Semyon Grigorev

Research interests

Graph theory, Formal language theory, Parsing algorithms, Static code analysis.
Graph algorithms, Path search algorithms, GraphBLAS API, Graph databases, Query languages.
Sparse linear algebra, Efficient matrix operations, Matrix multiplication, Sparse matrices.
GPGPU, Parallel computation, High performance computing, High-level languages for high-performance computing.
Advanced program optimizatrion and transformation techniues, Metacomputations, Metaprogramming.
Hardware design, Software-hardware codesign, Lambda-processors, Dataflow processors.

Education

2006–2010 **B.S in Mathematics and Computer Science**, *St.Petersburg State University*, St.Peresburg, Russia.
Thesis title: Developmnt of GLR parsing algorithm

2010–2012 **M.S in Information Technology**, *St.Petersburg State University*, St.Peresburg, Russia.
Thesis title: Automated translation of dynamic SQL queries in information system reengineering

2012–2016 **PhD in Phisics and Mathematics**, *St.Petersburg State University*, St.Peresburg, Russia.
Thesis title: Parsing of dynamically generated programms

Employment

2017–now Saint Petersburg State University, associate porfessor, St.Petersburg

2012–2022 JetBrains s.r.o., lead researcher at JetBrains Research laboratory, lead of research group at Programm languages and tools laboratory, St.Petersburg

2007–2012 Lanit-Tercom, developer, software engineer, St.Petersburg

Research projects

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Formal Language Constrained Path Querying	Research and development formal language constarined path querying algorithms: graph navigation algorithns which can be used for static code analysis, graph database querying, other graph analysis tasks. ○ New formal language constrained path querying algorithms development ○ Complexity analysis of algorithms ○ New classes of formal languages investigation ○ High performance algorithms implementation and evaluation
High-Performance Graph Analysis	Linear algebra based high performance graph analysis ○ Portable multi-GPGPU implementation of GraphBLAS-like API ○ GraphBLAS-based algorithms design, implementation and evaluation ○ GraphBLAS API analysis
High-Level Languages For High-Performance Computing	Development of methods and tools to utilize high-level languages for GPGPU programming, high-performance linear algebra based algorithms development, and hardware synthesis. ○ Implemetation of fusion-like optimization for sparse linear algebra routines (distillation) ○ Implementation of sparse linear algebra routines in functional language to make it more type safe, fusion-friendly, and utilize natural divide-and-conquer parallelism ○ Evaluation and development a special hardware and special hardware synthesis techniques for sparse linear algebra based algorithms

Research-related software projects

SPLA	Generalized sparse linear algebra framework for multi-GPU computations based on OpenCL
SpBLA	Sparse Boolean linear algebra for Nvidia Cuda, OpenCL and CPU computations
CFPQ_Data	Dataset for context-free path querying evaluation
CFPQ_PyAlgo	A set of context-free path querying algorithm
GLL4Graph	GLL-based context-free path querying algorithm (for Neo4j)
RedisGraph	CFPQ algorithm for RedisGraph
Brahma.FSharp	F# quotations to OpenCL translator and respective runtime to utilize GPGPUs in F# applications
Distiller	Fusion-like transformation for sparse linear algebra routines

Conferences and publications

Full list	**DBLP: https://dblp.org/pid/181/9903.html**.
GRADES-NDA 2021	**Context-Free Path Querying with All-Path Semantics by Matrix Multiplication**, *Rustam Azimov, Ilya Epelbaum, Semyon Grigorev*. Graph Data Management Experiences and Systems (GRADES) and Network Data Analytics (NDA) 2021

GrAPL 2021 **SPbLA: The Library of GPGPU-Powered Sparse Boolean Linear Algebra Operations**, *Egor Orachev, Maria Karpenko, Artem Khoroshev, Semyon Grigorev*.
2021 IEEE International Parallel and Distributed Processing Symposium Workshops (IPDPSW)

EDBT 2021 **Multiple-Source Context-Free Path Querying in Terms of Linear Algebra**, *Arseniy Terekhov, Vlada Pogozhelskaya, Vadim Abzalov, Timur Zinnatulin, Semyon Grigorev*.
Proceedings of the 24th International Conference on Extending Database Technology (EDBT), 2021

ADBIS 2020 **Context-free path querying by kronecker product**, *Egor Orachev, Ilya Epelbaum, Rustam Azimov, Semyon Grigorev*.
European Conference on Advances in Databases and Information Systems

PPoPP 2020 **Optimizing GPU programs by partial evaluation**, *Aleksey Tyurin, Daniil Berezun, Semyon Grigorev*.
Proceedings of the 25th ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming

GRADES-NDA 2019 **Evaluation of the context-free path querying algorithm based on matrix multiplication**, *Nikita Mishin, Iaroslav Sokolov, Egor Spirin, Vladimir Kutuev, Egor Nemchinov, Sergey Gorbatyuk, Semyon Grigorev*.
Proceedings of the 2nd Joint International Workshop on Graph Data Management Experiences & Systems (GRADES) and Network Data Analytics (NDA)

GRADES-NDA 2018 **Context-free path querying by matrix multiplication**, *Rustam Azimov, Semyon Grigorev*.
Proceedings of the 1st ACM SIGMOD Joint International Workshop on Graph Data Management Experiences & Systems (GRADES) and Network Data Analytics (NDA)

Grants

RSF 2017-2022 Logical and algebraic methods in formal language theory

RFBR 2019-2022 Formal language constrained path querying

RFBR 2018-2019 Methods and tools for embedded languages processing

Teaching

Courses Practice of programming, Algortithms and data structures, Formal language theory and parsing algorithms, Graph theory

Technical skills

Programming languages and platforms .NET, F#, Haskell, Python, JVM, Java, Scala

Databases SQL, Cypher, Neo4j, RedisGraph

GPGPU CUDA, OpenCL

Graph analysis	GraphBLAS API (SuiteSparse, pygraphblas), Graphalytics benchmarking system, SuiteSparse matrix collection and other datasets

Languages

Russian	Native
English	Intermediate