# Marwan Abdellah

*Curriculum Vitae*

## EDUCATION

*09.2012 — Present*
**Ph.D. Candidate · In Silico Neuroscience**
*Blue Brain Project · Neuroscience Doctoral School · École Polytechnique Fédéral de Lausanne (EPFL)*
*Lausanne · Switzerland*
**Thesis Title** — *In Silico Brain Imaging*
**Research Scope** — *Bio-physically-based rendering and visualization of complex brain tissue models using computational modeling and simulation of optical microscopes.*
**Advisors** — *Henry Markram · Felix Schürmann*
**Mentors** — *Ahmet Bilgili · Stefan Eilemann · Jean-Philippe Thiran*

*09.2009 — 02.2012*
**M.Sc. · Biomedical Engineering**
*Systems & Biomedical Engineering Department · School of Engineering · Cairo University*
*Cairo · Egypt*
**Thesis Title** — *High Performance Fourier Volume Rendering on Graphics Processing Units (GPUs)*
**Research Scope** — *Accelerating the generation of digitally-reconstructed radiographs (DRRs) on GPUs using Fourier slice theorem and frequency domain volume rendering.*
**Advisors** — *Ayman Eldeib · Amr Sharawi*

*09.2004 — 07.2009*
**B.Sc. · Biomedical Engineering**
*Systems & Biomedical Engineering Department · School of Engineering · Cairo University*
*Cairo · Egypt*
**Thesis Title** — *Software Development for Low Cost, High quality, Real-time, 4D Ultrasound on Personal Computers*
**Project Scope** — *Investigating various rendering algorithms for accelerating 4D Ultrasound volume reconstruction on GPUs.*
**Advisor** — *Yasser Kadah*

## RESEARCH INTERESTS

*Visualization*
*Scientific visualization · High performance, distributed, and scalable volume rendering · Transfer function design*

*Rendering*
*Physically-based Monte Carlo rendering · Rendering fluorescence materials with highly scattering heterogeneous media*

*Medical Imaging*
*High quality and high performance 3D/4D real-time volume reconstruction for medical data (CT, MRI and Ultrasound) · Digitally reconstructed radiograph generation with k-space volume rendering*

*High Performance Computing*
*GPU computing (GPGPU) with CUDA · Heterogeneous computing with OpenCL · Distributed computing with MPI and OpenMP*

*In Silico Neuroscience*
*Physically-plausible simulation of different microscopic imaging techniques of the cortical brain tissue using digital reconstructions of 3D neuronal models*

## EXPERIENCE & EMPLOYMENT HISTORY

*07.2011 – Present*
**Scientific Visualization Engineer**
*Blue Brain Project · Human Brain Project · École Polytechnique Fédéral de Lausanne (EPFL)*
*Lausanne · Switzerland*
**Role** — *High performance and distributed visualization, automated visualization workflows, and multimedia*

*generation for neuroscientific data.*
DIRECTOR — *Henry Markram*

| 01.2013 – 10.2013 | SOFTWARE ENGINEER |
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*Coursera · École Polytechnique Fédéral de Lausanne (EPFL)*
*Lausanne · Switzerland*
ROLE — *Building automated grading and systematic evaluation workflows for C++ and JAVA courses offered by Coursera.*

01.2013 – 10.2013 **RESEARCH ASSISTANT**
*SCI-STI-MM Multimedia Group · École Polytechnique Fédéral de Lausanne (EPFL)*
*Lausanne · Switzerland*
ROLE — *Pursuing a research on H.264 and re-configurable video coding.*
LAB DIRECTOR — *Marco Mattavilli*

01.2013 – 10.2013 **ASSOCIATE BIOMEDICAL SOFTWARE ENGINEER**
*Biomedical Group · Symbyo Technologies (360imaging)*
*Cairo · Egypt*
ROLE — *Development of dental implant software.*

01.2013 – 10.2013 **INSTRUCTOR**
*National Institute of Laser Advanced Sciences (NILES) · Cairo University*
*Cairo · Egypt*
ROLE — *Instructing different topics of visualization and high performance computing.*

09.2009 – 02.2010 **BIOMEDICAL SOFTWARE ENGINEER**
*Research and Development Team · International Biomedical Engineering (IBE) Technologies*
*Cairo · Egypt*
ROLE — *Development of 4D ultrasound reconstruction software.*

