Dear Admissions Committee,

I mentored Zichen (Charles) in his research intern in *Thorough Images*® in Beijing, China. He led the project for automatic breast cancer HER2 detection, significantly reducing the burden while keeping high accuracies for pathologists to read whole slide images. In the intern, his talent in computer vision programming, fast learning, creative problem solving, independent thinking, as well as his enthusiasm to explore the unknown territory, left me a deep impression. As he is the most exceptional undergraduate student I mentored, it is my great pleasure to recommend Zichen for admission to your RISS program.

Most research interns including ours are mainly hired for graduate students, but Zichen has done fantastic research just like a Ph.D. student. He was new to computer vision before he came to our company, but I was so surprised that he had just spent a day starting learning OpenCV and implementing a segmentation algorithm of nuclei and stained membrane in pathological images, where the accuracy and the performance were better than before, especially for segmenting the partially unclear and overlapped nuclei. I have always been impressed with the work he did during the intern. After a week, I was shocked when he presented his automatic HER2 detection system with high accuracy and pellucid visualizations during our company's weekly meeting. Besides, I could always see the delicate progress for improving and simplifying his algorithms. Beyond the considerable research achievements, after working with him, I am confident that his presentation skills, plenty of readings, organized research notes, and professional writing revealed by his research paper at the end must help him become a remarkable researcher as well.

Zichen is always with great passion to explore the unexplored world. I can imagine how much time and effort he devoted to the research. What's more, He was not satisfied with the current design, and the enthusiasm drove him to do something extra. He reached out to a foreign lab for the HER2 inspection dataset to test and improve his algorithms, and he met with pathologists in the People's Liberation Army General Hospital to listen to the realistic demand, not only just for good numbers shown in a scientific paper. He then re-designed an algorithm that provided explainable workflow strictly following the HER2 scoring guidelines and inspection procedures. The "positive control" he introduced into the algorithm was always ignored by other research and products, but was vital for the real deployment because of the variation of the staining kit. He also included interactive modifications and real-time visualized analysis which was proven that he really knew what pathologists really needed in clinical applications. Besides the mature automated HER2 scoring system, he also played with automated detection for PDL1 tests, which further indicated Zichen's solid knowledge and application of deep learning and computer vision.

In summary, Zichen has my highest recommendation for admission to your RISS program. He has demonstrated excellence in his great research background as well as endless curiosity, combined with his willingness to explore. This will lead him to have great achievements in research and beyond.

Sincerely,
Shuhao Wang (CTO, Thorough Images)
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