FaceBoxes: A CPU Real-time Face Detector with High Accuracy

Shifeng Zhang, Xiangyu Zhu, Zhen Lei, Hailin Shi, Xiaobo Wang and Stan Z. Li

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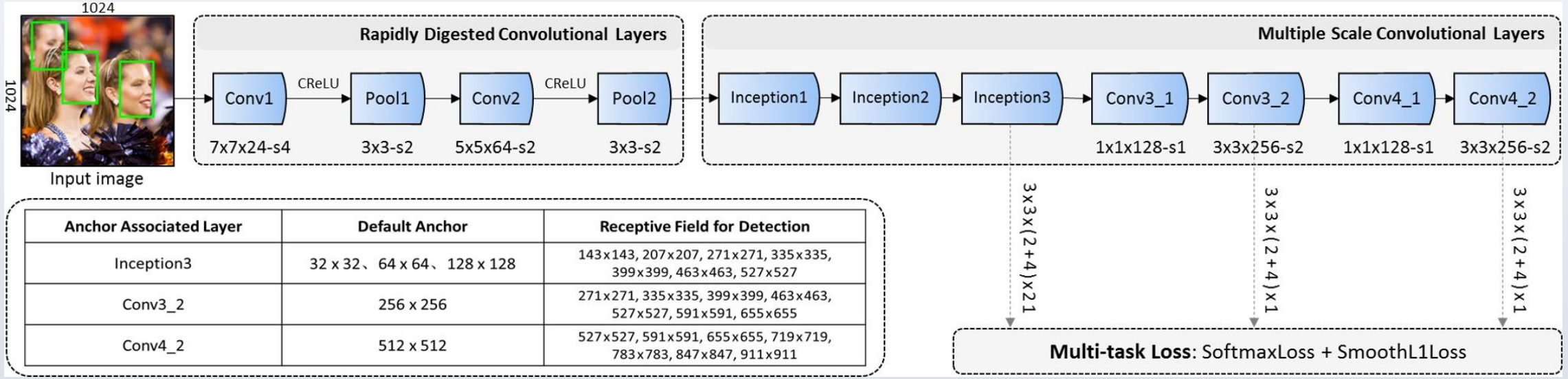
➢ Lightweight yet powerful architecture



Anchor Associated Layer	Default Anchor	Receptive Field for Detection
Inception3	32 x 32、64 x 64、128 x 128	143x143, 207x207, 271x271, 335x335, 399x399, 463x463, 527x527
Conv3_2	256 x 256	271x271, 335x335, 399x399, 463x463, 527x527, 591x591, 655x655
Conv4_2	512 x 512	527x527, 591x591, 655x655, 719x719, 783x783, 847x847, 911x911

- **Rapidly Digested Convolutional Layers (RDCL)**

  fast shrinking the input spatial size by suitable kernel size with reducing the number of output channels, enabling the FaceBoxes to reach CPU real-time speed

- **Multiple Scale Convolutional Layers (MSCL)**

  enriching the receptive fields and discretizing anchors over different layers to handle faces of various scales

