

Spyridon “Spiros” Tsalikis

Senior R&D Engineer @Kitware | CS Ph.D. Candidate @UNC

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TECHNICAL SKILLS

Specializations: Computational Geometry, Mesh Generation, Scientific Visualization, Parallel Computing, Performance Optimization, Algorithms, AR/VR, Robotics

Programming Languages: C++, C, Python, R, Java, HTML, CSS, JavaScript, PHP, MySQL

Libraries: VTK, Viskores, ParaView, OpenMP, CUDA, OptiX, Qt, ExprTk, {fmt}, scnlb, fast_float, CLI11, JSON, NumPy

Technologies: CMake, CTest, Google Test, CI/CD, Git, Linux, Windows, Microsoft Office, LaTeX, reStructuredText

EDUCATION

Ph.D. in Computer Science (4.00/4 GPA), [University of North Carolina at Chapel Hill](#) **Jan 2023-Dec 2027**

M.Sc. in Computer Science (3.96/4 GPA), [Old Dominion University](#) **Aug 2019-Dec 2021**

B.Sc. in Informatics (8.71/10 GPA), [Aristotle University of Thessaloniki](#) **Sep 2015-Jul 2019**

Diploma in High School (19.3/20 GPA), [Hellenic College of Thessaloniki](#) **Sep 2009-Jun 2015**

WORK EXPERIENCE

Senior Research and Development Engineer, [Kitware Inc.](#) **Jan 2025 – Present**

Develop and support the 3D visualization software platforms VTK, Viskores and ParaView.

- Modernized `vtkCellArray` and `vtkUnstructuredGrid` to support storing cell offsets, connectivity and types as any `vtkDataArray`, including implicit arrays that use no extra memory for efficiently storing single-cell-type meshes, as well as Viskores GPU arrays, enabling direct, zero-copy data sharing.
- Enabled visualization of `vtkPartitionedDataSetCollection` in ParaView’s chart views, allowing users to plot partitioned datasets directly in charts.
- Replaced all unsafe or slow C/C++ string conversion functions in VTK and ParaView with safer and faster alternatives using {fmt}, scnlb, and fast_float, with usage enforced via clang-tidy 20.1.3+ checks—improving safety, error handling, and I/O performance.
- Optimized the performance of reading OpenFOAM distributed datasets in VTK by 13.2× on network NFS-mounted drives by multithreading per-dataset reads to maximize network throughput and eliminating redundant metadata access across all partitions.
- Optimized the performance of appending filters for polygonal and volumetric unstructured meshes in VTK by 32.3x through a full re-design leveraging multithreading and efficient array processing.
- Optimized the performance of surface extraction for polyhedron meshes in VTK by 5.9x by integrating polyhedral support into an atomic hash counting approach originally designed for simple linear cells.

Research and Development Engineer, [Kitware Inc.](#) **Jan 2022 – Dec 2024**

Develop and support the 3D visualization software platforms VTK and ParaView.

- Changed ParaView’s Default Background and Color Map to Warm Gray and F.A.S.T., respectively.
- Enabled VTK’s robust SSIM method in ParaView to improve image testing accuracy and enhance robustness.
- Re-designed ParaView’s Multiblock Inspector to enable the coloring of different blocks using different arrays within a Partitioned DataSet Collection or MultiBlock DataSet.
- Enabled ParaView to save various data-such as state, screenshot, animation, script, and expression- both locally and remotely.

- Optimized the performance of several public functions provided by VTK's structured data structures by 2-3x using implicit arrays with pre-computed properties.
- Implemented a high-performance, parallel-aware writer utilizing the IOSS library to efficiently write simulation meshes in the Exodus file format.
- Re-designed ParaView's Prism plugin which coordinates a Phase-Space view and a Geometric view to visualize multi-physics simulation results and gain greater insight.
- Migrated and streamlined ParaView's self-directed and classroom tutorials from LaTeX/Wiki to Sphinx documentation using reStructuredText, enhancing accessibility and maintainability.
- Optimized the performance of core VTK/ParaView filters—such as Extract Surface, Clip, Slice, Contour, Threshold, Stream Tracing, Particle Tracing, Surface Normals, Resample with Dataset, Integration, Mesh Quality, and Extract Selection—by 10-79x using multithreading, caching, and efficient data structures and algorithms.
- Designed Selection Editor, a ParaView widget that collects multiple selections of points/cells supporting 9 selection types, such as query, frustum, and polygon, and combine them using a boolean expression.

Research and Development Intern, [Kitware Inc.](#)

Jul 2021 – Dec 2021

Develop and support the 3D visualization software platforms VTK and ParaView.

- Implemented a graphics hardware-accelerated picker in VTK enabling picking points/cells in a 3D scene.
- Designed the display-sized disk plane and coordinate-frame widgets in VTK/ParaView to clip/slice 3D models and specify coordinate-system transforms in a 3D scene.
- Multithreaded core VTK/ParaView filters-such as Merge Vector Components, Array Calculator, Vortex Cores, Extract Histogram, Superquadric, and Point Data to Cell Data-achieving 70-90% CPU parallel efficiency.
- Implemented the non-linear 19-nodes pyramid's API based on R. Browning's Ph.D. dissertation using C++ to provide interpolation and visualization capabilities for VTK/ParaView.
- Implemented a string-formatter with argument scopes using C++/{fmt} to standardize formatting syntax and facilitate string substitutions for ParaView's sources, filters, and render/spreadsheet views.
- Implemented a function parser for VTK's array calculator using C++/ExprTk to evaluate mathematical expressions defined with scalar/vector variables.

