Konstantin Knyazkov

[scientific researcher & software engineer]

Personal details

- 29 years old
- Male
- Russian citizen
- Software engineer (MSc ~ Specialist, 5 yr)
- PhD in Computer Science
- Have driving license

Languages

- English – full work proficiency
- Russian – mother tongue

Like

Contacts

constantinvk /at/ gmail.com

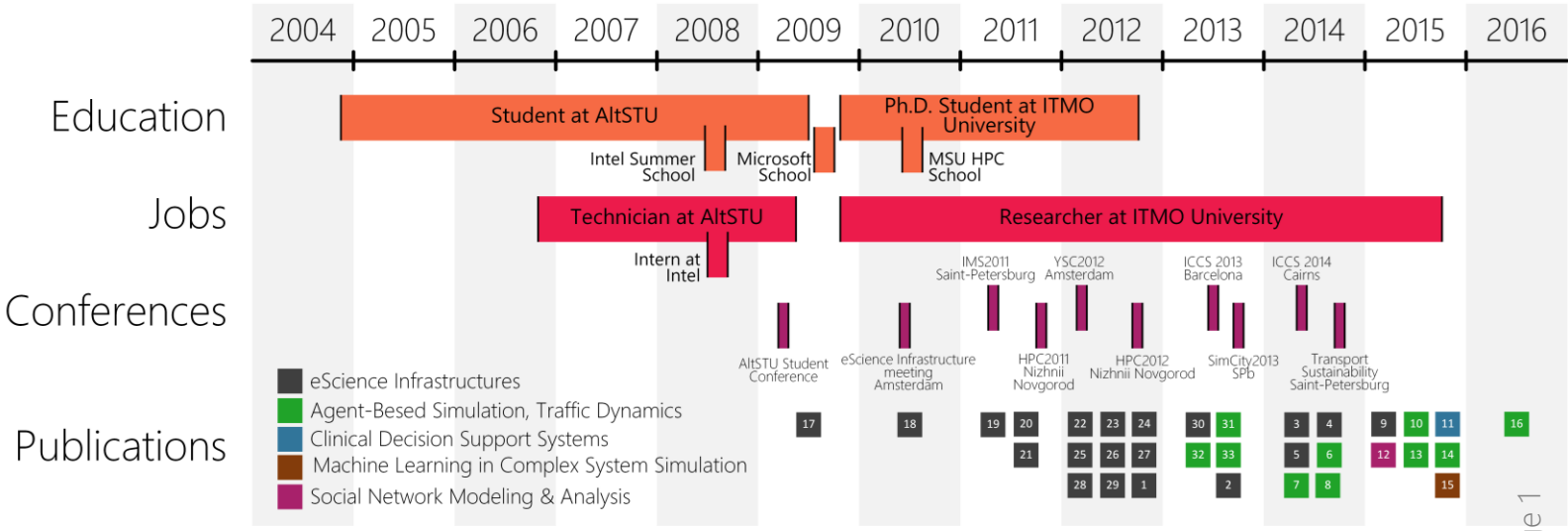
Summmary

A versatile researcher relies on both software engineering training and academic research experience in several areas: complex systems modeling and simulation, interactive eScience infrastructures, agent-based simulation, and decision support systems. Expertise in application domains of eScience, transportation systems simulation and analysis, crowd dynamics simulation, social networks analysis, hydro meteorological models, and clinical data analysis give a wide view in problem solving. Strong software development skills and analytical approach with the use of visual representation of complex information form the personal set of tools in research and development.

Interested in conducting research in the areas of interactive analysis of data and models, evolutionary computing, simulation-based structural optimization, and complex system control.

