

# U-Net 구현으로 배우는 딥러닝 논문 구현 with TensorFlow 2.0

## U-Net 모델 소개

---

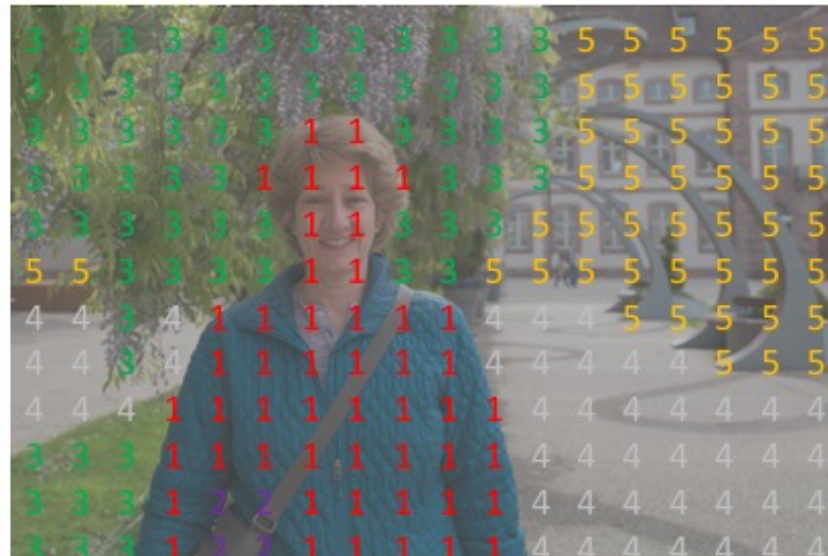
에이아이스쿨(AISchool) 대표  
양진호 (솔라리스)

<http://aischool.ai>

<http://solarisailab.com>

# Semantic Image Segmentation 문제 소개

- **Semantic Image Segmentation** : 전체 이미지 pixel에서 의미있는 부분끼리 묶어서 prediction하는 기법 (Dense prediction)



0: Background/Unknown

1: Person

2: Purse

3: Plants/Grass

4: Sidewalk

5: Building/Structures

Reference :

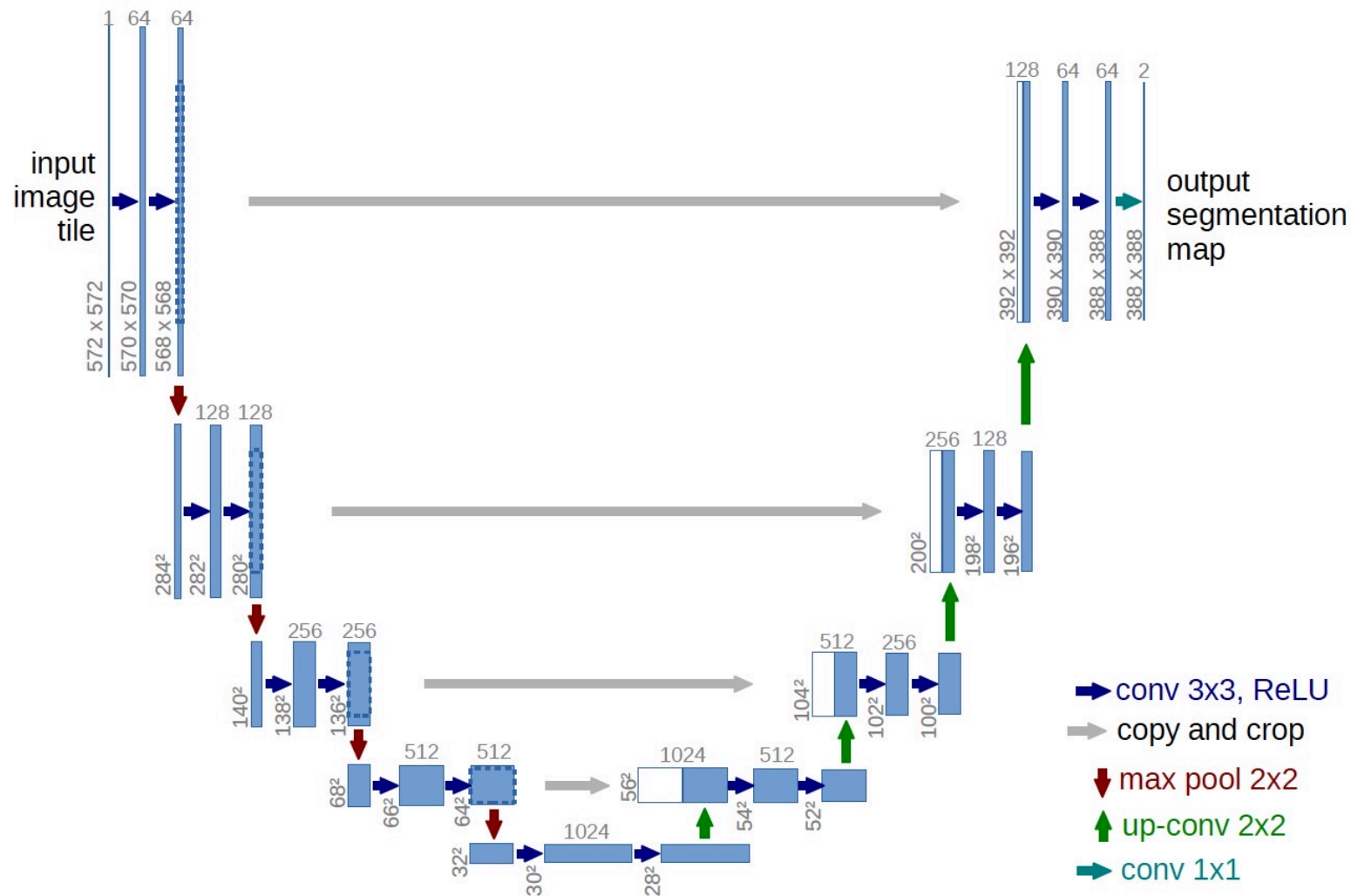
<https://www.jeremyjordan.me/semantic-segmentation/>

