Research at MLV Lab

데이터 진흥원 part2
2019.08.07

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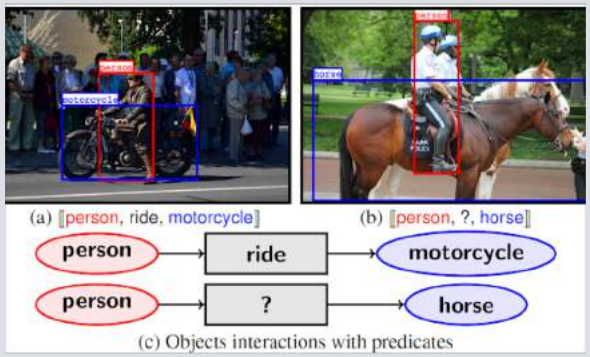
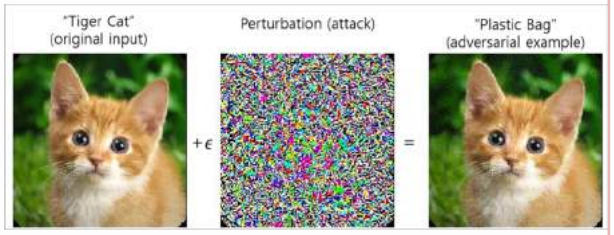
Research @ MLV Lab

Deep Understanding of Visual World



Object detection, object tracking, segmentation 등을 넘어 주어진 영상 속의 오브젝트들의 관계를 추론하고 보다 깊은 이해 가능한 모델 연구 (Scene understanding).

Safe AI, Adversaries, and Uncertainty



딥러닝 및 기계학습 알고리즘의 취약점을 분석하고 안전하고 강력한 AI 모델 학습법 연구

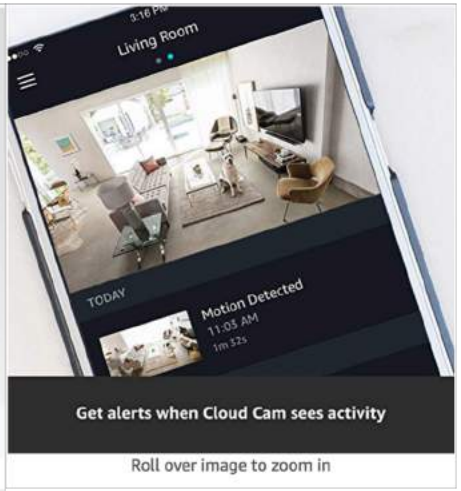
Uncertainty & Bayesian Neural Networks

Efficient Deep Learning

ANTNet

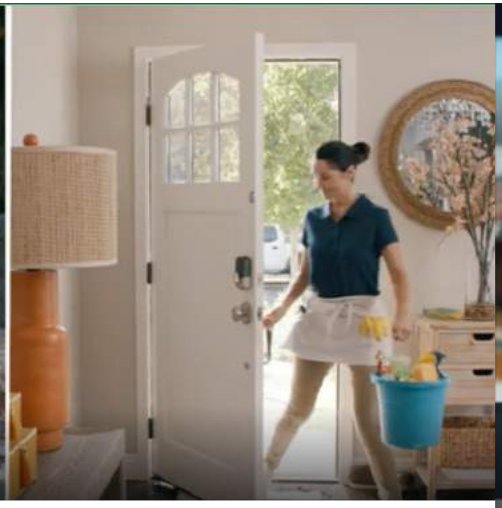
Smart Home

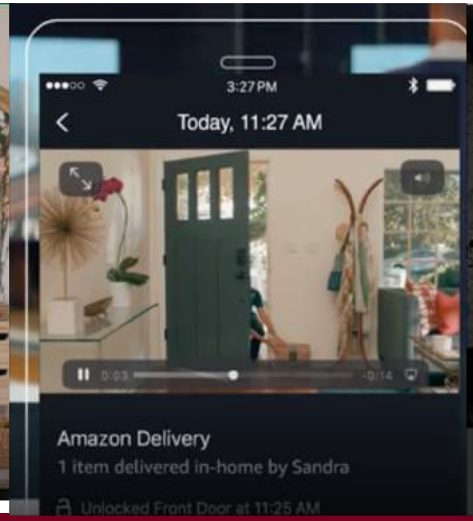

amazon cloud cam
1080p HD | Night Vision | Two-Way Audio
Roll over image to zoom in


Living Room
TODAY
Motion Detected
11:05 AM
Get alerts when Cloud Cam sees activity
Roll over image to zoom in


nest
nest
Front door
Ignore


AMAZON KEY
Amanda Cleaner unlocked Front Door.

