

# MARIO COSTA SOUSA, PhD

Associate Professor  
Department of Computer Science  
Faculty of Science | University of Calgary

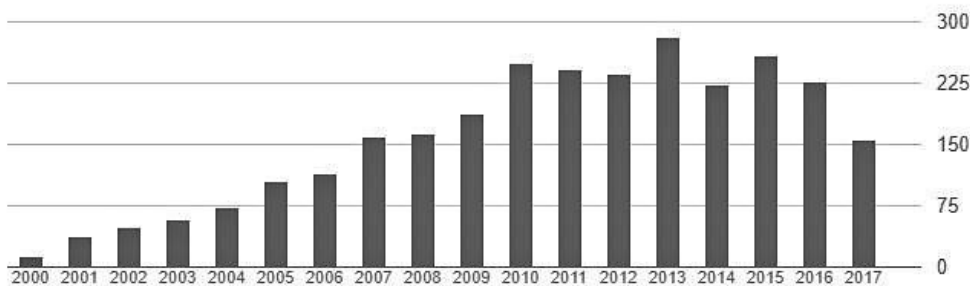
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## SECTION 1 – PROFILE

### 1.1. OVERVIEW & HIGHLIGHTS

- **Bio.** Tenured Associate Professor of Computer Science at the University of Calgary, Canada. Leading the *illustrares* research group, a multi-disciplinary team working on fundamental and applied research of Interactive Visual Computing technologies (Interactive Computer Graphics, Visualization, and Visual Analytics) applied to branches of science, engineering, medicine, and the field of scientific illustration. PhD from the University of Alberta, Canada in 1999 and MSc from PUC-Rio, Brazil, in 1994, both degrees in Computer Science with specializations in computer graphics and scientific visualization. Research interests include non-photorealistic rendering, sketch-based interfaces and modeling, visualization & visual analytics, modeling & simulation, and human-data & computer interaction. Authored/co-authored 160+ peer-reviewed publications, co-authored two books in computer graphics, and gave 80+ invited technical presentations (in both industry and academia)
- **Highly Qualified Personnel (HQP) Training.** Completed (since 2001): two research assistants, five postdoctoral fellows (PDF), 4 PhD, and 22 MSc students. In Progress: one research associate, 3 PDF, 9 PhD, and 2 MSc (all concluding in 2017/2018). My HQP have secured positions in industry (20 companies/industrial research labs worldwide) and academia, either as faculty or to continue their studies (5 universities worldwide).
- **Research Dissemination.** Published in venues from both Interactive Visual Computing (IVC) – i.e., interactive computer graphics, visualization & visual analytics, and human-data & computer interaction – and the disciplines of Geoscience & Petroleum Engineering (GPE) – i.e., the latter as part of my research program of applied IVC to GPE. Publications include 27 in peer-reviewed journals (22 in IVC and 5 in GPE), 138 in peer-reviewed conferences (110 in IVC and 28 in GPE), and two books in computer graphics. Invited presentations include 51 in academia and 30 in industry. h-index = 26 and number of citations chart per year below (source Google Scholar, as of August 2017).



- **Research Funding & Awards.** 50% from the Canadian government (both federal and provincial) and 50% from the industry sector (i.e., 60% from Canada and 40% international). On June 21, 2017 I received the "Schulich School of Engineering (SSE), University of Calgary Research Achievement Award"

### 1.2. PERSONAL DATA

Last, First name:	Costa Sousa, Mario
Date & place of birth:	February 13 <sup>th</sup> , 1967, Blumenau, SC, Brazil
Nationality (dual) & Passports:	Brazilian / Canadian

### 1.3. CONTACT INFORMATION

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### 1.4. EDUCATION

#### [1] Department of Computing Science, University of Alberta, Canada

*Period:* April 1996 – June 1999

*Qualification:* **Ph.D. in Computer Science**, with specialization in **Computer Graphics**

• PhD Thesis:	<i>Computer-Generated Graphite Pencil Materials and Rendering</i>
• Research Group & Lab:	Render Group, Computer Graphics Lab
• Topics:	Non-Photorealistic Rendering, Natural Media Simulation, 3D Rendering
• Supervisor:	Dr. John W. Buchanan
• Publications (Sec. 5):	<ul style="list-style-type: none"> <li>➤ <i>Journals:</i> (Costa Sousa &amp; Buchanan ['99a, '00])</li> <li>➤ <i>Conferences:</i> (Costa Sousa &amp; Buchanan '99b)</li> </ul>
• Invited Presentations (Sec. 6):	➤ <i>Academia:</i> (Costa Sousa '99)

#### [2] Department of Informatics, Pontifical Catholic University of Rio de Janeiro (PUC-Rio), Brazil

*Period:* March 1992 – July 1994

*Qualification:* **M.Sc. in Computer Science** (Thesis Based), with specialization in **Scientific Visualization**