CV Outline

Activity summary



Expertise

Research areas of expertise

- E-Science infrastructures
- Workflow-management systems
- Agent-based simulation
- Urban mobility and traffic modeling and simulation
- Evolutionary computation
- Social network analysis
- Clinical decision support systems

Research skills

- Data analysis
- Evolutionary computation
- Machine learning
- Statistical analysis
- Simulation
- Scientific visualization
- Successfully participated in many grants as researcher, developer, writer of reports and documentation
- Scientific Writing: 33 publications (16 in Scopus & WoS, see p. 6)
- Presented at 6 international conferences & meetings

Teaching experience

- Master students' research supervision
- Courses and lectures
  1. Software systems architecture course
  2. Master-class on WCF
  3. Lecture on Agent-based simulation
  4. Lecture on Transportation systems' simulation
  5. Lecture on Scientific visualization

Technical skills

- Software Architecture Design
- Desktop and web frontends development
- Object-oriented design and patterns
- Web-Services Development (SOAP, REST)
- Parallel programming and High-Performance Computing
- Distributed computing
- Functional Programming
- Internal and external DSL
- ORM
- Profiling and Performance Analysis
- UX
- VCS, CI
- Unit testing, TDD

Technological skills

language	level	Technologies & libs	Tools
C#	★★★☆	WCF, MEF, LINQ, WPF, NLog, NUnit, Entity, XNA	Visual Studio, ReSharper, dotTrace, MS Build, TeamCity, NAnt
Python	★★★☆	matplotlib, numpy, pandas, Django, scrapy	IPython, pyCharm
Java	★★★☆	processing, Junit	Eclipse, IntelliJ Idea, Maven, Ant
R	★★☆☆	ggplot2, Shiny	RStudio
JavaScript	★★★☆	jQuery, d3js	
Html, CSS	★★☆☆	bootstrap	
C/C++	★☆☆☆	OpenMP, MPI, pthreads	
Ruby	★★☆☆		
Matlab	★☆☆☆		
SQL	★☆☆☆		
Scala	★☆☆☆		
Erlang	★☆☆☆		
Perl, Php, Lisp	★☆☆☆		

Other technologies

GIT, SVN, MongoDB, SQLite, MSSQL, Postgres, MySQL, Gephi, Gnuplot, QGIS, Hadoop, HTTP, Protobuf, ZeroMQ, UML, DFD, XML, XPATH, XSLT, JSON, NetLogo, Jenkins, MS Visio, TeX

Education

2012
3 years

PhD in Software engineering
ITMO University, Saint-Petersburg, Russia

Thesis theme: "Composite applications development technology with the use of domain-specific software modules" [22, 23, in Russian]
Russian: «Технология разработки композитных приложений с использованием предметно-ориентированных программных модулей»

Short description: Proposed unified approach to description of software modules and scientific composite applications in form of workflows. The approach allows coupling of heterogeneous software modules within the workflow, which can be executed in distributed computational environment. For this purpose two domain-specific languages are developed. Proposed and implemented principles of "interactive workflows", which enable capabilities to execute long-running and communicating modules.

2010
~ 2 weeks

Summer School on High-Performance Computing
Moscow State University, Moscow, Russia

2009
~ 2 weeks

Microsoft Research Summer School on High Performance Computing
Moscow State University, Moscow, Russia

2009
5 years

Engineer in Software Engineering (specialist – equivalent to Bac+5)
Altai State Technical University, Barnaul, Russia

Thesis theme: "Technology and Framework for Distributed Systems Development based on the Active Object Concept" [17, in Russian]
Russian: «Разработка технологии и инструментария для создания распределённых систем на основе унифицированной структуры каркасов систем и приложений»

Description: Designed and created a technological framework for distributed software development based on the principle of Active Objects. Framework consisted of three logical parts: transportation fault-tolerant infrastructure written in Erlang, software framework in Java providing different RPC-based objects' communication patterns, and project management software in Python.

2008
2 months

Intel Summer School on High-Performance Computing
Novosibirsk State University & Intel office in Novosibirsk, Novosibirsk, Russia

Professional experience

2009 – 2015
6 years

Scientific Researcher / Software Developer
eScience Research Institute, ITMO University, Saint-Petersburg, Russia escience.ifmo.ru

Description: Conducted research in several directions: eScience distributed infrastructures, agent-based modeling and simulation with application to traffic dynamics models, clinical data analysis, decision support systems. Detailed projects' description is on pages 4 and 5.

2008
2 months

Summer intern
Intel Corporation, Novosibirsk, Russia

Description: Worked within the QA Tools team on the internal infrastructural project.