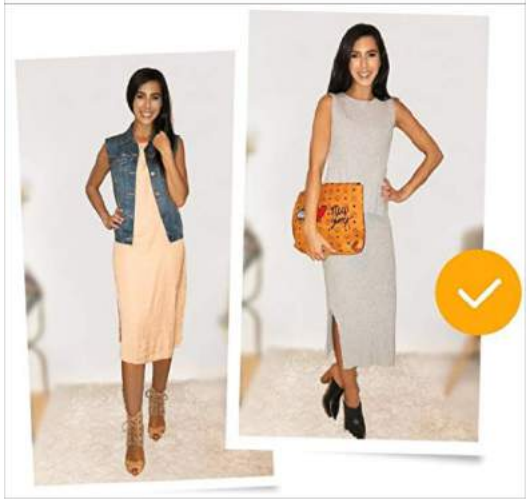


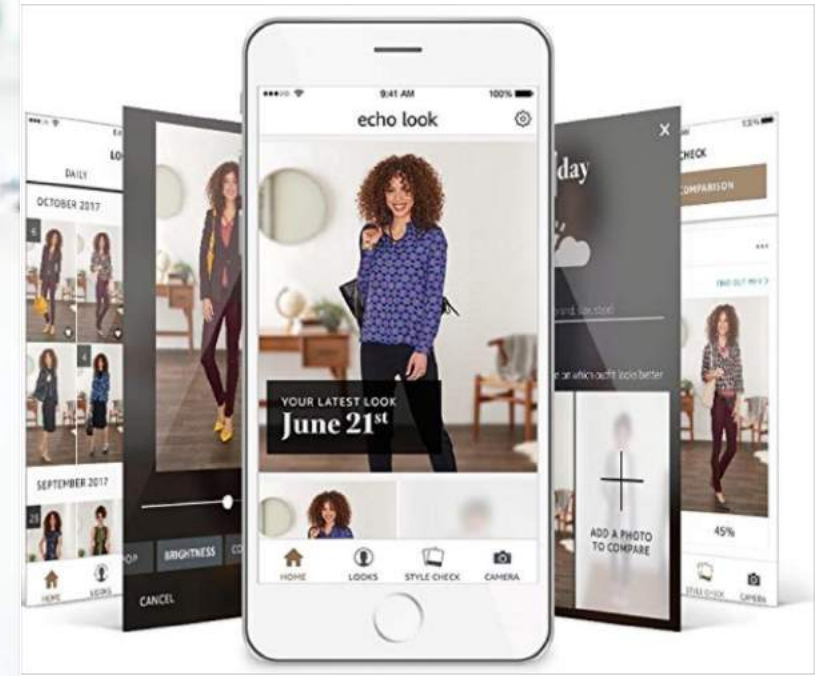

3:27 PM
Today, 11:27 AM
Amazon Delivery
1 item delivered in-home by Sandra


Night vision lets you see clearly in the dark

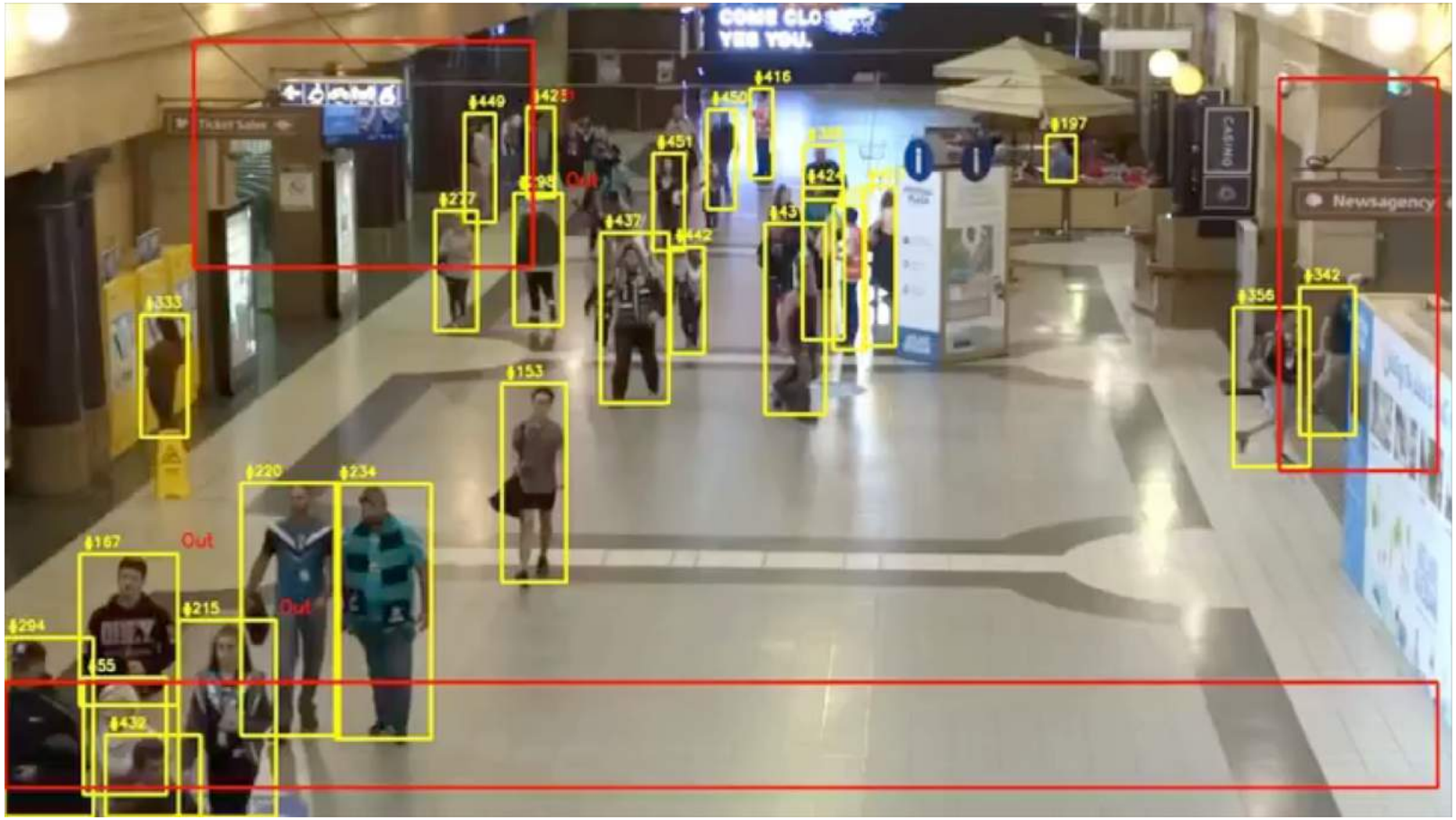
Fashion


echo look
Love your look. Every day.
amazon
intel REALSENSE

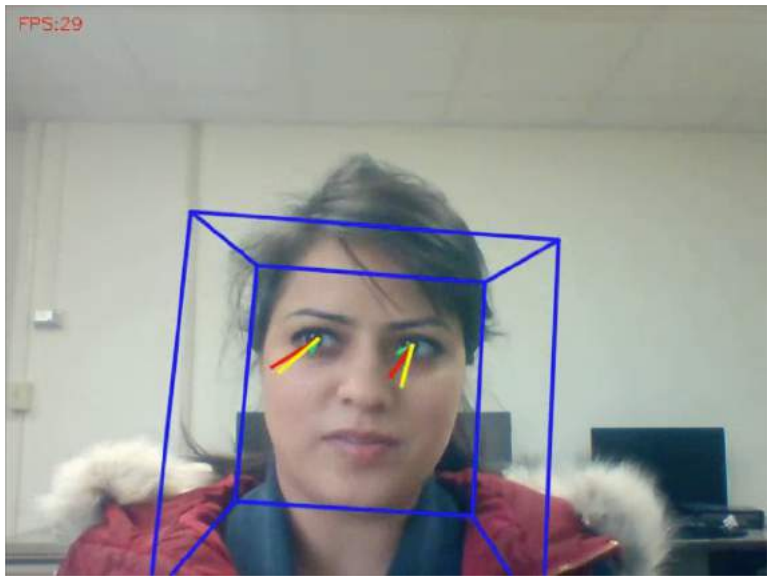


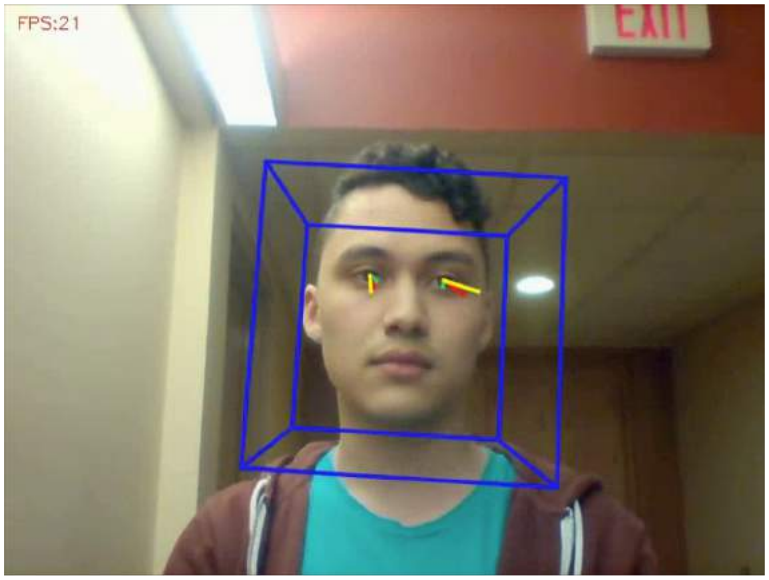

echo look
YOUR LATEST LOOK
June 21st
OCTOBER 2017
SEPTEMBER 2017
BRIGHTNESS
CANCEL
HOME
LOOKS
STYLE CHECK
CAMERA
ADD A PHOTO TO COMPARE
45%

