

Siniša Kolarić, Ph.D.

Postdoctoral Fellow

Digital Building Laboratory, School of Architecture

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Education

- Ph.D. *Simon Fraser University, Canada* 2016
School of Interactive Arts and Technology (SIAT)
Dissertation: *Interacting with Design Alternatives*
Download link: summit.sfu.ca/item/16743
Subject areas: interaction design (IXD), design computation, computer-aided design (CAD), design-based research, design methods, epistemology of design research
Advisors: R. Woodbury, Ph.D. and H. Erhan, Ph.D.
- M.Sc. *Pontifical Catholic University, Rio de Janeiro, Brazil* 2008
Department of Informatics and Computer Science
Dissertation: *Towards Direct Spatial Manipulation of Virtual 3D Objects*
Subject areas: 3D user interaction (3DUI), virtual/mixed/augmented reality (VR/MR/AR), 2D and 3D computer graphics
Advisors: M. Gattass, Ph.D. and A. B. Raposo, Ph.D.
- B.Sc. *University of Zagreb, Croatia* 1998
Department of Mathematics
Dissertation: *Reasoning About Knowledge and Belief Based on n-Agent Modal Logics*
Subject areas: formal reasoning, modal logics, computational logics, artificial intelligence
Advisor: M. Vuković, Ph.D.
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Awards, Fellowships, and Scholarships

2013	SIAT Graduate Fellowship award (Summer 2014)	\$3,125
	President's PhD Scholarship award (Spring 2014)	\$6,250
2012	FCAT Graduate Fellowship award (Spring 2013)	\$3,125
	SIAT Graduate Student Research Award (Summer 2013)	\$6,250
2011	SIAT Graduate Fellowship award (Spring 2012)	\$6,250
2010	SIAT Travel award (Fall 2010)	\$1,000
	SIAT Graduate Fellowship award (Fall 2010)	\$6,250
2009	FCAT Graduate Fellowship award (Spring 2010)	\$3,125

Research Experience

- Post-Doctoral Fellow **Digital Building Laboratory (DBL)** August 2017–present
College of Design, Georgia Institute of Technology, Atlanta, USA
Supervisor / Principal investigator: Assoc. Prof. D. Shelden, Ph.D. AIA
- This research is being sponsored by DBL's contributing and associate members, such as Autodesk, Vectorworks and the Smithsonian Institute.
- Research, design and development of platforms, systems and open standards supporting connected design, building and operations systems, including smart buildings, and smart city Internet of Things (IoT)
- Graduate Research Assistant **Computational Design Group** February 2009–September 2014
SIAT, Simon Fraser University, Canada
Supervisors / Principal investigators: R. Woodbury, Ph.D., and H. Erhan, Ph.D.
- This research was sponsored by NSERC (Natural Sciences and Engineering Research Council) and Bentley Systems Inc., a major maker of CAD (computer-aided design) software headquartered in Exton, Pennsylvania, US.
- Created conceptual interaction designs and GUIs, using sketching, hand-drawn storyboards, and wireframing tools (Balsamiq)
 - Designed and developed novel CAD prototype tools in C++, Qt, OpenGL and OpenSceneGraph using rapid prototyping approaches.
 - Conceptualized two major evaluatory studies (one quantitative, one qualitative); analyzed data using JMP, SPSS, and NVivo.
 - Organized and led a major research project (CAMBRIA) related to above.
 - Published research findings.
- Researcher **Virtual Reality (VR) Group** August 2006–August 2008
Tecgraf Institute, Rio de Janeiro, Brazil
Supervisors / Project coordinators: M. Gattass, Ph.D. and A. B. Raposo, Ph.D.
- This research was sponsored by Petrobras (Petróleo Brasileiro), a large Brazilian multinational corporation in the petroleum industry, seeking innovative VR products for oil exploration.
- Studied past VR approaches related to manipulating virtual 3D objects.
 - Designed and developed prototypes in C, OpenCV and OpenGL for free-hand manipulation of 3D objects.
 - Designed and developed a prototype for computing zones of thermal comfort within an architectural structure using C and OpenGL shaders.
 - Evaluted prototypes, and published findings.
- Jr. Researcher **Laboratory for Optoelectronics and Hypermedia Systems** Sep 1997—Dec 1998
Ruđer Bošković Institute, Zagreb, Croatia
Supervisor / Principal investigator: Karolj Skala, Ph.D.
- Conducted and published research on e-learning hypermedia systems.
 - Designed and developed Virtual Reality (VR) prototype tools, using HTML, VRML and Silicon Graphics (SGI) technologies.

