Phase 2: Core Computer Vision - Detailed Study Plan

Duration: 6-8 weeks (120-160 hours total)

Module 4: Image Processing Fundamentals (Week 4-5)

Primary Textbooks

1. **"Digital Image Processing" by Gonzalez & Woods** (Chapters 2-5, 9-10)
2. **"Computer Vision: Algorithms and Applications" by Szeliski** (Chapter 3)
3. **"Learning OpenCV 4" by Kaehler & Bradski** (Chapters 5-10)

Online Courses

1. **Computer Vision Basics (Coursera - University at Buffalo)**
   - Focus on image processing modules
2. **PyImageSearch University** (Paid but comprehensive)
   - Practical computer vision with OpenCV

Week 4-5 Schedule (40 hours)

Week 4: Basic Image Operations

- **Day 1-2: Image Representation (6 hours)**
  - Theory: Pixels, color spaces (RGB, HSV, LAB), bit depth
  - Practice: Convert between color spaces, analyze histograms
  - Code: Implement color space conversions from scratch
  - Resources: Gonzalez Ch. 2, OpenCV color space tutorial
- **Day 3-4: Histogram Processing (6 hours)**
  - Theory: Histogram equalization, specification, local enhancement
  - Practice: Build automatic contrast enhancement
  - Project: Create HDR-like effect using histogram manipulation
  - Resources: Gonzalez Ch. 3, implement CLAHE algorithm
- **Day 5-7: Spatial Filtering (8 hours)**
  - Theory: Linear/non-linear filtering, convolution masks
  - Practice: Implement smoothing, sharpening, edge-preserving filters
  - Code: Build bilateral filter from scratch
  - Resources: Szeliski Ch. 3.3, OpenCV filtering tutorial

Week 5: Advanced Processing