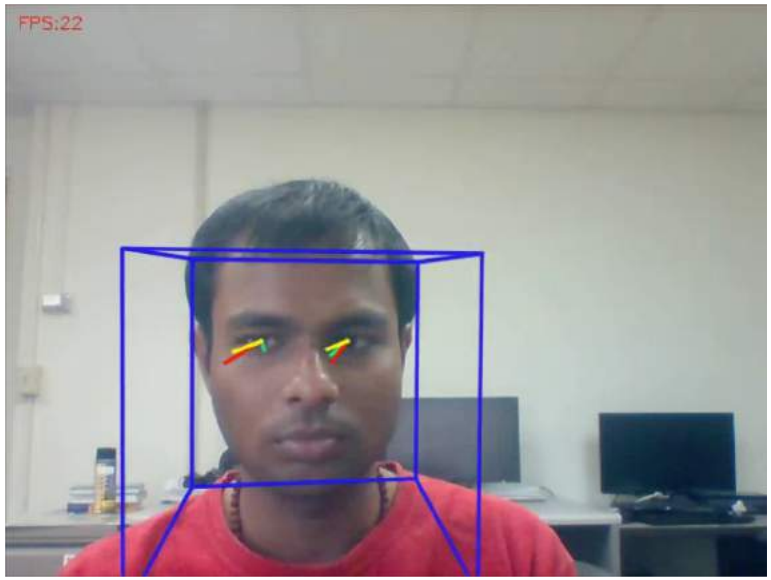
Multi-object Tracking

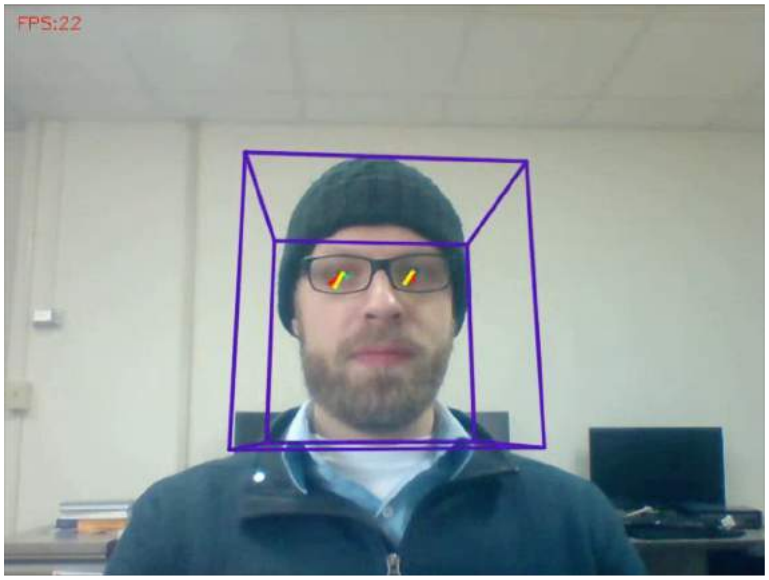


Gaze Estimation









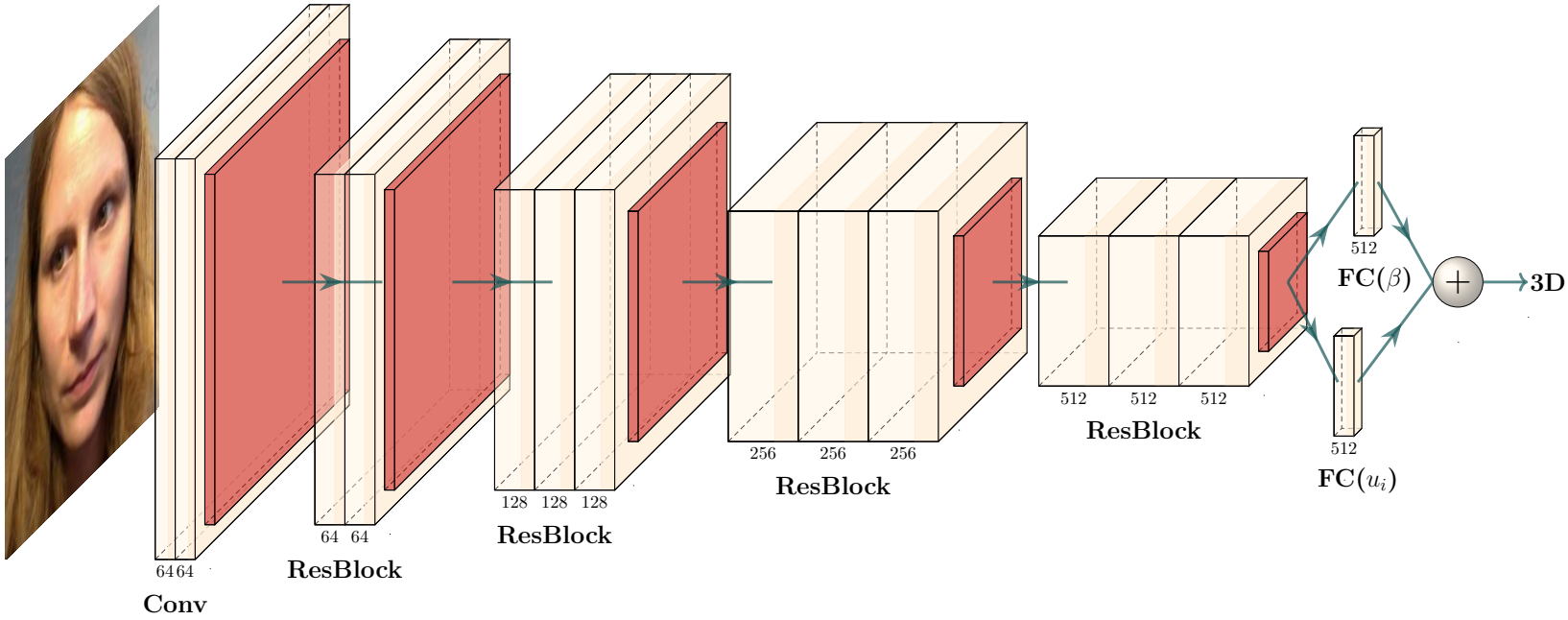
Ground Truth

Ours

Baseline

Computer Vision

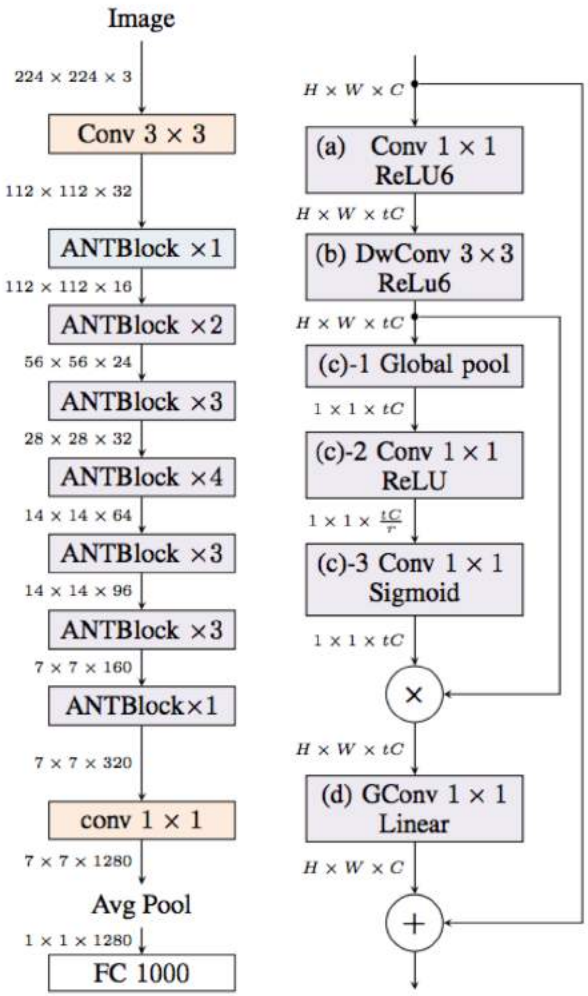
Goal 3. Practical Research for Computer Vision.



$$\boldsymbol{y}_i = \underbrace{\Gamma(X_i)\beta}_{\text{fixed effects}} + \underbrace{\Gamma(X_i)u_i}_{\text{random effects}}$$

[CVPR '19] Mixed Effects Neural Networks (MeNets) with Applications to Gaze Estimation

Efficient Deep Learning



Rep. Power:
Inverted Residual Block + Squeeze-N-Excitation
(MobileNet V2 Block) (Channel Attention)

Speed up:
Group Convolution (2 groups, 10-20% speed up)
Location: before projection
The highest number of channels

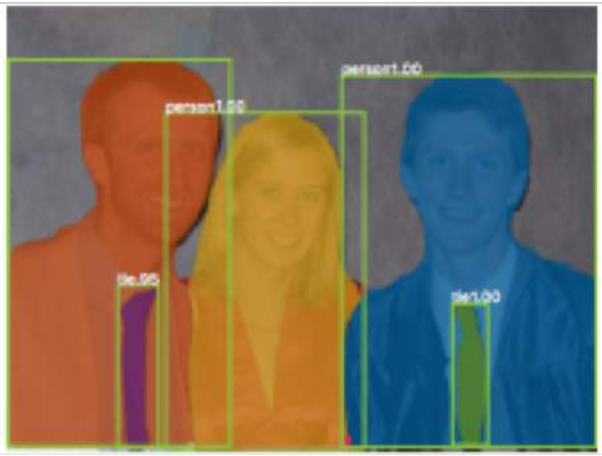
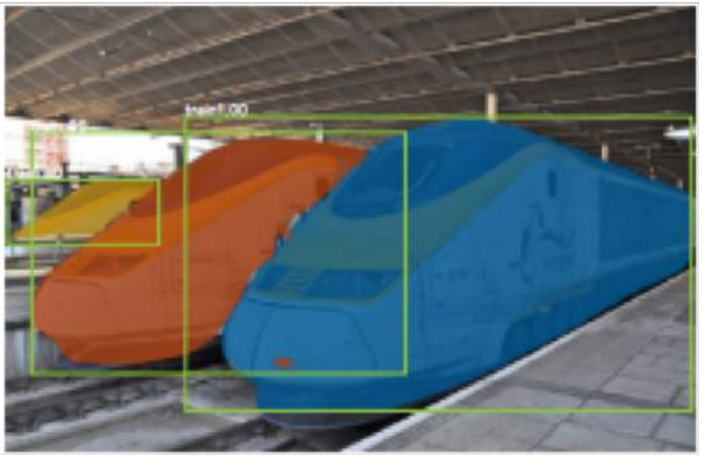
CIFAR 100

	Network	Top-1 Accu.	Top-5 Accu.
Google	MobileNetV2	74.2	93.3
	se-MobileNetV2	74.1	92.8
	c-ANTNet	73.4	93.3
	ANTNet-c	74.4	93.5
Ours	**ANTNet (proposed)**	**75.7**	**93.6**

