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DARTS: Deceiving Autonomous Cars with Toxic Signs

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Evasion attack

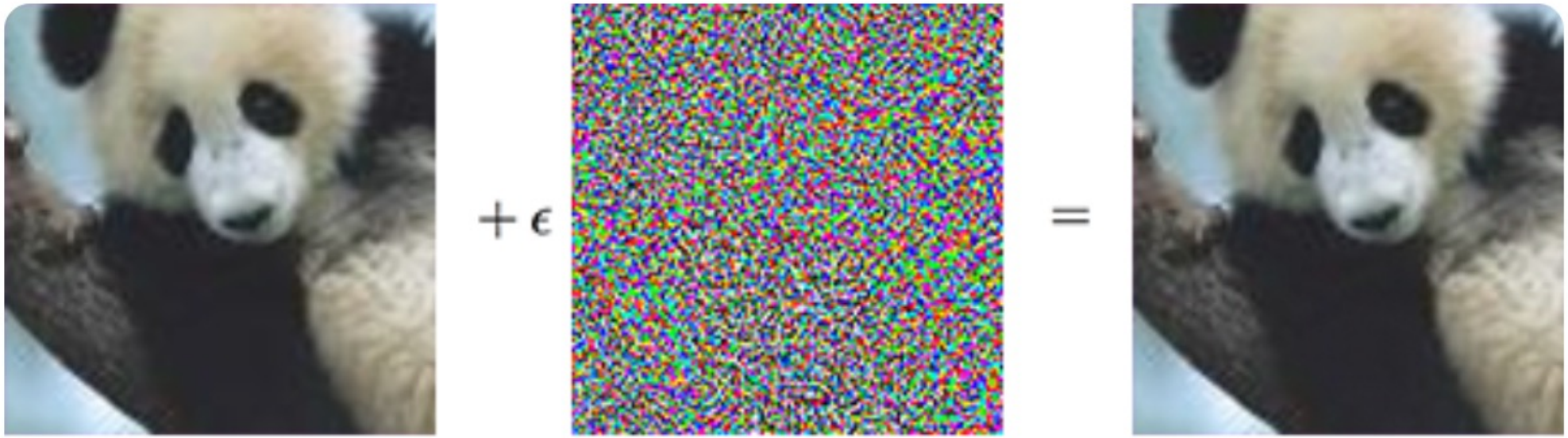

Image reference:
https://www.plugandplaytechcenter.com/resources/machine-learning-security-3-risks-be-aware/

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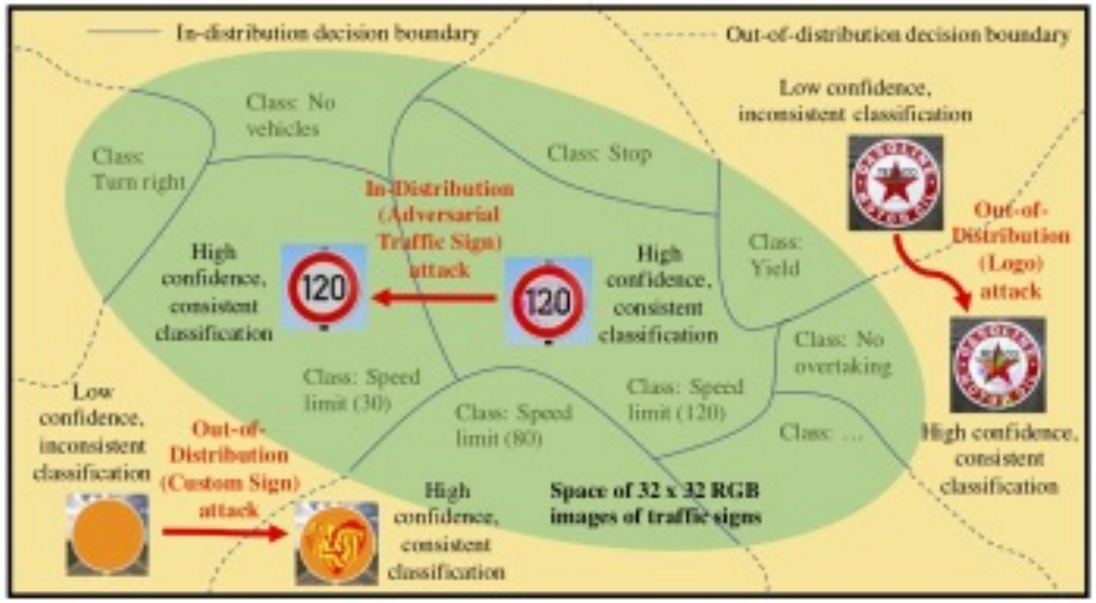
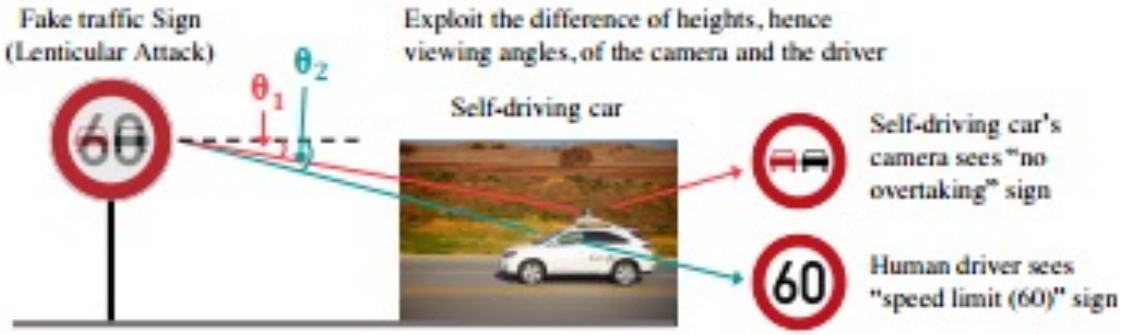
Attack methods





