

# MARINA A. AYAD, B.Sc.,M.Sc.

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## EDUCATION

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**RUTGERS UNIVERSITY, SCHOOL OF ENGINEERING, NEW BRUNSWICK, NJ**

*Doctoral Candidate in Biomedical Engineering (4<sup>th</sup> year), May 2023*

GPA: 3.85

Highlights: Graduate Assistant

**RUTGERS UNIVERSITY, SCHOOL OF ENGINEERING, NEW BRUNSWICK, NJ**

*Master of Engineering in Biomedical Engineering, October 2021*

GPA: 3.85

Highlights: Graduate Assistant

Awards: School of Engineering Graduate Fellowship Fall 2018-Spring 2020

**THE AMERICAN UNIVERSITY IN CAIRO, CAIRO, EGYPT**

*Master of Science in Physics, February 2015*

GPA: 3.95

Highlights: Research Assistant, Teaching Assistant

Awards: University Fellowship, Merit Fellowship

**AIN SHAMS UNIVERSITY, SCHOOL OF ENGINEERING, CAIRO, EGYPT**

*Bachelor of Sciences in Computer and Systems Engineering, Electrical Engineering Division, August 2011*

## WORK EXPERIENCE

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**RUTGERS UNIVERSITY, BIOMEDICAL ENGINEERING, NEW BRUNSWICK, NJ**

*Graduate Assistant in Bio-optics Laboratory, January 2019 – Present*

- Developed new image processing methods for registration, segmentation and analysis of captured neuronal microscopic images like Deep learning.
- Calibrated FRET microscopy system that included CCD and CMOS cameras.
- Imaged cortical neurons and immortal baby kidney cells using FRET microscopy.
- Maintained neuronal and epithelial cell culture on glass substrates and hydrogel substrates.
- Applied Transformation and Transfection with molecular probes using sterile techniques.
- Participated in DNA plasmid purification and cloning.
- Applied differential interference contrast (DIC) microscopy for neuronal and epithelial cell imaging.

**DIGITAL TEST, CAIRO, EGYPT**

*Software Engineer in C-Link Software Team, June 2015 – July 2018*

- Developed new modules for C-Link Software. C-LINK DTM a fully integrated and easy to use CAD to Test and Assembly systems solution. Debugged and upgraded modules to enhance the software performance.
- Designed and implemented C++ modules to load and save several CAD interfaces.
- Provided mentoring to junior engineers to get all tasks and projects done by due date.

## RESEARCH EXPERIENCE

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**RUTGERS UNIVERSITY, BIOMEDICAL ENGINEERING, NEW BRUNSWICK, NJ**

*Graduate Assistant in Bio-optics Laboratory, January 2019 – Present*

Dissertation: Vinculin Tension Probe within Neurons on Stiff and Complaint Substrates.

AMERICAN UNIVERSITY OF CAIRO, DEPARTMENT OF PHYSICS, CAIRO, EGYPT

Research Assistant in Nanophotonics Laboratory, June 2012 – June 2015

Dissertation: Numerical Techniques and Sensitivity Analysis for Schrodinger's Equation.

- Optimized of Finite Difference method to calculate fundamental and higher order modes calculations using the Imaginary Time Propagation (ITP) method for several quantum well and quantum wire structures.
- Enhanced a sensitivity analysis method for the parameters of the quantum structures using the Adjoint Variable Method (AVM) for both the fundamental mode and the higher order modes calculated using the imaginary time propagation method and comparing it to the sensitivity calculated using the Central Finite Difference (CFD) method.
- Nanophotonics Devices: Nanophotonics structures design used for interconnects as the submicron power splitters with wide-band using the metal insulator metal (MIM) plasmonics configuration, and optimizing the structure using the finite difference time domain (FDTD) software tool. Designed optical interconnects using Mid Infrared Plasmonics with minimum losses.
- Computational Techniques for Nanophotonics Modelling (Funded by Mentor Graphics): Modelling and parameter extraction for constructing a closed-form parametric model for waveguides. Fitting techniques are used to extract parameters, such as the coupling length. Thus, reducing the high computational cost of the eigenmode solvers.

## PUBLICATIONS

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1. Ayad, M. A, Mahon, T., Sumetsky, D., Cararo-Lopes M., Firestein, B. and Boustany N., Vinculin Tension Probe in Neurons, *Proc. SPIE, BIOS*, 2021.
2. Ayad, M. A., Obayya, S. S. A., & Swillam, M. A. (2014). Submicron 1xN Ultra Wideband MIM Plasmonic Power Splitters. *Journal of Lightwave Technology*, 32(9), 1814–1820.
3. Ayad, M. A, Swillam, M., “Submicron-integrated plasmonic power splitter”, *SPIE Proceedings Integrated Optics: Devices, Materials, and Technologies XVIII*, Vol. 8988, February 2014.
4. Ayad, M. A, Swillam, M., “Efficient Modelling of Quantum Nanostructures,” *NUSOD Proceedings*. September 2014.
5. Ayad, M. A, Salah S A Obayya and Swillam, M.A. Modelling of quantum confinement in optical nanostructures. *Journal of Optics* 18(1), pp. 015201. 2016.
6. Ayad, M. A, Salah S. A. Obayya, Swillam, M.A, “Efficient and accurate modelling of quantum nanostructures,” *Proc. SPIE 9742, Physics and Simulation of Optoelectronic Devices XXIV*, 97421L (2016/03/15).
7. Ayad, M. A ,and Swillam ,M. A, "Mid-Infrared Plasmonic Power Splitters," in *IEEE Photonics Technology Letters*, vol. 28, no. 21, pp. 2431-2434, Nov.1, 1 2016.

## SKILLS AND RELEVANT COURSE WORK

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**CELL CULTURE SKILLS:** Lab sterile techniques including micropipetting and liquid handling, Neuronal and epithelial cell culture handling and maintenance, DNA plasmid cloning and dilution, cell transfection.

**PROGRAMMING:** Advanced in C++, Matlab, R Studio, Introductory Linux, Python, C# and Java.

**IMAGING & MICROSCOPY:** Live Cell imaging, Fluorescent imaging, DIC imaging using Confocal Microscopy, Image processing techniques using Matlab, mounting cell samples, microscope calibration.

**SIMULATORS:** COMSOL, Lumerical.

**TEACHING:** Teaching Assistant in introductory and computational Physics courses, and Biomedical measurements laboratory course.

**INVOLVEMENTS:** MEMS training in the American University in Cairo that included design, optimization, microfabrication and characterization. High Performance Computing Summer School to gain more knowledge of dealing with linux on cluster computers.

**RELEVANT COURSE WORK:** Data structures, Mathematical Physics, Computational Physics, Nanophotonics, Quantum Mechanics, Image Processing, Biosignal Processing, Computer Integrated Medical Interventions, Biocontrol, Mamalian Physiology, Advanced Molecular Biology, Stem Cell Biology, Biomems and microfluidics, Biostatistics.

#### **INTERESTS AND SERVICE**

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Scout Leader since 2008, leading and participating in several camps.  
Learning Leadership and communication skills, and to be independent and more observant.