2006 – 2009
3 years

Technician
Altai State Technical University, Barnaul, Russia

Description: Technical support of university's computer labs, system administration, installation of the university's Ethernet network.

Research & development directions (projects)

Direction #1. CLAVIRE – eScience platform development

CLAVIRE – 3-year research and development project, aimed at development of the cloud-computing platform of new generation. The platform uses the idea of workflows atop the SaaS level of simple software modules. I contributed to the project by development of several core components and by conducting of related research. Official CLAVIRE website in Russian [ ], project description [ ], video [ ].

Selected research tasks

#	Tasks	Related publications
1	Designed the module description DSL (EasyPackage). Participated in design of a declarative DSL for scientific workflow definition (EasyFlow).	[1, 4] [19, 22, 23]
2	Proposed interactive workflow principles and patterns for Urgent Computing. Prototyped the corresponding technology. Then, worked on an interactive virtual environment concept, based on the proposed principles.	[2, 3, 9] [20, 22, 23, 24]
3	Participated in development of hybrid scheduling algorithm with the use of both heuristics and meta-heuristics. Brought the idea of generic ensemble scheduler.	[5]

Selected development tasks

#	Tasks	Technologies used
1	Developed a workflow management service for workflow orchestration. The service includes interpreter of the scripts in EasyFlow.	C# WCF IIS MongoDB
2	Created external DSL (based on Ruby) for modules description with corresponding processing infrastructure: script interpretation library, web-service, console debugger.	C# WCF IronRuby MongoDB
3	Developed web UI, which provides the workflow execution functionality of the platform. Developed two frontends with corresponding backends: Silverlight component and website in HTML/JavaScript.	JavaScript jQuery REST Ajax C# WCF MongoDB Silverlight
4	Developed infrastructural services for event processing and monitoring. Created WCF profiling library, which supports services online tracing and visualization of services activity.	ZeroMQ processing C# java WCF MongoDB MSSQL
5	Implemented the technology of interactive workflows, considering real-time communication of modules within the workflow in two possible forms: formal communication using reactive programming library and plain socket interaction.	C# WCF ZeroMQ

Direction #2. Agent-based simulation in transportation

Designed and developed microscopic agent-based simulation framework for urban mobility simulation. The framework is capable of running in distributed computational environments in order to support large models. Conducted several research studies with the use of the created traffic model. In frames of this direction, I led a team of several master students. Nowadays urban studies research team at the eScience Research Institute uses the created tools.

Selected research tasks

#	Tasks	Related publications
1	Designed and developed large-scale traffic simulation system for cloud computing environment to be used in decision support systems.	[31, 32, 33] [ ]
2	Evaluated the efficiency of different driver decision support systems in case of evacuation in dynamic conditions.	[6, 7, 8] [ ]
3	Participated in project of structural optimization of detectors layout at the airport with the use of genetic algorithm and agent-based mobility model.	[13] [ ]
4	Managed students' research on analysis of flight tickets price behavior for Russian ticket market based on the data fetched from aggregation services.	[10]

Selected development tasks

#	Tasks	Technologies used
1	Designed and developed agent-based framework, microscopic traffic model, and various plugins for different simulation scenarios.	C# Protobuf
2	Developed an interactive visualization component for the simulation framework. The component supports touch interface.	XNA MS Surface OpenStreetMap

Direction #3. Validation of ensemble-based water level forecasting model composed of alternative meteorological models

Performed validation of new version of model ensemble for predicting of water level in Baltic Sea. The ensemble model is used within the St. Petersburg Dam. Participated in creation and testing of new methods of ensemble performance evaluation targeting the following goals: better peaks detection, better ensemble sustainability.

