Nadine Aburumman

Lecturer, Computer Science Department - Brunel University London

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Profile

First Name: Nadine   **Last Name:** Aburumman
Gender: Female   **Nationality:** Jordanian
Languages: Arabic, English (fluent written and spoken), Italian (A2), German and French (A1)

Research Interests

Computer Graphics and Animation: I have a broad interest in computer graphics and animation. My primary area of research includes interactive character animation, real-time skinning, deformation, finite element methods, particle-based simulations, smoothed particle hydrodynamics, implicit skinning, collision detection, contact, and interactive physics.

Immersive Virtual Reality (VR): I am using VR in interdisciplinary research projects that include computing, cognitive neuroscience, social interaction, training and education.

Vision and Perception: SLAM, 3D reconstruction, feature detection, pattern recognition, structure from motion, and visual learning.

Education

2012–2016	**Ph.D.**, Computer Science	Sapienza University of Rome, Italy

Dissertation Title: **Position-based Skin Deformations for Interactive Character Animation**
Advisor: Prof. Dr. Marco Schaerf
Co-advisor: Prof. Dr. Marco Fratarcangeli
Examiners: Prof. Dr. Catherine Pelachaud, Prof. Dr. Marco Tarini and Prof. Dr. Fiora Pirri

2008–2010	**M.Sc.**, Computer Science	Al Balqa' Applied University, Jordan

Thesis Title: **Robust Digital Watermarking for Compressed Three Dimensional Models Based on Polygonal Representation**
GPA: 3.88/4.0 (excellent: ranked 2nd out of 138)

2003–2007	**B.Sc.**, Computer Science	Princess Sumaya University for Technology, Jordan

Awards & Fellowships

2017-2018	**Postdoctoral Fellowship**	CIMI Postdoctoral Fellowship Grant (a successful grant acquisition for 2 years at IRIT)
2012–2015	**Doctoral Scholarship**	Avempace EU Erasmus Mundus Project
30 May 2014	**Best paper and Best Presentation awards**	at Spring Conference on Computer Graphics

Paper Title: Position Based Skinning of Skeleton-driven Deformable Characters

Research Experience

Sep 2019–Now   **Member of the Intelligent Data Analysis Research Group (IDA)**   Computer Science Department, Brunel University London, United Kingdom

Head of the Intelligent Data Analysis Research Group: Prof. Dr. Allan Tucker
I am doing research in computer graphics, physics-based animation, real-time physics, skinning, secondary motions, cloth and fluid simulation. My ultimate goal is to improve the quality of 3D animated movies, video games and VR/AR/XR through physically based simulations of virtual characters, cloth, soft bodies, fluids and rigid bodies. Towards this goal, I intend to advance computer games and computer animation on various levels, mainly through efficient physics-based algorithms, skeletal based deformation, and machine learning.

Dec 2018–Now   **Research Associate**   Institute of Cognitive Neuroscience, University College London, United Kingdom

Advisor: Prof. Dr. Antonia Hamilton
Nonverbal Social Communication: Real-time face-to-face social conversation involves complex coordination of nonverbal cues such as head movement (nodding), gaze (i.e. eye contact), facial expressions and gestures. In this research, we investigate how coordination in such subtle nonverbal communication can have effects over closeness and trust. Virtual Reality (VR) provides a high level of social presence with conversation patterns that are very similar to face-to-face interaction. Therefore, we employ VR to understand how coordination influences social bonding and strongly perceived similarities in personality.

Feb 2017–Nov 2018   **Postdoctoral Researcher**   IRIT, Paul Sabatier University, France

Advisor: Prof. Dr. Loïc Barthe
Muscle Deformations for Implicit Skinning: We developed a controllable muscle deformation method for character animation. In this work, the muscles act as skin deformers by automatically propagating their contraction/stretch, inflation/deflation and eventual activation (when the character forces) on the mesh representing the character skin. The muscle is represented as a 3D scalar function-based muscle representation mimicking the shape and deformation of real muscles, from relatively simple biceps to more complicated pectorals, at nearly constant volume.

