



Detecting False Captioning Using Common Sense Reasoning

By

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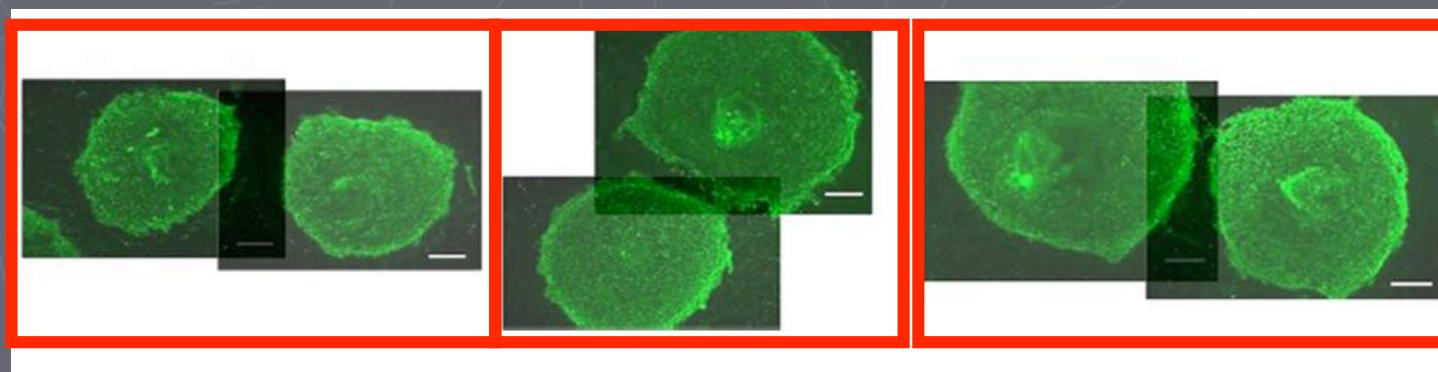
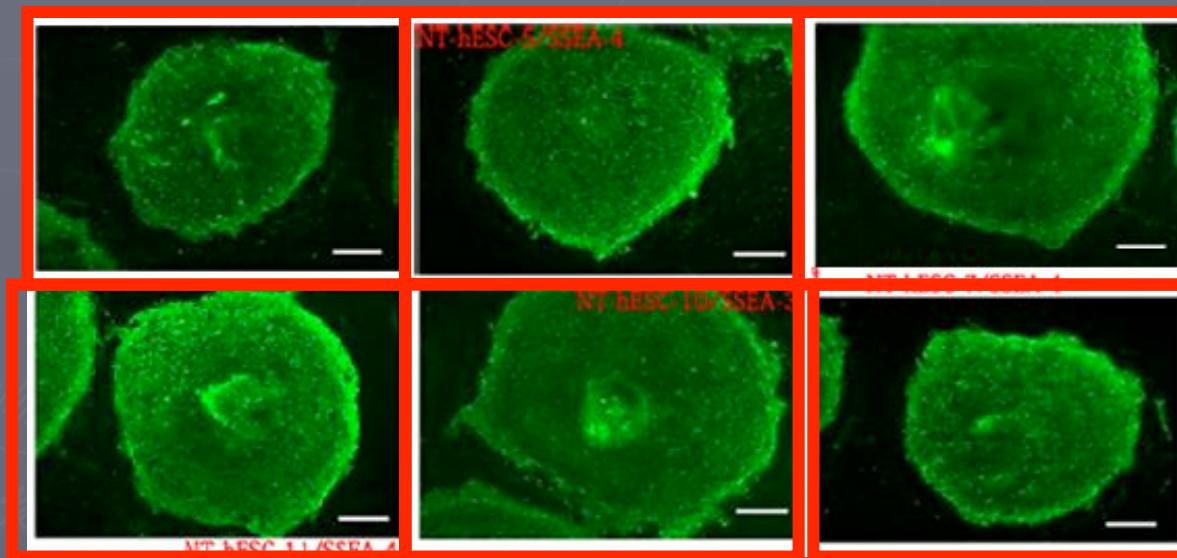
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Detecting False Captioning using Common-Sense Reasoning

