Popular science summary of the PhD thesis

PhD student	Johan Ziruo Ye
Title of the PhD thesis	Deep Generative Models for Dental Scans and Dental Treatments
PhD school/Department	Compute

Science summary

* Please give a short popular summary in English (approximately half a page) suited for the publication of the title, main content, results and innovations of the PhD thesis also including prospective utilizations hereof. The summary should be written for the general public interested in science and technology.

Digital dentistry is rapidly changing how dental care is delivered. Modern intraoral scanners generate detailed 3D models of patients' teeth, replacing traditional impressions and enabling personalized treatment planning. However, working with this complex 3D data presents unique challenges for machine learning.

This research explores new ways to teach computers to understand and generate realistic dental geometry. It introduces methods for learning compact shape representations, simulating changes in tooth structure over time, and generating dental crowns with high anatomical accuracy. A key innovation is a diffusion-based model that reconstructs detailed tooth surfaces by reversing a smoothing process rather than adding random noise. To bridge the gap between 3D dental scans and modern deep learning tools, we also explore how to transform 3D shapes into structured image-like formats. The result is a set of geometry-aware generative techniques designed to meet the technical constraints of real-world dental software, offering new possibilities for faster, more precise, and patient-specific dental care.

Please submit the summary to the department PhD coordinator together with your thesis