01.2005 – 09.2010 **FREELANCER**
*Web design*

## CLASSES & TEACHING

*Spring 2014*
*Spring 2013*
NUMERICAL ANALYSIS · MATH–251
*Life Sciences School · $4^{th}$ Bachelor semester*
*École Polytechnique Fédéral de Lausanne (EPFL)*
TOPICS — *Stability, condition number and convergence of numerical methods · Polynomial interpolation and least squares approximation · Numerical integration · Direct methods for the solution of linear systems · Iterative methods for the solution of linear and nonlinear systems · Numerical approximation of ordinary differential equations · Introduction to MATLAB and Octave*
LECTURER — *Simone Deparis*

*July 2010*
HIGH PERFORMANCE COMPUTING
*National Institute of Laser Advanced Sciences (NILES)*
TOPICS — *Basic theory of HPC topics like Amdahl's law, speed up, UMA and NUMA architectures · GPU architecture · CUDA · Parallel algorithms*

*October 2009*
COMPUTER GRAPHICS & VISUALIZATION
*National Institute of Laser Advanced Sciences (NILES)*
TOPICS — *OpenGL Pipeline · Surface rendering · Graphics Modeling using 3D Studio Max*

## OPEN SOURCE CONTRIBUTIONS

*2011 – 2015*
THE NEOCORTICAL MICROCIRCUIT COLLABORATION PORTAL
*This portal provides an online public resource of the Blue Brain Project's first release of a digital reconstruction of*

*the microcircuitry of juvenile Rat somatosensory cortex, access to experimental data sets used in the reconstruction, and the resulting models.*

2011 — 2012    EQUALIZER
*Equalizer is the standard middleware to create and deploy parallel OpenGL-based applications.*

2012    THE PORTABLE HARDWARE LOCALITY (HWLOC)
*This software package provides a portable abstraction of the hierarchical topology of modern architectures, including NUMA memory nodes, sockets, shared caches, cores and simultaneous multithreading.*

## HONORS & AWARDS

January 2010    ITIDA GRADUATION PROJECT AWARD
*My graduation project was awarded the first place in 2009 from the Minsters of Higher Education and Tele-Communication in Egypt during a celebration that was organized by ITIDA.*

June 2010    NVIDIA AWARD
*NVIDIA GeForce GTX 9800 GPU Awarded as a prize for accelerating ultrasound volume rendering application in ICTP.*

July 2009    DISTINCTION WITH HONOR · B.Sc. BIOMEDICAL ENGINEERING
*Systems & Biomedical Engineering Department · Faculty of Engineering · Cairo University*

## GRANTS & FELLOWSHIPS

September 2010    PH.D. FELLOWSHIP
*Fully funded Ph.D. fellowship from the Blue Brain Project · École Polytechnique Fédéral de Lausanne (EPFL)*

January 2011    ICTP GRANT
*Travel award to attend the Advanced Workshop in High Performance Computing & Grid Computing in the International Center for Theoretical Physics (ICTP) in Trieste, Italy.*

August 2009    ICTP GRANT
*Travel award to attend the Advanced Workshop in High Performance Computing in the International Center for Theoretical Physics (ICTP) in Trieste, Italy.*

January 2009    ITIDA/ITAC GRANT
*Grant of EGP 10000 from ITAC to support my graduation project.*

## TECHNICAL

| | |
|---|---|
| *Programming* | *C/C++ · JAVA · Python · Unix Shell · OOP · Design Patterns* |
| *Libraries* | *STL · Boost · Qt* |
| *Visualization & CG* | *OpenGL · Open Inventor · OpenSceneGraph · VTK · XIP · NVIDIA Cg · GLSL* |
| *Rendering* | *PBRT · LuxRender · Mitsuba* |
| *HPC* | *CUDA · OpenCL · OpenMP · pthreads* |
| *Web Development* | *HTML · CSS · PHP · JavaScript* |
| *Mobile Development* | *iOS · OpenGL ES · Swift · Metal* |
| *Software Process* | *Agile · Scrum · Bamboo · Jira · Jenkins* |
| *Scientific Packages* | *MATLAB · Octave · Vensim* |
| *3D Graphics* | *Maya (including MEL scripting) · 3DSMax · Blender (scripting with Python)* |