• MSc Thesis:	<i>Scientific 3D Visualization of the Numerical Simulation of Petroleum Reservoirs</i>
• Research Group & Lab:	Tecgraf/PUC-Rio (Institute of Technical and Scientific Software Development)
• Industry Collaboration:	Petrobras (Brazilian multinational corporation in the petroleum industry)
• Topics:	Reservoir Simulation & Visualization, 4D Volume Rendering
• Supervisors:	Dr. Marcelo Gattass (supv) & Dr. Marcelo Dreux (co-supv)
• Publications (Sec. 5):	➤ <i>Conferences:</i> (Costa Sousa '93, Costa Sousa & Miranda-Filho '94)
• Invited Presentations (Sec. 6):	<ul style="list-style-type: none"> <li>➤ <i>Academia:</i> (Costa Sousa '94a)</li> <li>➤ <i>Industry:</i> (Costa Sousa ['93, '94b])</li> </ul>

#### [3] Department of Informatics, Catholic University of Petropolis (UCP), Brazil

*Period:* July 1985 – July 1989

*Qualification:* **B.Sc. in Computer Science**

• Final year project:	<i>Interactive Computer Graphics</i>
• Scholarship:	<i>Scientific Initiation Program (CNPQ, Brazilian Government)</i>
• Topics:	Computer Graphics (Theory & Practice), Graphics APIs
• Supervisor:	Prof. Jose Carlos Tavares

## 1.5. EMPLOYMENT HISTORY

### 1.5.1. Positions

Empl. History	'85	'87	'88	'89	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99	'00	'01	'06	'17	(...)
(1) U. of Calgary																			Academia
(2) Cambridge AS																Industry			
(3) U. of Alberta														Academia					
[1] U. of Alberta											PhD degree								
(4) Tecgraf									Industry										
[2] PUC-Rio							MSc degree												
(5) CompuSystems						Industry													
(6) UCP					Academia														
(7) GRO Integral				Industry															
(8) PetroSoft		Industry																	
[3] UCP	BSc degree																		

#### (1) Department of Computer Science, University of Calgary, Canada

*Period:* July 2007 – present

*Position:* **Associate Professor** (Tenured)

*Period:* July 2001 – July 2007

*Position:* **Assistant Professor**

#### (2) Cambridge Animation Systems, UK

*Period:* August 2000 – June 2001

*Position:* **Graphics Software Engineer**

*Responsibilities:*

- Research and development of non-photorealistic rendering (NPR) algorithms and software tools for:
  - Vector representation and geometric consolidation of 3D surfaces for different rendering styles, region shading / texturing, non-realistic coloring generation, and real-time interaction.
  - Line modeling and rendering considering hand gestures, texturing, and stroke placement on 3D models.
- Part of a suite of software systems used for 3D content creation in production by film and animation studios.
- Hardware and software environment: PC, C/C++, OpenGL API.

#### (3) Department of Computing Science, University of Alberta, Canada

*Period:* July 1999 – July 2000

*Position:* **Faculty lecturer**

*Responsibilities:*

- Developed and lectured courses for the Computer Science BSc program (Sec. 2).
- Research and development of non-photorealistic rendering (NPR) techniques at the Render Group, Computer Graphics Research Lab (in collaboration w/ Dr. John W. Buchanan, PhD supervisor)
- Publications (Sec. 5): conference paper (Buchanan & Costa Sousa '00)

**(4) The Tecgraf Institute of Technical-Scientific Software Development of PUC-Rio (Tecgraf/PUC-Rio) (BRA)**

*Period:* January 1994 – January 1996

*Position:* **Visualization Software Engineer**

*Responsibilities:*

- Continuing the research and development from my MSc degree of software systems to enhance the visualization and analysis of petroleum reservoirs simulation mechanisms.
- Worked at Tecgraf Labs and Petrobras headquarters (Reservoir Simulation Division).
- Lead the design, implementation, deployment, and tests of a new enhanced version of “PostProc,” the 3D scientific visualization system for reservoir simulation post-processing I developed as part of my MSc thesis.
- Design and implementation of “Reservoir Grid Editor,” a series of software tools for interfacing surface modeling with in-house reservoir simulation systems - *team of 3 people*.
- Downsize of existing 2D reservoir post-production visualization system (xy plots, aerial, and cross-sectional maps) from IBM 3090/3060 Graphics System, FORTRAN, graPHIGS to graphical workstations -- *team of 4 people*.
- Integration of the 3D reservoir visualization system with the existing 2D visualization systems - *team of 4 people*.
- Hardware and software environment: UNIX-based graphical workstations (Silicon Graphics), C/Fortran, IRIS Graphics Language (IRIS GL) API, X-Windows/Motif APIs.

**(5) CompuSystems, Brazil**

*Period:* January 1991 – January 1992

*Position:* **System Analyst & Developer**

*Responsibilities:*

- Analysis, design, and implementation of software systems for bank transactions management -- *team of 4 people*.
- Developed new training courses on X-Windows and UNIX.
- Invited Presentations at Industry/Academic Conferences (Sec. 6): (Costa Sousa ['90, '92])
- Hardware and software environment: UNIX workstations, C, database management systems APIs.

