2025 Biomedical Research Award
Dr. Divakar Karanth, University of Florida

Dr. Divakar Karanth earned his BDS and MDS degrees from SDM College of Dental Sciences, Dharwad. He also holds an M. Orth RCS from Edinburgh, UK, and a Master's degree (MS) & Certificate in Orthodontics from the University of Kentucky, USA. He is a diplomate of the American Board of Orthodontics. Currently, Dr. Karanth serves as the Program Director of Graduate Orthodontics and holds the position of Clinical Associate Professor in the Department of Orthodontics. Dr. Karanth is a proud member of The Edward H. Angle Society of Orthodontists and he was the President of the Society of Educators (American Association of Orthodontists) during 2023-24.

Dr. Karanth's research interests are bone regeneration, the biology of tooth movement, and investigating the application of Artificial Intelligence (AI) in orthodontics. Looking ahead, Dr. Karanth aims to integrate AI models further into research and education. He is currently working on the use of natural language processing research interceptive orthodontics diagnosis and treatment planning, ultimately benefiting thousands of patients in the future.

Beyond research, Dr. Karanth actively contributes to the orthodontics by presenting and publishing articles. He also serves as a reviewer for over a dozen journals, ensuring the quality and rigor of orthodontic research. In addition, Dr. Karanth is deeply committed to orthodontic education. He plays an essential role in teaching orthodontic residents, pediatric dentistry residents, and predoc students. Furthermore, Dr. Karanth runs a highly successful private practice at the UF Faculty Clinic in Florida. Dr. Karanth's multifaceted contributions to orthodontics and education underscore his dedication to advancing the field and improving patient care.

Developing an automated interceptive orthodontic diagnostic and treatment planning model using Natural Language Processing and Machine Learning.

This study investigates the effectiveness of interceptive orthodontic treatment (Phase I) in children with malocclusion. By leveraging electronic health records (EHR) and advanced natural language processing (NLP) techniques, we aim to develop predictive models to identify key factors influencing treatment outcomes and optimize orthodontic intervention strategies. We will analyze EHR data from 2005 to 2023 to assess the prevalence and types of malocclusion in children and adolescents. Additionally, we will create and validate an NLP

application to extract relevant clinical information from orthodontic notes and use machine learning (ML) techniques to determine the optimal timing and approach for interceptive treatment. The study will also evaluate the clinical implications of early versus delayed orthodontic treatment on patient outcomes and quality of life.

Our long-term goal is to enhance the quality of life for children with malocclusion by providing evidence-based guidelines for early orthodontic intervention, reducing the prevalence of severe malocclusion, minimizing the need for extensive Phase II treatments, and improving overall orthodontic care effectiveness. By analyzing a large dataset of orthodontic records, we aim to identify predictors of treatment success and offer actionable insights for clinicians to optimize treatment plans. The key research question is: What factors influence the success of interceptive orthodontic treatment in children, and how can these factors be used to optimize early intervention strategies?

The findings will have significant clinical implications for orthodontic practice. Identifying the optimal approach and timing for interceptive treatment will improve patient outcomes, reduce the burden of severe malocclusion, and enhance the quality of life for affected children. Predictive models will equip clinicians with valuable tools to personalize treatment plans and make informed decisions about early intervention.

AAOF's support has been crucial to my academic success. My time constraints as clinical faculty prevent me from pursuing NIH grants. A previous AAOF Faculty Development Grant (OFDFA) enabled development of a machine learning algorithm for root resorption detection and quantification, along with a virtual reality program for resident orthodontic biomechanics training. This Biomedical Research Award will fund development of a natural language processing pipeline, creating an AI clinical tool to diagnose malocclusion, predict prognosis, and suggest treatment plans. Through these two awards, AAOF has significantly advanced my career through publications and presentations, culminating in my upcoming application for full professorship.