

# Computer Vision SDML Book Club

June 14, 2025



TEXTS IN COMPUTER SCIENCE

# Computer Vision

Algorithms and Applications  
Second Edition



Richard Szeliski

 Springer

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Practical Computer Vision with Pytorch

by Antonio Rueda-Toicen


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Common Tasks in Computer Vision

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2



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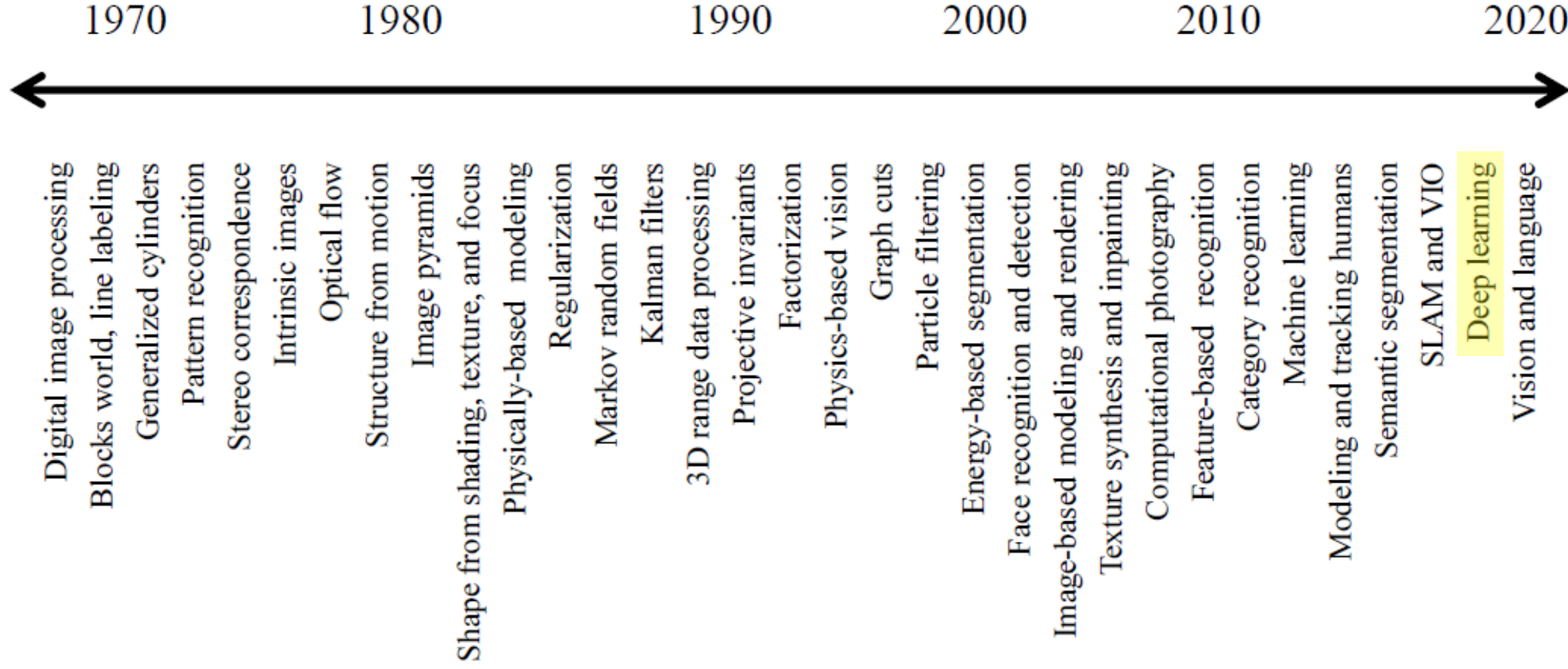
# Chapter 1 contents

- What is computer vision
- History of computer vision
- Book overview/organization

