

Spyridon “Spiros” Tsalikis

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

Carrboro, NC, US | +1-757-201-5879 | spiros.tsalikis@outlook.com

spirostsalikis.com | kitware.com/spiros-tsalikis | linkedin.com/in/spiros-tsalikis

scholar.google.com/citations?user=Q-i8WR8AAAAAJ | orcid.org/0000-0001-5113-7195 | github.com/spyridon97

gitlab.kitware.com/spiros.tsalikis | stackoverflow.com/users/14140986/spiros-tsalikis

Summary

I am a Senior Research and Development Engineer at Kitware. C++/C/Python are my best pals in developing high-performance and quality code, preferably, related to Geometry! I am interested in Computational Geometry, Mesh Generation, Scientific Visualization, Parallel Computing, Performance Optimization, Algorithms, AR/VR, and Robotics. I earned my B.Sc. in Informatics at AUTH, my M.Sc. in Computer Science at ODU, and currently I am pursuing my Ph.D. in Computer Science at UNC.

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}, scilb, 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)

Jan 2023-Dec 2027

University of North Carolina at Chapel Hill

Chapel Hill, NC, US

Courses:

- COMP915 - Technical Communication in Computer Science
- COMP790 - Introduction to VR and 3D Graphics
- COMP781 - Robotics
- COMP533 - Distributed Systems

M.Sc. in Computer Science (3.96/4 GPA)

Aug 2019-Dec 2021

Old Dominion University

Norfolk, VA, US

Courses:

- CS895 - DevOps, Containers & Cloud
- CS895 - Advanced Computational Methods and Software
- CS800 - Research Methods
- CS822 - Machine Learning
- CS665 - Computer Architecture
- CS625 - Data Visualization
- CS600 - Algorithms and Data Structures
- CS578 - Computational Geometry, Methods and Applications
- CS517 - Computational Methods and Software
- CS500 - Foundations of Computing

Courses:

- NNA-08-05 - Performance of Parallel and Distributed Systems
- NIS-08-04 - Machine Learning
- NIS-08-02 - Operational Research & Business Intelligence
- NET-08-02 - Computer Music
- NGE-08-01 - Entrepreneurship and Innovation
- NIS-07-08 - Software Systems Quality Assurance
- NIS-07-06 - Discrete Mathematics II
- NIS-07-03 - Datawarehouses and Data Mining
- NET-07-02 - Flexible Learning
- NIS-07-01 - Web Information Systems
- NIS-06-07 - Data Structuring Techniques
- NIS-06-06 - Algorithmic Graph Theory
- NNA-06-04 - Mobile Applications And Development
- NIS-06-03 - Distributed and Internet Computing
- NGE-06-02 - Optimization
- NGE-06-01 - Mathematical Modeling
- NCO-05-05 - Software Engineering
- NCO-05-04 - Operating Systems
- NCO-05-03 - Databases
- NCO-05-02 - Communication Networks
- NCO-05-01 - Signals and Systems
- NCO-04-05 - Digital Communications
- NCO-04-04 - Human-Computer Interaction
- NCO-04-03 - Algorithms
- NCO-04-02 - Artificial Intelligence
- NCO-04-01 - Programming Language And Compilers
- NCO-03-05 - Computer Architecture
- NCO-03-04 - Object Oriented Programming
- NCO-03-03 - Electronics
- NCO-03-02 - Numerical AnalysisNumerical Analysis
- NCO-03-01 - Applied Mathematics
- NCO-02-05 - Theory of Computation
- NCO-02-04 - Digital Design
- NCO-02-03 - Data Structures
- NCO-02-02 - Probabilities & Statistics
- NCO-02-01 - Mathematical Analysis II
- NCO-01-05 - Basic Programming Principles

- NCO-01-04 - Discrete Mathematics I
- NCO-01-03 - Linear Algebra
- NCO-01-02 - Introduction to Informatics
- NCO-01-01 - Mathematical Analysis I

Diploma in High School (19.3/20 GPA)

Hellenic College of Thessaloniki

Sep 2009-Jun 2015

Thessaloniki, GR

WORK EXPERIENCE

Senior Research and Development Engineer

Kitware Inc.