Ph.D. Candidate, [University of North Carolina at Chapel Hill](#)

Jan 2023 – Present

Research focused on designing performance and memory optimized parallel algorithms used in the Scientific Visualization Domain. Member of the IRON Lab. Advised by Kenneth Moreland & Daniel Szafr.

- Designed a parallel external facelist calculation algorithm in VTK (for CPUs) & Viskores (for CPUs & GPUs) using an atomic hash counting approach that improves performance by 7.37x and reduces memory footprint by 5.99x.
- Designed a parallel accelerated Clip algorithm in VTK (for CPUs) & Viskores (for CPUs & GPUs) for unstructured volumetric meshes using a batch-driven approach that improves performance by 32.6x and reduces memory footprint by 4.37x.
- Implemented the Kabsch algorithm to align the coordinate systems of Vicon, Hololens, and Unity, enabling Parkinson's patients to perform AR-guided physical therapy.
- Contributed to the geometric derivation of computing angles for safe start regions in medical steerable needle automation.
- Designed a User-Interface in 3DSlicer enabling physicians to visually select the safest and best plan of a Steerable Needle Lung Robot using intuitive data exploration and easily interpretable metrics.

Graduate Research Assistant, [Old Dominion University](#)

Aug 2019 – Dec 2021

Research focused on parallel mesh generation. Member of the Center for Real-time Computing lab. Advised by Nikos Chrisochoides.

- Implemented 3D discrete vertex smoothing using C++/CUDA to improve the quality of meshes' cells.
- Designed the GPCD software using C++, Parallel Mesh Generation and GPU ray-traced Ambient Occlusion with OptiX to expedite the detection of protein pockets and cavities by 10-15x.

- Implemented an HPC pipeline to generate 3D adaptive unstructured look-up tables using C++, and Parallel Mesh Generation to approximate Compton Form Factors which can be used to expedite Monte Carlo Event Generation by 10-1000 times depending on the number of events.
- Multithreaded the steps of computing the surface and box of a 3D image and assembling the resulting mesh of the Parallel Optimistic Delaunay Mesher PODM3D and achieved 90% CPU parallel efficiency.

Graduate Teaching Assistant, [Old Dominion University](#)

Aug 2019 – May 2020

Served as a grader for undergraduate courses.

- Spring 2020: CS517 - Computational Methods and Software
- Fall 2019: CS390 - Introduction to Theoretical Computer Science

Undergraduate Research Assistant, [Old Dominion University](#)

Oct 2017 – Jul 2019

Research focused on mesh generation. Member of the Center for Real-time Computing lab. Advised by Nikos Chrisochoides and Athena Vakali.

- Integrated Detri2 - a sequential 2D Delaunay triangulation library- into the parallel 2D method for constrained Delaunay Mesh Generation that utilizes the static geometric Medial Axis Domain decomposition.
- Designed a library using C++ to read and write meshes supporting 10 file formats.

High School Programming Tutor, *Self-Employed*

Sep 2017 – Jun 2018

Teaching senior-year high-school students the algorithmic programming course, supervise them the whole academic year, and prepare them for the final Pan-hellenic exams

PUBLICATIONS

- *[Safe Start Regions for Medical Steerable Needle Automation](#)*, Janine Hoelscher, Inbar Fried, **Spiros Tsalikis**, Jason Akulian, Robert J. Webster III, Ron Alterovitz, IEEE Transactions on Robotics, Mar 2025.
- *[An Accelerated Clip Algorithm for Unstructured Meshes: A Batch-Driven Approach](#)*, **Spiros Tsalikis**, Will Schroeder, Daniel Szafr, Kenneth Moreland, The 24th Eurographics Symposium on Parallel Graphics and Visualization, May 2024.
- *[3-Dimensional Adaptive Unstructured Tessellated Look-up Tables for the Approximation of Compton Form Factors](#)*, Charles Hyde, Mitch Kerver, Christos Tsolakis, Polykarpos Thomadakis, **Spiros Tsalikis**, Kevin Garner, Angelos Angelopoulos, Wirawan Purwanto, Gagik Gavalian, Christian Weiss, Nikos Chrisochoides, arXiv, Aug 2025.
- *[Investigating Encoding and Perspective for Augmented Reality](#)*, Jade Kandel, Sriya Kasumarthi, **Spiros Tsalikis**, Chelsea Duppen, Daniel Szafr, Michael Lewek, Henry Fuchs, Danielle Szafr, arXiv, Oct 2025.
- *[A High-Performance SurfaceNets Discrete Isocontouring Algorithm](#)*, Will Schroeder, **Spiros Tsalikis**, Michael Halle, Sarah Frisken, arXiv, Jan 2024.

HONORS & AWARDS

- **Honorable Mention Best Paper Award**, [The 24th Eurographics Symposium on Parallel Graphics and Visualization](#), Received for my paper: An Accelerated Clip Algorithm for Unstructured Meshes: A Batch-Driven Approach, May 2024.
- **1st Prize**, [Hellenic Mathematical Society](#), Received for my performance in the Hellenic Mathematical Competition, Jan 2010.
- **1st Prize**, [Hellenic Mathematical Society](#), Received for my performance in the Hellenic Mathematical Competition, Feb 2009.