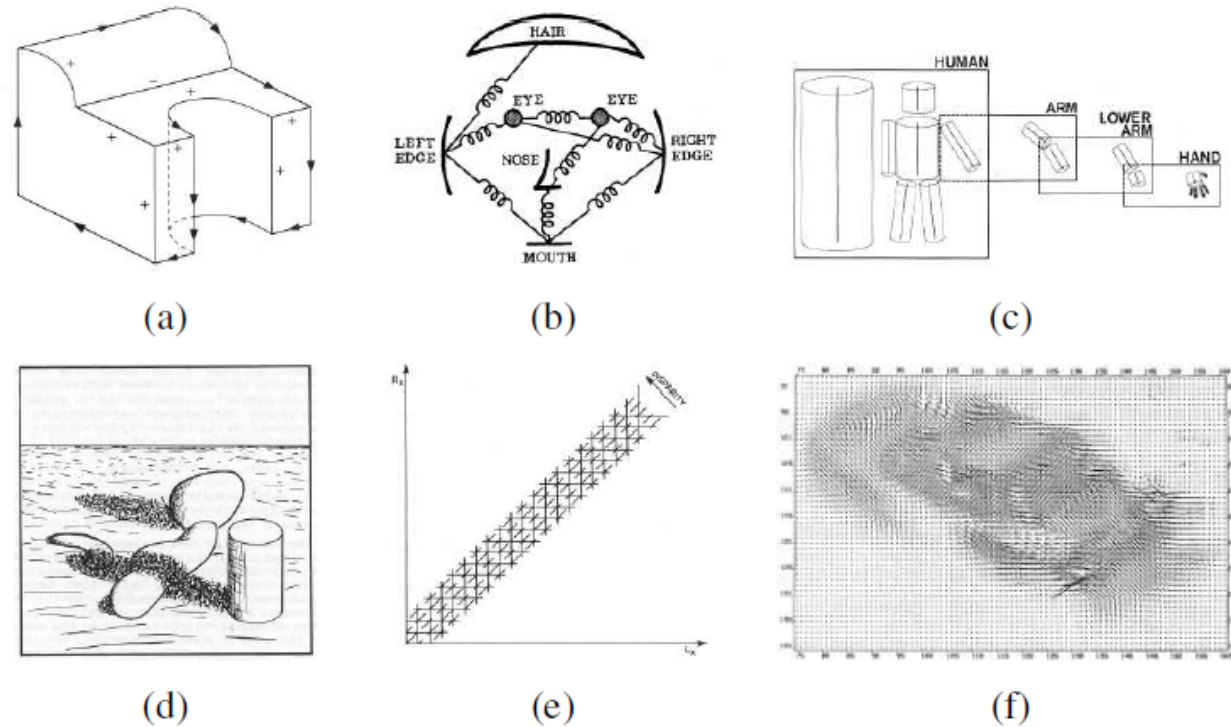
# What is computer vision

- Computer vision includes:
  - Classification
  - Object detection
  - Semantic segmentation
- And more advance tasks:
  - Pose estimation
  - Self driving
- But also, older and other tasks and applications:
  - OCR
  - Exposure bracketing
  - Stitching and morphing