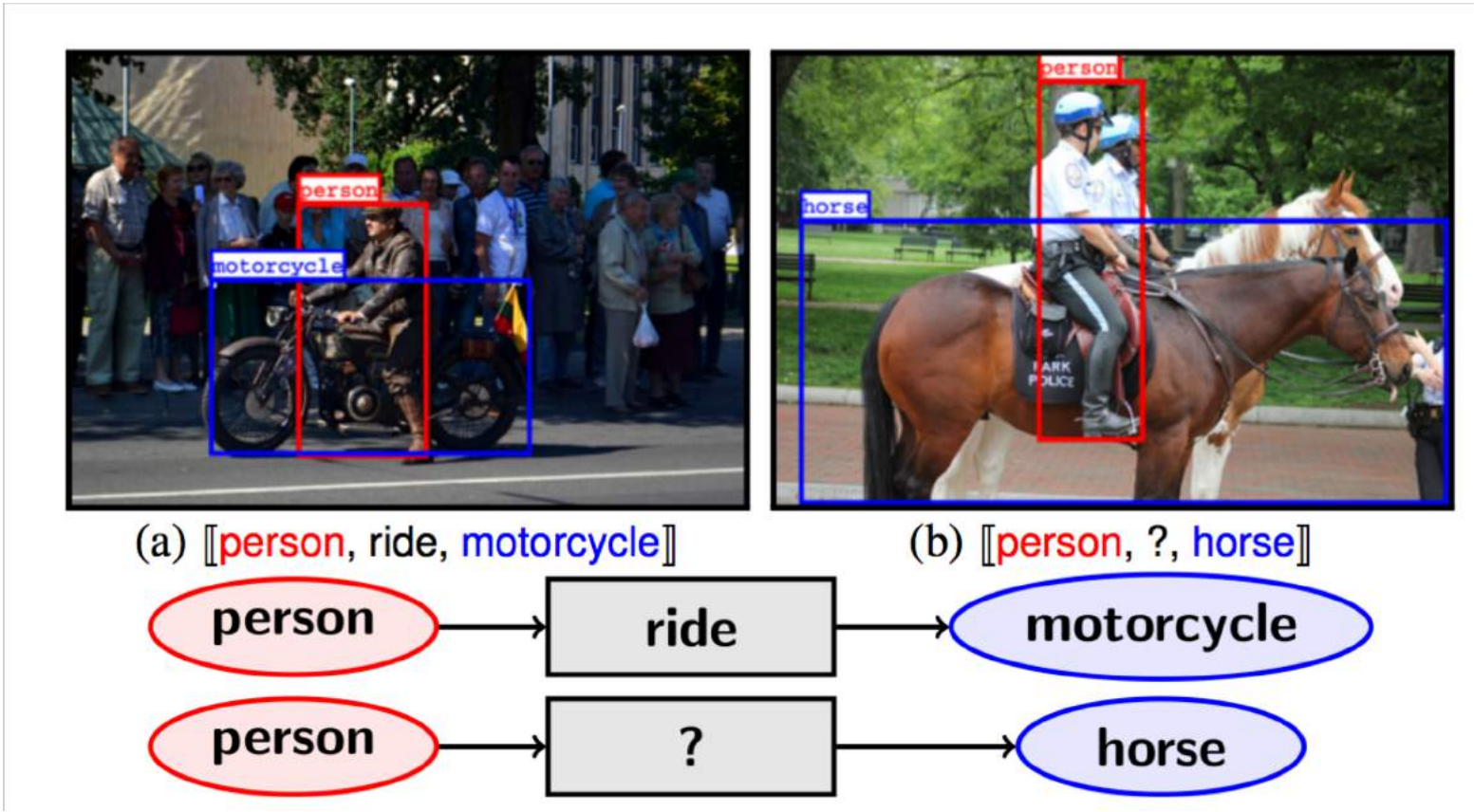
+1.5

[CVPRW 2019] ANTNets: Mobile Convolutional Neural Networks for Resource Efficient Image Classification,

Object detection/pose estimation
Object segmentation

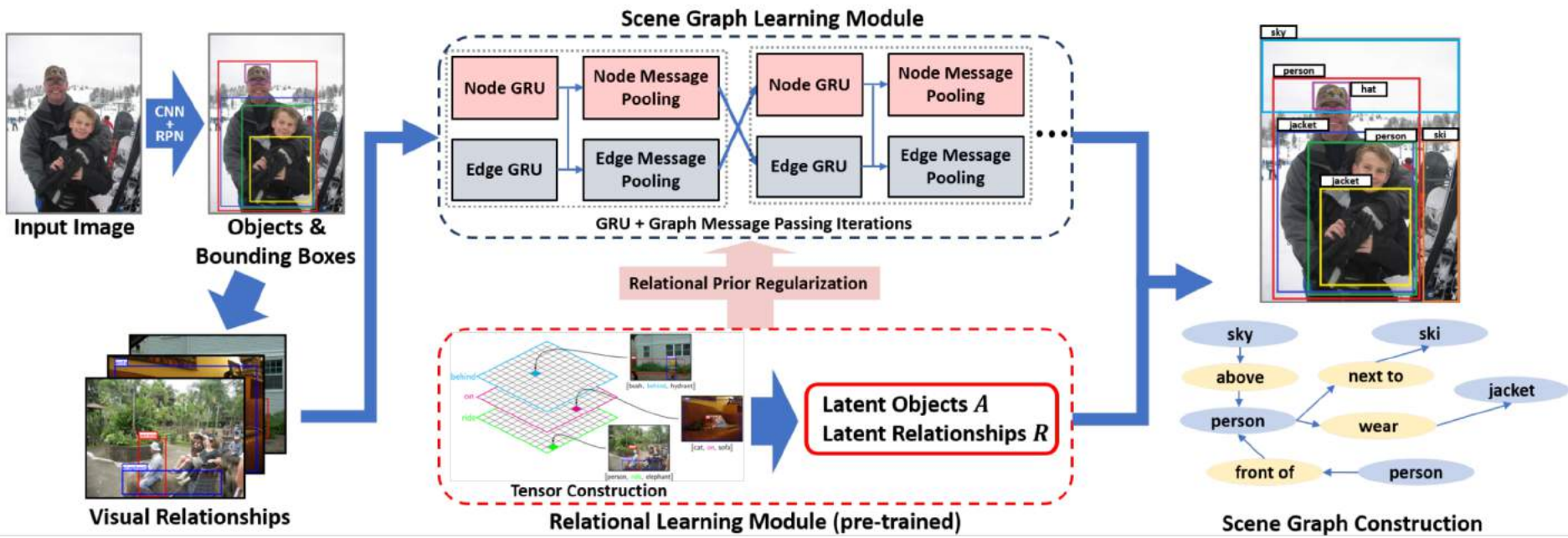



Deep Learning on Graphs/Manifolds



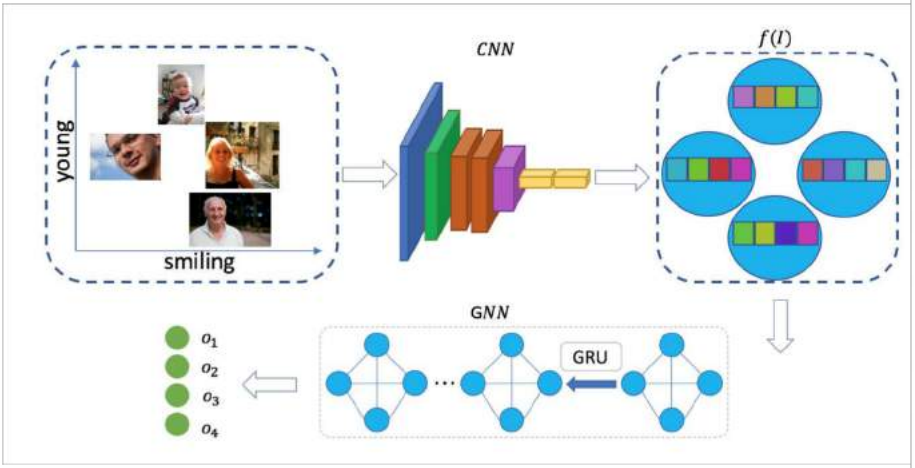
[CVPR ‘18] Tensorize, Factorize and Regularize: Robust Visual Relationship Learning