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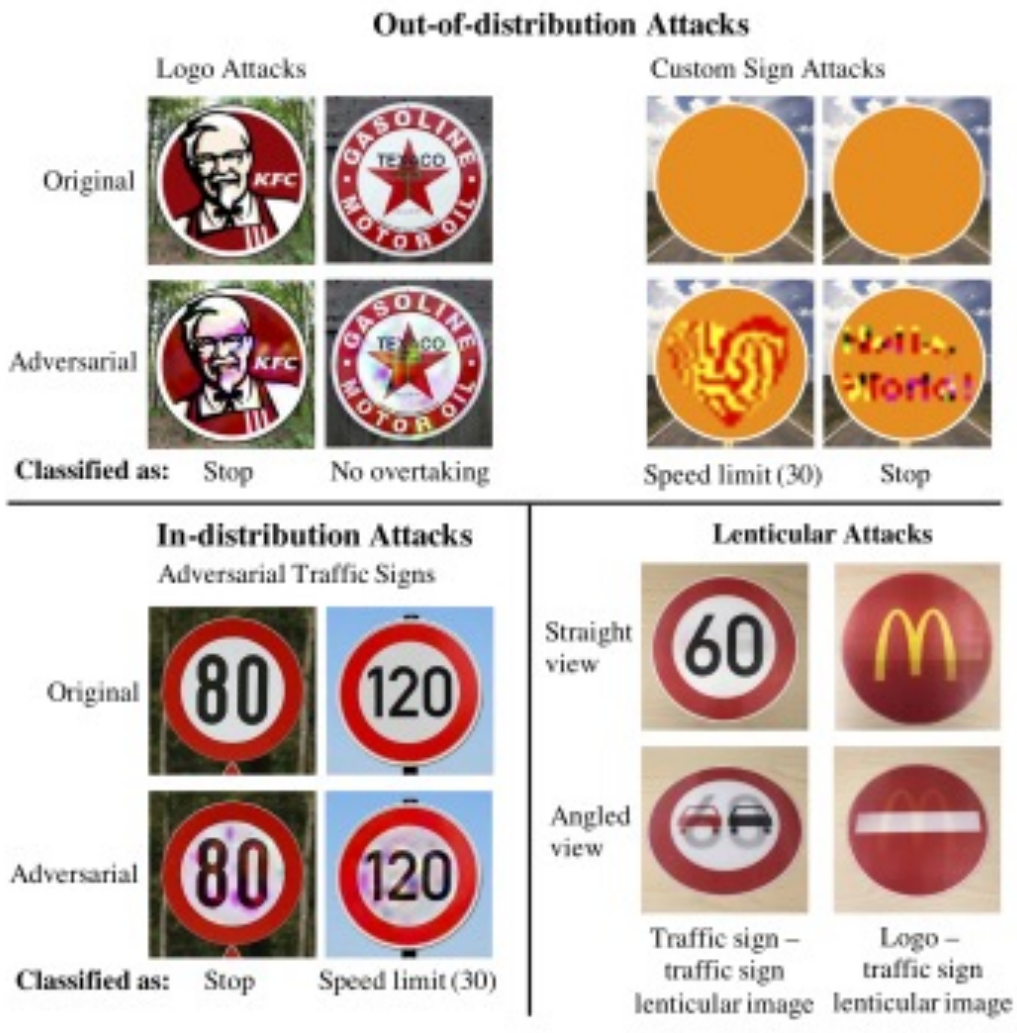