# Timeline

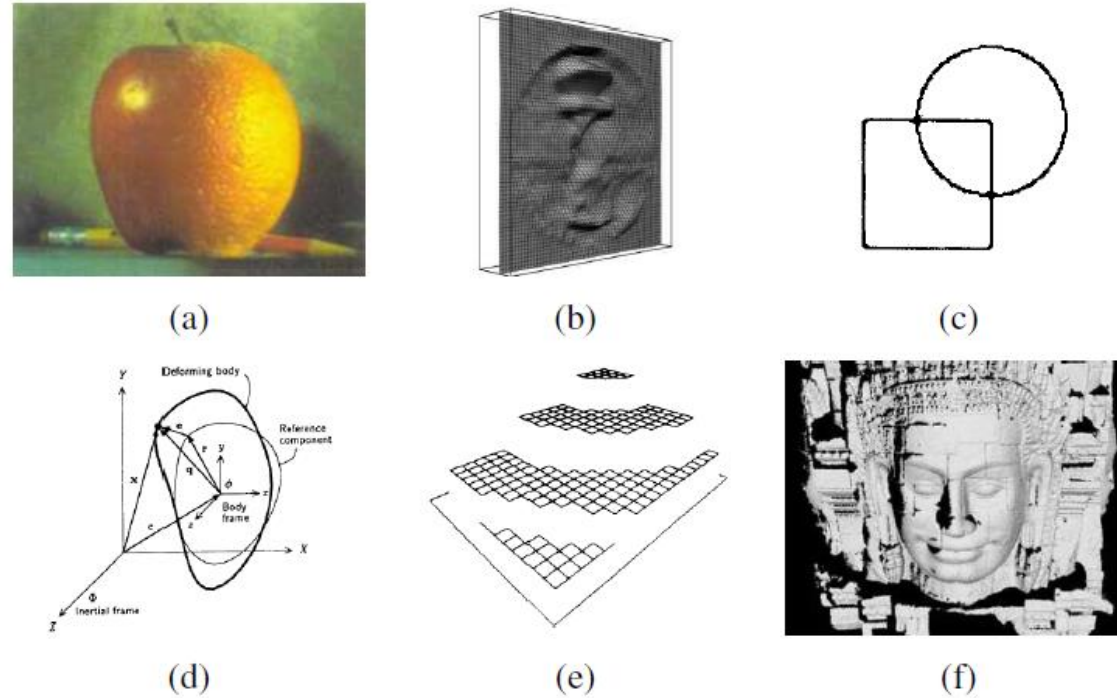


# 1970s



**Figure 1.7** Some early (1970s) examples of computer vision algorithms: (a) line labeling (Nalwa 1993) © 1993 Addison-Wesley, (b) pictorial structures (Fischler and Elschlager 1973) © 1973 IEEE, (c) articulated body model (Marr 1982) © 1982 David Marr, (d) intrinsic images (Barrow and Tenenbaum 1981) © 1973 IEEE, (e) stereo correspondence (Marr 1982) © 1982 David Marr, (f) optical flow (Nagel and Enkelmann 1986) © 1986 IEEE.