Professional Development

VA School *Visual Analytics (VA) School* July 28–August 1, 2014
Canadian Visual Analytics School (CANVAS) 2014
University of British Columbia, Canada

- Participated in a condensed series of hands-on workshops and exercises in the field of visual analytics.

Research Interests

Human-computer interaction (HCI); interactive computing; interaction design (IxD); user experience (UX); visualization; computer-aided design (CAD); computer-aided architectural design (CAAD); generative design; computational design; design computation; computational tools; design cognition; the practice of design; design-based research; design research methods and methodologies; and the epistemology of design research and design practice.

Teaching Experience

I have a broad range of teaching experience, from being an instructor for a graduate-level university course, to being an undergraduate teaching assistant and lab instructor. As an instructor at the School of Architecture, Georgia Tech, I re-designed, developed and taught a graduate-level course for MSc and PhD students of architecture. As a teaching assistant and lab instructor, I co-managed design studios and labs, held lectures when instructor away, provided guidance to students, participated in design critiques, and evaluated their assignments.

Co-Instructor *Advanced Design Scripting (ARCH 8833)* Fall'18
School of Architecture, Georgia Institute of Technology

A graduate-level course for MSc and PhD students of architecture that offers a comprehensive introduction to computer programming focused on graphics, 3D CAD and BIM applications. Students were also introduced to advanced concepts from the disciplines of interaction design (IxD), HCI, and design research, including: interaction sketches, GUI state transition diagrams, interaction design evaluation methods, paradigms of design, and cyclic models of cognition relevant for computational artifacts such as scripts, systems, and tools.

Supervisor *GT Campus BIM Database* Summer–Fall'18
School of Architecture, Georgia Institute of Technology

Managed, supervised, and instructed a team of three graduate students (Xinyi Suo, Sounok Sarkar, Wentian Suo). Scheduled and led task meetings, instructed team members on the Revit features and GIS concepts needed to implement Campus Revit BIM Database, and on required scope of work.

Teaching Assistant *Materials in Design (IAT 336)* Eight (8) terms, from Fall'11–Spring'17
SIAT, Simon Fraser University, Canada

A third-year course with emphasis on materiality in design, design processes, product design, interaction, affordances, human-centered design, and design thinking. Typical students' final project artifacts included a pair of custom-designed novel tabletop

speakers, survival radios, timepieces, and lattice lamps. Particular emphasis was placed on ways to interact with any of these artifacts, as well as interaction affordances.

Teaching Assistant ***Interaction Design Methods (IAT 333)*** Summer'16, Summer'17
SIAT, Simon Fraser University, Canada

A third-year course on interaction design and user experience methods such as ethnography, personas, cultural probes, design games, role-playing, scenarios, participatory workshops, and prototyping. Typical final project artifacts included interactive kiosks, art installations, as well as mobile, web, and Arduino applications.

Teaching Assistant ***Spatial Thinking and Communicating (IAT 106)*** Spring'17
SIAT, Simon Fraser University, Canada

A comprehensive first-year foundations course aiming to provide students with the basic knowledge and technical skills required to envision three-dimensional structures, visualize and think in three dimensions, and to analyze and solve specific spatial thinking problems. Techniques taught include isometric and perspective sketching, computer-based geometric modeling, and physical modeling.

Teaching Assistant ***Drawing as Inquiry (IAT 208)*** Spring'15
SIAT, Simon Fraser University, Canada

A second-year introductory course on various forms and languages of sketching and drawing, with focus on visual perception and observation in order to depict subjects accurately. Topics studied include human forms, anatomical structures, proportions, perspective of architectural forms, spaces and landscape, using techniques such as pencil, charcoal, markers, and watercolors.

Teaching Assistant ***Multimedia Programming for Art and Design (IAT 265)*** Fall'12
SIAT, Simon Fraser University, Canada

A second-year programming course that enhances students' programming knowledge and skills in order that they are able to propose, design, implement and test complete interactive graphics/multimedia programs in areas such as design, animation, cinema, and music.

Teaching Assistant ***Informatics I and Optoelectronics*** Fall'97—Fall'98
Faculty of Graphic Arts, University of Zagreb, Croatia

First-year introductory courses on fundamental concepts of informatics (computer and information science) as well as of technologies concerned with the combined use of electronics and light for students of graphic arts.

Professional Development in Teaching

Fundamentals in Teaching and Learning Series ***University Course Design*** Spring'19
Georgia Institute of Technology, Atlanta, USA
A workshop on university-level course design. Based on evidence-based principles, best practices and strategies for effective course development in higher education.