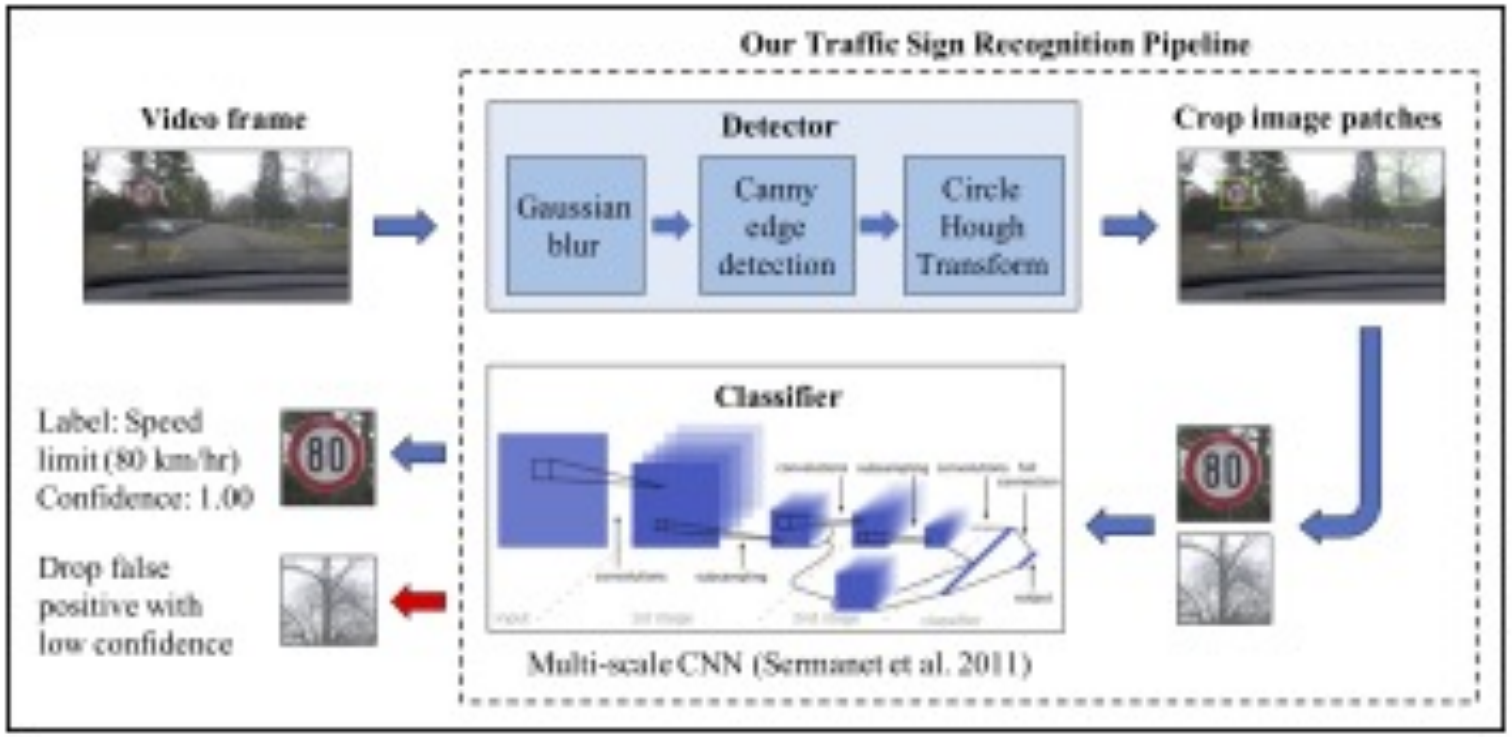
attack methods