Mar 2016–Feb 2017   **Postdoctoral Researcher**   MSS, Friedrich-Alexander University, Germany

Advisors: Prof. Dr. Thorsten Pöschel and *Dr. Patric Müller*
Coupled Simulation of Deformable Bodies and Fluids: We developed a stable method for simulating two-way coupling of deformable bodies and incompressible fluid. The method is able to handle thin deformable shells or membranes (such as clothes), which is a rather complex problem in the case of two-way coupling. In our method the fluid is represented by particles, and simulated using a Lagrangian method, namely incompressible Smoothed Particle Hydrodynamics (SPH). The deformable bodies are represented by volumetric meshes, where the elastic deformations are simulated using a Position Based Dynamics (PBD) scheme.

| Nov 2012–Mar 2016 | **Graduate Research Assistant** | Sapienza University of Rome, Italy |

Advisors: Prof. Dr. Marco Schaerf and Prof. Dr. Marco Fratarcangeli
Real-time Skin Deformations: This project addresses the problem of creating believable mesh-based skin deformation for soft articulated characters. We present a novel two-layered deformation framework, which is able to mimic the macro-behaviours of the skin and capture secondary effects, such as volume conservation and jiggling. While minimising the manual post-processing time, our system provides the artist with some level of control over the secondary effects. Our system is practical, relatively easy to implement and fast enough for real-time applications.

| Mar 2015–Jun 2015 | **Visiting Scholar** | IGG Team/ICube Lab, University of Strasbourg, France |

Advisor: Prof. Dr. Dominique Bechmann
Collision Handling: Solving the collision detection problem has become of major interest in various application areas, ranging from games, animation and virtual reality to surgery simulation and robotics. Moreover, efficient and reliable collision detection is a critical part of almost all graphics applications. In order to simulate the skin's behaviour in a believable manner, an appropriate collision response has to be considered. We studied the possibility to obtain real-time responses with accurate edge/edge collision detection.

| Mar 2013–Sep 2013 | **Computer Vision Research Assistant** | ALCOR Lab, Sapienza University of Rome, Italy |

Advisor: Prof. Dr. Luca Iocchi
Gender Classification of Human Faces: The human face provides a lot of information such as age, gender, identity, and emotional state. In particular, gender recognition from a human face is an active research area of computer vision, and there is a large number of applications where gender recognition can be useful, such as in biometric authentication for security systems, criminology and augmented reality. We addressed the problem of gender classification using frontal facial images as training images. The goal of this project is to automatically detect faces on images or video, and to quickly and reliably classify the gender of the detected faces.

| Sep 2012–Jun 2013 | **Graduate Research Assistant** | Sapienza University of Rome, Italy |

Advisor: Prof. Dr. Marco Fratarcangeli
Face Modelling from Laser Scanner: Facial modelling is one of the most challenging problems in the field of computer graphics. Given a laser scan of a real face as input, we proposed an efficient automatic algorithm for 3D face modelling, which produces a 3D virtual face with topological properties suitable for facial animation. Our algorithm finds a matching between the facial features of the input laser scan and a template mesh. Such a matching does not rely on the texture information and it is used to define a morphing function, which is applied to the template mesh. The resulting deformed mesh conserves the topological properties of the template mesh and it effectively represents the shape of the laser scan.

Selected Publications

International peer-reviewed journals:

- **Aburumman, N.**, Nair, P., Mueller, P., Barthe, L., Vanderhaeghe, **ISPH-PBD: Coupled Simulation of Incompressible Fluids and Deformable Bodies**, The Visual Computer journal, 36(5), 893-910, **2019**.
- Casti, S., Livesu, M., Mellado, N., **Aburumman, N.**, Scateni, R., Barthe, L., Puppo, E., **Skeleton Based Cage Generation Guided by Harmonic Fields**, Computers & Graphics journal, Volume 81, June 2019, 140-151, **2019**.

- Roussellet, V., **Aburumman, N.**, Canezin, F., Mellado, N., Barthe, L., Kavan, L., **Dynamic Implicit Muscles for Character Skinning**, Computers & Graphics journal, 77: 227-239, December **2018**.
- **Aburumman, N.** and Fratarcangeli, M., **Position-Based Skinning for Soft Articulated Characters**. Computer Graphics Forum, 34: 240-250, September **2015**.
- Abou El-seoud, S., **Aburumman, N.**, Islam A.T.F Taj-eddin, F Khatatneh, K. and Gutl, C, **Robust Digital Watermarking for Compressed 3D Models based on Polygonal Representation**, International Journal of Computer Applications 61(4):1-14, January **2013**.
- **Aburumman, N.**, Abou El-Seoud, S., F Khatatneh, K. and Gutl, C. **Geometry Compression for 3D Polygonal Models using a Neural Network**, International Journal of Computer Applications 1(29):13- 22, February **2010**.