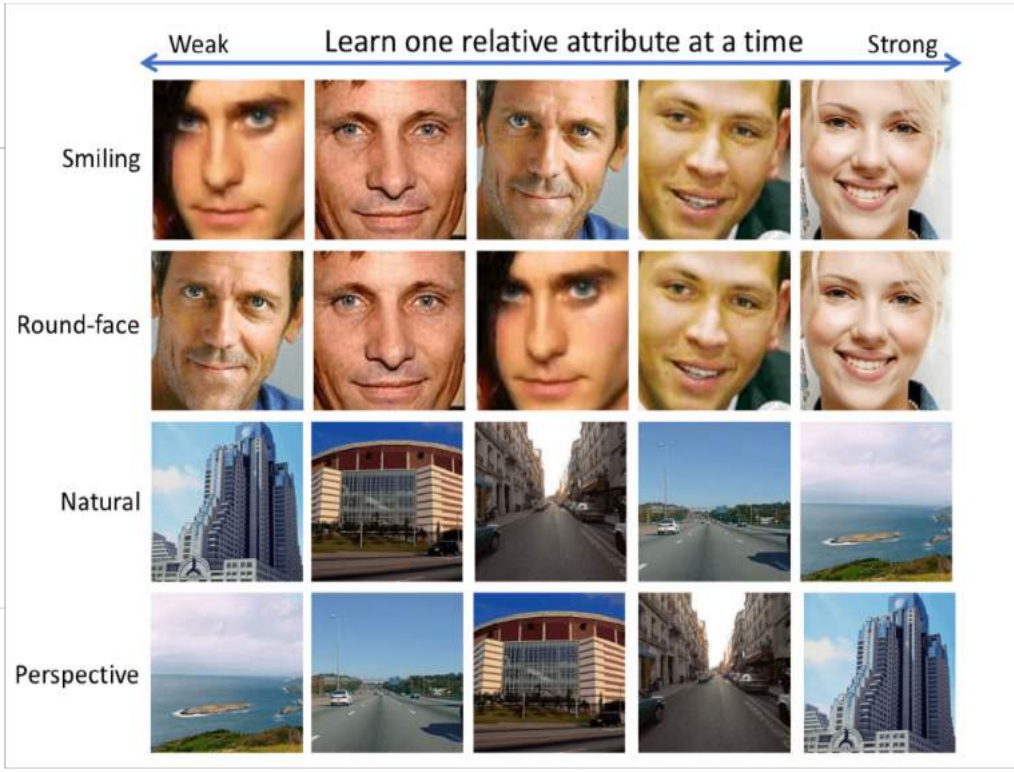
Deep Learning on Graphs/Manifolds



[CVPR ‘18] Tensorize, Factorize and Regularize: Robust Visual Relationship Learning

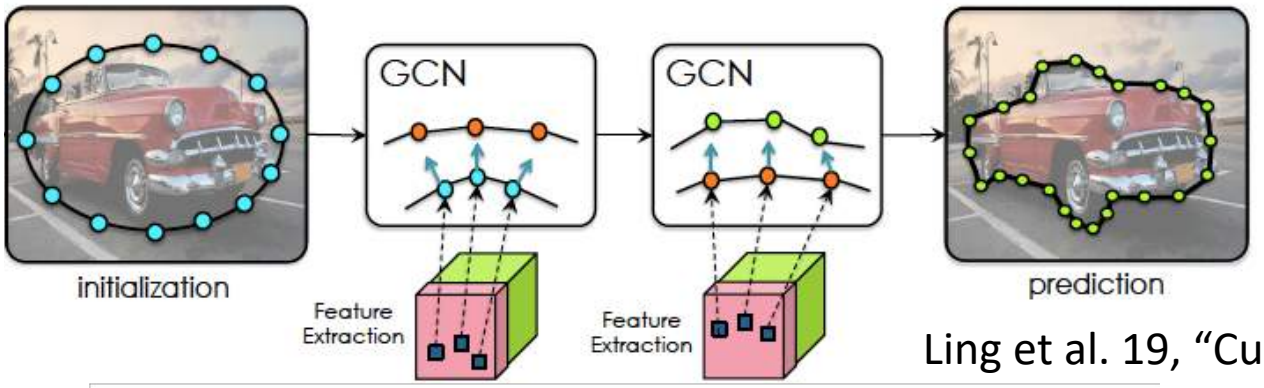
Deep Learning on Graphs/Manifolds



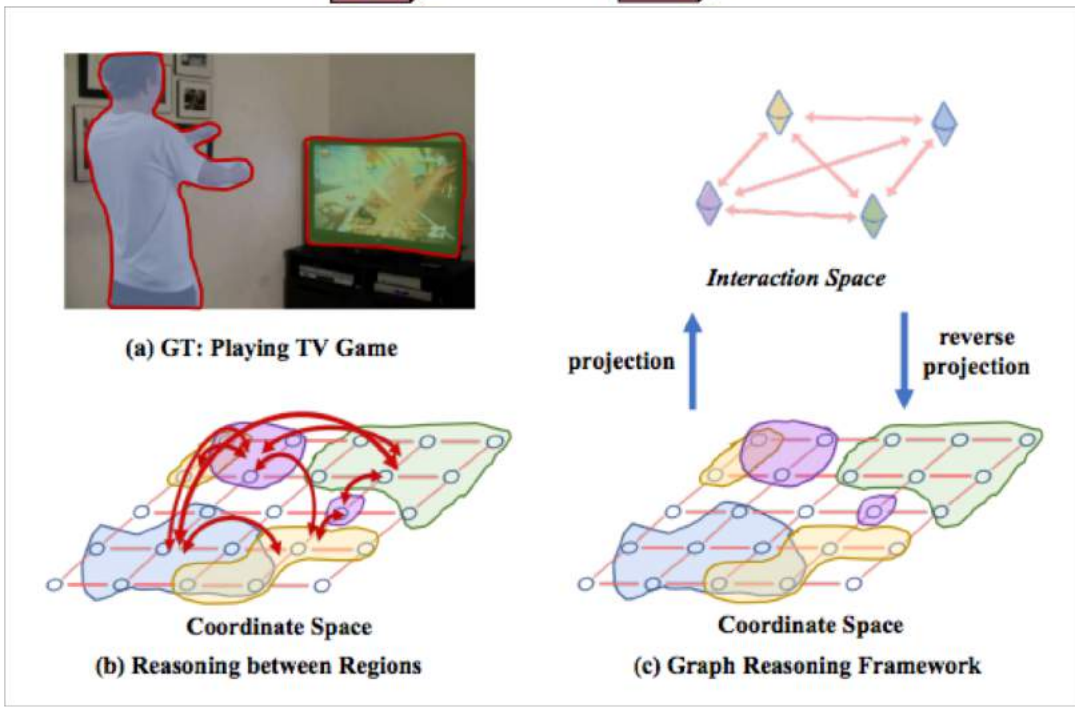


[ECCV ‘18] Graph Neural Networks for Relative Attribute Learning

Related Works



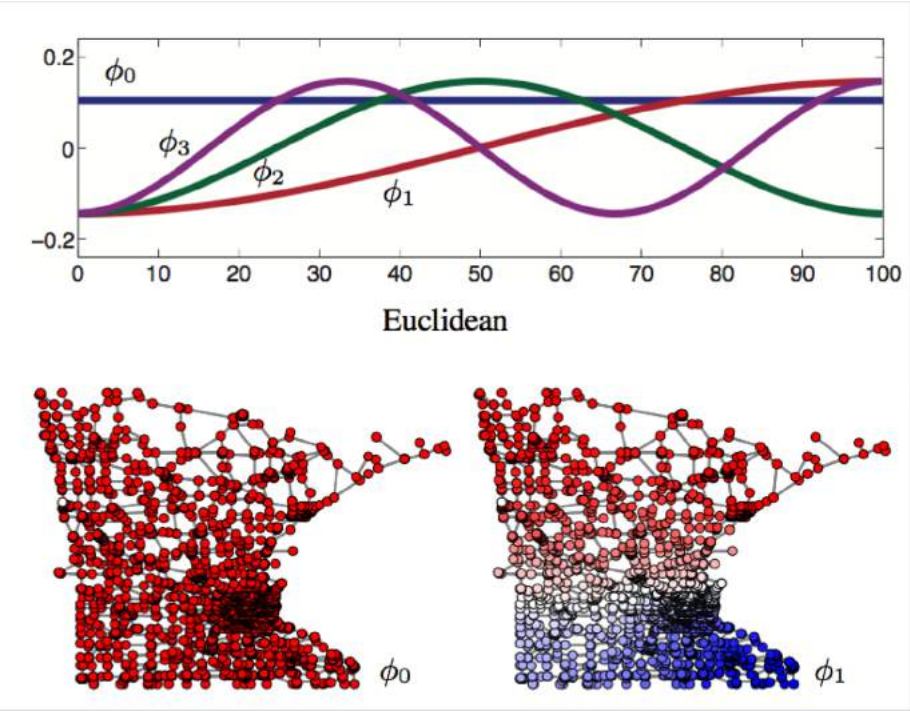
Ling et al. 19, “Curve-GCN”



