

CSCI 5922 - NEURAL NETWORKS AND
DEEP LEARNING

DEEP LEARNING AND SOCIETY

DEEP LEARNING IS AN UNALLOYED GOOD



Deepfake Videos Are Getting Terrifyingly Real | NOVA | PBS [[YouTube](#)]

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- ▶ ON 24 OCTOBER 2018, [ALI BONGO ONDIMBA, THE PRESIDENT OF THE GABONESE REPUBLIC] WAS HOSPITALIZED IN RIYADH FOR AN UNDISCLOSED ILLNESS.
- ▶ ON 29 NOVEMBER 2018 BONGO WAS TRANSFERRED TO A MILITARY HOSPITAL IN RABAT TO CONTINUE RECOVERY.
- ▶ ON 9 DECEMBER 2018 IT WAS REPORTED ... THAT BONGO SUFFERED A STROKE IN RIYADH AND HAD SINCE LEFT THE HOSPITAL IN RABAT AND WAS RECOVERING AT A PRIVATE RESIDENCE IN RABAT.
- ▶ SINCE 24 OCTOBER 2018, BONGO HAS NOT BEEN SEEN IN PUBLIC AND DUE TO LACK OF EVIDENCE THAT HE IS EITHER ALIVE OR DEAD MANY HAVE SPECULATED IF HE IS TRULY ALIVE OR NOT.
- ▶ ON 1 JANUARY 2019 GABON GAVE HIS FIRST PUBLIC ADDRESS VIA A VIDEO POSTED TO SOCIAL MEDIA SINCE FALLING ILL IN OCTOBER 2018 **PUTTING TO REST ANY RUMORS HE WAS DEAD.**

BUT WHEN GABON'S GOVERNMENT RELEASED THE VIDEO, IT RAISED MORE QUESTIONS THAN IT ANSWERED. SOME GABONESE, SEEING THE VIDEO, THOUGHT THERE WAS LITTLE LEFT TO DOUBT ABOUT THEIR PRESIDENT'S HEALTH. BUT BONGO'S CRITICS WEREN'T SOLD.

[The Bizarre and Terrifying Case of the "Deepfake" Video that Helped Bring an African Nation to the Brink](#), Mother Jones, 2019

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<https://www.youtube.com/watch?v=YcklZ5QyNVw>

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<https://www.facebook.com/tvgabon24/videos/324528215059254/?v=324528215059254>

ONE WEEK AFTER THE VIDEO'S RELEASE, GABON'S MILITARY ATTEMPTED AN ULTIMATELY UNSUCCESSFUL COUP—THE COUNTRY'S FIRST SINCE 1964—CITING THE VIDEO'S ODDNESS AS PROOF SOMETHING WAS AMISS WITH THE PRESIDENT.

[The Bizarre and Terrifying Case of the "Deepfake" Video that Helped Bring an African Nation to the Brink](#), Mother Jones, 2019

“I JUST WATCHED SEVERAL OTHER VIDEOS OF PRESIDENT BONGO AND THEY DON’T RESEMBLE THE SPEECH PATTERNS IN THIS VIDEO, AND EVEN HIS APPEARANCE DOESN’T LOOK THE SAME,” HANY FARID, A COMPUTER SCIENCE PROFESSOR AT DARTMOUTH WHO SPECIALIZES IN DIGITAL FORENSICS. “SOMETHING DOESN’T LOOK RIGHT,” HE SAID, **WHILE NOTING THAT HE COULD NOT MAKE A DEFINITIVE ASSESSMENT.**

[The Bizarre and Terrifying Case of the “Deepfake” Video that Helped Bring an African Nation to the Brink](#), Mother Jones, 2019

UNCERTAINLY IS WIDESPREAD: DEEPTRACE LABS, A FAKE VIDEO DETECTION FIRM, TOLD MOTHER JONES IT DID NOT BELIEVE THE VIDEO WAS A DEEPPFAKE, **THOUGH IT ALSO CAVEATED THAT IT COULD NOT MAKE A DEFINITIVE ASSESSMENT.**

[The Bizarre and Terrifying Case of the "Deepfake" Video that Helped Bring an African Nation to the Brink](#), Mother Jones, 2019

