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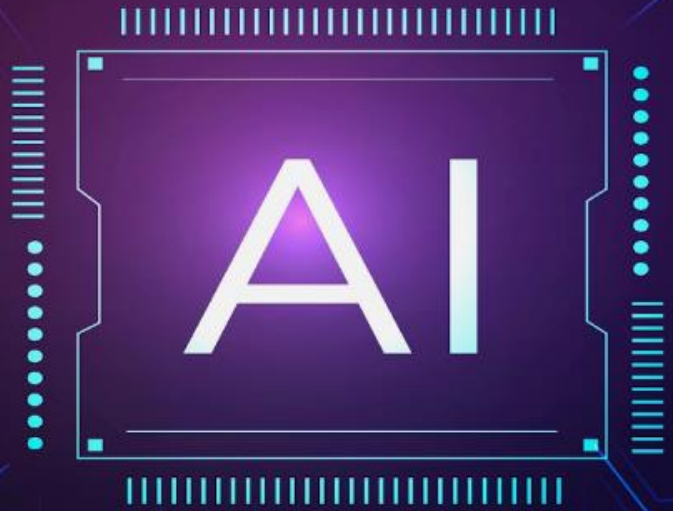

Case Study

Revolutionizing Bone Implant Surgery Simulation through Noise Removal and Landmark Detection – Phase 3

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About the Client

The Client is a Health Care Tech Start-up involved in research work in the field of Orthopaedics & Bone Implants

Business Problem

Building upon the success of the previous phases, the third phase addressed the critical issues of scattered noise caused by metal implants in shoulder bones and the precise identification of landmarks. The aim was to enhance the authenticity of the surgical simulation platform by delivering a clearer and more accurate representation of bone anatomy.

Solution

To address the new challenges, a multi-faceted approach combining paired CNN for noise removal and heatmap regression for landmark detection was deployed. The team harnessed the power of Paired Convolutional Neural Networks (CNNs) to tackle scattered noise caused by metal implants in Di-com images. Synthetic noisy data was generated to train the model, as the client's existing noise data was limited. The model was trained on pairs of denoised and noisy images, achieving an impressive 80-85% reduction in noise.

The accurate identification of landmarks on Humerus and Scapula bones was paramount. Heatmap regression was employed to accurately detect these landmarks. Surgeons also had the flexibility to manually adjust landmark positions if needed, ensuring precise positioning for surgical simulations.

Implementation

- **Denoising Model Development:** The paired CNN architecture was crafted to remove scattered noise from Di-com images. The model was trained on synthetic noisy data and paired denoised images, resulting in significant noise reduction.
- **Landmark Detection Algorithm:** The heatmap regression approach was fine-tuned to detect landmarks on Humerus and Scapula bones. The surgeon's ability to manually adjust landmark positions added an extra layer of accuracy.

Outcome

The culmination of the third phase marked a monumental achievement. By successfully addressing scattered noise and enhancing landmark detection, the client was empowered to construct a Bone Implant Surgery Simulation platform that harnessed state-of-the-art AI models. This platform's accuracy and authenticity have the potential to revolutionize surgical simulations and training.

The success of phase 3 opens new avenues for ongoing enhancements. The application of AI models in medical simulations could extend beyond bone implant surgeries to other orthopaedic procedures and beyond. Continual model refinement and data expansion promise to further elevate the platform's capabilities.

By embracing challenges related to noise elimination and landmark detection, our collaboration with the client unlocked the door to a pioneering surgical simulation platform. This platform not only exemplifies technical prowess but also underscores the potential for AI to reshape medical training and surgical procedures, positioning the client as a trailblazer in healthcare technology.

Technology Used

Python, Open CV, Tensor-flow Deep Learning, Paired CNN, Heatmap Regression

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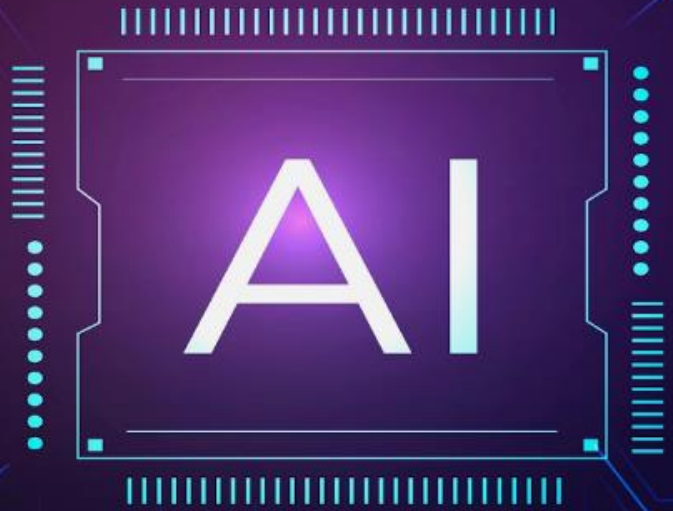

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