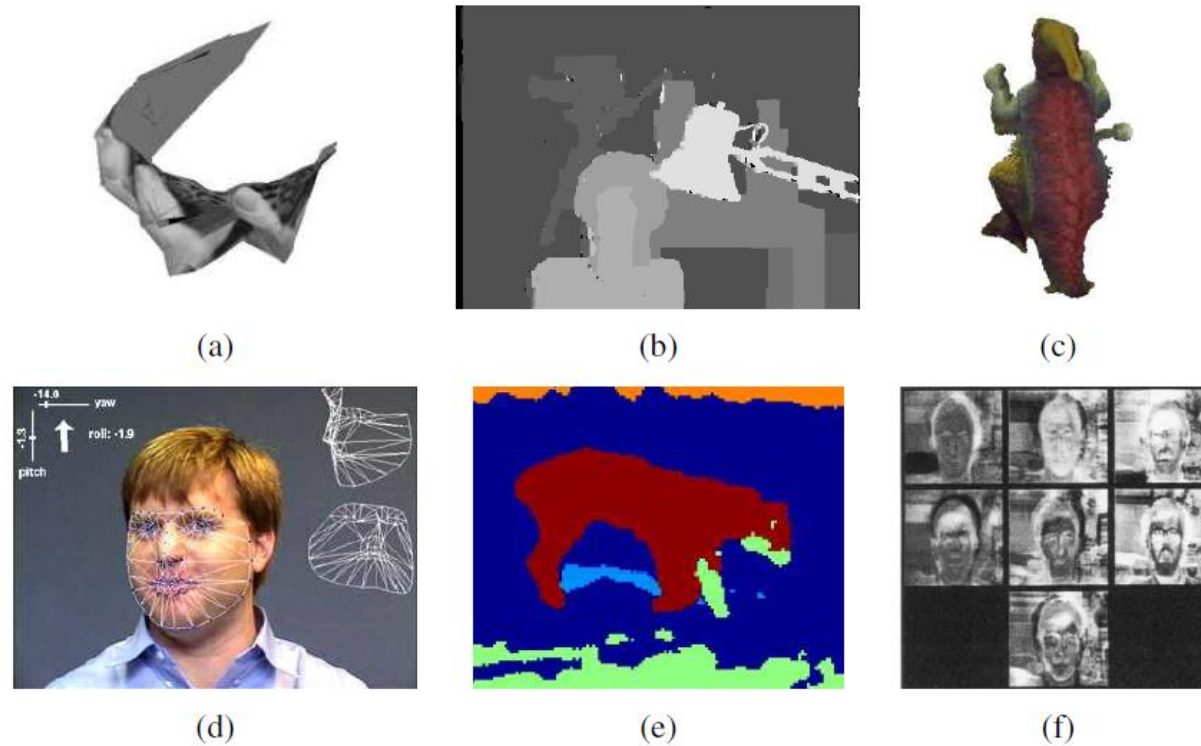
# 1980s



**Figure 1.8** Examples of computer vision algorithms from the 1980s: (a) pyramid blending (Burt and Adelson 1983b) © 1983 ACM, (b) shape from shading (Freeman and Adelson 1991) © 1991 IEEE, (c) edge detection (Freeman and Adelson 1991) © 1991 IEEE, (d) physically based models (Terzopoulos and Witkin 1988) © 1988 IEEE, (e) regularization-based surface reconstruction (Terzopoulos 1988) © 1988 IEEE, (f) range data acquisition and merging (Banno, Masuda et al. 2008) © 2008 Springer.