Jan 2025 – Present

Carrboro, NC, US

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}`, `scnlib`, 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

Carrboro, NC, US

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

Jul 2021 – Dec 2021

[Kitware Inc.](#)

Norfolk, VA, US

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

Jan 2023 – Present

[University of North Carolina at Chapel Hill](#)

Chapel Hill, NC, US

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

Aug 2019 – Dec 2021

[Old Dominion University](#)

Norfolk, VA, US

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

Aug 2019 – May 2020

Old Dominion University

Norfolk, VA, US

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

Oct 2017 – Jul 2019

Old Dominion University

Thessaloniki, GR

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

Sep 2017 – Jun 2018

Self-Employed

Thessaloniki, GR

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

Journal Papers

- *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.

Conference & Symposium Papers

- *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.

Pre-print Papers

- *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.
- *Safe Start Regions for Medical Steerable Needle Automation*, Janine Hoelscher, Inbar Fried, **Spiros Tsalikis**, Jason Akulian, Robert J. Webster III, Ron Alterovitz, arXiv, Apr 2024.
- *A High-Performance SurfaceNets Discrete Isocontouring Algorithm*, Will Schroeder, **Spiros Tsalikis**, Michael Halle, Sarah Frisken, arXiv, Jan 2024.

Blogs

- *New Default Colormap and Background in the next version of ParaView*, Francesca Samsel, Ken Moreland, W. Alan Scott, **Spiros Tsalikis**, Cory Quammen, Kitware Blog, Oct 2024.
- *Really Fast Isocontouring*, Will Schroeder, **Spiros Tsalikis**, Kitware Blog, Jun 2023.
- *Coming in ParaView 5.12: ParaView State Embedded in PNG Screenshots*, **Spiros Tsalikis**, John Patchett, Cory Quammen, Kitware Blog, Feb 2023.
- *New in ParaView 5.11: Selection Editor*, **Spiros Tsalikis**, Cory Quammen, Kitware Blog, Dec 2022.
- *VTK/ParaView Filters: Performance Improvements*, **Spiros Tsalikis**, Will Schroeder, Cory Quammen, Mary Elise Dedicke, Kitware Blog, Jul 2022.

Presentations

- [*Design Patterns for Multithreaded Algorithm Design and Implementation*](#), Will Schroeder, **Spiros Tsalikis**, University of Utah, Feb 2023.
- [*Smart Tessellated Look-up Tables for Nuclear Femtography*](#), Mitchell R. Kerver, Charles E. Hyde, **Spyridon Tsalikis**, Nikos Chrisochoides, American Physical Society Division Nuclear Physics Hawaii Meeting 2021, Oct 2021.

Dissertation & Thesis

- [*Survey: A parallel two-dimensional method for constrained Delaunay Mesh Generation*](#), **Spyridon Tsalikis**, Aristotle University of Thessaloniki, Nov 2019.

WORKSHOPS

- **Scientific Computing and Imaging Institute Workshops**, University of Utah, Feb 2023
Design Patterns for Multithreaded Algorithm Design and Implementation
- **CNF Workshops**, Jefferson Lab, Sep 2020
Roadmap to Compton Form Factors of Quarks and Gluons
- **CNF Workshops**, Jefferson Lab, Sep 2020
High Performance Computing Workshop
- **CNF Workshops**, Jefferson Lab, Aug 2019
Imaging Workshop

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.

VOLUNTEER EXPERIENCE

Competition Monitor

Mar 2020 – Mar 2020

[*Great Computer Challenge*](#)

Norfolk, VA, US

Monitored competition room and contestants in the scientific programming category, and enforce rules.

Summer Camp Leader

Jul 2014 – Jul 2018

[*Thavor Summer Camp*](#)

Chalkidiki, GR

Led children aged 6-18 years old at a summer camp.

Cook

Jan 2017 – Jan 2017

[*City Plaza Hotel*](#)

Athens, GR

Cooked for Syrian Refugees

LANGUAGES

Greek (Native Speaker), English (Expert)