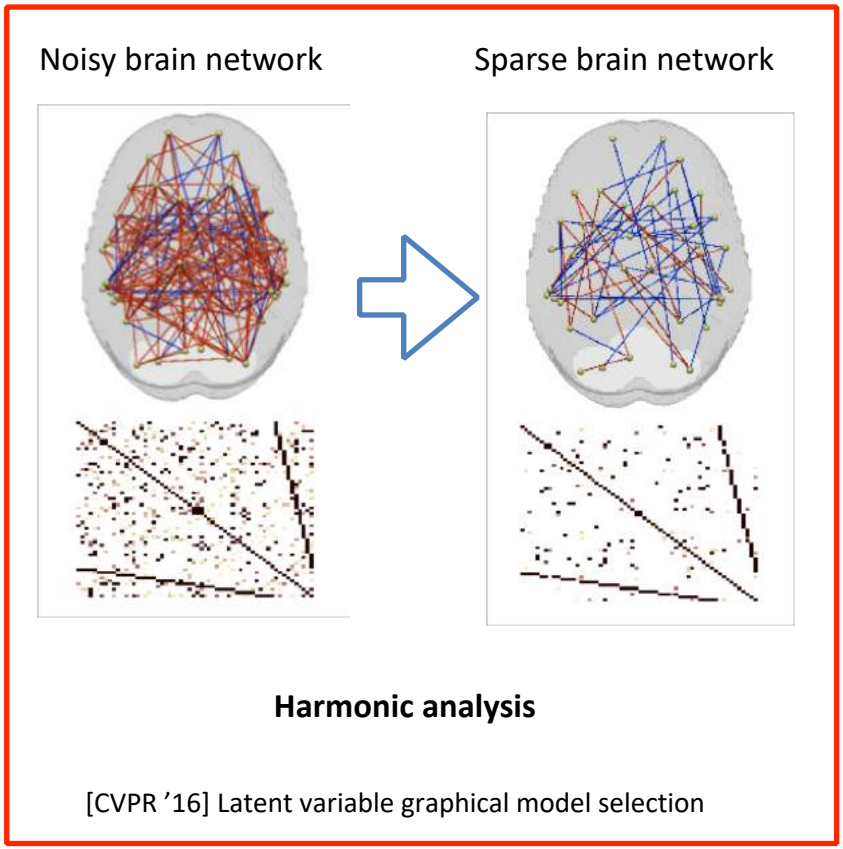
Chen, et al ‘19. "Graph-based global reasoning networks."

Deep Learning on Graphs/Manifolds

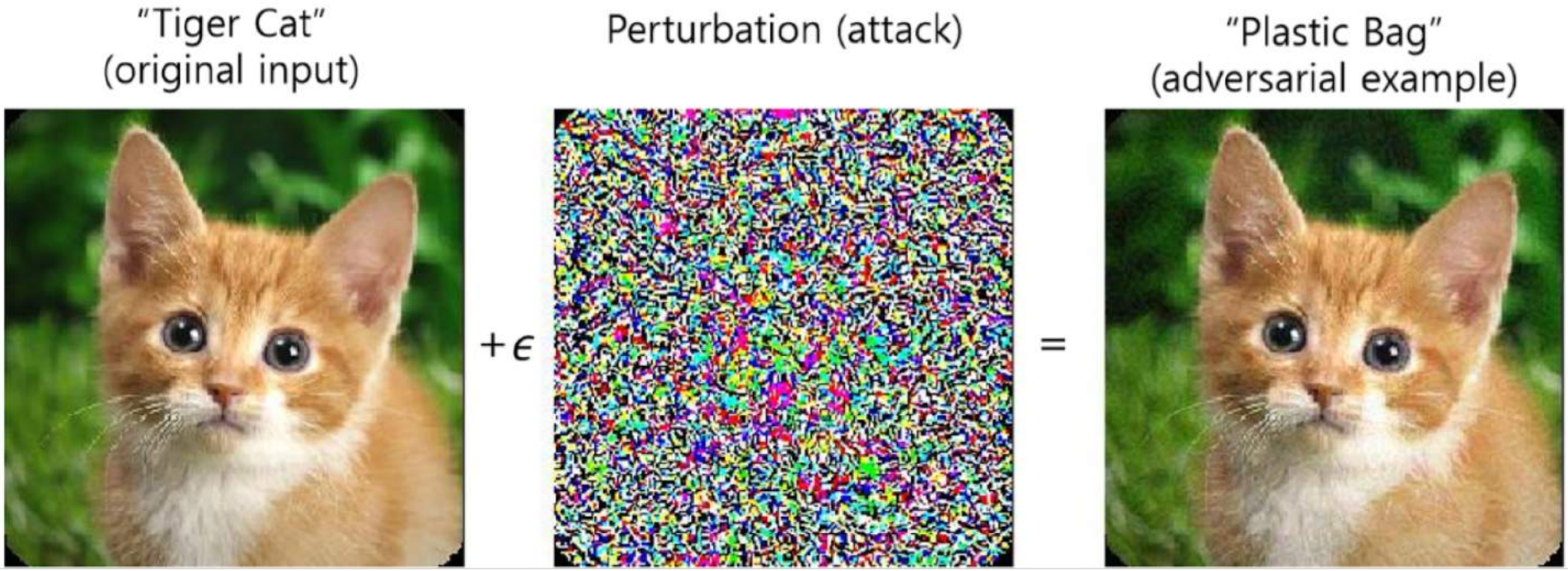
- Structured input/output



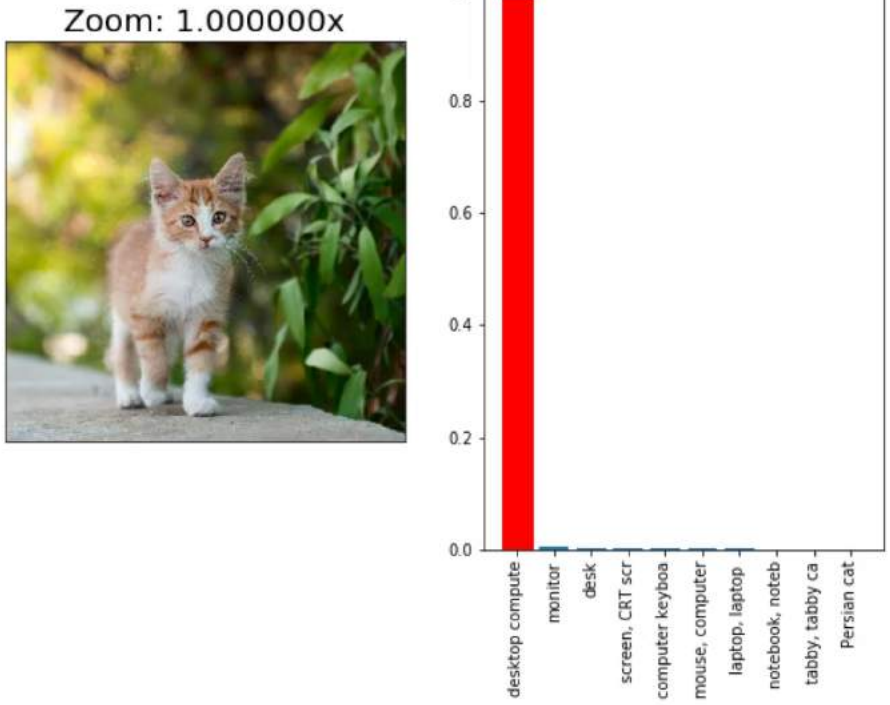
Bronstein, Michael M., et al. "Geometric deep learning"



Safe AI
Attack ML w/ Adversarial Examples



Adversarial Examples



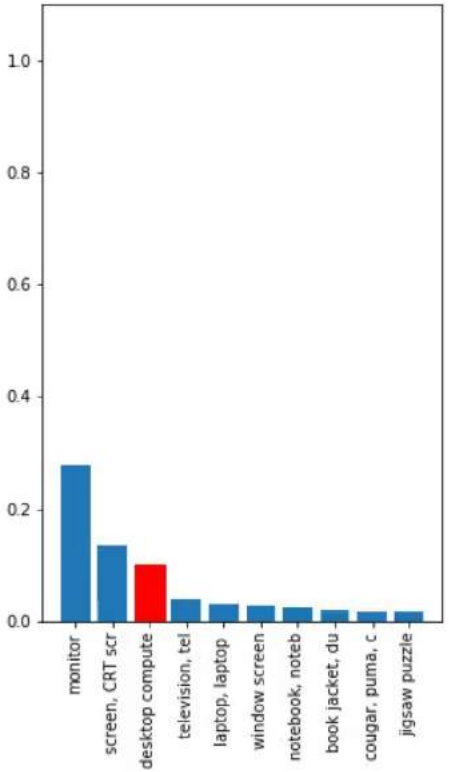
By openAI

Robust Adversarial Examples

- Robust ML/Robust attack invariant to transformations!