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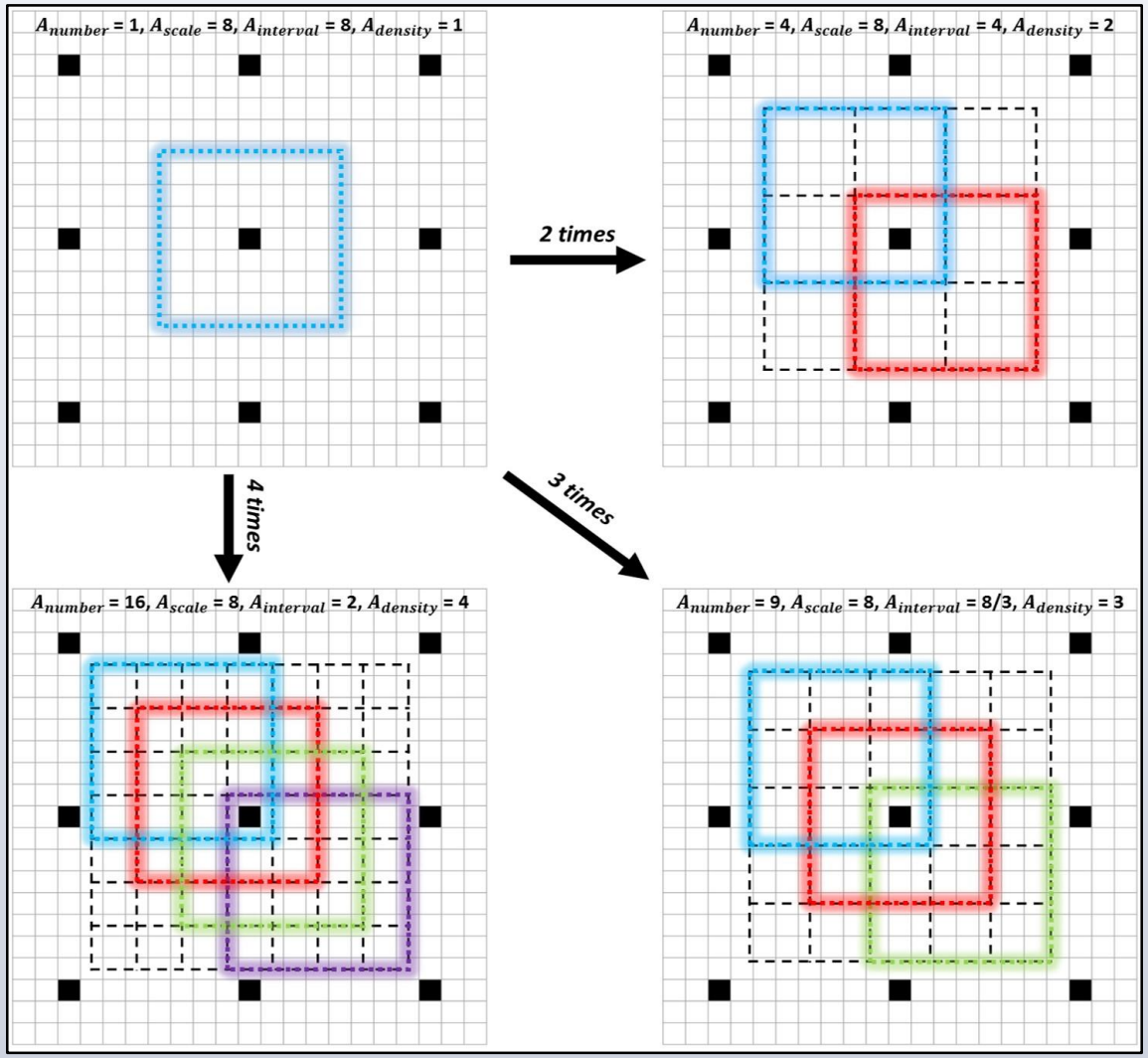
➢ Anchor densification strategy

- **Problem:** Different scales of default anchor have different tiling density
- **Solution:** Uniformly tile multiple anchors around the center of one receptive field to predict
- **Purpose:** Making different types of anchors have the same density to improves the recall rate of small faces.



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➢ FaceBoxes: efficiency & accuracy

Approach	CPU-model	mAP(%)	FPS
ACF	i7-3770@3.40	85.2	20
CasCNN	E5-2620@2.00	85.7	14
FaceCraft	N/A	90.8	10
STN	i7-4770K@3.50	91.5	10
MTCNN	N/A@2.60	94.4	16
Ours	E5-2660v3@2.60	**96.0**	**20**

Dataset	AFW	PASCAL face	FDDB	
			Disc	Cont
Accuracy	98.9%	96.3%	96.0%	82.9%

- **Speed：** **20** FPS on the CPU devices, **125** FPS on a single GPU
- **Model size：** **3.87** MB
- **Accuracy:** **State-of-the-art** performance on AFW、 PASCAL face、FDDB