Sangwon Lee, David A. Shamma, and Bruce Gooch
Northwestern University

Image Manipulation

- Science paper



Time Magazine

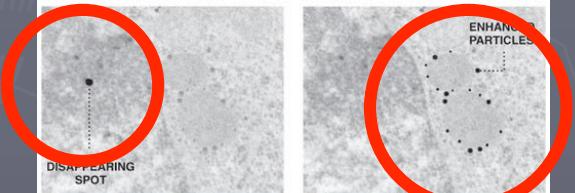
Anatomy of a Fraud

The Journal of Cell Biology created these examples of the types of photo manipulation it has encountered since it began inspecting submissions from scientists.

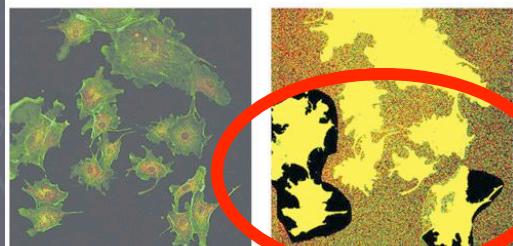
- 1** Scientists often use brightness and contrast controls to clean up an image. That is acceptable, but not if it causes data to disappear.



- 2** In this example, particles that were present in the original have been darkened. Also, the background dot in the original has been removed.

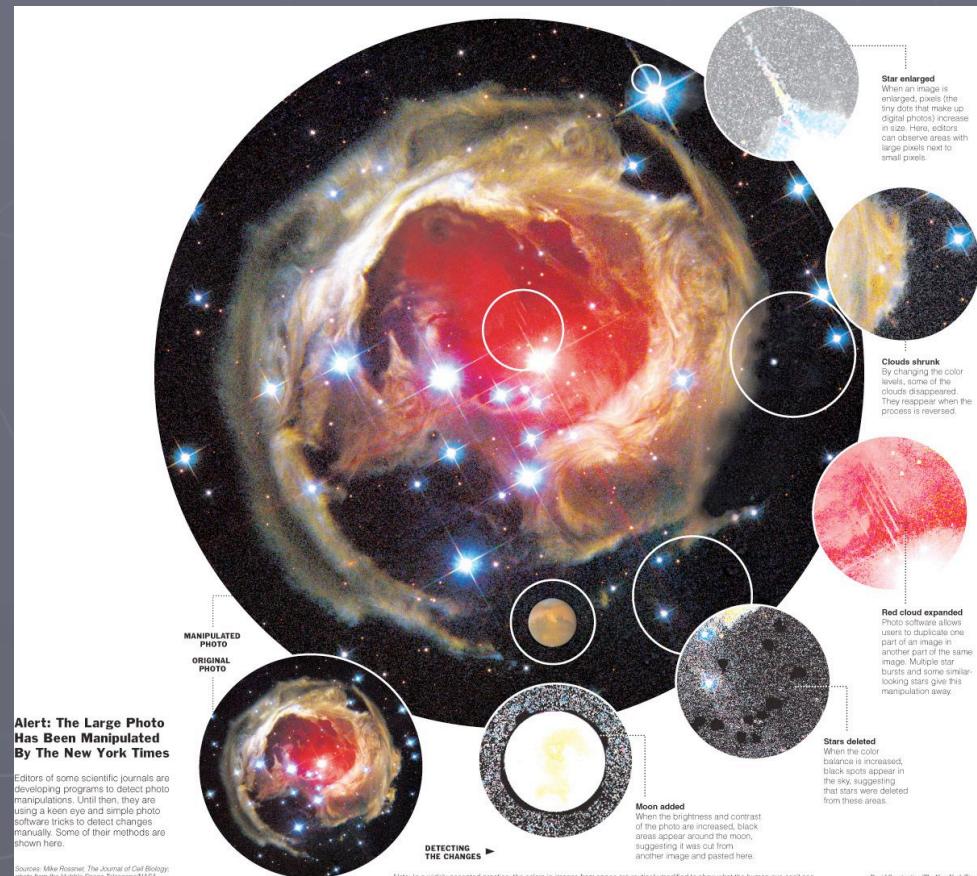


- 3** Cells from different images have been combined into a single image, giving the impression that they were present in the same microscope field.