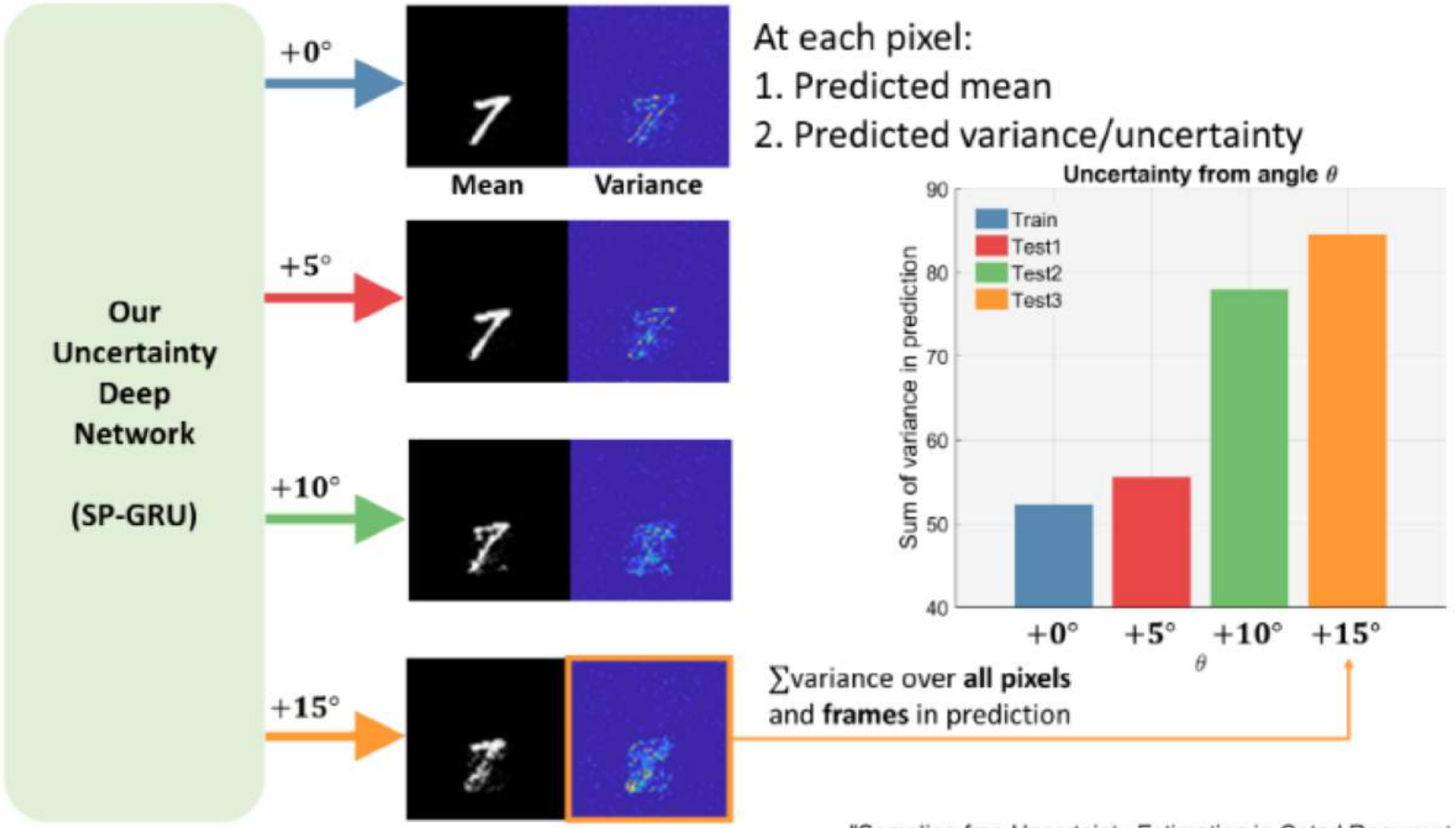
$$\arg\max_{\hat{x}} \; \mathbb{E}_T \left[P(\hat{y} | T(\hat{x})) \right]$$