TA Workshop ***Instructional Skills Workshop for TAs*** Fall'16
SIAT, Simon Fraser University, Canada
Participated in a two-day training workshop for teaching assistants at SIAT.

ISW Workshop *Instructional Skills Workshop (ISW)* November 10–12, 2012
Simon Fraser University, Canada
Participated in this three-day intensive workshop focused on university-level teaching.

Teaching Interests

- Basic research topics: design computation; computational design; generative design; computer-aided design (CAD); computer-aided architectural design (CAAD); building information modeling (BIM); human-computer interaction (HCI); interaction design (IxD); the fundamentals of design cognition; design research; science of design; design thinking; design research methods and methodologies.
- Applied research topics: digital media; graphic design; typography; materials in design; human-computer interaction; interaction design; evaluation methods for interactive artifacts; various computer science, mathematics, and information technology topics.
- Technology-related and vocational topics: (a) IT systems development (applications, Internet, WWW, databases, cloud, 3D, VR, AR), (b) technical skills (3D/CAD modeling, document preparation, digital content creation, photography), and (c) occupational topics (e.g., project management).

Industry Experience

IT Professional *META GmbH* September 2001–August 2004
Fürth, Germany

- Projected and deployed several large relational and OLAP databases.
- Developed Windows processes in C/C++ for real-time data collection.
- Planned, deployed a database backup infrastructure (BackupExec by Veritas).
- Architected and deployed a centralized SNMP monitoring system.
- Maintained a Java-based application for visualizing industrial data.
- Gathered requirements, wrote documentation, trained end users.

Software Developer *Intes LLC* June 1999–August 2000
Los Angeles, CA, U.S.A.

- Developed parts of a financial website (Microsoft Windows NT, ASP, SQL Server), as well as parts of a mobile app (Windows Mobile, Microsoft Visual C++).

Software Developer *Ekobit d.o.o.* June 1995–December 1996
Zagreb, Croatia

- Coded and maintained business desktop applications using a variety of Microsoft technologies (Windows NT, SQL Server, Access, Visual Studio C++, Visual Basic, Crystal Reports) and Novel Btrieve.
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Publications

Book chapters:

- R. Woodbury, S. Kolarić, H. Erhan, J. Guenther: “*Exploring for Designs: Five Basic Elements*”. In Rachel Armstrong (Author, Editor) and Simone Ferracina (Editor): “*Unconventional Computing: Design Methods for Adaptive Architecture*”, Riverside Architectural Press / ABC Art Books Canada (2013).

Conference publications:

- S. Kolarić, D. Shelden: “*DBL SmartCity: An Open-Source IoT Platform for Managing Large BIM and 3D Geo-Referenced Datasets*”, Full paper, Proceedings of the 52nd Hawaii International Conference on System Sciences (HICSS-52), Grand Wailea, Maui, HI (2019).
- S. Kolarić, H. Erhan, R. Woodbury: “*CAMBRIA: Interacting with Multiple Design Alternatives*”, Long paper (20 p.), published in: (a) Proceedings of the 17th International CAAD Futures Conference (CAADFutures 2017), Istanbul, Turkey (2017), and in (b) G. Çağdaş *et al.*, “*Computer-Aided Architectural Design. Future Trajectories*”, the book of selected papers, part of *Communications in Computer and Information Science* (CCIS) series, Volume 724, Springer Press (2017).
- S. Kolarić, R. Woodbury, H. Erhan: “*CAMBRIA: A Tool for Managing Multiple Design Alternatives*”, Extended Abstract, Proceedings of the ACM conference on Designing Interactive Systems (DIS’14), Vancouver, BC, Canada (2014).
- S. Kolarić, H. Erhan, B. Riecke, R. Woodbury: “*Comprehending Parametric CAD Models: An Evaluation of Two Graphical User Interfaces*”, Short Paper, Proceedings of the 6th Nordic Conference on Human-Computer Interaction (NordiCHI 2010), Reykjavik, Iceland, p.707-710 (2010).
- S. Kolarić, A. Raposo, M. Gattass: “*Direct 3D Manipulation Using Vision-Based Recognition of Uninstrumented Hands*”, Full Paper, X Symposium on Virtual and Augmented Reality (SVR 2008), Conference Proceedings, Joao Pessoa, PB, Brazil, p.212-220 (2008).
- K. Skala, S. Kolarić: “*Intelligent Hypermedia Textbook*”, Full Paper, Conference Proceedings of the 15th International Scientific Conference on Graphic Arts, Zagreb, Croatia, p.207-215 (1998).
- K. Skala, S. Kolarić, I. Sostarec, I. Ziha, V. Horvat: “*Interactive Collaborative Hypermedia Textbook*”, Full Paper, Conference Proceedings of the International Conference on Multimedia Technology and Digital Telecommunication Services, Budapest, Hungary, p.205-211 (1998).