To discover the manipulation, editors increased the photo's contrast. Black shapes appear around the three cells that were transplanted to this image.

Source: Mike Rossner; *The Journal of Cell Biology*



Derek Cianfanelli/The New York Times

Journalism



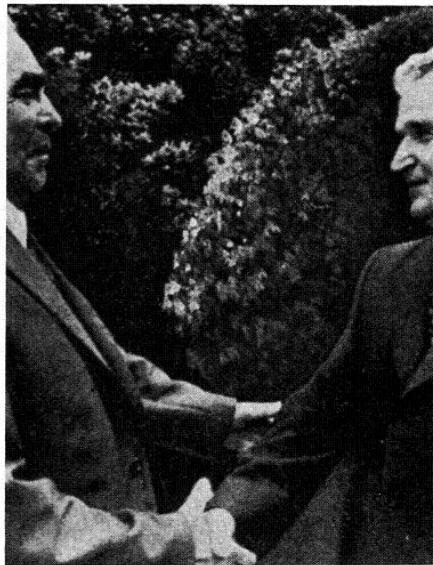
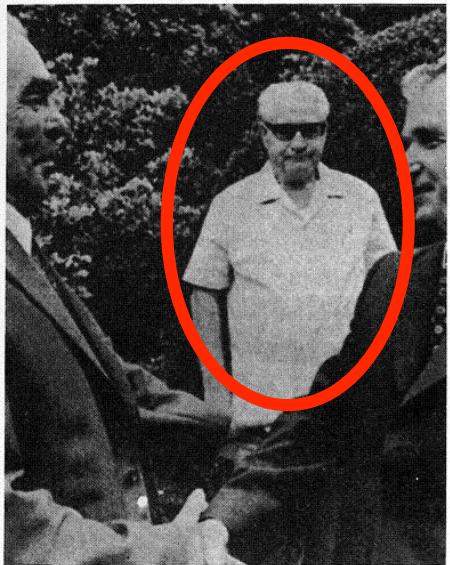
And more..



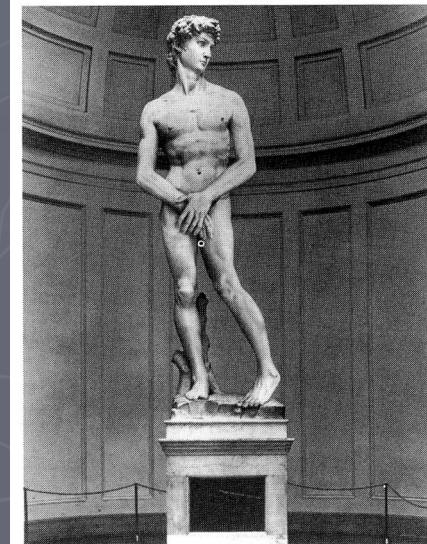
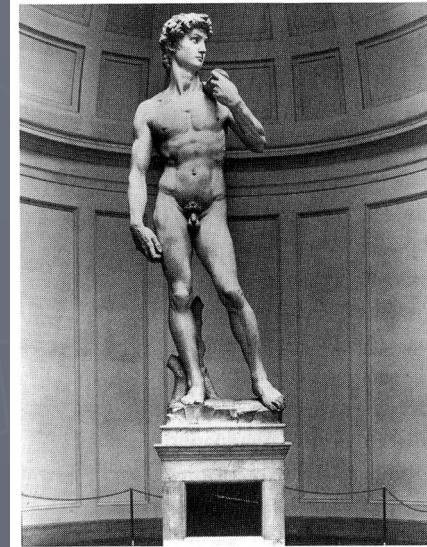
Photo Fakery

- ▶ By Dino Brugioni
 - Founder of CIA's Photo Interpretation Center
- ▶ Four types of Fakery
 - Deletion of Details
 - Insertion of Details
 - Photomontage
 - False Captioning

