



2024 OFDFA
Dr. Sarah Abu Arqub, University of Florida

Short Biography

Sarah Abu Arqub, B.D.S., M.Sc., M.Dent.Sc., joined the University of Florida College of Dentistry (UFCD) on July 1, 2022, as a Clinical Assistant Professor in the Department of Orthodontics. Dr. Abu Arqub is involved in teaching both pre-doctoral and graduate dental students in clinical and didactic courses. She also mentors research projects for orthodontics residents, interns, and dental students. She also provides patient care in the UFCD Orthodontics Faculty Practice.

Originally from Jordan, Dr. Abu Arqub came to Gainesville after three years at the University of Connecticut School of Dental Medicine (UConn) in Farmington, Connecticut. There, she earned her master's degree in dental science and a certificate in orthodontics – for the second time. Dr. Abu Arqub began her education at the University of Jordan in Amman, Jordan, obtaining her Bachelor of Dental Surgery degree in 2003. She furthered her studies by earning her Master of Dental Science in Orthodontics at the Jordan University of Science and Technology in Irbid, Jordan 2007.

After completing her initial education in Jordan, Dr. Abu Arqub practiced privately as an associate orthodontist for five years. Subsequently, she pursued a fellowship in craniofacial orthodontics at UConn from 2013 to 2014. Following five additional years in private practice in Jordan, she returned to the United States and UConn to earn her second master's degree and orthodontics certificate in 2022, leading her to Gainesville.

Dr. Abu Arqub is actively engaged in various research projects. She has published over 40 articles in high-impact peer-reviewed journals, with several pending publications and ongoing research in journals such as PGIO, AJODO, Angle, OCR, and JWFO. She has garnered more than 500 citations throughout her career thus far. Her research primarily focuses on clinical orthodontics and its applications in practice, including topics such as clear aligners, temporary anchorage devices (TADs), systematic reviews, retention, digital technology applications in orthodontics (Teleorthodontics, AI, and Dental Monitoring), biomechanics, early treatment, white spot lesions, impacted teeth, treatment outcomes, and perceptions. She serves as an associate editor in Progress in Orthodontics and on the editorial board of Seminars in Orthodontics. In recognition of her expertise, she was among the top reviewers for AJODO in 2023.

Brief Description of the Project

Detecting, localizing, and assessing the severity of impacted teeth poses a significant challenge for dental clinicians due to potential complications such as bone loss, root resorption, and gingival recession. These complications often arise from inaccurate localization and assessment of impaction severity. Accurate identification and localization of impacted teeth on 2D panoramic radiographs are crucial for determining the necessity of early intervention or the feasibility of surgical intervention and orthodontic traction. This can also reduce financial burdens and risks associated with additional exposure to ionizing radiation from 3D CBCT images.

Variability in interpretations of impaction among clinicians highlights the need for an artificial intelligence-based algorithm. Such an algorithm, trained on a diverse dataset of panoramic radiographs, would automatically estimate the location and severity of impacted maxillary teeth. Utilizing semantic segmentation with convolutional neural networks (CNN), the algorithm would segment maxillary teeth, including impacted ones, to precisely identify their location and orientation.

We will use a heterogeneous dataset of panoramic radiographs collected from various dental centers, hospitals, and clinics worldwide to develop this algorithm. The CNN will generate segmentation maps to identify impacted teeth, and an iterative algorithm will estimate their location and orientation. Classification for the severity of impaction will be incorporated based on clinical standards using an independently validated dataset of panoramic radiographs.

The accuracy of the AI algorithm will be evaluated against known impacted tooth locations and classifications, with outputs compared to those of experienced clinicians. This comparative analysis will reveal any necessary improvements before integrating the algorithm into clinical practice. Ultimately, this project aims to establish a robust, safe, economical, and systematic approach for diagnosing and classifying impacted maxillary teeth, benefiting clinicians with varying experience levels.

The proposed AI-based algorithm seeks to optimize safety, accuracy, and interpretability, empowering clinicians to effectively identify the location and severity of maxillary impacted teeth. Successful completion of this project will pave the way for creating an intuitive, user-friendly interface for clinical applications, ensuring accessibility across different levels of expertise.

How will orthodontic education benefit from my award?

As a Junior Faculty member, I recognize the importance of continually integrating the latest skills and knowledge to enhance my effectiveness as an educator and perpetual learner. In light of the ongoing advancements in evidence-based orthodontics, artificial intelligence (AI), and digital diagnostic tools, my goal is to uphold the highest level of subject matter expertise and foster an interactive and dynamic learning environment within the field of orthodontics.

This educational environment will emphasize a comprehensive understanding of how advancements in AI science can shape the orthodontic profession. Furthermore, I am committed to nurturing a learning atmosphere centered on evidence-based patient care, adhering to established standards of practice, and applying biomechanical principles accurately in diagnosis and treatment planning.

Through deliberate professional development initiatives, I aim to further enhance my expertise, research endeavors, and clinical proficiency in effective communication, leadership, and evidence-based orthodontics. My primary focus will be on advancing clinical research and AI applications within the realm of orthodontics, thereby contributing to the continuous improvement of patient care and treatment outcomes.

Why the Foundation is important to your project? And how Foundation funding is expected to or has benefitted your career?

The American Association of Orthodontists Foundation (AAOF) plays a pivotal role in driving forward orthodontic research, and its continued support is vital for further advancements in the field. With their

backing, I could elevate my career and research endeavors, delving into novel techniques, technologies, and treatment modalities. Ultimately, this support would translate into enhanced patient care and improved outcomes in orthodontics.

Moreover, receiving support from the AAOF for my research would benefit my personal growth and contribute to the broader development of my teaching profession. By enabling me to expand my expertise in research and teaching, this funding would ensure that I can impart the latest evidence-based practices to dental students and residents, enriching their learning experiences and preparing them for their future careers.

The AAOF's commitment to funding orthodontic research also underscores its dedication to evidence-based practice, which aligns closely with my research goals. Through their support, I have the potential to generate new knowledge and insights, particularly in the realm of AI and its application in detecting the severity of impaction. This research could have far-reaching implications for advancing diagnostic accuracy and treatment planning in orthodontics.

In summary, the continued support of the AAOF would fuel my individual growth and research aspirations and contribute significantly to the advancement of orthodontics as a whole.