

PAR for a New IEEE Standard

Section 1

- 1.1 Assigned Project Number:
- 1.2 Type of Document: **Standard**
- 1.3 Life Cycle: **Full Use**

Section 2

- 2.1 Project Title: **Standard for Digital Retina Systems** Deleted[Shan Liu]: **Architecture and Protocols**

Section 3

- 3.1 Working Group: **Digital Retina Systems (C/DC/DRS)**
 - 3.1.1 Contact Information for Working Group Chair:
Name: Yaowei Wang
Email Address: wangyw@pcl.ac.cn
 - 3.1.2 Contact Information for Working Group Vice Chair:
Name: Wenwu Zhu
Email Address: wwzhu@tsinghua.edu.cn
Name: Wen Ji
Email Address: jiwen@ict.ac.cn
- 3.2 Sponsoring Society and Committee: IEEE Computer Society/Data Compression Standards Committee(C/DC)
 - 3.2.1 Contact Information for Standards Committee Chair:
Name: Feng Wu
Email Address: fengwu@ustc.edu.cn
 - 3.2.2 Contact Information for Standards Committee Vice Chair:
Name: Yonghong Tian
Email Address: yhtian@pku.edu.cn
 - 3.2.3 Contact Information for Standards Representative:
None
- 3.3 Joint Sponsor:

Section 4

- 4.1 Type of Ballot: **Individual**

4.2 Expected Date of Submission of Draft to the IEEE-SA for Initial Sponsor Ballot

Month: **Dec** Year: **2024**

4.3 Projected Completion Date for Submittal to RevCom

Month: **Dec** Year: **2025**

Section 5

5.1 Approximate number of people expected to be actively involved in the development of this project: **50**

5.2 Scope of the proposed standard:

Digital retina is a biologically-inspired visual computing framework, in which three streams, i.e., video stream, feature stream, and model stream, work collaboratively for real time analysis and process of video big data.

This standard defines architecture, components, interface, transmission and connection protocols to enable highly efficient digital retina systems. The efficiency of digital retina systems will be measured by the accuracy of feature extraction from camera-captured video contents over transmission data rates, with the power consumption of capturing devices, edge servers, and cloud servers taken into consideration.

5.3 Is the completion of this standard contingent upon the completion of another standard? **No**

5.4 Will this document contain a Purpose clause? **No**

5.5 Need for the project:

The ubiquitous camera networks in current **smart cities** grow at a rapid pace, creating massive amount of images and videos at a range of spatial-temporal scales and thereby forming the “biggest” big data. However, the **capability of sensing systems** often lags the **fast growth of video applications**. Therefore, digital retina, a novel visual computing framework, **is designed to align high-efficiency sensing models with video coding, feature coding, model coding, as well as their joint optimization.** Within the digital retina framework, three streams, including video stream, feature stream, and model stream, work collaboratively over the end-edge-cloud platform. In particular, the compressed video stream **targets** for human vision, the compact feature stream for machine vision, and the model stream incrementally updates deep learning models to improve the performance of human/machine vision tasks.

Most of the existing technology standards target on defining one-camera-one-stream framework, whereas, digital retina **systems employ a one-camera-three-streams** mechanism. Consequently, digital retina allows **comprehensive**, intelligent, and efficient interactions

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between retina-like cameras and edge servers over the cloud through the three streams. Moreover, digital retina systems can achieve higher compression ratio for visual data while maintaining competitive performance with uncompressed signals for various visual analysis tasks. It can support precise localization and tracking of objects across multiple cameras in different cities, playing a fundamental role in visual big data analysis and retrieval in smart cities. Currently there is no existing specifications for the visual computing architecture based upon the three streams.

The committee views standardization as essential for providing architectures, protocols, transmission, components, functions, interfaces, and cooperation procedure in digital retina systems, for city-scale intelligent applications.

5.6 Stakeholders for the standard: - Industry and commerce: AI chip manufacturers, equipment manufacturers, AI algorithm or service providers, edge computing vendors, cloud computing vendors, and multimedia related vendors.

Section 6

6.1 Intellectual Property:

A. Is the Sponsor aware of any copyright permissions needed for this project? **No**

B. Is the Sponsor aware of possible registration activity related to this project? **No**

Section 7

7.1 Are there other standards or projects with a similar scope? **No**

7.2 Joint Development - Is it the intent to develop this document jointly with another organization? **No**

7.3 International Standards Activities

Adoptions - Is there potential for this standard to be adopted by another organization?: **No**

B. **Harmonization** - Are you aware of another organization that may be interested in portions of this document in their standardization development efforts? **No**

7.4 Does the Standards Committee foresee a longer term need for testing and/or certification services to assure conformity to the standard? **No**

Additionally, is it anticipated that testing methodologies will be specified in the standard to assure consistency in evaluating conformance to the criteria specified in the standard? **No**

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7.5 Does your Standards Committee require the completed standard to be submitted to the AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI) for approval consideration as an American National Standard?

No

Section 8

8.1 Additional Explanatory Notes:

8.2 IEEE Code of Ethics

The PAR will not be accepted if the box below is not checked.

I acknowledge that I have read and I understand the IEEE Code of Ethics

I agree to conduct myself in a manner that adheres to the IEEE Code of Ethics when engaged in official IEEE business.

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Digital retina is a novel visual computing framework which aims at overcoming video big data challenges in smart cities. It is biologically inspired, rooted on the widely accepted view that the retina encodes the visual information for human perception, and extracts features by the brain downstream areas to disentangle the visual objects. Within the digital retina framework, three streams, including video stream, feature stream, and model stream, work collaboratively over an end-edge-cloud platform. However, and there is no existing specification exist for the visual computing architecture based upon the three streams. The proposed PAR project achieves significant efficiency improvement for video big data analysis and processing in city-scale intelligent applications.

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