenSpace software.
- Implemented library in C++ using Vulkan shared textures and semaphores to efficiently render and synchronize projections across applications (https://github.com/dtorban/VisLink).
- Integrated an OpenGL connector for sharing textures with Unity and other OpenGL applications.

XML, UML, SQL, TCP/IP, UDP, FAST Data Search, Entity Framework, Betaflight

Web:
Javascript, REST API, HTML, CSS, Node.js, Angular, React, Django, WebGL, Three.js, D3, JQuery, VTK-js, Spring MVC, JSF, ASP.NET, WPF, GWT, Ruby on Rails, WebSockets, SOAP

Cloud:
Docker, AWS, EC2, S3, Appistry, Hadoop, VMware

Source Control / Build:
GIT, SVN, TFS, CMake, GTest

Databases:
MySQL, PostgreSQL, SQL Server, Oracle, SQLite, SimpleDB

Platforms:
Linux, Microsoft Windows, Mac OS., Unix

Commodity Exchanges:
FIX/FIXML, QuickFix, CME, ICE, TT, Nodal Exchange

Awards

PSOC Pilot Project Program Grant Award
University of Minnesota Physical Sciences in Oncology Center (December, 2018)

Thank a Teacher Award
University of Minnesota Center for Educational Innovation, (Spring 2018, Fall 2019, Summer 2020)

Grand Prize Poster Winner
Minnesota Supercomputing Institute Research Exhibition (2016)

S&P I/T Directors Award
Dell Inc. (2004)

Competent Communicator
Toastmasters International (October 2006)

First Place Small Block Sculpting Contest
Vulkan Snow Sculpting (January 2020)

2018-12 - 2019-07

Extending the parameter space visualization research and techniques to aid the development and analysis of cell migration models and experiments

University of Minnesota, MN

- Co-Investigator for project, applying multidimensional algorithms to cancer cell migration simulations models.
- Extending existing high-dimensional visualization tools in order to explore and analyze the parameters in light of uncertainty (https://github.com/dtorban/cinema_quest).

2017-05 - 2018-08

Cinema Science Open Source Project

Los Alamos National Lab, NM, University of Minnesota, MN

- Lead developer for Cinema:Quest and Cinema:Bandit, web-based multidimensional ensemble visualization tools. (https://github.com/cinemascience/cinema_quest, https://github.com/cinemascience/cinema_bandit)
- Integrated VTK-js into Cinema:Explorer.
- Cinema:Bandit was used for multiple Stanford Linear Accelerator (SLAC) experiments.

2015-01 - 2016-08

BigData: Coupling Data-Intensive Modeling, Simulation, and Visualization with Human Facilities for Design: Application to Next-Generation Medical Device Prototyping

University of Minnesota, MN

- Worked closely with the UMN Medical Device Center and collaborators from the University of Chicago.
- Investigated cardiac lead design based on how lead stiffness and lead length relate to tissue stress and fluid flow in the right atrium of the heart (https://ivlab.cs.umn.edu/Johnson-2019-BentoBox.html, https://youtu.be/gn8bo8TgCHI).
- Developed GPU based algorithms to render large fluid-structure interaction comparison in virtual reality.
- Used C++, OpenGL, multi-context rendering, and deferred rendering techniques.
- Converted Abaqus simulations to the VisCDF file format for visualizing simulations using resources at the Minnesota Supercomputing Institute (MSI).

2015-01 - 2018-01

MinVR Open Source Project

University of Minnesota, MN

- Collaborated with the University of Minnesota and Brown University to develop a robust, cross-platform VR toolkit for use with many different VR displays and input devices (https://github.com/MinVR).
- One of the key contributors to the library design including the display graph architecture and plugin framework.
- Implemented multithreading, multiple graphics / device plugins, and graphics examples.

Professional Experience

2022-01 - Present

Research and Development / Curriculum Design

CreateMPLs, Minneapolis, MN

- Researched STEM curriculum for K-12 students to be used in public and private schools.
- Integrated device software for the Arduino and Raspberry PI for using motors and sensors.
- Developed and implemented curriculum for building, programming, and flying drones.
- Mentored college students on how to build a drone simulator with physics and graphics.