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|---|---|
| *Design & Web* | *Gimp · Photoshop · Illustrator · After Effects* |
| *Typography* | *LaTeX· Lyx · Microsoft Office* |
| *Others* | *Git · SVN · Doxygen* |

## PROFESSIONAL ACTIVITIES

### PROFESSIONAL MEMBERSHIPS

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|---|---|
| *01.2010 − Present* | GRADUATE STUDENT MEMBER<br>*Institute of Electrical and Electronic Engineers (IEEE)* |
| *01.2010 − Present* | GRADUATE STUDENT MEMBER<br>*IEEE Engineering in Medicine and Biology Society (EMBS)* |
| *02.2015 − Present* | GRADUATE STUDENT MEMBER<br>*IEEE Engineering Computer Society* |
| *04.2015 − Present* | STUDENT MEMBER<br>*The European Association of Computer Graphics (Eurographics)* |
| *05.2015 − Present* | STUDENT MEMBER<br>*International Society for Computational Biology (ISCB)* |

### REVIEWER

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| *March 2016* | EUROGRAPHICS SYMPOSIUM ON PARALLEL GRAPHICS & VISUALIZATION (EGPGV) 2016 |
| *August 2015* | DESIGN AUTOMATION FOR EMBEDDED SYSTEMS |
| *July 2015* | COMPUTER GRAPHICS FORUM |
| *March 2015* | EUROGRAPHICS SYMPOSIUM ON PARALLEL GRAPHICS & VISUALIZATION (EGPGV) 2015 |
| *January 2014* | JOURNAL OF MEDICAL IMAGING & HEALTH INFORMATICS |
| *August 2012* | IEEE, CAIRO INTERNATIONAL BIOMEDICAL ENGINEERING CONFERENCE (CIBEC) 2012 |

### ATTENDED EVENTS, CONFERENCES & WORKSHOPS

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| *May 2016* | EUROGRAPHICS 2016<br>*Lisbon · Portugal* |
| *April 2016* | 37th INTERNATIONAL SYMPOSIUM ON BIOMEDICAL IMAGING: FROM NANO TO MACRO (ISBI 2016)<br>*Prague · Czech Republic* |
| *October 2015* | THE SECOND BIOMEDICAL ENGINEERING WORKSHOP (ORGANIZER)<br>*Systems & Biomedical Engineering Department · School of Engineering · Cairo University · Cairo · Egypt* |
| *October 2015* | THE 2nd IEEE EMBS INTERNATIONAL STUDENTS CONFERENCE (KEYNOTE)<br>*Cairo · Egypt* |
| *September 2015* | THE HUMAN BRAIN PROJECT SUMMIT<br>*Madrid · Spain* |
| *August 2015* | 37th INTERNATIONAL CONFERENCE OF THE IEEE EMB SOCIETY (EMBC 2015)<br>*Milan · Italy* |
| *July 2015* | 5th SYMPOSIUM ON BIOLOGICAL DATA VISUALIZATION (BioVis 2015) AT ISMB/ECCB 2015<br>*Dublin · Ireland* |
| *May 2015* | EUROGRAPHICS 2015<br>*Zürich · Switzerland* |
| *March 2015* | THE BRAIN FORUM<br>*Lausanne · Switzerland* |
| *December 2014* | IEEE, 7th CAIRO INTERNATIONAL BIOMEDICAL ENGINEERING CONFERENCE (CIBEC 2014)<br>*Cairo · Egypt* |