# U-Net

- U-Net 모델의 기본 컨셉 :

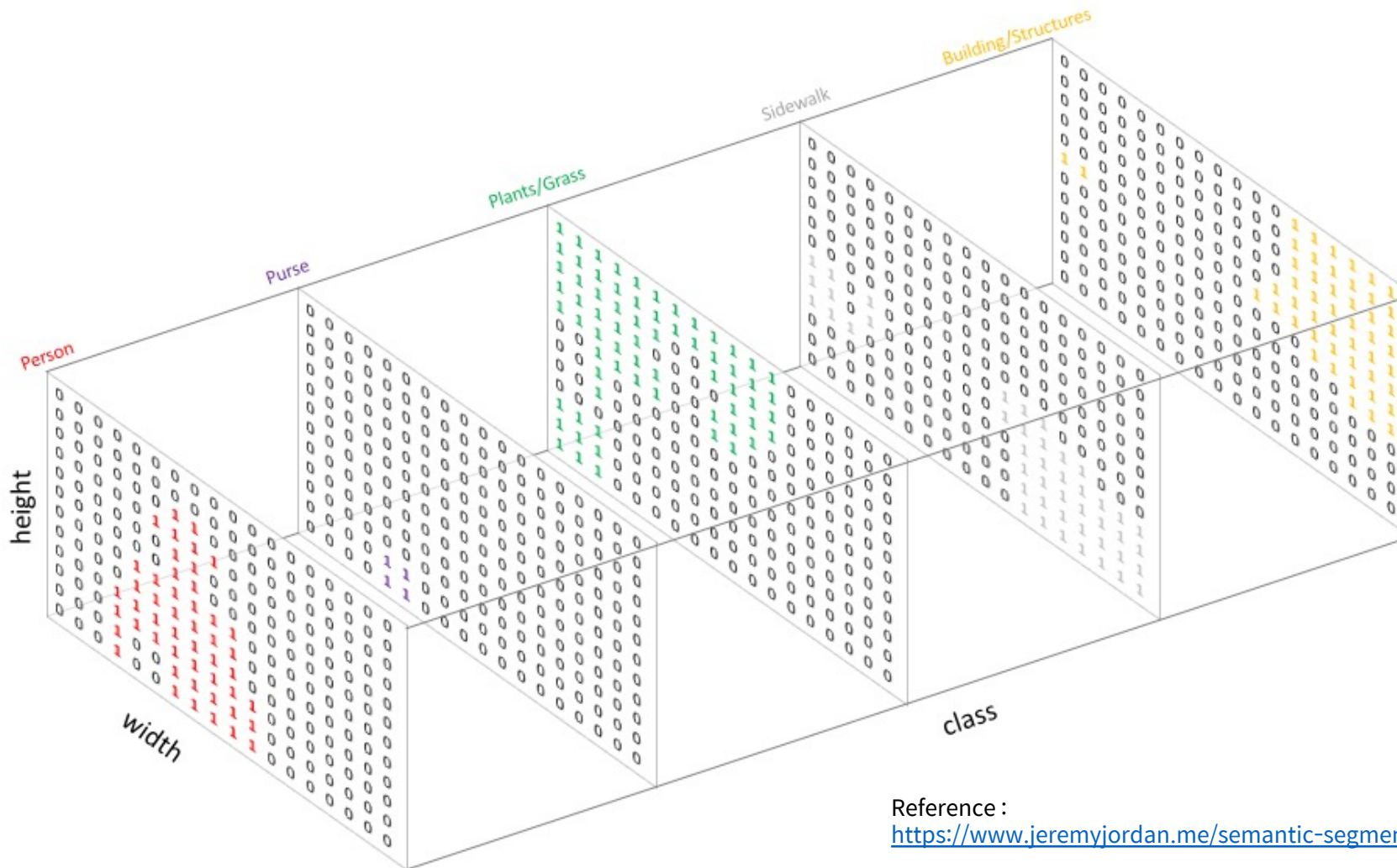
인풋 이미지에 대한  
Contracting Path를 통해서  
특징을 추출하고,