2015-01 - 2021-09

PhD Candidate / Research Assistant

University of Minnesota, MN

- Visualized large, spatially complex, high-dimensional simulation data sets in the context of parameter spaces (https://conservancy.umn.edu/handle/11299/225099).
- Much of the research involved efficiently sampling and streaming large amounts of data from multiple simulations onto the GPU for real-time interaction in VR environments.
- We needed to support multithreaded, multi-context rendering for both head mounted displays and multiple large displays (e.g. screen / touch table, cave environment, and planetarium). I am very familiar with graphics pipelines, with experience using OpenGL and Vulkan. I have written graphics engines and entity component systems using C++ (https://github.com/dtorban/sandbox).
- Since simulations were run on a supercomputer, I wrote several communication frameworks for TCP/IP and Web Sockets. I also needed to share graphics resources via file handles to share textures over multiple processes.
- Using my research, I wrote a teaching framework using C++ and Three.js to facilitate building a drone delivery simulator.

2018-05 - 2018-08

Graduate Student Intern

Los Alamos National Laboratory, Los Alamos, NM

2017-05 - 2017-08

- Worked closely with material scientists and experimentalists to improve the visual analysis of shock physics experiments.
- Implemented an ensemble visualization tool called Cinema:Bandit, allowing users to view filtered velocimetry data, x-ray diffraction images, and integration curves.
- Contributed to several beamline experiments at the Stanford Linear Accelerator Center (SLAC) by using a continuous workflow for visual analysis.
- Developed Cinema:Quest, a predictive analysis tool for analyzing high-dimensional data using dimensionally reduced views and direct manipulation.

2014-02 - 2014-12

Computer Graphics Programmer

Computer Science Department, University of Minnesota, MN

- Extended functionality for Virtual Interactive Table System (ISliceWIM) for medical device design.
- Worked closely with two high-profile medical device companies to implement FEA Analysis volume visualization in virtual reality.
- Created flexible scene file format for transforming and aggregating mesh file formats for real-time manipulation.
- Implemented VisCDF, an open source toolkit written in C++ for visualizing scientific data using the NetCDF format.
- Assisted graduate and undergraduate students technically in their research.

2012-08 - 2014-02

Software Developer

OATI Inc, Minneapolis, MN

- Lead for WebREC, a renewable energy credit (REC) tracker for resource energy generation.
- Developed core attribution engine to allocate energy and RECs to various contracts and markets. Uses OO design to flexibly allow the user to create, customize, and debug rules in C# / .NET.
- Extended core company functionality to build powerful data pivot functionality which takes objects and dynamically builds reports based on the user's chosen properties or dimensions using WPF.

- Became technical expert of WebFinancial, a live financial trading analytics application. Implemented real-time quotes and live profit and loss updates for futures, swaps, physicals, and options.
- Designed and implemented FIX / FIXML trade capture adapters to interface with live commodity exchanges including the Intercontinental Exchange (ICE), the Chicago Mercantile Exchange (CME), Trading Technologies (TT), and the Nodal Exchange. Also used QuickFix as an underlying framework for energy and financial trades.

2010-08 - 2010-10

Software Contractor

BCforward, Austin, TX

- Extended Cloud Map/Reduce (CMR) project for Accenture to use the Appistry Cloud environment.
- Redesigned CMR application to flexibly use a variety of distributed infrastructures.
- Designed CMR for no single point of failure and incremental processing of previous aggregations.
- Created serialized storage model which allows for streaming aggregation of successive runs.

2007-04 - 2009-05

Research Associate

Accenture Technology Labs, San Jose, CA

- Designed and implemented Cloud Map/Reduce (CMR) in Java using EC2, S3, SQS, and Simple DB.
- Investigated network topology discovery and optimization techniques with TCP/IP socket programming.
- Discovered network security risk involving bandwidth limitations in shared resource environments.
- Designed Remote Network Labs in Java, AJAX, and the Google Web Toolkit (GWT), which allows users to test network configurations from a pool of distributed physical network devices.
- Modified and extended Hadoop file system and Hadoop map reduce framework to create Gridbatch. Gridbatch provides flexibility for data storage locality and enables tasks similar to map or reduce.
- Published peer reviewed papers on distributed computing, cloud computing, and network virtualization.
- Delivered interactive presentations on synthetic biology, networking, and distributed computing.

