Sergei Shudler

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Education

Ph.D. in Computer Science **Feb 2013 – Apr 2018 (expected)**
Technical University of Darmstadt (TU Darmstadt) *Germany*
Dissertation title: "Scalability Engineering for Parallel Programs Using Empirical Performance Models"
Advisor: Prof. Dr. Felix Wolf

M.Sc. in Computer Science (Grade: 92) **Oct 2004 – Dec 2009**
The Hebrew University of Jerusalem *Israel*
Thesis title: "The Effects of Untruthful Bids on User Utilities and Stability in Computing Markets"
Advisor: Prof. Amnon Barak

B.Sc. in Computer Science (Grade: 95, Magna cum laude) **Oct 2000 – Aug 2003**
The Hebrew University of Jerusalem *Israel*
Top 15% of graduating class; Dean's List in the 2nd year

Research Interests

My research interests focus on exploiting parallelism at extreme-scale. Specifically, I am interested in four aspects of this problem: (i) performance analysis and modeling; (ii) parallel programming paradigms and algorithms; (iii) HPC applications; and (iv) visualization of analysis data.

Research and Teaching Experience

Visiting Researcher (Intern) **Oct 2016 – Mar 2017**
Lawrence Livermore National Laboratory *CA, USA*

- Researched ways to represent OpenMP code as task dependency graphs.
- Developed a tool (*libtdg*) that creates task dependency graphs from OpenMP code using OpenMP Tools Interface (OMPT). Extended LLVM OpenMP runtime to generate callbacks for loop chunks.
- Performed initial evaluation of resource contention overhead at a task and chunk level using *libtdg*.
- Research mentor: Prof. Dr. Martin Schulz.

Doctoral Researcher **Feb 2013 – Present**
RWTH Aachen University and Technical University of Darmstadt *Germany*

- Explored directions for using empirical performance modeling in the analysis of parallel programs.
- Designed a framework for validating performance expectations. It is based on empirical performance modeling and allows developers of HPC libraries to uncover unexpected scalability bottlenecks. It also allows users to evaluate alternative library implementations and choose the most suitable one.
- Proposed a practical method for deriving isoefficiency functions of real world task-based applications. The approach allows users to choose appropriate input sizes to maintain target efficiency as the core count increases. It also sheds light on key co-design questions.
- Developed a replay engine, which can use various OpenMP runtimes, for task dependency graphs. By comparing execution times of original applications with the replay times we can analyze the resource contention overhead.
- Collaborated with fellow graduate students and researchers in Germany, Switzerland, and the US.

Teaching Assistant **Feb 2013 – Present**
RWTH Aachen University and Technical University of Darmstadt *Germany*

- Administered yearly seminars focused on various topics in parallel computing and HPC.
- Prepared MPI and multithreading exercises for graduate-level courses focused on parallel programming.
- Supervised and mentored bachelor and masters students.
- Presented in tutorial (*21st VI-HPS Tuning Workshop*, Garching, Germany).

Master's Researcher **May 2007 – May 2010**
The Hebrew University of Jerusalem *Israel*

- Evaluated a novel job scheduling algorithm that combines game theory and market aspects with preemptive process migration.
- Conducted extensive simulations with real world workload traces.

Publications

EuroPar'17: P. Reisert, A. Calotoiu, S. Shudler, F. Wolf: Following the Blind Seer – Creating Better Performance Models Using Less Information. In *Proc. of the 23rd Euro-Par Conference*, Santiago de Compostela, Spain.

PPoPP'17: S. Shudler, A. Calotoiu, T. Hoefler, F. Wolf: Isoefficiency in Practice: Configuring and Understanding the Performance of Task-based Applications. In *Proc. of the ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming (PPoPP)*, Austin, TX, USA.

ESPT'15: D. Lorenz, S. Shudler, F. Wolf: Preventing the explosion of exascale profile data with smart thread-level aggregation. In *Proc. of the Workshop on Extreme Scale Programming Tools (ESPT)*, held in conjunction with SC'15, Austin, TX, USA.

EuroPar'15: C. Iwainsky, S. Shudler, A. Calotoiu, A. Strube, M. Knobloch, C. Bischof, F. Wolf: How many threads will be too many? On the scalability of OpenMP Implementations. In *Proc. of the 21st Euro-Par Conference*, Vienna, Austria.

ICS'15: S. Shudler, A. Calotoiu, T. Hoefler, A. Strube, F. Wolf: Exascaling Your Library: Will Your Implementation Meet Your Expectations?. In *Proc. of the ACM International Conference on Supercomputing (ICS)*, Newport Beach, CA, USA.

CCGrid'10: S. Shudler, L. Amar, A. Barak, A. Mu'alem: The Effects of Untruthful Bids on User Utilities and Stability in Computing Markets. In *Proc. of the 10th IEEE/ACM Conference on Cluster, Cloud and Grid Computing (CCGrid)*, Melbourne, Australia.