Expansive Path를 통해서 다  
시 원본 사이즈 만큼 확대해 나  
가는 U자형 구조



# U-Net - Output

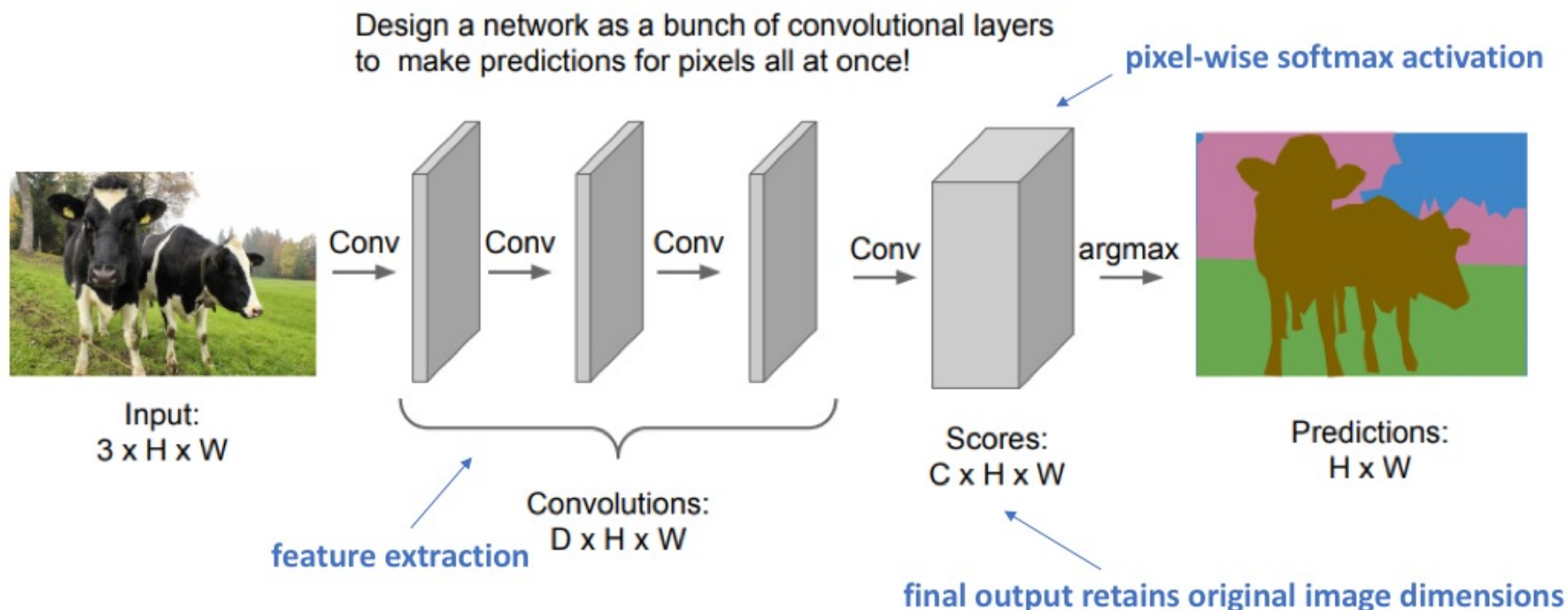
- **U-Net 모델의 Output:** Target 클래스 개수 만큼의 Channel map을 가진 Prediction 결과가 나오고, 이에 대한 argmax를 취해서 픽셀별 최종 예측값을 만듦



