

**Year: 2024**

**Type of Awards: Elite**

**Name of Principal Investigator: Jie Fang**

**Affiliated Institution: West China Hospital of Stomatology, Sichuan University**

### About of the PI

- **Introduction & Education:**

West China School of Stomatology, Sichuan University, DDS/PhD. Harvard School of Dental Medicine, Harvard University, Visiting Scholar. West China School of Stomatology, Sichuan University, Associate Professor

- **Career Trajectory:**

Prof. Fang has been engaged in research on the pathogenesis and gene therapy of TMDs, and has rich experience in transgenic mouse models, cytological experiments, and molecular biology studies. Prof. Fang has hosted 4 national/provincial scientific research funds and currently served as a young member of the Chinese Orthodontic Society and a member of the Sichuan Orthodontic Society.

- **Research Contributions, Impact & Recognition:**

Prof. Fang has 25 publications as the first author and corresponding author, including the Journal of Dental Research, with an H-index of 13 and a total of nearly 636 citations. The review on the regulation of chondrocyte homeostasis by mechanotransduction pathways has been cited 137 times (J CELL MOL MED 2020, IF=5.3, ESI highly cited).

- **Personal Insights:**

TMD is a common disease in the oral and maxillofacial regions, which will cause damages to the TMJ structures and affect important physiological functions such as chewing, swallowing, and pronunciation. The etiology and pathogenesis of TMDs are not yet clear, and it is currently difficult to reverse the pathological damages of TMJ. Besides, MRI is the gold standard for diagnosing TMDs. But it is not easy even for highly trained clinicians to analyze TMJ MRI images.

- **Future Directions:**

Prof. Fang has focused on exploring the pathogenesis of TMDs and rebuilding the biological morphology and function of TMJ. Moreover, With the rapid development of computer technology, Prof. Fang aims to develop a diagnostic system for TMDs using an automatic 3D-ResNet approach, employing transfer learning. It will hold significant potential in addressing the diagnostic difficulties encountered by dentists and is projected to yield considerable time and cost savings.



**Brief Summary of the Project:**

It's crucial for orthodontists and other dental professionals to consider the potential impact on the TMJ when planning orthodontic procedures, ensuring that the patient's oral health is improved, and any risk of TMJ disease is minimized. The most common TMJ disorder is disc displacement, including anterior disc displacement with reduction, anterior disc displacement without reduction, mediolateral disc displacement and posterior disc displacement. MRI is the gold standard for describing the position and morphology of the articular disc. But it is not easy even for highly trained clinicians to analyze TMJ MRI images in both the closed and open mouth positions. Transfer learning presents a promising strategy that offers an appealing approach to effectively tackle the challenge of striking a balance between the limited sample size and the extensive number of model parameters. Therefore, this project aims to develop a diagnostic system for TMJ disc displacement using an automatic 3D-ResNet approach, employing transfer learning. The initial objective is to extract a generalized medical 3D deep model by conducting pre-training on diverse publicly available datasets, such as the 3Dseg-8 dataset, which are abundant and relevant but not identical. Subsequently, the well pre-trained 3D deep model is transferred or fine-tuned using our derived TMJ data. This study will present a groundbreaking automatic 3D-ResNet diagnostic system for TMJ disc, which is anticipated to enhance diagnostic accuracy for less experienced clinicians, thereby offering substantial benefits to patients residing in remote areas.