Deletion of Details



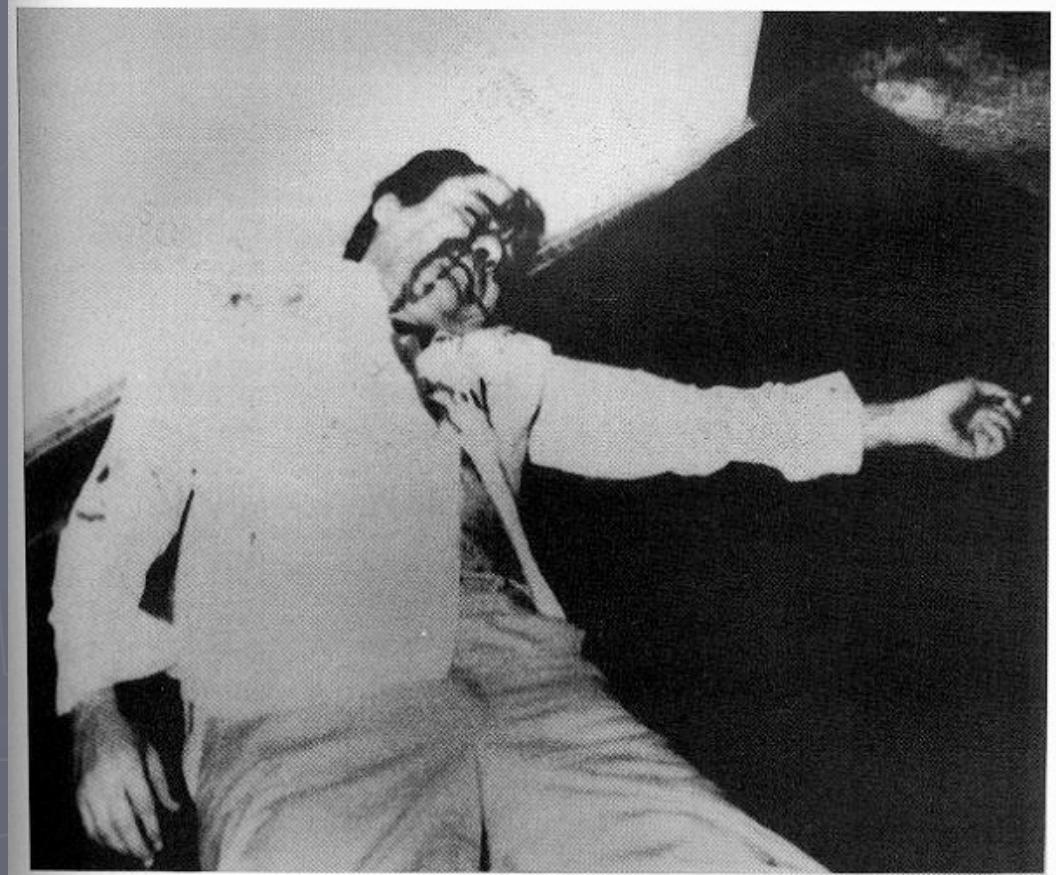
Insertion of Details



Photomontage

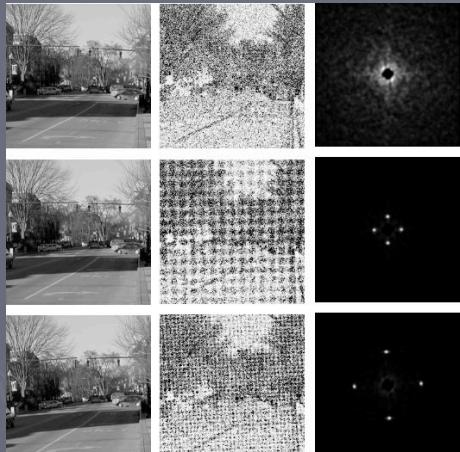


False Captioning



Previous Methods

- ▶ Signal-processing based approaches



Alin Popescu and Hany Farid '05



Fridrich et al. '03



Digital Watermarking

- ▶ Deletion & Insertion
- ▶ state-of-the art image manipulation & texture synthesis technique
- ▶ Hard to apply to large database
- ▶ Requires original photos