Reference :  
<https://www.jeremyjordan.me/semantic-segmentation/>

# U-Net - Output

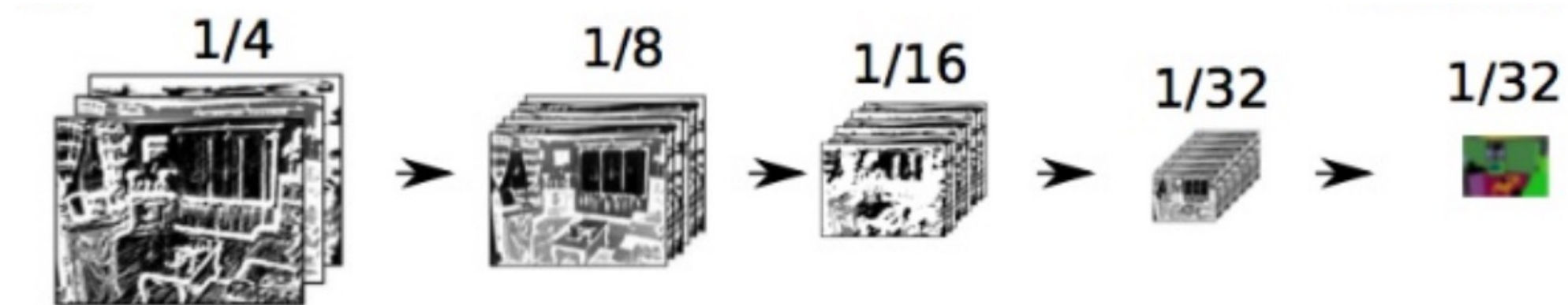
- **U-Net 모델의 Output:** Target 클래스 개수 만큼의 Channel map을 가진 Prediction 결과가 나오고, 이에 대한 argmax를 취해서 픽셀별 최종 예측값을 만듦



**Downside:** Preserving image dimensions throughout entire network will be computationally expensive.

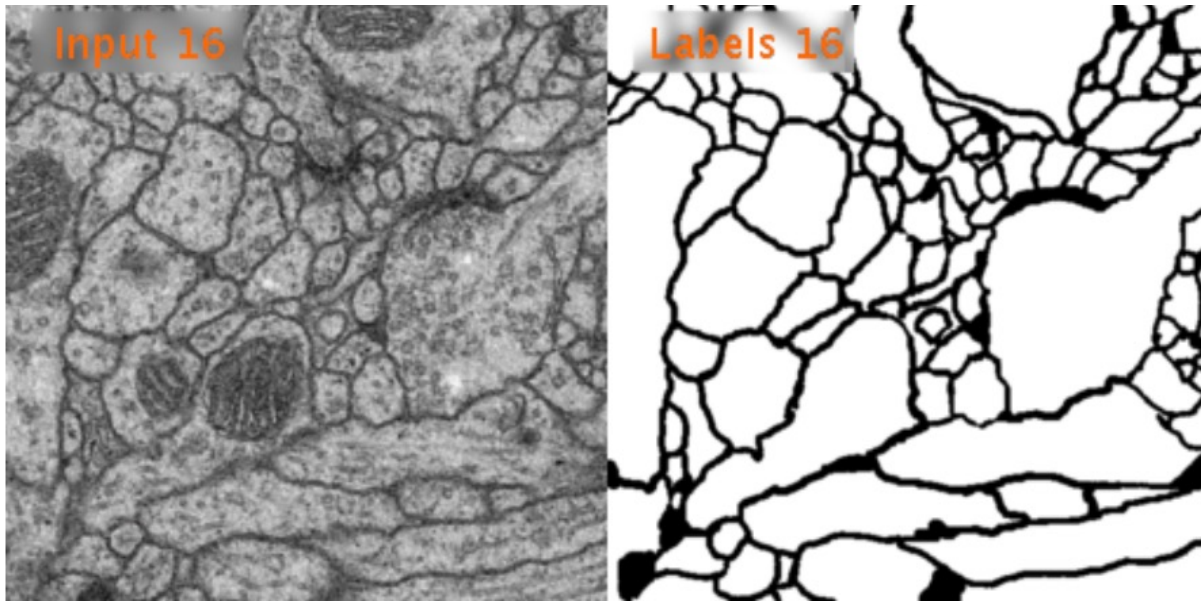
## Expansive Path에서 Contracting Path의 Feature Map들을 Concatenation