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| *December 2013* | The Brain Forum<br>*Jeddah · The Kingdom of Saudi Arabia* |
| *October 2013* | The Human Brain Project Summit<br>*École Polytechnique Fédéral de Lausanne (EPFL) · Lausanne · Switzerland* |
| *December 2012* | The First Biomedical Engineering Workshop (Organizer)<br>*Biomedical Engineering Department · School of Engineering · Cairo University · Cairo · Egypt* |
| *December 2012* | IEEE, 6th Cairo International Biomedical Engineering Conference (CIBEC 2012)<br>*Cairo · Egypt* |
| *November 2012* | Brain Mind Institute (BMI) Retreat Meeting<br>*Bex · VD · Switzerland* |
| *April 2011* | Advanced School in High Performance Computing & Grid Computing<br>*International Center for Theoretical Physics (ICTP) · Trieste · Italy* |
| *November 2009* | Advanced School in High Performance Computing<br>*International Center for Theoretical Physics (ICTP) · Trieste · Italy* |
| *November 2009* | IEEE, International Conference of Image Processing (ICIP 2009)<br>*Cairo · Egypt* |
| *March 2009* | URSI, 26th National Radio Science Conference (NRSC)<br>*Cairo · Egypt* |
| *December 2008* | IEEE, 4th Cairo International Biomedical Engineering Conference (CIBEC 2008)<br>*Cairo · Egypt* |

## OTHER INFORMATION

### PERSONAL

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|---|---|
| *Residence* | Permit B · *Lausanne · Switzerland (since 2010)* |
| *Address* | *Campus Biotech · Chemin des Mines, 9 · Geneva · CH-1202 · Switzerland* |
| *Mobile Phone* | *+41 (0) 79 470 xx xx* |
| *HomePage* | *www.marwan-abdellah.com* |
| *Emails* | *abdellah.marwan@gmail.com · marwan.m.abdellah@ieee.org* |
| *Languages* | English — *Fluent*<br>French — *Good*<br>Arabic — *Mothertongue* |

# PUBLICATIONS

## PEER-REVIEWED JOURNAL ARTICLES

*October 2015*

1. RECONSTRUCTION AND SIMULATION OF NEOCORTICAL MICROCIRCUITRY
*Cell*
AUTHORS — *Henry Markram, Eilif Muller, Srikanth Ramaswamy, Michael W. Reimann,* **Marwan Abdellah**, *Carlos Aguado Sanchez, Anastasia Ailamaki, Lidia Alonso Nanclares, Nicolas Antille, Selim Arsever, Guy Antoine Atenekeng Kahou, Thomas K. Berger, Ahmet Bilgili, Nenad Buncic, Athanassia Chalimourda, Giuseppe Chindemi, Jean-Denis Courcol, Fabien Delalondre, Vincent Delattre, Shaul Druckmann, Raphael Dumusc, James Dynes, Stefan Eilemann, Eyal Gal, Michael Emiel Gevaert, Jean-Pierre Ghobril, Albert Gidon, Joe W. Graham, Valentin Haenel, Etay Hay, Thomas Heinis, Juan B. Hernando, Michael Hines, Lida Kanari, Daniel Keller, John Kenyon, Georges Khazen, Yihwa Kim, James G. King, Zoltan Kisvarday, Pramod Kumbhar, Sebastien Lasserre, Bruno R.C. Magalhaes, Angel Merchán-Pérez, Julie Meystre, Benjamin Roy Morrice, Jeffrey Muller, Alberto Munoz-Cespedes, Shruti Muralidhar, Keerthan Muthurasa, Daniel Nachbaur, Taylor H. Newton, Max Nolte, Aleksandr Ovcharenkov, Juan Palacios, Luis Pastor, Rodrigo Perin, Rajnish Ranjan, Imad Riachi, José-Rodrigo Rodríguez, Roman Juan Luis Riquelme, Christian Andreas Rössert, Ying Shi, Julian C. Shillcock, Ricardo Silva, Farhan Tauheed, Martin Telefont, Maria Toledo-Rodriguez, Thomas Tränkler, Werner Van Geit, Jafet Villafranca Diaz, Richard Walker, Yun Wang, Stefano M. Zaninetta, Javier DeFelipe, Sean L. Hill, Idan Segev and Felix Schürmann*

*August 2015*

2. THE NEOCORTICAL MICROCIRCUIT COLLABORATION PORTAL: A RESOURCE FOR RAT SOMATOSENSORY CORTEX
*Frontiers in Neural Circuits*
AUTHORS — *Srikanth Ramaswamy, Jean-Denis Courcol,* **Marwan Abdellah**, *Stanislaw Adaszewski, Nicolas Antille, Selim Arsever, Atenekeng Kahou Guy Antoine, Ahmet Bilgili, Yury Brukau, Giuseppe Chindemi, Raphael Dumusc, Stefan Eilemann, Lida Kanari, Daniel Keller, James G. King, Rajnish Ranjan, Michael Wolfgang Reimann, Christian Roessert, Martin Telefont, Werner Van Geit, Jafet Villafranca Diaz, Richard Walker, Yun Wang, Stefano Zaninetta, Javier DeFelipe, Sean L Hill, Jeffrey Muller, Idan Segev, Felix Schürmann, Eilif Benjamin Muller and Henry Markram*