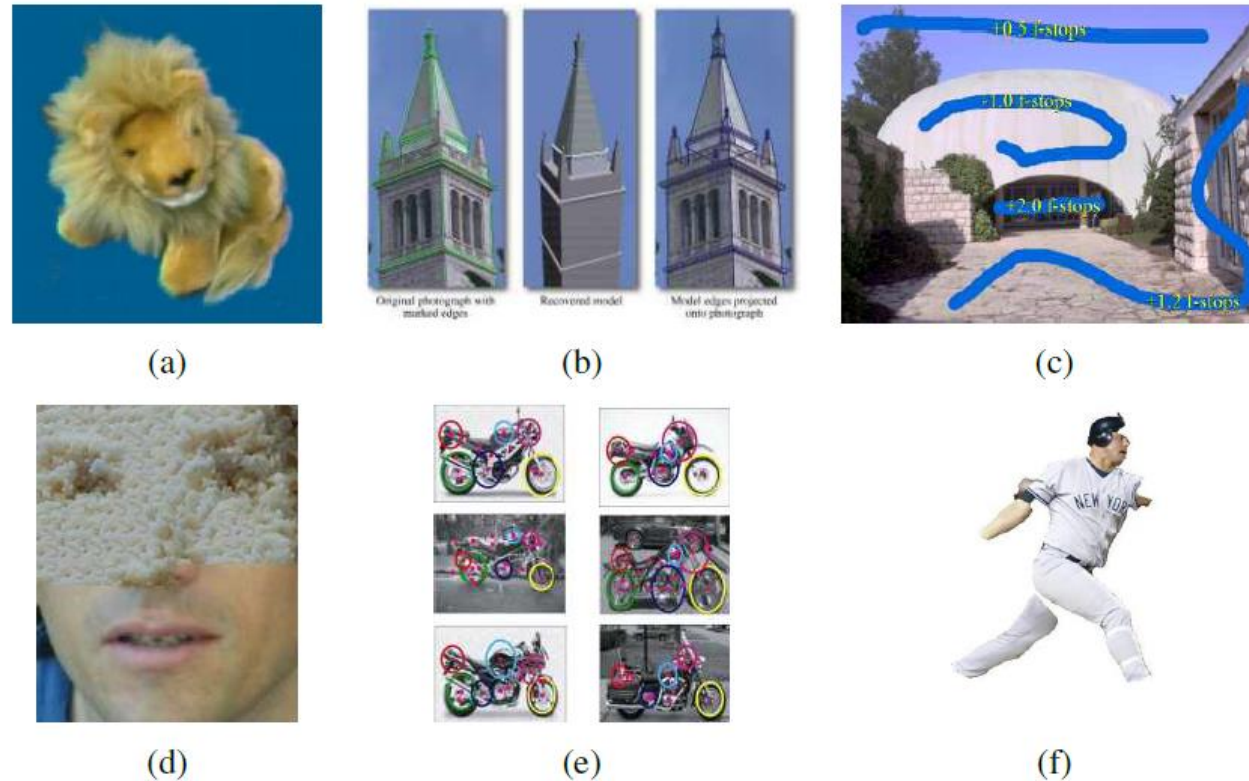


# 1990s



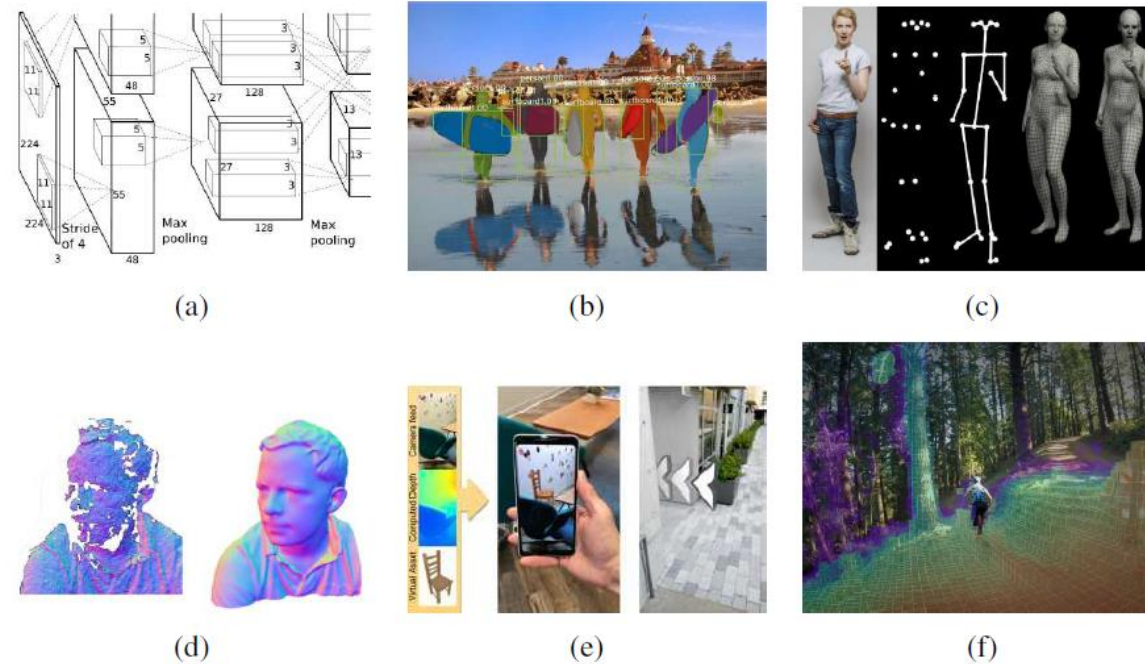
**Figure 1.9** Examples of computer vision algorithms from the 1990s: (a) factorization-based structure from motion (Tomasi and Kanade 1992) © 1992 Springer, (b) dense stereo matching (Boykov, Veksler, and Zabih 2001), (c) multi-view reconstruction (Seitz and Dyer 1999) © 1999 Springer, (d) face tracking (Matthews, Xiao, and Baker 2007), (e) image segmentation (Belongie, Fowlkes et al. 2002) © 2002 Springer, (f) face recognition (Turk and Pentland 1991).

# 2000s



**Figure 1.10** Examples of computer vision algorithms from the 2000s: (a) image-based rendering (Gortler, Grzeszczuk et al. 1996), (b) image-based modeling (Debevec, Taylor, and Malik 1996) © 1996 ACM, (c) interactive tone mapping (Lischinski, Farbman et al. 2006) (d) texture synthesis (Efros and Freeman 2001), (e) feature-based recognition (Fergus, Perona, and Zisserman 2007), (f) region-based recognition (Mori, Ren et al. 2004) © 2004 IEEE.

# 2010s forward



**Figure 1.11** Examples of computer vision algorithms from the 2010s: (a) the SuperVision deep neural network © Krizhevsky, Sutskever, and Hinton (2012); (b) object instance segmentation (He, Gkioxari et al. 2017) © 2017 IEEE; (c) whole body, expression, and gesture fitting from a single image (Pavlakos, Choutas et al. 2019) © 2019 IEEE; (d) fusing multiple color depth images using the KinectFusion real-time system (Newcombe, Izadi et al. 2011) © 2011 IEEE; (e) smartphone augmented reality with real-time depth occlusion effects (Valentin, Kowdle et al. 2018) © 2018 ACM; (f) 3D map computed in real-time on a fully autonomous Skydio R1 drone (Cross 2019).