International conferences with peer-reviewing process:

- **Aburumman, N.** and Fratarcangeli, M., **Coupled Simulation of Deformable Bodies and ISPH Fluids for Secondary Bone Healing**, in proceedings of EUROGRAPHICS 2017, Lyon, France, pages 3-4, April **2017**.
- **Aburumman, N.** and Fratarcangeli, M., **State of the Art in Skinning Techniques for Articulated Deformable Characters**, in Proceedings of the 11th Joint Conference on Computer Vision, Imaging and Computer Graphics Theory and Applications, Rome, Italy, ISBN 978-989-758-175-5, pages 200-212, February **2016**.
- **Aburumman, N.**, Schaerf, M. and Bechmann, D., **Collision Detection for Articulated Deformable Characters**, in Proceedings of the ACM SIGGRAPH Conference on Motion in Games (MIG2015), November **2015**.
- **Aburumman N.**, and Fratarcangeli M, **Position Based Skinning of Skeleton-driven Deformable Characters**, in Proceedings of the 30th Spring Conference on Computer Graphics. , pp. 83-90. ACM. May **2014**. (**Best Paper Award**).

Book chapter:

- **Aburumman, N.** and Fratarcangeli, M., **Skin Deformation Methods for Interactive Character Animation**, in CCIS Communications in Computer and Information Science, Springer International Publishing, volume 693, 153—174, August **2017**.

Under preparation:

- **Aburumman, N.**, Gillies, M., Ward, Jamie A., Hamilton, A., **Being with a Virtual Character: Nonverbal Communication in Virtual Reality**, to be submitted to International Journal of Human Computer Studies.
- **Aburumman, N.** and Davare, M, VirtuGrasp: **Real-time Visual and Haptic Feedback of Grasping Movements in Virtual Reality**, to be submitted to Frontiers in Virtual Reality.

Talks

Invited Talks:

22 June 2019	**Being with a Virtual Character: Nonverbal Communication in Virtual Reality**	Invited Talk at
	Intelligent Data Analysis Research Group (IDA) at Brunel University London	
	London, United Kingdom	
26 Feb 2018	**Dynamic Phenomena using Implicit Incompressible SPH** Invited Talk at Computer Graphics and	
	Multimedia Systems Group at the University of Siegen	
	Siegen, Germany	
5 Dec 2016	**Stability in Incompressible SPH (ISPH)**	Invited Talk at Computer Graphics Group
	at the Friedrich-Alexander University	
	Erlangen, Germany	
7 Nov 2016	**Position-based Skin Deformations for Interactive Character Animation**	Invited Talk at LabEx
	Toulouse, France	

12 Mar 2015	**Position-based Skinning for Soft Articulated Characters** Invited Talk at ICube Lab
	Strasbourg, France

Conference Talks:

05 Sep 2019   **Understanding Nonverbal Communication in Face2Face Social Interaction** Conference Poster Presentation at ACII 2019
Cambridge, United Kingdom

24 Apr 2017   **Coupled Simulation of Deformable Bodies and ISPH Fluids for Secondary Bone Healing** Conference Poster Presentation at EUROGRAPHICS 2017
Lyon, France

8 May 2016   **Collision Detection for Articulated Deformable Characters** Conference Talk at ACM SIGGRAPH on MiG 2015
Lisbon, Portugal

29 Feb 2016   **State of the Art in Skinning Techniques for Articulated Deformable Characters** Conference Talk at GRAPP 2016
Rome, Italy

30 May 2014   **Position-based Skinning of Skeleton-driven Deformable Characters** Conference Talk at SCCG 2014
Smolenice, Slovakia

15 July, 2013   **Automatic Face Modelling From Laser Scanner** Poster Presentation at ICVSS 2013
Calabria, Italy

Teaching Experience

Academic year of 19/20 **Co-leading Modules and Tutoring**
Brunel University London, Computer Science Department

- CS3005: Digital Media and Games Module, Academic Year 2019/20
- CS1701: Group Project Lectures and Tutorials Module, Academic Year 2019/20
- CS3072/CS3605: Supervised Ten Final Year Projects Theses, Academic Year 2019/20
- CS2555 Work Placement: Supervised Three Placement Projects, Academic Year 2019/20

Fall semester of 2014 **Teaching Assistant**
Sapienza University of Rome, Computer Science and Engineering Department

- 1044398: Interactive Graphics (WebGL), Academic Year 2014/15

Fall semester of 2013 **Teaching Assistant**
Sapienza University of Rome, Computer Science and Engineering Department

- 1022793: Introduction to Computer Graphics, Academic Year 2013/14

Academic year of 2012 **Full-time Lecturer and Postgraduate Demonstrator**

> Princess Sumaya University for Technology, Computer Graphics and Animation Department

- CG12479: Advanced Animation: 3 hours per week for 20 weeks
- I have supervised graduation for 8 undergraduate students

Academic year of 2011 **Full-time Lecturer**

> Princess Sumaya University for Technology, Computer Graphics and Animation Department