$$\text{s.t.} \|x - \hat{x}\| \leq \epsilon$$



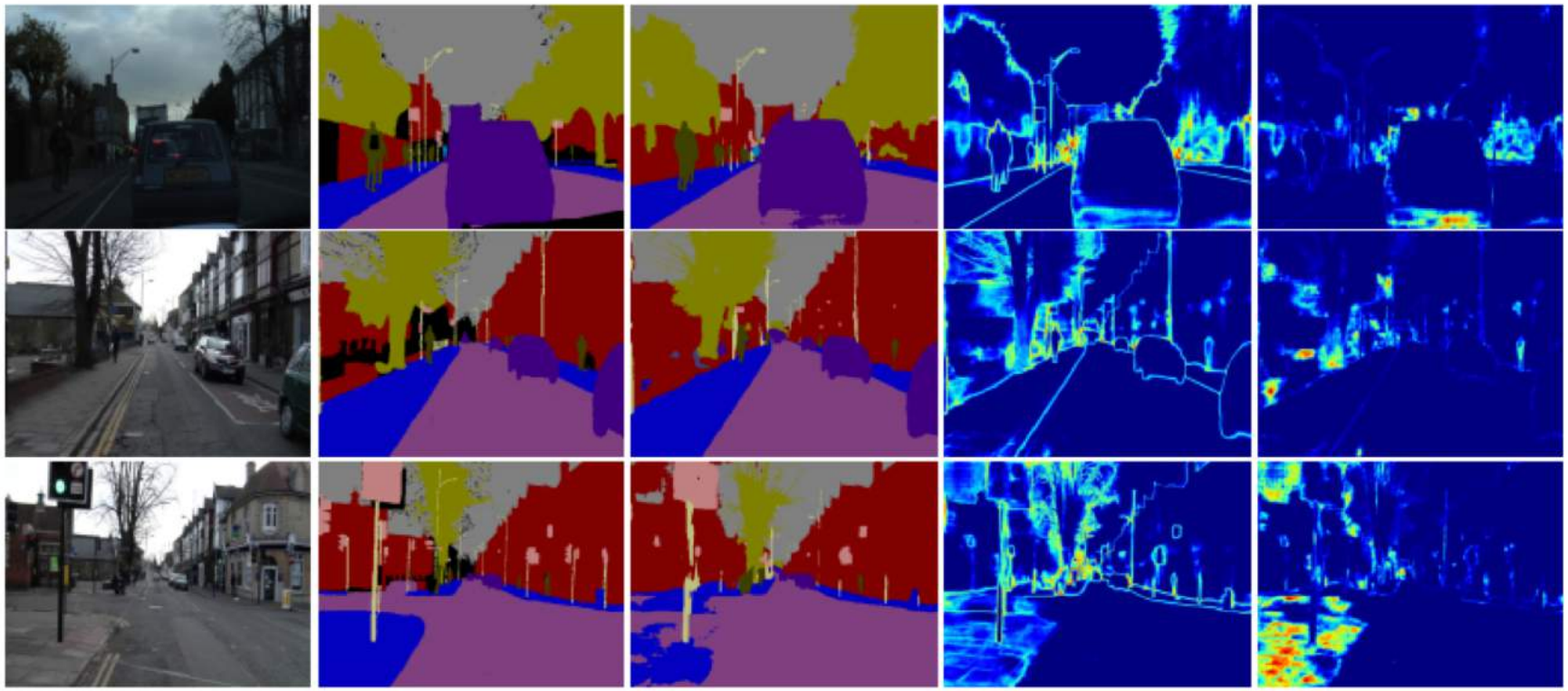
By openAI

Uncertainty



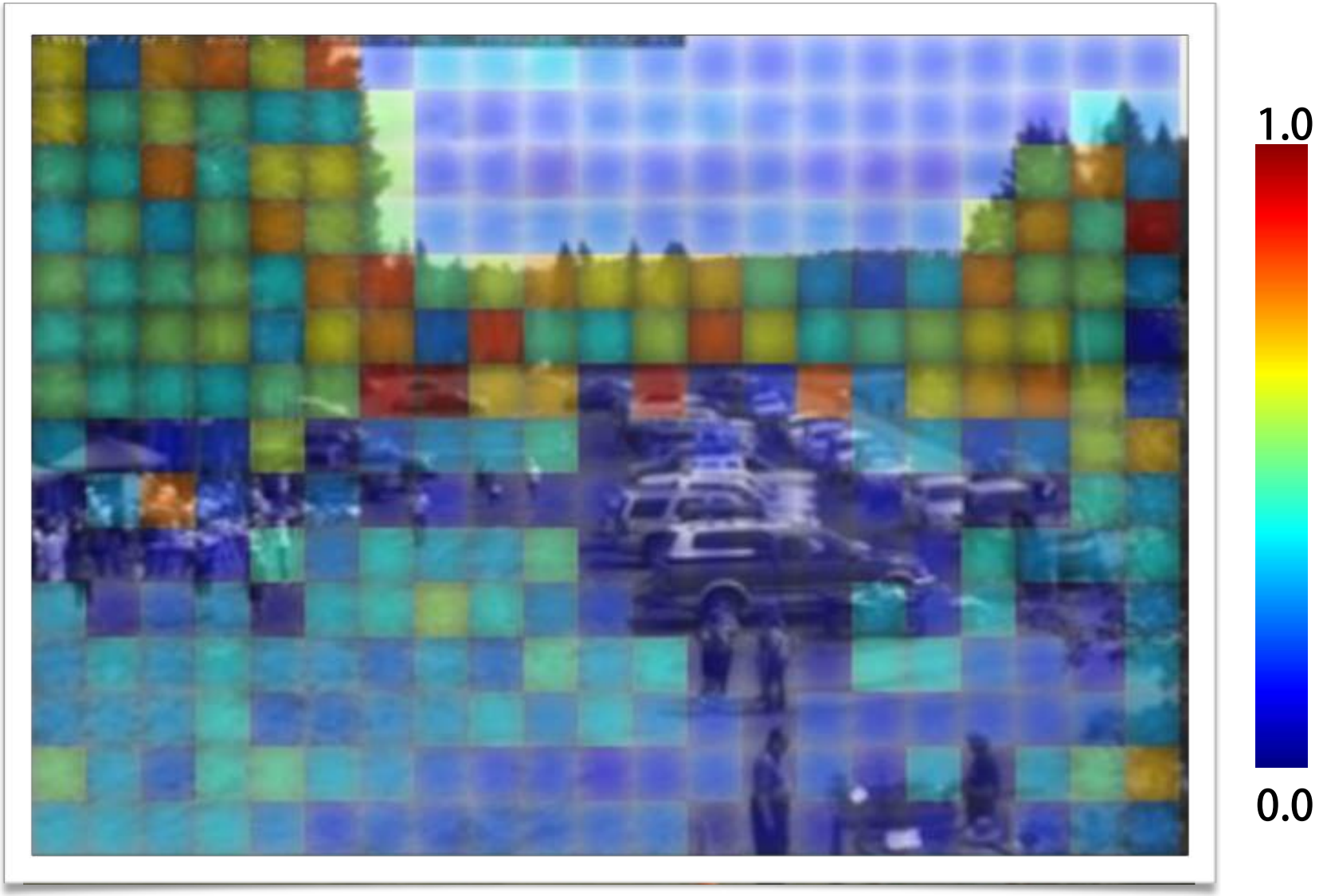
"Sampling-free Uncertainty Estimation in Gated Recurrent Units with Exponential Families." *arXiv preprint arXiv:1804.07351* (2018).

Related Work



Kendall et al., ’17, "What uncertainties do we need in Bayesian deep learning for computer vision?.”

Explainable AI



Example 1

Actual: 1 degrees Celsius
Estimated: 4 degrees Celsius

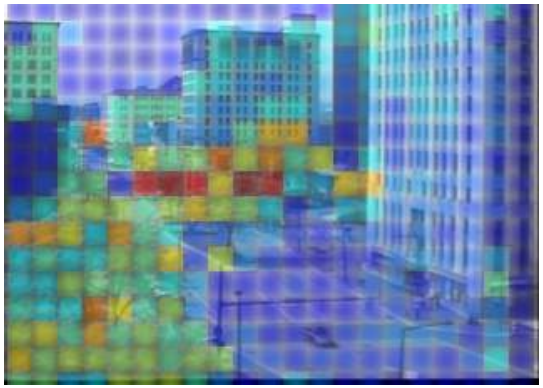
0.0 1.0

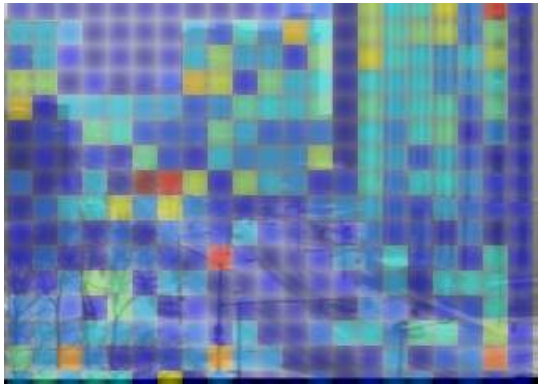
Hot or Not dataset, Glasner et al.

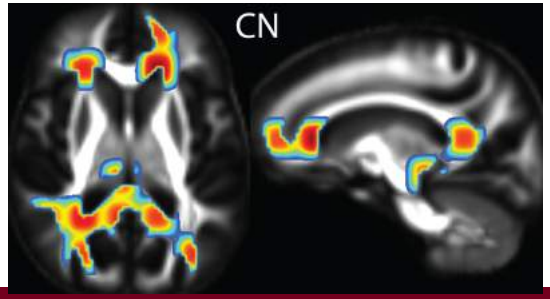
More Results

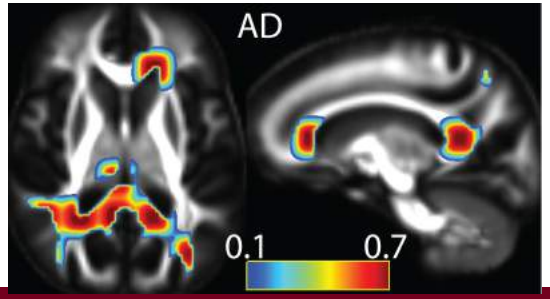
Actual 25 C
Est. 23.6 C

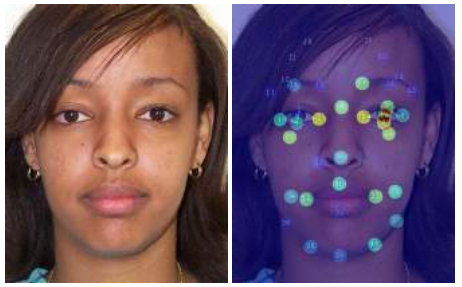
Actual -7.2 C
Est. -3.7 C





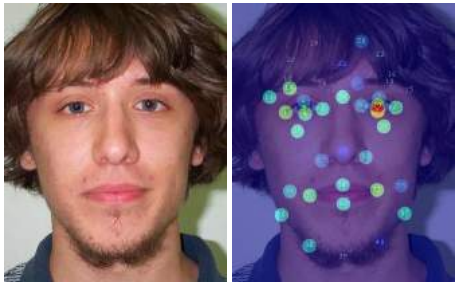




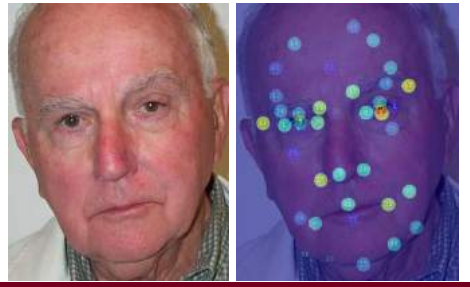


Actual 20
Estimate 16

Actual 36
Estimate 38.4



Actual 20
Estimate 34.7



Actual 74
Estimate 69

Info

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