Conference Presentations and Talks

Scalable Tools: Isoefficiency in Practice: Configuring and Understanding the Performance of Task-based Applications, *11th Scalable Tools Workshop*, Granlibakken Resort, CA, USA, August 7, 2017.

7th JLESC: Isoefficiency in Practice: Configuring and Understanding the Performance of Task-based Applications, *7th Joint Laboratory for Extreme-Scale Computing Workshop (JLESC)*, Champaign, IL, USA, July 17, 2017.

PPoPP'17: Isoefficiency in Practice: Configuring and Understanding the Performance of Task-based Applications, *ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming (PPoPP)*, Austin, TX, USA, February 6, 2017.

Livermore Natl. Lab.: Isoefficiency in Practice: Configuring and Understanding the Performance of Task-based Applications (seminar talk), *Lawrence Livermore National Laboratory*, Livermore, CA, USA, January 27, 2017.

ISC'16: Systematic Scalability Validation of HPC Libraries: Performance Engineering Approach (PhD forum presentation), *31st International Supercomputing Conference (ISC)*, Frankfurt, Germany, June 20, 2016.

4th JLESC: Exascaling Your Library: Will Your Implementation Meet Your Expectations?, *4th Joint Laboratory for Extreme-Scale Computing Workshop (JLESC)*, Bonn, Germany, December 4, 2015.

ICS'15: Exascaling Your Library: Will Your Implementation Meet Your Expectations?, *29th ACM International Conference on Supercomputing (ICS)*, Newport Beach, CA, USA, June 9, 2015.

Greifswald: Exascaling Your Library: Will Your Implementation Meet Your Expectations?, *Workshop on Sparse Solvers for Exascale: From Building Blocks to Applications*, Greifswald, Germany, March 15, 2015.

CCGrid'10: The Effects of Untruthful Bids on User Utilities and Stability in Computing Markets, *10th IEEE/ACM Conference on Cluster, Cloud and Grid Computing (CCGrid), Melbourne*, Australia, May 18, 2010.

Professional Experience

Software Developer II **Nov 2011 – Jan 2013**
Paradigm Geophysical Ltd. *Israel*

- Paradigm Geophysical Ltd. specializes in solutions for the discovery and extraction of subsurface natural resources. Worked on a C++ and OpenGL-based 3D visualization system called 3D-Canvas.
- Introduced a multithreaded, progressive fetching mechanism for multi-resolution visual data and worked with other developers to integrate it into 3D-Canvas.
- Implemented a capability to correlate two instances of 3D volumetric data.
- Developed a functionality to display semi-transparent, floating text annotations within an OpenGL 3D scene. Used Win32 to port this functionality to Windows.

Software Developer (part-time) **Apr 2011 – Nov 2011**
SagivTech Ltd. *Israel*

- SagivTech specializes in development of GPGPU algorithms for image and signal processing applications.
- Optimized morphological operators for a de-noising algorithm using OpenCL.
- Helped to prepare a three day OpenCL course by converting CUDA code to OpenCL.

3D Graphics Developer **Nov 2009 – Oct 2011**
Tiltan Systems Engineering Ltd. *Israel*

- Maintained the company's main 3D engine that was developed in C++ on top of DirectX. It was used as a rendering library for aerial and ground simulators, and designed to support vast terrains and large number of objects.
- Developed DirectX shaders in HLSL to render terrain-embedded geometric entities and 3D objects.
- Implemented the shadow-map algorithm to display shadows cast by 3D objects.
- Implemented a prototype for large-scale terrain rendering based on experimental work at Zuse Institute Berlin, Germany.

C++ Programmer **Jan 2004 – Aug 2009**
Israeli Air Force (IAF) *Israel*

- Worked on a distributed, Windows-based command & control system for operational units. It provided a situational awareness capability allowing multiple units to coordinate their actions in a joint mission.
- Ported the entire system's code-base from MS Visual Studio 6 to MS Visual Studio 2005, thereby enabling developers to use the .NET Framework.
- Developed a C++ wrapper module for a .NET-based 2D map (GIS) engine.
- Developed a multithreaded communication (TCP / UDP) module on top of WinSockets.
- Collaborated with other developers to implement and test application-level communication protocols.
- Mentored junior developers (code-reviews, guidance).

Technical Skills & Languages

Programming: C/C++, Python, R, Bash, C#, Java, HLSL, SQL

Tools: Git, SVN, GDB, Totalview, MS Visual Studio, Matlab

APIs: MPI, OpenMP, STL, OpenCL, CUDA, OpenGL, DirectX

Languages: English (fluent), Hebrew (native), Russian (native), German (basic proficiency)

References

Felix Wolf
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Laboratory for Parallel Programming
Technical University of Darmstadt, Germany
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Torsten Hoefler
Professor
Scalable Parallel Computing Lab
ETH Zürich, Switzerland
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Martin Schulz
Professor
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Technical University of Munich, Germany
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