*August 2015*

3. PHYSICALLY-BASED IN SILICO LIGHT SHEET MICROSCOPY FOR VISUALIZING FLUORESCENT BRAIN MODELS
*BMC Bioinformatics 2015 · Volume 16 · Supplement 11:S8*
AUTHORS — **Marwan Abdellah**, *Ahmet Bilgili, Stefan Eilemann, Henry Markram, and Felix Schürmann*

*January 2015*

4. HIGH PERFORMANCE GPU-BASED FOURIER VOLUME RENDERING
*International Journal of Biomedical Imaging · Article ID 590727*
AUTHORS — **Marwan Abdellah**, *Ayman Eldeib and Amr Sharawi*

## CONFERENCE PROCEEDINGS

*May 2016*

5. PHYSICALLY-BASED RENDERING OF HIGHLY SCATTERING FLUORESCENT SOLUTIONS USING PATH TRACING
*Eurographics 2016 · Lisbon, Portugal*
AUTHORS — **Marwan Abdellah**, *Ahmet Bilgili, Stefan Eilemann, Henry Markram, and Felix Schürmann*

*April 2016*

6. INTERACTIVE HIGH RESOLUTION RECONSTRUCTION OF 3D ULTRASOUND VOLUMES ON THE GPU
*2016 IEEE International Symposium on Biomedical Imaging: From Nano to Macro · Prague, Czech Republic*
AUTHORS — **Marwan Abdellah**, *Asem Abdelaziz, and Ayman M. Eldeib*

*April 2016*

7. OPTIMIZED GPU-ACCELERATED FRAMEWORK FOR X-RAY RENDERING USING $k$-SPACE VOLUME RECONSTRUCTION
*XIV Mediterranean Conference on Medical & Biological Engineering & Computing (MEDICON 2016) · Paphos, Cyprus*
AUTHORS — **Marwan Abdellah**, *Yassin Amer, and Ayman Eldeib*

*August 2015*

8. ACCELERATING DRR GENERATION USING FOURIER SLICE THEOREM ON THE GPU
*37th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBS) (EMBC 2015) · Milan, Italy*
AUTHORS — **Marwan Abdellah**, *Ayman M. Eldeib, and Mohamed Owis*

*August 2015*

9. GPU ACCELERATION FOR DIGITALLY RECONSTRUCTED RADIOGRAPHS USING BINDLESS TEXTURE OBJECTS AND CUDA/OPENGL INTEROPERABILITY

*37th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBS) (EMBC 2015) · Milan, Italy*
Authors — **Marwan Abdellah**, *Ayman M. Eldeib, and Mohamed Owis*

*July 2015*
10. Physically-based In Silico Light Sheet Microscopy for Visualizing Fluorescent Brain Models
*5th Symposium on Biological Data Visualization (BioVis 2015) · Dublin, Ireland*
Authors — **Marwan Abdellah**, *Ahmet Bilgili, Stefan Eilemann, Henry Markram, and Felix Schürmann*

*May 2015*
11. A Computational Model of Light-Sheet Fluorescence Microscopy using Physically-based Rendering
*Eurographics 2015 · Zürich, Switzerland*
Authors — **Marwan Abdellah**, *Ahmet Bilgili, Stefan Eilemann, Henry Markram, and Felix Schürmann*

*December 2014*
12. MATLAB-based Fourier Volume Rendering Framework
*IEEE, Proceedings of the 7th Cairo International Biomedical Engineering Conference (CIBEC 2014) · Cairo, Egypt*
Authors — **Marwan Abdellah**, *Ayman Eldeib and Amr Sharawi*

*December 2014*
13. Offline Large Scale Fourier Volume Rendering on Low-end Hardware
*IEEE, Proceedings of the 7th Cairo International Biomedical Engineering Conference (CIBEC 2014) · Cairo, Egypt*
Authors — **Marwan Abdellah**, *Ayman Eldeib and Amr Sharawi*

