

# Computer Vision Metrics

## 1 Introduction

Here we present a number of tasks in computer vision and detail the metrics applicable to them. The tasks are organized into categories. Within each metric-applied-to-task there are four points that should be covered, as shown in the example in Section 1.1.1. Comments can be made using the `\textcomment{}` command like so: **Comment:** Comments can be used for ideas or references to papers.

### 1.1 Example CV Task

Basic task description.

#### 1.1.1 Metric

Details of the metric as applied to the given CV task. Points that should be covered:

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

## 2 Image Analysis Tasks

### 2.1 Object detection

Basic task description.

#### 2.1.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*

- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

## 2.2 Object localisation

Basic task description.

### 2.2.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

## 2.3 Binary object classification

Basic task description.

### 2.3.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

## 2.4 Multi-class object classification

Basic task description.

### 2.4.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

## 2.5 Multi-label object classification

Basic task description.

### 2.5.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

## 2.6 Semantic segmentation

Basic task description.

### 2.6.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

## 2.7 Instance segmentation

Basic task description.

### 2.7.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

## 2.8 Panoptic segmentation

Basic task description.

### 2.8.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

## 2.9 Face analysis

Basic task description.

### 2.9.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*

- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

## 2.10 Saliency detection

Basic task description.

### 2.10.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

## 2.11 Scene graph generation

Basic task description.

### 2.11.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

## 2.12 Instance identification

Basic task description.

### 2.12.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

## 2.13 Feature extraction

Basic task description.

### 2.13.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

## 2.14 Geometric feature detection

Basic task description.

### 2.14.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

## 2.15 Image registration

Basic task description.

### 2.15.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

## 2.16 Image stitching

Basic task description.

### 2.16.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

## 2.17 Image similarity

Basic task description.

### 2.17.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*

- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

## 2.18 Image retrieval (including cross modal retrieval)

Basic task description.

### 2.18.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

## 3 Spatial Analysis Tasks

### 3.1 Depth estimation

Basic task description.

#### 3.1.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

### 3.2 Object / 3D reconstruction

Basic task description.



### 3.2.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

## 3.3 Object pose estimation

Basic task description.

### 3.3.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

## 3.4 Camera pose estimation

Basic task description.

### 3.4.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

### 3.5 SLAM

Basic task description.

#### 3.5.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

## 4 Temporal analysis

### 4.1 Optical flow estimation

Basic task description.

#### 4.1.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

### 4.2 Motion detection

Basic task description.

#### 4.2.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

### 4.3 Single object tracking

Basic task description.

#### 4.3.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

### 4.4 Multiple object tracking

Basic task description.

#### 4.4.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

## 4.5 Action recognition

Basic task description.

### 4.5.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

## 4.6 Event detection

Basic task description.

### 4.6.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

## 4.7 (Multiple) Object re-identification

Basic task description.

### 4.7.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*

- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

## 4.8 Visual Odometry

Basic task description.

### 4.8.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

## 4.9 Change detection

Basic task description.

### 4.9.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

## 4.10 Deep fake detection

Basic task description.

#### 4.10.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

### 4.11 Video summarisation

Basic task description.

#### 4.11.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

## 5 Image Generation Tasks

### 5.1 Image creation

Basic task description.

#### 5.1.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

## 5.2 Image denoising

Basic task description.

### 5.2.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

## 5.3 Super-resolution

Basic task description.

### 5.3.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

## 5.4 Image inpainting

Basic task description.

### 5.4.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*

- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

## 5.5 Image-to-image translation

Basic task description.

### 5.5.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

## 5.6 Style transfer

Basic task description.

### 5.6.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

## 5.7 Object swapping

Basic task description.



### 5.7.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

## 5.8 Novel view synthesis

Basic task description.

### 5.8.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

## 6 Video Generation Tasks

### 6.1 Video enhancement

Basic task description.

#### 6.1.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

## 6.2 Video stabilisation

Basic task description.

### 6.2.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

## 6.3 Talking head generation

Basic task description.

### 6.3.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

## 7 Multi-modal Tasks

### 7.1 Visual question answering

Basic task description.

### 7.1.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

## 7.2 Image captioning

Basic task description.

### 7.2.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

## 7.3 Visual grounding

Basic task description.

### 7.3.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*

## 7.4 RGB-depth fusion

Basic task description.

### 7.4.1 Metric

- a. *Metric definition and/or formula:*
- b. *Any further details, hyperparameters, processing steps, underspecification of the formula, context dependencies, or other ambiguities in the metric itself that can affect reproducibility:*
- c. *Typical range of values obtained with this metric on state-of-the-art systems for this particular task:*
- d. *Any other issues or subtleties that should be mentioned regarding this metric when applied to this task:*