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BY THE WAY, THE STORY ABOUT THE TWO PICTURES OF A FIELD, WITH AND WITHOUT ARMY TANKS IN THE PICTURE, COMES FROM ME. I ATTENDED A MEETING IN LOS ANGELES, ABOUT HALF A CENTURY AGO WHERE SOMEONE GAVE A PAPER SHOWING HOW A RANDOM NET COULD BE TRAINED TO DETECT THE TANKS IN THE PICTURE. I WAS IN THE AUDIENCE. AT THE END OF THE TALK I STOOD UP AND MADE THE COMMENT THAT IT WAS OBVIOUS THAT THE PICTURE WITH THE TANKS WAS MADE ON A SUNNY DAY WHILE THE OTHER PICTURE (OF THE SAME FIELD WITHOUT THE TANKS) WAS MADE ON A CLOUDY DAY. I SUGGESTED THAT THE “NEURAL NET” HAD MERELY TRAINED ITSELF TO RECOGNIZE THE DIFFERENCE BETWEEN A BRIGHT PICTURE AND A DIM PICTURE. –

[EDWARD FREDKIN](#)

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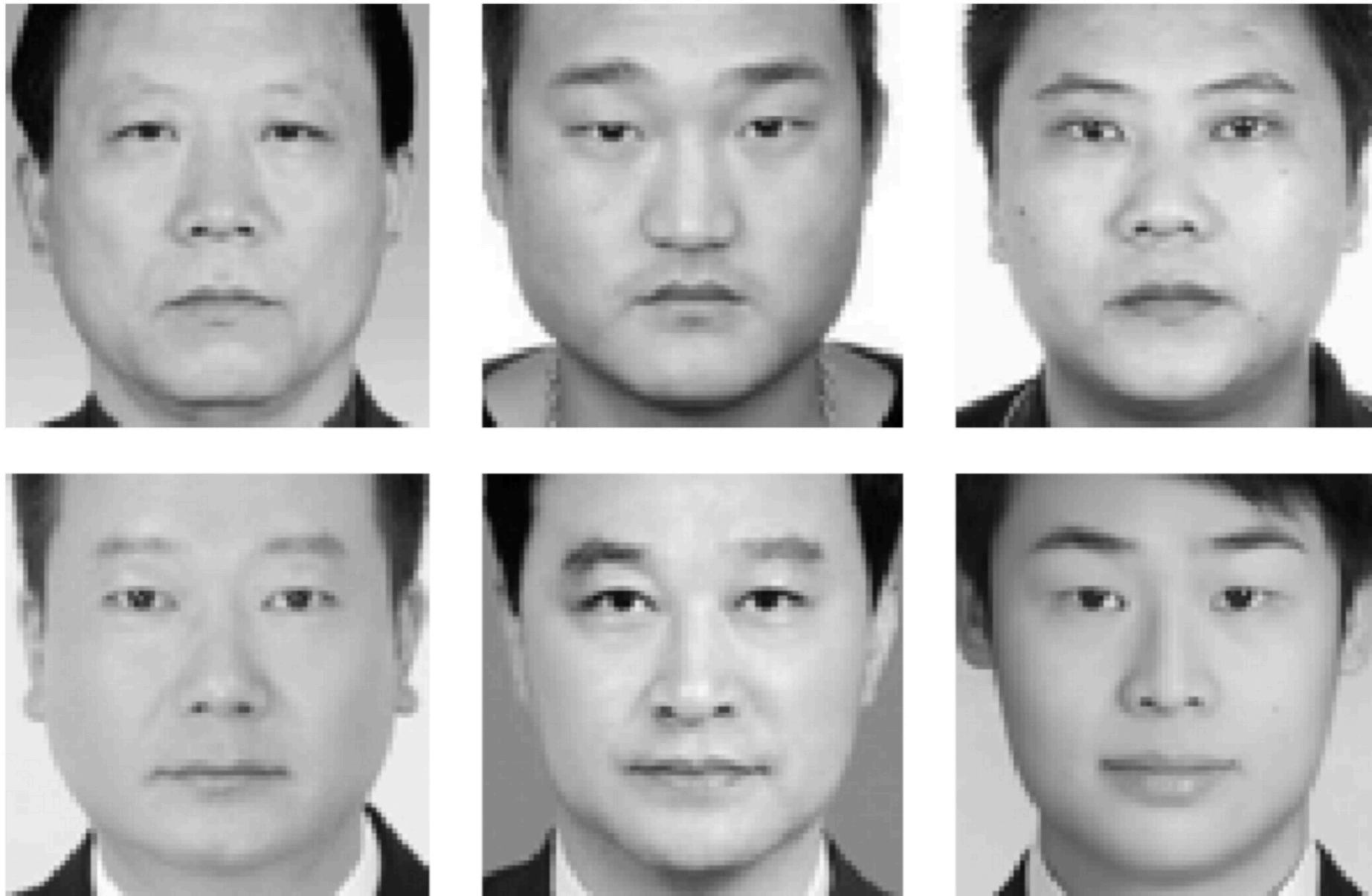
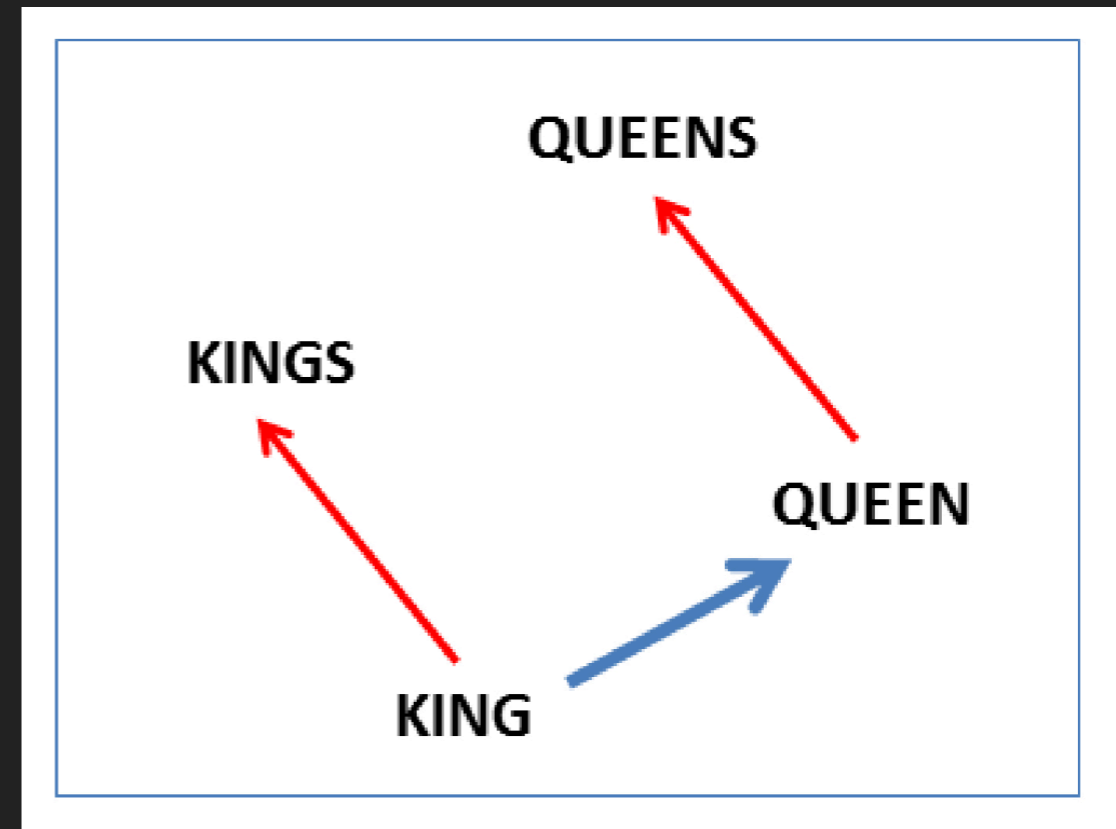


Figure 3. Wu and Zhang's "criminal" images (top) and "non-criminal" images (bottom). In the top images, the people are frowning. In the bottom, they are not. These types of superficial differences can be picked up by a deep learning system.

MACHINE LEARNING AND BIAS

WORD EMBEDDINGS (E.G. WORD2VEC) ENCODE ANALOGICAL RELATIONSHIPS IN TEXT.