- CG12477: Computer Animation (2): 3 hours per week for 20 weeks
- CG12463: Fundamentals of Movie Production: 3 hours per week for 20 weeks
- CG12481: Game Design: 3 hours per week for 20 weeks

Academic year of 2010 **Full-time Lecturer**

> Princess Sumaya University for Technology, Computer Graphics and Animation Department

- CG12258: Computer Applications in Fine Art: 3 hours per week for 20 weeks
- CG12262: 2D Animation: 3 hours per week for 20 weeks

Academic year of 2009 **Teaching Assistant**

> Princess Sumaya University for Technology, Computer Graphics and Animation Department

- CG12477: Computer Animation (2)
- CG12324: Human Computer Interaction

Ph.D and M.Sc theses Supervision

- Pierre Cholet, Adèle Saint-Denis and Karim Salama, **Master students**, IRIT, Paul Sabatier University, Toulouse, **from Jun 2018-Dec 2018** (topic: Position-based Simulations for Clothes and Soft Bodies).
- Alban Odot, **Master student**, IRIT, Paul Sabatier University, Toulouse, **from Sep 2017-Apr 2018** (topic: Particle-based Fluid Simulation).
- Sara Casti, **visiting Ph.D student**, IRIT, Paul Sabatier University, Toulouse, **from Sep-Dec 2017** (topic: Cage Deformation and Skinning for Character Animation).
- Fernanda Grella, **Master student**, Sapienza University of Rome, Rome, **from Feb 2014- Oct 2015** (topic: Fast Collision Detection for Interactive Deformable Bodies).

Technical Skills

Operating Systems:	Mac OS X, Windows and Linux
Programming Languages:	C/C++, MEL, Python, Java, J2ME, HTML, C Sharp, ASP.NET, JavaScript and Matlab
Graphics and Visualisation Toolkits:	Qt, OpenGL, OpenCV, CGAL, VCG, OpenVR, SteamVR and Bullet

| **Professional Tools:** | Autodesk Maya, Unity Engine, Unreal Engine, Adobe AfterEffects, Cinelerra-CV, Apple Final Cut Pro, Adobe Premiere, Adobe Flash, Adobe Photoshop, GIMP, Adobe Illustrator, Toon Boom Animate, Toon Boom Storyboard, Cinema 4D Studio, ParaView, VisIt and $\LaTeX$ |
| **Soft Skills:** | Team player, self-motivated, creative, enthusiastic learner, problem solver, multicultural, and highly adaptable |

Collaboration with Industrial Partners

- **Elastic Implicit Skinning for Character Animation:** Transfer technology supported by Toulouse Tech Transfer (TTT) – for the program description (*click here)*

Professional Activities

- **Wrote reviews for the following journals:** ACM Transactions on Graphics (TOG), Visual Computer, Computer Animation and Virtual Worlds, Computer & Graphics and IEEE Transactions on Visualisation and Computer Graphics TVCG.
- **Wrote reviews for the following conferences:** International Conferences in Central Europe on Computer Graphics, Visualisation and Computer Vision (WSCG), Computer Graphics International (CGI), and International Conference on Computer Animation and Social Agents (CASA).

Professional Training

30 June - 4 July, 2014	**Regularisation Methods for Machine Learning Summer School, Genova, Italy**
14 July - 20 July, 2013	**International Computer Vision Summer School, Calabria, Italy**
01 June - 09 Sep, 2010	**Summer internship on 3D Rigging using Maya, Kharabeesh Company, Amman, Jordan**
4 June - 30 August, 2009	**Toon Boom Digital Pro, Training Course, Grenoble, France**
12 July - 18 July, 2008	**Management of Innovation, Training Course, Rabat, Marocco**
21 May - 30 Sep, 2008	**Cinema 4D Studio, Training Course, Amman, Jordan**
01 Feb - 30 June, 2006	**Internship on J2EE and J2ME, Specialised Technical Services (STS), Amman, Jordan**
01 June - 31 August, 2005	**Internship on Java Programming language, Royal Scientific Society, Amman, Jordan**

Professional Memberships

UK Higher Education Academy: Associate Fellow
Eurographics Association: Individual Member
EuroVR Association: Individual Member

Creative Works

"The Race"   **36 seconds of a 2D animated sequence, demonstrating highly dynamic human body motion, including jumping and running**
                                        https://vimeo.com/47348160

"Tumorous Smiles"   **A 2 minute short film highlighting the need for medical support to fighting childhood cancer worldwide**
                                        https://vimeo.com/117742885

Voluntary Experience

Student volunteer for the Computer Graphics International Conference (CGI), 2015