# New Work Item Proposal: Pixel-Aligned Parametric Map

## Submitted by Harry Solomon

## On Behalf of WG-09 Ophthalmology

## Introduction/Scope

This work item proposes to add a new Pixel-Aligned Parametric Map IOD and SOP Class to the DICOM standard. Many analytic processes that generate derivative images simultaneously compute one or more parameters, such as a confidence measure, for each of the created pixels. A Pixel-Aligned Parametric Map would provide an efficient way to record such parameters.

## Limitations of Current Standard

Currently, the DICOM standard defines the Parametric Map IOD, which provides a general capability for characterizing data points within the real-world space defined by a Frame of Reference. A Parametric Map may specify frames with position, orientation, and matrix pixel spacing independent of the referenced (derivation source) image characteristics. Such an approach cannot be used with projection images, or other images without a Frame of Reference defining a 3D space. Moreover, it requires support for 3D volumetric reorientation and reconstruction in the receiving application if alignment with the source image is desired.

A large number of use cases, especially in the area of machine learning based analytics, would be better served by a map that is inherently aligned to the pixel matrix of the source images. The Parametric Map, while potentially usable for some such pixel-aligned use cases where there is a 3D Frame of Reference, still imposes a relatively heavy implementation burden for receiving applications as it requires support for arbitrary 3D volumetric reorientation and reconstruction. A pixel-aligned map would significantly simplify implementations, and would be usable with those imaging modalities that are not inherently 3D.

Note that the Segmentation IOD provides both a 3D Frame of Reference method and a pixel aligned method for projection images.

Also note the trade-off made between creator and receiver implementation burden when defining an IOD. An IOD with many options makes it easy for a SOP Instance creator to select only the options that match its needs, while a conformant receiver must support all options that a SOP Instance might use. A highly constrained IOD simplifies receiver conformance.

## Description of Proposal

The proposed Pixel-Aligned Parametric Map IOD will specify a map data structure whose pixels align 1:1 with the source data pixels. For each source image pixel, the map should be able to encode a numeric quantitative value and/or a coded qualitative value. Existing data elements from Parametric Map and Segmentation IODs would be reused where appropriate. Allowed pixel value encodings need to be defined during development of the IOD, but should include 8-bit integers.

Note that the ophthalmology use case requires a quantitative confidence measure, nominally a integer percentage 0..100, and/or one of a small number of flags (e.g., manually edited, padding, …).

## Parts of Standard Affected

This work item will affect Parts 3, 4, 6, and possibly 17 of the DICOM standard.

## Resources & Time Line

While WG-09 has active interest in the work, it is not an appropriate work group to lead the effort on an IOD broadly applicable outside its domain. As this is an adaptation of existing IODs, it is proposed that either an ad hoc subcommittee of WG-6 undertake the drafting, or that it be assigned to WG-23: Artificial Intelligence/Application Hosting as the lead work group; interested members of WG-09 will support the effort. It is estimated that the work will take about 12 months, and the supplement will be approximately 30 pages. A first draft should be available by mid-2024.

It is anticipated that four hours of WG-06 meeting time will be required on each of four occasions during 2024 and 2025 to review and approve an early draft as well as public comment, letter ballot, and final text versions of the supplement.