Selected research tasks

#	Tasks	Related publications
1	Tried symbolic regression technique to search of ensemble configuration. Tried Markov's chains as a model selection algorithm.	[15]
2	Validation of regression-based model ensemble with the use of PCA.	[15]

Selected development tasks

#	Tasks	Technologies used
1	Developed the symbolic regression pipeline to search of ensemble configuration.	python deap sympy
2	Developed the software infrastructure for validation: models output data processing, ensembles execution, results visualization.	gnuplot python C#

Direction #4. Modeling in health care-related tasks

Worked as a researcher and engineer in cooperation with researchers from the Federal Almazov North-West Medical Research Centre on the two groups of tasks: development of the data-driven clinical decision support system, analysis of influence of traffic dynamics on ambulance system performance in the city of Saint-Petersburg. Supervised master students' work.

Selected research tasks

#	Tasks	Related publications
1	Performed statistical data analysis of the information of real time traffic load. Data source – Yandex.Maps.	[14]
2	Supervised the student's work on development of the agent-based model of city's ambulance system.	[ ]
3	Participated in designing of the personalized clinical decision support system, based on the real clinical data.	[11]

Selected development tasks

#	Tasks	Technologies used
1	Multidimensional data analysis of ambulance routes during the day	python R gnuplot
2	Development of the bridge from existing information medical system with backend on InterSystems Cache to the designing CDSS. Development of a small OLAP-like framework for data analysis.	python Cache gnuplot

Direction #5. Information spreading optimization in social networks

Participated in research relied to investigation of information spreading in social networks. The goal is to design a framework for simulation-based optimization of information spreading strategies based on a genetic algorithm and an information flow model [12].

Recent Publications (in English)

2012	1	CLAVIRE: E-Science Infrastructure for Data-Driven Computing	*Knyazkov K.V., Kovalchuk S.V., Tchurov T.N., Maryin S.V., Boukhanovsky A.V.*	Journal of Computational Science 3 (6), 504-510
2013	2	Interactive Workflow-Based Infrastructure for Urgent Computing	*Knyazkov K.V., Nasonov D.A., Tchurov T.N., Boukhanovsky A.V.*	Procedia Computer Science 18, 2223-2232
	3	Modeling and Simulation Framework for Development of Interactive Virtual Environments	*Knyazkov K.V., Kovalchuk S.V.*	Procedia Computer Science 29, 332-342
	4	Knowledge-Based Expressive Technologies within Cloud Computing Environments	*Kovalchuk S.V., Smirnov P.A., Knyazkov K.V., Zagarskikh A.S., Boukhanovsky A.V.*	Practical Applications of Intelligent Systems (pp. 1-11). Springer Berlin Heidelberg
	5	Hybrid Evolutionary Workflow Scheduling Algorithm for Dynamic Heterogeneous Distributed Computational Environment	*Nasonov D., Butakov N., Balakhontseva M., Knyazkov K., Boukhanovsky A.V.*	International Joint Conference SOCO'14-CISIS'14-ICEUTE'14 (pp. 83-92). Springer International Publishing
2014	6	Evaluation of In-Vehicle Decision Support System for Emergency Evacuation	*Ivanov S.V., Knyazkov K.V.*	Procedia Computer Science, 29, 1656-1666
	7	A Multi-Agent Simulation of Human Behavior During Emergency Evacuations with In-Vehicle Decision Support System	*Karbovskii V.A., Ivanov S.V., Knyazkov K.V.*	WIT Transactions on Information and Communication Technologies. 2014. C. 635-644.
	8	Towards a Framework for Simulation-Based Evaluation of Personal Decision Support Systems for Flood Evacuation	*Knyazkov K., Balakhontceva M., Ivanov S.*	SGEM2014 Conference Proceedings, ISBN 978-619-7105-10-0/ISSN 1314-2704, June 19-25, 2014, Vol. 1 (2014): 883-894
2015	9	Interactive E-Science Cyberinfrastructure for Workflow Management Coupled with Big Data Technology	*Nasonov D., Visheratin A., Knyazkov K., Kovalchuk S.*	SGEM2015 Conference Proceedings, ISBN 978-619-7105-34-6 / ISSN 1314-2704, June 18-24, 2015, Book2 Vol. 1, 175-182 pp
	10	Data-driven Modeling of Airlines Pricing	*A Lantseva, K Mukhina, A Nikishova, S Ivanov, K Knyazkov*	Procedia Computer Science 66, 267-276
	11	Personalized Clinical Decision Support with Complex Hospital-Level Modelling	*SV Kovalchuk, KV Knyazkov, II Syomov, AN Yakovlev, AV Boukhanovsky*	Procedia Computer Science 66, 392-401
	12	Evolutionary-based Framework for Optimizing the Spread of Information on Twitter	*N Butakov, Y Chuprova, K Knyazkov, N Shindyapina, A Boukhanovsky*	Procedia Computer Science 66, 287-296
	13	The Multi-Agent Simulation-Based Framework for Optimization of Detectors Layout in Public Crowded Places	*Butakov N., Nasonov D., Knyazkov K., Karbovskii V., Chuprova Y.*	Procedia Computer Science, 51, 522-531
	14	Evaluation of Dynamic Ambulance Routing for the Transportation of Patients with Acute Coronary Syndrome in Saint-Petersburg	*K Knyazkov, I Derevitsky, L Mednikov, A Yakovlev*	Procedia Computer Science 66, 419-428
	15	On Classification Issues within Ensemble-Based Complex System Simulation Tasks	*Sergey V. Kovalchuk, Aleksey V. Krikunov, Konstantin V. Knyazkov, Sergey S. Kosukhin, Alexander V. Boukhanovsky*	arXiv preprint
2016	16	Bus scheduling in dynamical urban transport networks with the use of genetic algorithms and high performance computing technologies	*Shmelev, V.A., Dukhanov, A.V., Knyazkov, K.V., Ivanov, S.V.*	*Knowledge, Information and Creativity Support Systems (pp. 97-104). Springer International Publishing*