Non-refereed publications:

- S. Kolarić: “*A Hierarchical Model of Design Knowledge*”, Technical Report, Simon Fraser University (2017).
- E. Mestrovic, T. Friscic, N. Judas, D. Mrvos-Sermek, Z. Bojanic, M. Mocibob, S. Kolarić, M. Knok: “*Internet Centar za Nastavu Kemije*” (in Croatian), Poster, Conference Proceedings of XVI Hrvatski Skup Kemicara i Kemijskih Inzenjera, Zagreb, Croatia, p.372 (1999).
- S. Kolarić, K. Skala, B. Medved Rogina: “*Optoelektronicki Sustavi*” (in Croatian), textbook (manuscript) for undergraduate students, Faculty of Graphic Arts, University of Zagreb (1999).

Theses and dissertations:

- S. Kolarić: “*Interacting with Design Alternatives*”, Ph.D. Thesis, School of Interactive Arts and Technologies, Simon Fraser University, BC, Canada (2016).
- S. Kolarić: “*Towards Direct Spatial Manipulation of Virtual 3D Objects Using Vision-Based Tracking and Gesture Recognition of Unmarked Hands*”, M.Sc. Thesis, PUC-Rio, Rio de Janeiro, RJ, Brazil (2008).
- S. Kolarić: “*Rezoniranje o Znanju i Vjerovanju u Kontekstu n-Agentnih Modalnih Logika*” (in Croatian), B.Sc. Dissertation, University of Zagreb, Department of Mathematics, Croatia (1998).

Reviewing Activities:

- Journal of Management in Engineering (2019)
- Graphics Interface (2018)
- International Journal of Human-Computer Studies (2014)

Organizing Activities:

- Organized, managed, and led the “Blockchain in Construction” workshop at the 2018 Digital Building Laboratory (DBL) Members Annual Meeting, Georgia Tech, Atlanta, May 3, 2018. Team members: Pardis Pishdad-Bozorgi, Tay-Sheng Jeng, Siniša Kolarić, Matthew Swarts.

Public Talks, Workshops, and Posters

- S. Kolarić, D. Shelden: “*DBL SmartCity: An Open-Source IoT Platform for Managing Large BIM and 3D Geo-Referenced Datasets*” 2019
52nd Hawaii International Conference on System Sciences (HICSS-52)
Grand Wailea, Maui, HI, January 8–11, 2019.
- S. Kolarić, D. Shelden: “*DBL SmartCity Platform*” 2018
Georgia Tech Shenzhen campus working group
College of Design, Georgia Tech, Atlanta, October 5, 2018.
- P. Pishdad-Bozorgi, S. Kolarić, M. Swarts, T. Jeng: “*Blockchain in Construction*” 2018
Digital Building Laboratory (DBL) Members Annual Meeting
Georgia Tech, Atlanta, May 3, 2018.
- R. Woodbury, S. Kolarić, H. Erhan, J. Guenther: “*Design Exploration and Configuration Management: Two Sides of the Same Coin?*” 2013
Congress on the Future of Engineering Software (COFES)
Scottsdale Plaza Resort, Scottsdale, AZ, USA, April 11–14, 2013.
- N. Shireen, H. Erhan, R. Woodbury, S. Kolarić, “*Exploring Representations for Parallel Development of Design Solutions Using Parametric Systems*”, Poster 2013
GRAND 2013 Conference
Metro Toronto Convention Centre, Toronto, ON, Canada, May 14–16, 2013.