*April 2014*
14. cufftShift: High Performance CUDA-accelerated FFT-shift Library
*Proceedings of the High Performance Computing Symposium (HPC '14), Article No. 5 · Tampa, FL, USA*
Authors — **Marwan Abdellah**

*December 2012*
15. Constructing a Functional Fourier Volume Rendering Pipeline on Heterogeneous Platforms
*IEEE, Proceedings of the 6th Cairo International Biomedical Engineering Conference (CIBEC 2012) · Cairo, Egypt*
Authors — **Marwan Abdellah**, *Ayman Eldeib and Amr Shaarawi*

*December 2012*
16. High Performance Multi-dimensional (2D/3D) FFT-Shift Implementation on Graphics Processing Units (GPUs)
*IEEE, Proceedings of the 6th Cairo International Biomedical Engineering Conference (CIBEC 2012) · Cairo, Egypt*
Authors — **Marwan Abdellah**, *Ayman Eldeib and Amr Shaarawi*

*December 2012*
17. High Performance CUDA-based Implementation for the 2D Version of the Maximum Subarray Problem (MSP)
*IEEE, Proceedings of the 6th Cairo International Biomedical Engineering Conference (CIBEC 2012) · Cairo, Egypt*
Authors — *Salah Saleh,* **Marwan Abdellah**, *Ahmed A. Abdel Raouf and Yasser M. Kadah*

*May 2012*
18. Parallel Rendering on Hybrid Multi-GPU Clusters
*Eurographics Symposium on Parallel Graphics and Visualization (EGPGV'12) · Cagliari, Italy*
Authors — *Stefan Eilemann, Ahmet Bilgili,* **Marwan Abdellah**, *Juan Hernando, Maxim Makhinya, Renato Pajarola, and Felix Schürmann*

*September 2009*
19. GPU-Based Reconstruction and Display for 4D Ultrasound Data
*2009 IEEE International Ultrasonics Symposium · Rome, Italy*
Authors — *Ahmed Elnokrashy, Ahmed Elmalky, Tamer Hosny,* **Marwan Abdellah**, *Alaa Megawer, Abubakr Alsebai, Abou-Bakr Youssef and Yasser Kadah*

*March 2009*
20. Software Development for Low Cost, High quality, Real-time, 4D Ultrasound on Personal Computers
*IEEE, 26th National Radio Science Conference (NRSC), Union Radio Scientifique Internationale (URSI) · Cairo, Egypt*
Authors — **Abdellah M.**, *Megawer A. and Kadah Y. Mh*

### poster abstracts

*October 2012*
21. A Unifying Model of the Neocortical Column 15: High Performance Computing and Software Development Challenges

*2012 Society for Neuroscience (SFN) Meeting, 268.A Unifying Model of the Neocortical Column · New Orleans, USA*

Authors — *F. Delalondre,* **M. Abdellah**, *C. Aguado Sanchez, A. Bilgili, N. Buncic, J.-D. Courcol, S. Eilemann, V. Haenel, S. L. Hill, T. Heunus, J. B. Hernando, M. Hines, J. G. King, E. Muller, B. R. C. Magalhaes, G. Mateescu, J. Muller, K. Murthurasa, D. Nachbaur, L. Pastor, J. M. Pena, R. Ranjan, M. W. Reimann, F. Tauheed, W. Van Geit, A. Ailamaki, H. Markram, F. Schürmann*

### THESES

*February 2012*

22. High Performance Fourier Volume Rendering on Graphics Processing Units (GPUs)
*M.Sc. Thesis · Systems & Biomedical Engineering Department, School of Engineering, Cairo University · Cairo, Egypt*
Authors — **Marwan Abdellah**

*July 2009*

23. High Quality, High Performance, 3D Real-time Ultrasound Volume Reconstruction on Graphics Processing Units (GPUs)
*B.Sc. Thesis · Systems & Biomedical Engineering Department, School of Engineering, Cairo University · Cairo, Egypt*
Authors — **Marwan Abdellah**, *Alaa Megawer, and Yasser Kaddah*

May 9, 2016