- In distribution
- Out of distribution
- Lenticular

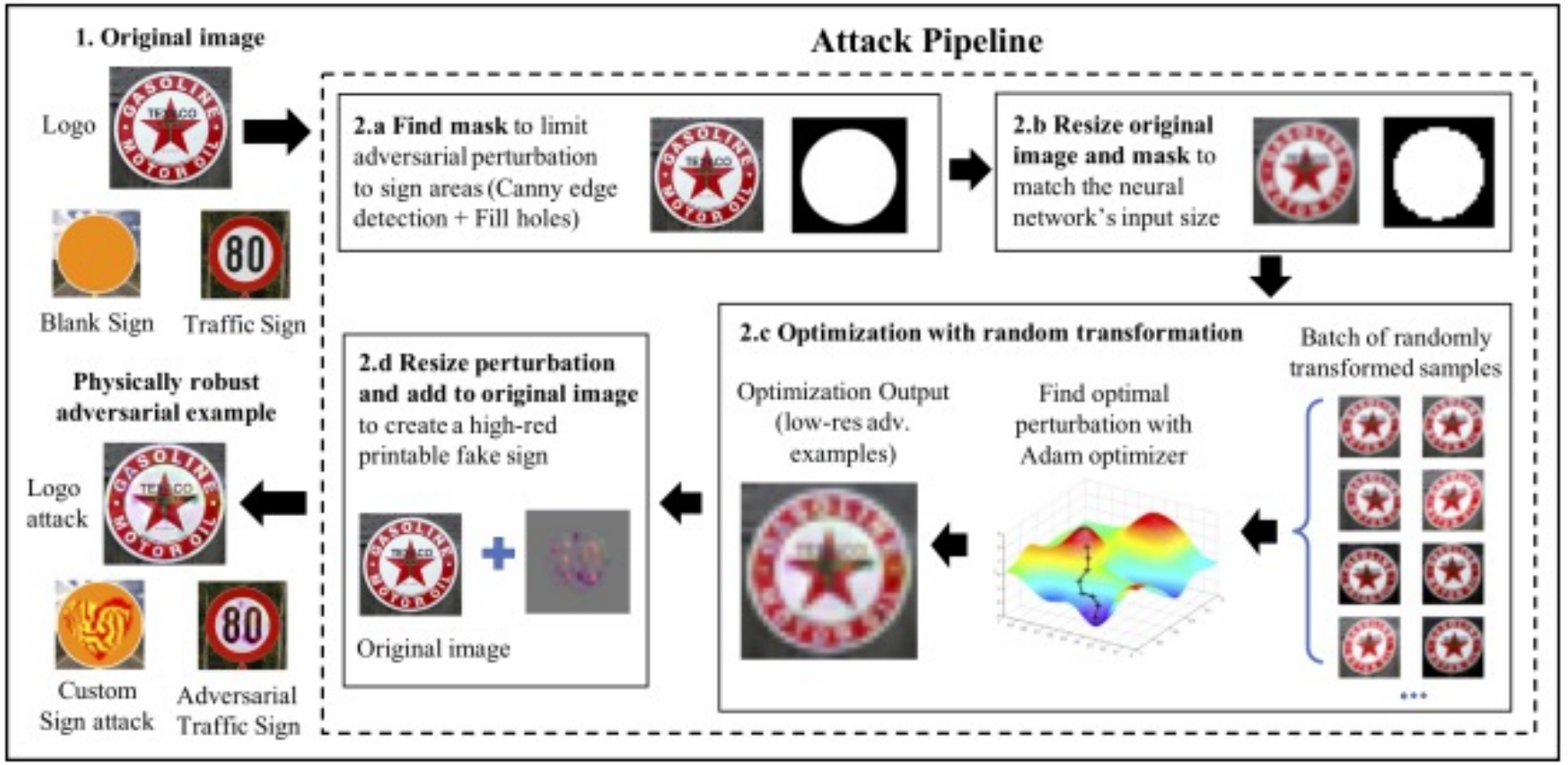


Classification pipeline

- Detection
- classification

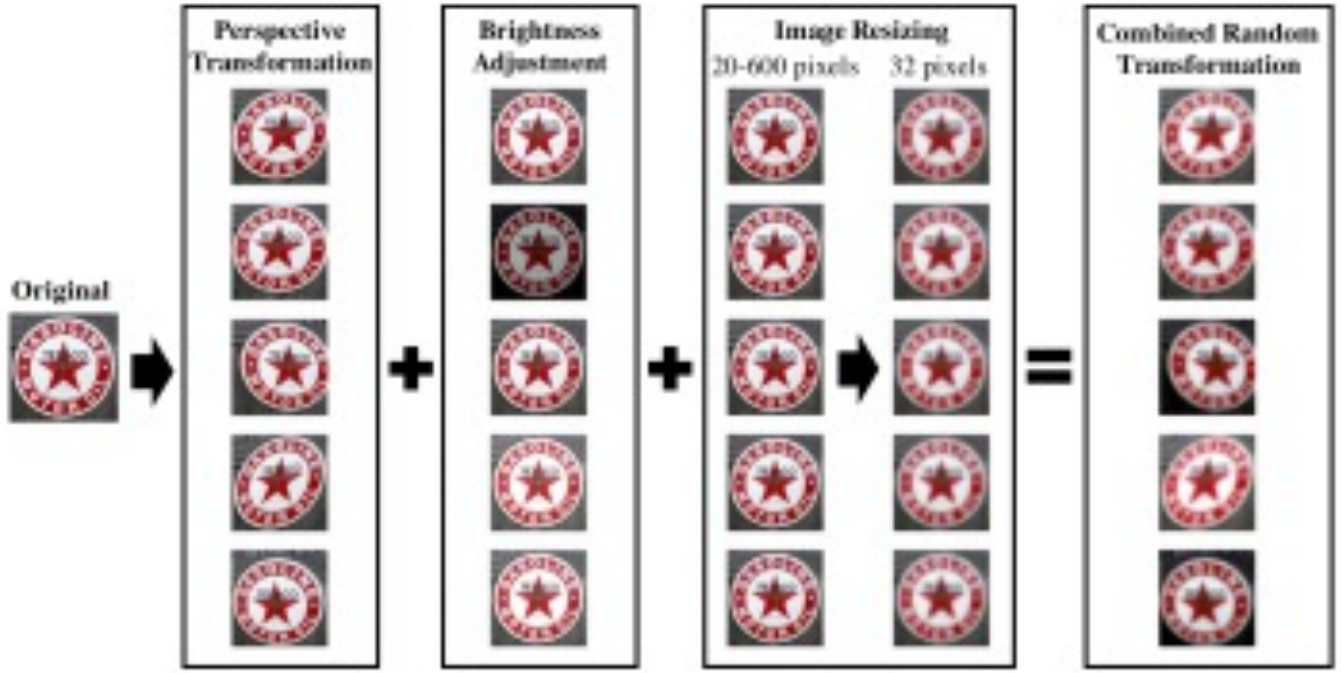


Attack pipeline



How to make it real?

- Generate physical robust adversarial examples



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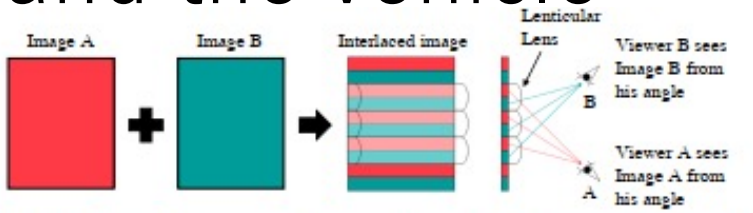
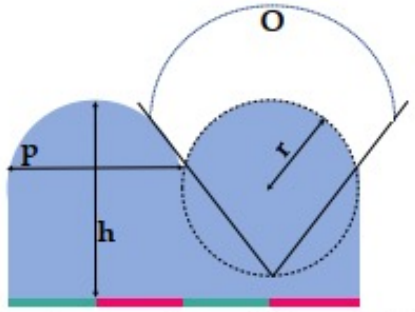
Lenticular attack

- Lenticular Printing attack is motivated by the key insight that the human driver and the vehicle mounted camera observe



(a) Illustration of the process of generating a lenticular image and its angle-dependent appearance.



(b) Several parameters (ρ, r, and h) determine the full angle of observation (O)

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results

Attacks	Virtual attack success (VAS)	Simulated physical attack success (SPAS)	Avg. norm (L_1)	Avg. confidence
In-Distribution (auxiliary traffic data)	54.34 %	36.65 %	37.71	0.9721
Out-of-Distribution (Logo)	85.71%	65.07%	34.89	0.9753
Out-of-Distribution (Custom Sign)	29.44%	18.72%	N.A.	0.9508

Attacks	White-box (Avg. confidence)	Black-box (Avg. confidence)
In-Distribution (auxiliary traffic data)	92.82% (0.9632)	96.68% (0.9256)
Out-of-Distribution (Logo)	52.50% (0.9524)	32.73% (0.9172)
Out-of-Distribution (Custom Sign)	96.51% (0.9476)	97.71% (0.9161)

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What about defense?

Adversarial training cannot defend against Lenticular Printing and Out-of-Distribution

Discussion points

- They are using their own classifier for detection and recognizing the signs.
- Where are the logos ? Are they looks like the signs?
- This method is useful for AR?