**(6) Department of Informatics, Catholic University of Petropolis (UCP), Brazil**

*Period:* July 1990 – July 1995

*Position:* **Sr. Faculty Lecturer**

*Responsibilities:*

- Developed and lectured courses for the Computer Science BSc program (Sec. 2).

**(7) GRO Integral, Yugoslavia**

*Period:* August 1989 – June 1990

*Position:* **Software Developer**

*Responsibilities:*

- This was my first professional work in computer graphics software development.
- Lead the design and development of the first version of an in-house computer graphics system to assist civil engineers in the design of reinforced concrete footing structures and patterns – *Team of 3 people*.
- Hardware and software environment: PC, Pascal, Graphical Kernel System (GKS) API.

**(8) PetroSoft, Brazil**

*Period:* August 1987 – August 1988

*Position:* **Software Programmer**

*Responsibilities:*

- This was my first professional work in software development.
- Design and development of real-estate management system – *Team of 4 people.*
- Hardware and software environment: PC, Pascal, in-house database management system.

**1.5.2. Chairs**

**NSERC/AITF/Foundation CMG Industry Research Chair (IRC) in *Scalable Reservoir Visualization***

Department of Computer Science, University of Calgary, Canada

*Period:* September 2009 – September 2017

- Awarded in 2009 with an 8-year Industry Research Chair (IRC) in Scalable Reservoir Visualization. This IRC program was jointly funded by CMG Reservoir Simulation Foundation (Foundation CMG), Alberta Innovates Technology Futures (AITF, provincial funding agency), the Natural Sciences and Engineering Research Council of Canada (NSERC, federal funding agency), and the oil & gas industry sector (in Canada and worldwide).
- Established a research program in interactive visual computing technologies (i.e., computer graphics, visualization & visual analytics, and human-data & computer interaction) to address fundamental and applied research challenges in the disciplines geoscience and petroleum engineering, with collaboration from industry and academia in Canada and worldwide.

**1.5.3. Visiting Positions**

I spent my first Sabbatical Leave (July 2007 – July 2008), in four institutions as described below. In the CV's PDF format, click on the research group/lab's title for additional information.

**1. The Institute of Computer Graphics and Algorithms, Vienna University of Technology, Austria**

*Period:* June 2008 – July 2008

• Rsrch Group/Lab (Head):	<i>Visualization Working Group</i> (Dr. Eduard Gröller)
• Topics:	Illustrative Visualization
• Publications (Sec. 5):	➤ <i>Journals:</i> (Bruckner <i>et al.</i> '10)
• Teaching (Sec. 2):	➤ <i>Conferences</i> (Tutorial organization & lecturing): (Costa Sousa <i>et al.</i> '08)

**2. Department of Computer Science and Engineering, Technical University of Lisbon, Portugal**

*Period:* April 2008 – June 2008

• Rsrch Group/Lab (Head):	<i>Visualization and Multimodal Interfaces Group</i> (Dr. Joaquim Jorge)
• Topics:	Sketch-based Interfaces & Modeling
• Publications (Sec. 5):	➤ <i>Conferences:</i> (Olsen <i>et al.</i> '08; Proença <i>et al.</i> '08)
• Presentations (Sec. 6):	➤ <i>Academia:</i> (Costa Sousa '08c)

**3. IMPA – National Institute of Pure and Applied Mathematics, Brazil***Period:* December 2007 – April 2008

• Rsrch Group/Lab (Head):	<i>VISGRAF: Computer Graphics Lab</i> (Dr. Luiz Velho)
• Topics:	Non-Photorealistic Rendering, Sketch-based Interfaces & Modeling, Illustrative Visualization
• Publications (Sec. 5):	➤ <i>Books: Gomes et al. '12(a, b)</i> (book project initiated during this Sabbatical visit)
• Teaching (Sec. 2):	➤ “Interactive Illustrative Graphics and Visualization” (Graduate Level) ➤ “3D Graphics Systems” (Graduate Level)

**4. School of Electrical and Computer Engineering, Purdue University, USA***Period:* July 2007 – December 2007

• Rsrch Group/Lab (Head):	➤ <i>PURVAC: Purdue U. Visualization and Analytics Center</i> (Dr. David S. Ebert) ➤ <i>PURPL: Purdue U. Rendering and Perceptualization Lab</i> (Dr. David S. Ebert)
• Topics:	Non-Photorealistic Rendering, Illustrative Visualization for Medicine
• Publications (Sec. 5):	➤ <i>Journals: (Maciejewski et al. '08)</i> ➤ <i>Conferences: (Kim et al. '09; Maciejewski et al. '07)</i>
• Presentations (Sec. 6):	➤ <i>Academia: (Costa Sousa '07b)</i>
• Teaching (Sec. 2):	➤ <i>Conferences (Tutorial organization &amp; lecturing): (Costa Sousa et al. '08)</i>