2002-06 - 2006-10

Programmer Analyst

Dell Inc., Round Rock, TX

- Technical lead and senior developer for the Software and Peripherals online web application, a large scale, real-time, performance-sensitive, customer facing, production application written in C#, ASP.NET.
- Promoted flexibility using object oriented techniques, efficient coding, and design patterns.
- Wrote core pricing and business logic in C#. Compiled into libraries to be used across applications.
- Designed and developed production Dell.com Search application. Determined FAST Data Search indexes to optimize for flexibility and performance.
- Received S&P I/T Director's Award in 2004 for efforts and teamwork.
- Used multithreading in C# and Microsoft SQL Server stored procedures to update search index.
- Administered Microsoft SQL Server application databases, and optimized queries.
- Automated application build using VSS, NAnt, and Cruise Control.
- Trained Brazil global developers as project lead. Mentored replacement for global development lead.

Teaching Experience

2024-09 - 2025-05

Lecturer (Future Position)

University of Minnesota, MN

- CSCI 4041 - Algorithms and Data Structures (Fall 2024)
- CSCI 2081 - Introduction to Software Development (Fall 2024)

2024-01 - 2024-04

Adjunct Professor

University of Minnesota, MN

- CSCI 5609 - Visualization (Spring 2024)

2022-01 - 2023-02

High School Teacher

CreateMPLs, Minneapolis, MN

- Innovator (3D Design) - Hope Academy (Fall 2022, Fall 2023)
- Drone Bootcamp - Brooklyn Center High School (Summer 2022)
- Drone Bootcamp - Relentless Academy (Summer 2022)
- Introduction to Robotics - Hope Academy (Spring 2022)
- STEM Block - Heritage STEM Academy, Minneapolis Public Schools (Spring 2022)

2021-09 - 2022-01

Lecturer

University of Minnesota, MN

- CSCI 3081 - Program Design & Development (Fall 2021)

2020-06 - 2021-05

PhD Candidate Graduate Instructor

University of Minnesota, MN

- CSCI 2011 - Discrete Structures of Computer Science (Spring 2021)
- CSCI 3081 - Program Design & Development (Fall 2020)
- CSCI 1113 - Introduction to C/C++ Programming for Scientists and Engineers (Summer 2020)

2016-01 - 2019-12

Teaching Assistant

University of Minnesota, MN

- CSCI 4611 - Programming Interactive Computer Graphics and Games (Fall 2019, Spring 2018)
- CSCI 3081 - Program Design & Development (Spring 2019, Fall 2018, Spring 2016)
- CSCI 5619: Virtual Reality and 3D Interaction (Fall 2017)
- CSCI 2011 - Discrete Structures of Computer Science (Fall 2017)
- CSCI 5421 - Advanced Algorithms & Data Structures (Spring 2017)

2011-08 - 2012-06

High School Technology Teacher

Hope Academy, Minneapolis, MN

- Taught 11th and 12th grade students typing, spreadsheets, programming, search engine optimization, and website design.
- Lead and organized the HopeWORKS Summer Internship Program for Hope Academy students.

2009-09 - 2010-09

Alternative Teacher Certification Candidate

Texas Teacher Alternative Certification Program, Austin, TX

- Eligible for probationary certificate to teach high school math and computer science in Texas.
- Substitute teacher for Austin Independent School District.
- Observed classrooms in Vandegrift High School and Westwood High School.
- Attended Texas Teacher Alternative Certification training in classroom management, lesson design, differentiated learning, assessments, and effective teaching.

2000-01 - 2002-05

Mathematics Tutor

Mathematics Learning Resource Center, Oklahoma State University, Stillwater, OK

- Tutored college students in basic math, algebra, geometry, trigonometry, precalculus, and calculus.
- Volunteered to help students who elected to take a mathematics application class.