THEY ALSO ENCODE GENDER AND OTHER STEREOTYPES.



[Mikolov et al, 2014](#)

WHAT DOES THIS SUGGEST ABOUT MACHINE LEARNING MODELS DEPLOYED IN REAL WORLD SETTINGS?

sewing-carpentry
nurse-surgeon
blond-burly
giggle-chuckle
sassy-snappy
volleyball-football

Gender stereotype *she-he* analogies.

register-nurse-physician
interior designer-architect
feminism-conservatism
vocalist-guitarist
diva-superstar
cupcakes-pizzas

housewife-shopkeeper
softball-baseball
cosmetics-pharmaceuticals
petite-lanky
charming-affable
hairdresser-barber

queen-king
waitress-waiter

Gender appropriate *she-he* analogies.

sister-brother
ovarian cancer-prostate cancer
mother-father
convent-monastery

CONVOLUTIONAL NETWORKS FOR OBJECT DETECTION AND SEGMENTATION ARE COMMONLY USED IN AUTONOMOUS VEHICLE PROTOTYPES.

Model	Backbone	AP (%)		AP ₅₀ (%)		AP ₇₅ (%)	
		LS	DS	LS	DS	LS	DS
Faster R-CNN	R-50-C4	57.3	52.7	90.3	90.0	64.5	53.6
Faster R-CNN	R-50-FPN	57.2	53.3	91.3	91.8	63.1	53.6
Faster R-CNN	R-101-FPN	59.7	56.9	91.6	93.0	70.0	57.3
Faster R-CNN	X-101-32x8d-FPN	60.6	55.4	93.1	90.0	69.8	62.1
Mask R-CNN	R-50-C4	59.3	53.8	91.3	90.5	66.9	51.5
Mask R-CNN	R-50-FPN	58.9	53.2	92.5	92.3	67.6	51.2
Mask R-CNN	R-101-FPN	60.1	54.7	92.4	92.1	65.6	55.2
Mask R-CNN	X-101-32x8d-FPN	60.8	57.1	93.3	91.6	69.2	62.9
Average		59.2	54.6	92.0	91.4	67.1	55.9

Table 4. Performances of the person class on BDD100K *validation* set for models trained using MS COCO. We note that these models were not trained on BDD100K.

CONVOLUTIONAL NETWORKS FOR OBJECT DETECTION AND SEGMENTATION ARE COMMONLY USED IN AUTONOMOUS VEHICLE PROTOTYPES.

THEY HAVE BEEN SHOWN TO BE 5% LESS ACCURATE ON PEDESTRIANS WITH DARKER SKIN COLOR (4-6 ON THE FITZPATRICK SKIN TYPE SCALE).

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- ▶ **GOOD ENGINEERS ARE BUILDERS AND SCIENTISTS**
 - ▶ **WE MUST TO SWITCH BETWEEN — OR SIMULTANEOUSLY PERFORM — BOTH ROLES**
 - ▶ **A DANGER**
 - ▶ **BUILDING HAS ITS OWN JOY**
 - ▶ **IT CAN BE ADDICTIVE**
 - ▶ **DISTINGUISH BETWEEN LOVING TO BUILD AND LOVING WHAT YOU BUILD**
 - ▶ **FORGETTING THE DISTINCTION CAN PREVENT YOU FROM VIEWING YOUR WORK WITH THE CRITICAL MIND OF A SCIENTIST**

I HAVE A LOT OF HOPE THAT MOST OF THE PEOPLE USING COMPUTER VISION ARE JUST DOING HAPPY, GOOD STUFF WITH IT, LIKE COUNTING THE NUMBER OF ZEBRAS IN A NATIONAL PARK, OR TRACKING THEIR CAT AS IT WANDERS AROUND THEIR HOUSE. BUT **COMPUTER VISION IS ALREADY BEING PUT TO QUESTIONABLE USE AND AS RESEARCHERS WE HAVE A RESPONSIBILITY TO AT LEAST CONSIDER THE HARM OUR WORK MIGHT BE DOING AND THINK OF WAYS TO MITIGATE IT. WE OWE THE WORLD THAT MUCH.**

REDMON & FARHADI, [YOLOV3: AN INCREMENTAL IMPROVEMENT](#)