- Expansive Path 부분에서 Contracting Path의 Feature Map들을 Concatenation 해줌





## U-Net을 이용한 데이터셋 - ISBI-2012

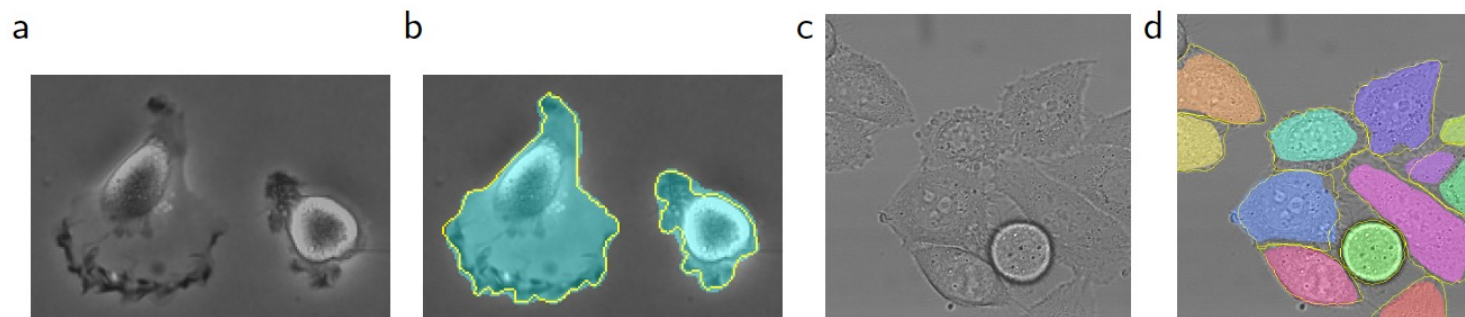


*Input training data and corresponding labels.*

**Table 1.** Ranking on the EM segmentation challenge [14] (march 6th, 2015), sorted by warping error.

Rank	Group name	Warping Error	Rand Error	Pixel Error
	** human values **	0.000005	0.0021	0.0010
1.	u-net	<b>0.000353</b>	0.0382	0.0611
2.	DIVE-SCI	0.000355	0.0305	0.0584
3.	IDSIA [1]	0.000420	0.0504	0.0613
4.	DIVE	0.000430	0.0545	<b>0.0582</b>
	⋮			
10.	IDSIA-SCI	0.000653	<b>0.0189</b>	0.1027

## U-Net을 이용한 데이터셋 – PhC-U373 & DIC-HeLa



**Fig. 4.** Result on the ISBI cell tracking challenge. (a) part of an input image of the “PhC-U373” data set. (b) Segmentation result (cyan mask) with manual ground truth (yellow border) (c) input image of the “DIC-HeLa” data set. (d) Segmentation result (random colored masks) with manual ground truth (yellow border).

**Table 2.** Segmentation results (IOU) on the ISBI cell tracking challenge 2015.

Name	PhC-U373	DIC-HeLa
IMCB-SG (2014)	0.2669	0.2935
KTH-SE (2014)	0.7953	0.4607
HOUS-US (2014)	0.5323	-
second-best 2015	0.83	0.46
u-net (2015)	<b>0.9203</b>	<b>0.7756</b>



# Thank you!

---