Other Experience

2023-08 -
2023-11

Minneapolis City Council - Ward 9 Candidate

Minneapolis, MN

- Local, low budget, and loving campaign to revitalize south Minneapolis, focusing on breaking up open air drug scenes, providing shelter and care for those experiencing homelessness, and helping those struggling with drug addiction or mental health.
- Worked to create a positive vision for Minneapolis (https://danorban.github.io).
- Met with neighborhood leaders and law enforcement officials in hopes to restore trust in public servants.
- Endorsed by Star Tribune Editorial Board.
- Active participant in Ward 9 public forum with opponent.
- Passed out flyers and knocked on doors to discuss the platform and encourage voting.

2023-03 -
2023-08

Hobby Farmer

Lanesboro, MN

- Managed and maintained a 20 acre off-grid Amish hobby farm.
- Implemented motorized well pump using pulley system.
- Created a custom electrical system using solar panels to run equipment and charge multiple types of batteries (12V DC / 110V AC through an inverter). The system enables custom lighting, a composting fan, a chainsaw, gardening power tools, and smaller water pumps.
- Setup solar powered electric fences for animals.
- Designed goat enabled brush removal and tiling process for preparing soil for future crops.
- Worked with local farmers to maintain 15 acres of pasture land using cattle.

Selected Publications

- **Daniel Orban**. *Data-Driven Exploratory Interfaces for Contextualizing Parameter Spaces: Adding Intuition to Big Data* (Doctoral dissertation, University of Minnesota). (2021)

- **Daniel Orban**, Divya Banesh, Cameron Tauxe, Christopher M. Biwer, Ayan Biswas, Ramon Saavedra, Christine Sweeney et al. "Cinema: Bandit: a visualization application for beamline science demonstrated on XFEL shock physics experiments." *Journal of Synchrotron Radiation* 27, no. 1 (2020).

- Seth Johnson, **Daniel Orban**, Hakizumwami Birali Runesha, Lingyu Meng, Bethany Juhnke, Arthur Erdman, Francesca Samsel, Daniel F. Keefe. "Bento Box: An Interactive and Zoomable Small Multiples Technique for Visualizing 4D Simulation Ensembles in Virtual Reality." Frontiers in Robotics and AI 6 (2019): 61.

- **Orban, Daniel**, Daniel F. Keefe, Ayan Biswas, James Ahrens, David Rogers. "Drag and Track: A Direct Manipulation Interface for Contextualizing Data Instances within a Continuous Parameter Space." *IEEE transactions on visualization and computer graphics* 25.1 (2019): 256-266.

- **Daniel Orban**, Seth Johnson, Hakizumwami Birali Runesha,, Lingyu Meng, Bethany Juhnke, Arthur Erdman, Francesca Samsel, Daniel F. Keefe. "Poster: Comparison of Multiple Large Fluid-Structure Interaction Simulations in Virtual Reality." *Symposium on Large Data Analysis and Visualization*, IEEE (2018)

- Bethany Tourek, **Daniel Orban**, Bogden Tanasoiu, Hakizumwami Birali Runesha, Daniel F. Keefe, Arthur G. Erdman. "Poster: Inverse Design Process: New Methodology to Design Medical Devices with BIG DATA." *Minnesota Supercomputing Institute Research Exhibition.* (2016)

- Liu, Huan, and **Dan Orban**. "Cloud mapreduce: A mapreduce implementation on top of a cloud operating system." *Proceedings of the 2011 11th IEEE/ACM international symposium on cluster, cloud and grid computing*. IEEE Computer Society, 2011.

- Liu, Huan, and **Dan Orban**. "Remote network labs: An on-demand network cloud for configuration testing." *ACM SIGCOMM Computer Communication Review* 40.1 (2010): 83-91.

- Liu, Huan, and **Dan Orban**. "Computing median values in a cloud environment using GridBatch and MapReduce." *Cluster Computing and Workshops, 2009. CLUSTER'09. IEEE International Conference on*. IEEE, 2009.

- Liu, Huan, and **Dan Orban**. "Gridbatch: Cloud computing for large-scale data-intensive batch applications." *Cluster Computing and the Grid, 2008. CCGRID'08. 8th IEEE International Symposium on*. IEEE, 2008.