- S. Kolarić, R. Woodbury, H. Erhan: “*CAMBRIA: Supporting Sets of Alternatives in Parametric Design*”, Poster
GRAND 2012 Conference
Le Centre Sheraton, Montréal, QC, Canada, May 2–4, 2012. 2012
 - S. Kolarić: “*Alternatives in Parametric CAD*” 2011
SIAT researchers, SFU Surrey Campus, Surrey, BC, Canada, November 2, 2011.
 - S. Kolarić, H. Erhan, R. Woodbury: “*Complex Floor Plans: How to Represent Them, and Interact With Them?*”, Poster 2011
GRAND 2011 Conference
Vancouver Convention Centre, Vancouver, BC, Canada, May 12–14, 2011.
 - S. Kolarić, R. Woodbury, H. Erhan: “*Comprehending Parametric CAD Models: An Evaluation of Two Graphical User Interfaces*” 2010
6th Nordic Conference on Human-Computer Interaction (NordiCHI’10)
Hilton Reykjavik Nordica Hotel, Reykjavik, Iceland, October 16–20, 2010.
 - S. Kolarić, R. Woodbury, H. Erhan, A. Wong: “*Latest Research and Development at Computational Design Group, SIAT, SFU*”, Research report 2010
Bentley Systems, Incorporated
Exton PA, USA, June 21–25, 2010.
 - S. Kolarić: “*Comprehending Parametric CAD Models*” 2010
SIAT Research Colloquium, SFU Surrey Campus, Surrey, BC, Canada, April 4, 2010.
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Expertise and Knowledge Base

A. Teaching Expertise

I have acquired significant university-level teaching expertise as an instructor and graduate teaching assistant at the following universities: Georgia Institute of Technology, Simon Fraser University and University of Zagreb. I also participated in professional development workshops on university-level teaching. Please refer to the Teaching Experience section on page 3 for details.

B. Design Expertise

This refers to my skills, knowledge, and experiences related to various types of designing, such as product, industrial, interaction, and architectural design. Includes: the knowledge of design materials; the knowledge of design guidelines (e.g., building codes, interaction design guidelines); the knowledge of design principles; the knowledge of design patterns; sketching, drawing, illustrating, and painting skills; modeling and prototyping skills; design fabrication methods (e.g. 3D printing, laser cutting); the knowledge of design approaches, processes and methods.

C. Research Expertise

Various bodies of specialized, advanced knowledge related to my ability to investigate, establish, and report research findings in a systematic fashion. This includes, but is not limited to: the fundamentals of design-based research; design thinking; design research methods and methodologies; the fundamentals of

interactive artifacts; designing interactive artifacts; computational design; generative design; computer-aided design.

D. Undergraduate-Level Expertise

In addition to aforementioned teaching, designing, and research skills, I also possess various types of knowledge at the level of an university undergraduate, such as: digital media; graphic design; materials in design; various topics in mathematics, physics, engineering, and computer science.

E. Systems & IT Expertise

Various types of information technology (IT) and systems development knowledge, including: Internet; World Wide Web (WWW); cloud computing; databases (SQL, NoSQL); programming languages (C, C++, Java, Python); markup languages (HTML, XML, XSLT); web applications (JavaScript, jQuery, PHP, SQL, REST); CMS systems (WordPress, Drupal); mobile apps (iOS, Android, Qt); desktop apps (Qt); interactive 3D applications (C, C++, Qt, OpenGL, Unity3D, Unreal Engine); VR / AR systems; 3DUI systems; revision control systems (Git); APIs and frameworks (Qt, Win32); IDEs (Visual Studio, Xcode, Eclipse, Processing); and OSes (Windows, macOS, Linux, iOS, Android).

F. Supporting Creative and Technical Skills

Photography & Videography My skills related to the art of photography and videography, including: camera technologies (DSLR/mirrorless/bridge cameras/digicams/analog); photo composition/aesthetics; camera parameters (aperture, focus, bokeh, white balance, metering, exposure).

Audio/Visual Digital Content Creation Skills related to 2D and audio/video content creation. Includes: vector image editing (Adobe Illustrator, Fireworks, FreeHand; Microsoft Visio; Inkspace, yEd, pdfsam, Dia), raster image editing (Paint.NET, MS Paint, GIMP; Adobe PhotoShop and PhotoShop Lightroom), animation editing (Adobe Animate & Flash), sound editing (Audacity), and video/film editing (Adobe Premiere, Apple Final Cut Pro X).

3D Model Creation My skills related to 3D modeling, including: Autodesk Revit, Maya, 3ds Max, and Dynamo; Rhino3D and Grasshopper; Microstation and GenerativeComponents by Bentley Systems Inc.; SketchUp by Trimble Navigation Inc.

Document and Report Preparation \LaTeX , MiKTeX, TeX Live, MS Office Suite (Word, Excel, PowerPoint), figure preparation tools (Inkspace, yEd, pdfsam, Dia, Paint.NET, MS Paint, MS Visio, Adobe PhotoShop, IrfanView), PDF viewers, statistical & math packages (JMP, SPSS, R, Mathematica).