Other Publications (In Russian)

2009

17 Technology and Framework for Distributed Systems Development based on the Active Object Concept

Разработка технологии и инструментария для создания распределённых систем на основе унифицированной структуры каркасов систем и приложений / Карымов И.Л., Князьков К.В., Крючкова Е.Н. // Ползуновский альманах. 2009. Т. 2. № 3. С. 154-158.

2010

18 Intelligent Technologies of Distributed Computations for Complex Systems' Modeling and Simulation

Интеллектуальные технологии распределенных вычислений для моделирования сложных систем / Марьин С.В., Ларченко А.В., Ковальчук С.В., Князьков К.В., Болгова Е.В., Бухановский А.В. // Научно-технический вестник информационных технологий, механики и оптики. 2010. № 6 (70). С. 123-124.

19 Domain-Specific Technologies for Development of Software in Distributed Environment

Предметно-ориентированные технологии разработки приложений в распределенных средах / Князьков К.В., Ларченко А.В. // Известия высших учебных заведений. Приборостроение. 2011. Т. 54. № 10. С. 36-43.

2011

20 Towards the Management of Long-Running Workflows within the iPSE Concept

Особенности работы с потоками задач длительного исполнения в рамках концепции IPSE / Князьков К.В. // Известия высших учебных заведений. Приборостроение. 2011. Т. 54. № 10. С. 94-97.

21 Results of the Young Scientists Mobility Project in 2010: Development of Functional Elements of iPSE Technology and Extension of Domain Services Set

Результаты реализации проекта "Мобильность молодых ученых в 2010 году: Развитие функциональных элементов технологии ipse и расширение состава прикладных сервисов" / Бухановский, А.В., Марьин С.В., Князьков К.В., Сиднев А.А., Жабин С.Н., Баглий А.П., Штейнберг Р.Б., Шамакина, А.В., Воеводин В.В., Головченко Е.Н., Фалалеев, Р.Т., Духанов А.В., Тарасов А.А., Шамардин Л.В., Моисеенко А.И. // Известия высших учебных заведений. Приборостроение. 2011. Т. 54. № 10. С. 80-86.

