Computer Vision

01: OpenCV Fundamentals

(Introduction)

Dr Ram Prasad Krishnamoorthy

Associate Professor
School of Computing and Data Science

ram.krish@saiuniversity.edu.in

Computer Vision

Classical Computer Vision

- Filtering, Morphology, Color Spaces, Image Equalization.
- Direction analysis - Gabor filter and Histogram of Oriented Gradients.
- Keypoints and Descriptors (BRIEF, ORB).
- Multiview Geometry - Disparity Maps.

Assignment/Grade breakdown

1. Assignments - 10%
2. Projects – 20%
3. Exams – 40%
4. End-Sem exam – 30%

Deep Computer Vision

- Convolutional Neural Networks, Transfer Learning
- Vision Transformers
- Object Detection, Semantic Segmentation
- Autoencoders - Stacked, Convolutional.
- Generative models - Variational-AE, GAN and Diffusion

Computer Vision

Indicative List of Readings:

1. Keras/TensorFlow/PyTorch/HuggingFace Tutorials
2. OpenCV/Scikit-Image Tutorials
3. Computer Vision: Algorithms and Applications by Richard Szeliski,
4. Digital Image Processing by Rafael C. Gonzalez, Richard E. Woods
5. Hands–On Machine Learning with Scikit–Learn, Keras, and TensorFlow 3e: Concepts, Tools, and Techniques to Build Intelligent Systems; by Aurélien Géron
6. Machine Learning with PyTorch and Scikit-Learn: Develop machine learning and deep learning models with Python; by Sebastian Raschka et al
7. Understanding Deep Learning by Simon J.D. Prince , by MIT Press, 2023.

OpenCV Fundamentals

- Originally developed by Intel Research.
- Primarily written in C++ with Python, Java and MATLAB/Octave bindings.
- It is cross-platform, supports Linux, MacOS, Windows, Android, iOS etc.

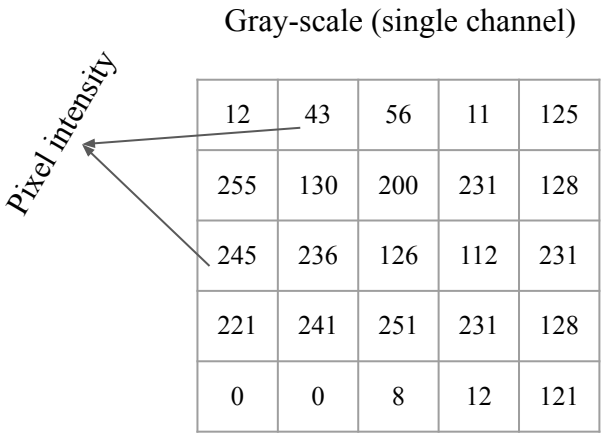
OpenCV Fundamentals

- Suitable for real-time computer vision applications.
- Support GPU acceleration.
- Well optimized codes for many operations.
- Initial release in June 2020.
    - Current release: 4.10.0

- It also include statistical machine learning library.
    - SVM
    - Bagging
    - Boosting etc.

OpenCV Fundamentals

Gray-scale vs Color Images



OpenCV Fundamentals

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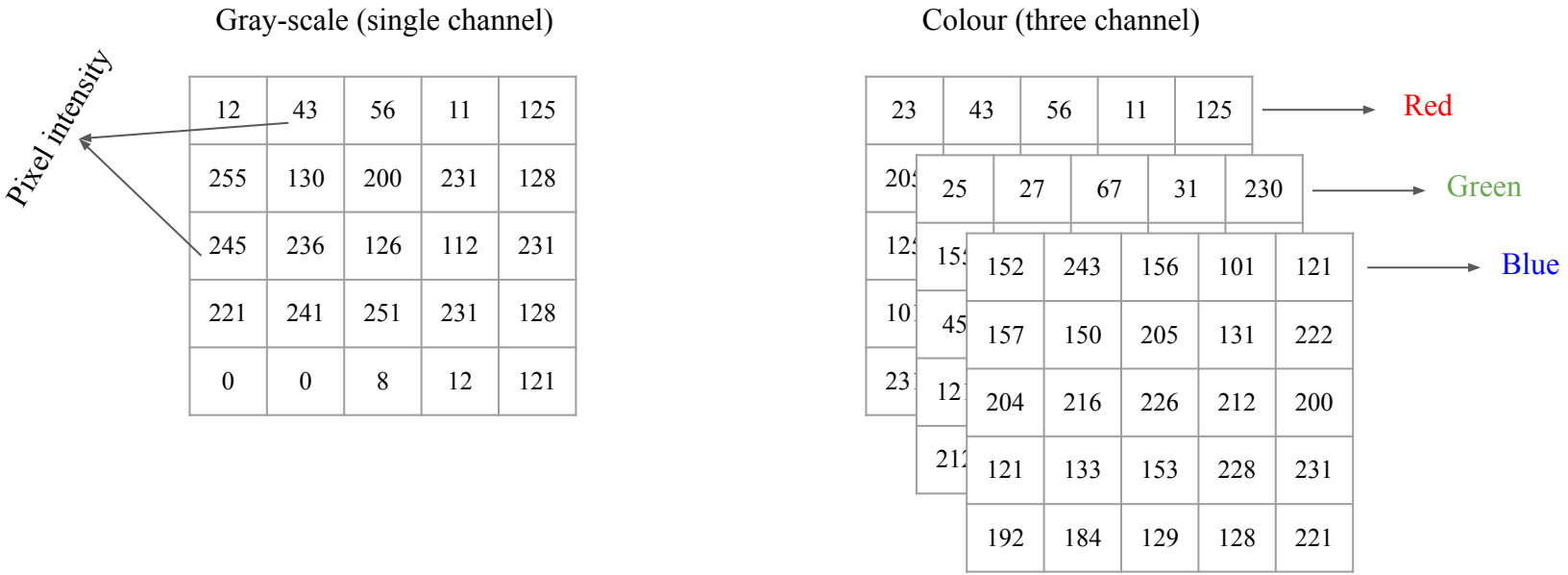

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