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Dear Sir/Madam:

I write this letter to support the immigrant visa petition of [redacted] on behalf of [redacted] Dr. [redacted] has made significant research contributions to the field of image sensors and video processing as described below.

First, let me better acquaint you with my credentials. I am a professor in the Department of Electrical Engineering at Stanford University. I have been the Principal Investigator of the Programmable Digital Camera (PDC) project at Stanford University. The PDC project under my supervision is a collaborative research effort between Stanford University and a distinguished group of industrial partners to investigate algorithms, architectures and circuit designs for single chip programmable digital cameras. Current and previous industrial partners of the PDC project include Canon Inc., Eastman Kodak Inc., Hewlett-Packard Inc., Intel Inc., Interval Research Inc., Agilent Inc., and Motorola Inc. The total funding for the project exceeds 4 million dollars.

I received my M.S. in Statistics and Ph.D. in Electrical Engineering from Stanford University in 1977 and 1978, respectively. I have published more than 140 journal and conference articles, contributed to three books and graduated 20 doctoral students. I have broad research interests and have made various original contributions in areas such as information theory, communication complexity, very large scale integrated-circuits (VLSI) design, computer aided design (CAD), Field-Programmable Gate Arrays (FPGAs), and most recently CMOS image sensors and imaging systems. I was elected as a fellow of Institute of Electrical and Electronics Engineers (IEEE) in 2000 "for pioneering applications of probability and statistics to develop new methods for the analysis and design of integrated circuits." I was on leave from Stanford from 1984 to 1988, first as Director of LSI Logic Research Lab (Milpitas, CA), where I developed compilation technology and digital and image signal processing application-specific integrated circuits (ASIC), and then as a cofounder and Chief Scientist of Actel Corporation (Sunnyvale, CA), a market leader in Field Programmable Gate Array (FPGA) chips. In 1990, I co-founded Silicon Architects, which is currently part of Synopsys Inc. (Mountain View, CA). In 1999, I co-founded Pixim Inc. (Mountain View, CA), a startup company whose core digital pixel sensor (DPS) technology was developed in the mid-1990s by my research group at Stanford University. Currently, I am the

Principal Investigator for 2 projects related to digital imaging and image sensors at Stanford University.

I am [redacted]'s principal advisor for his Ph.D. studies at Stanford University. I have known him since 1997, when he joined my group and started conducting research on image sensors and their applications. We worked very closely together until his recent graduation from Stanford University with a Ph.D. in Electrical Engineering. During the five years he worked in my research group, he performed outstanding PhD research that led to the publication of several research papers. He participated in the Programmable Digital Camera Project, which was the main focus for my group. His focus in the project was on the design CMOS image sensors and the development of video processing applications that can take advantage of the sensors developed.

In the first part of his thesis, he co-designed with two of his colleagues an ultra-high speed (10,000 frames per second) image sensor chip. The design was quite challenging because of the speed requirement, the high leakage, and the high complexity involved in designing with the most advanced (at that time) fabrication process. He focused on the design of the dynamic memory portion and laying out the pixel circuitry. He played a central role because of his versatility in handling CAD tools. After designing the chip, he proposed a framework for CMOS image sensor that enables practical implementations of high speed imaging systems. Based on this framework, he took on the task of developing new algorithms that can leverage the high-speed capability of the developed image sensor. His outstanding work greatly improved the performance of motion estimation and enhanced image quality by correcting prevalent gain fixed pattern noise (FPN) in image sensors. In fact prior to this work, I had thought that it is not possible to solve the problem of gain FPN correction. His research has opened the door for other applications of high-speed imaging, for example, to computer vision, by extending the scope of processing from 1D temporal to the 3D spatio-temporal domain.

The impact of Dr. [redacted]'s research spans from scientific to consumer electronic applications, which is unusual for a recent PhD graduate. His contributions to high-speed imaging enabled capturing video at extremely high frame rates. Furthermore, his research has significantly improved practical aspects of implementation. Previously, high-speed imaging systems were based on enormously complex and high cost devices. The high speed CMOS image sensor designed by Dr. [redacted] and his colleagues achieves the high frame rate capability effortlessly and at very low cost. This can have significant impact on several fields of natural sciences where capturing video information at high frame rates is necessary. His research on video processing applications can also have great impact on consumer electronics such as digital camcorders and digital cameras. [redacted]'s work was motivated by practical applications in addition to pure scientific applications. I can summarize his research on video processing as an innovative bridge between high-speed imaging technology and consumer digital still and video cameras.

Dr. [redacted] is also special because of his broad expertise in hardware, algorithms and software for digital imaging. His expertise will definitely benefit [redacted], where the

research is focused on a broad spectrum of next generation digital imaging technologies and products.

Dr. [redacted] is an exceptional researcher whose is capable of producing valuable results, not only to [redacted] but also to this society as a whole. I highly support his immigrant petition.

Sincerely,

[redacted]

[redacted]
Professor, Electrical Engineering