22 Composite applications development technology with the use of domain-specific software modules (Full Thesis)

Технология разработки композитных приложений с использованием предметно-ориентированных программных модулей / Князьков К.В. // диссертация на соискание ученой степени кандидата технических наук / Санкт-Петербургский национальный исследовательский университет информационных технологий, механики и оптики. Санкт-Петербург, 2012

23 Composite applications development technology with the use of domain-specific software modules (Short Thesis)

Технология разработки композитных приложений с использованием предметно-ориентированных программных модулей / Князьков К.В. // автореферат диссертации на соискание ученой степени кандидата технических наук / Санкт-Петербургский национальный исследовательский университет информационных технологий, механики и оптики. Санкт-Петербург, 2012

24 Interactive Workflows as a Technology for the Development of Information-Measurement and Control Systems in Distributed Environments

Интерактивные композитные приложения: технология для разработки информационно-измерительных и управляющих систем в распределенных средах / Князьков К.В., Ковальчук С.В., Бухановский А.В. // Информационно-измерительные и управляющие системы. 2012. Т. 10. № 11. С. 40-46.

2012

25 CLAVIRE: Cloud Computing Platform for Big Data Processing

CLAVIRE: облачная платформа для обработки данных больших объемов / Васильев В.Н., Князьков К.В., Чуров Т.Н., Насонов Д.А., Марьин С.В., Ковальчук С.В., Бухановский А.В. // Информационно-измерительные и управляющие системы. 2012. Т. 10. № 11. С. 7-16.

26 Automation of Virtual Laboratories Development on the base of Cloud Computing

Автоматизация процесса разработки виртуальных лабораторных практикумов на основе облачных вычислений / Болгова Е.В., Богачёва А.В., Балахонцева М.А., Князьков К.В., Духанов А.В., Хоружников С.Э. // Информационно-измерительные и управляющие системы. 2012. Т. 10. № 11. С. 71-81.

27 Technology for Development of Neurocomputer Virtual Reality Systems on the base of Cloud Computing

Технология разработки нейрокомпьютерных систем виртуальной реальности на основе облачных вычислений / Безгодов А.А., Князьков К.В., Ковальчук С.В., Бухановский А.В. // Нейрокомпьютеры: разработка, применение. 2012. № 11. С. 023-029.

28 Cloud Computing Infrastructure for Virtual Laboratories within Interdisciplinary Educational Programs

Инфраструктурное обеспечение виртуальных лабораторных практикумов для междисциплинарных образовательных программ в рамках концепции облачных вычислений / Болгова Е.В., Богачёва А.В., Духанов А.В., Князьков К.В., Бухановский А.В. // Современные проблемы науки и образования. 2012. № 5. С. 92.

29 Human-Computer Interaction in Computer Modeling and Simulation Environments based on Cloud Computing

Организация человеко-компьютерного взаимодействия в средах компьютерного моделирования на базе облачной инфраструктуры / Ковальчук С.В., Князьков К.В., Чуров Т.Н., Смирнов П.А., Бухановский А.В. // Прикладная информатика. 2012. № 5 (41). С. 89-102.

30 Methods of Development and Utilization of Performance Models for Cloud Services

Методы построения и использования моделей производительности облачных сервисов / Ковальчук С.В., Чиркин А.М., Князьков К.В. // Динамика сложных систем - XXI век. 2013. Т. 7. № 3. С. 090-094.

2013

31 Simulation and Optimization of Urban Traffic in CLAVIRE Cloud Computing Environment

Моделирование и оптимизация движения городского пассажирского транспорта в среде облачных вычислений CLAVIRE / Иванов С.В., Князьков К.В., Чуров Т.Н., Духанов А.В., Бухановский А.В. // Динамика сложных систем - XXI век. 2013. Т. 7. № 3. С. 035-039.

32 Framework for Distributed Agent-Based Simulation of Complex Systems

Программный инструментарий для распределенного мультиагентного моделирования сложных систем / Князьков К.В. // Динамика сложных систем - XXI век. 2013. Т. 7. № 3. С. 101-105.

33 Application of Urgent Computing Technologies to Public Transport Planning and Dispatching

Технологии экстренных вычислений в задачах планирования и диспетчеризации маршрутов наземного общественного транспорта / Чуров Т.Н., Князьков К.В., Иванов С.В., Духанов А.В., Бухановский А.В. // Научно-технический вестник информационных технологий, механики и оптики. 2013. № 5 (87). С. 173-174.