Our pipeline



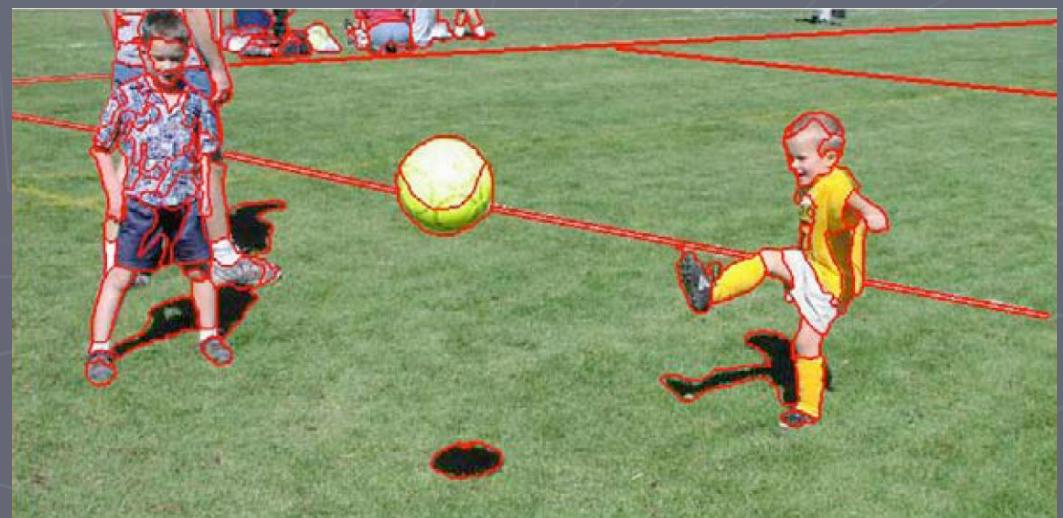
- Divide an image into small segments
- Define Region Of Importance

- Annotate ROI with semantic content
- Easy to apply Reasoning

- Resolve local ambiguities
- Reason large corpora of images

Segmentation

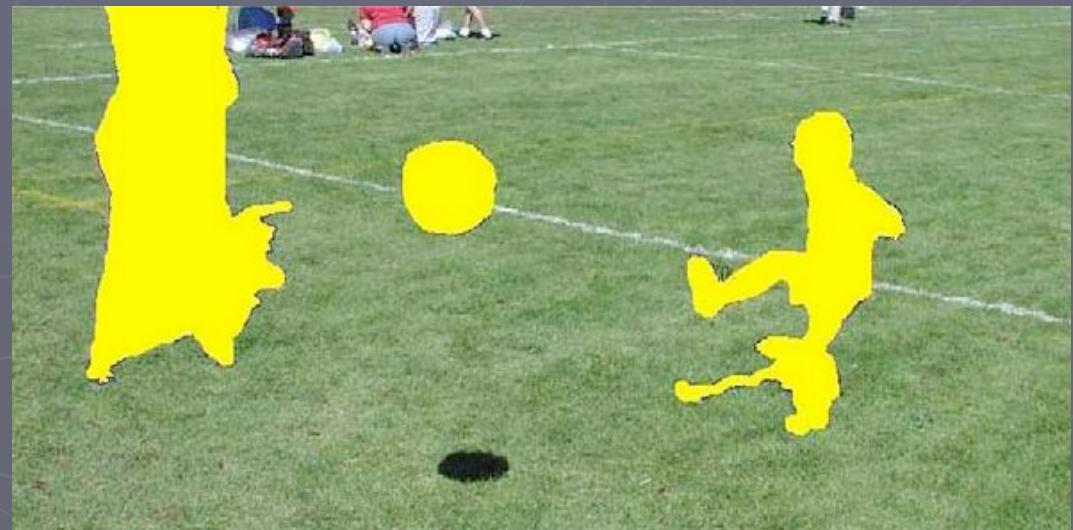
- ▶ Divide image into segments
 - color, proximity, and size
- ▶ Over-segment using low-value parameters
- ▶ Segment merging using color histogram



Region of Importance

- ▶ Importance Map
 - Visual saliency
 - Specific objects (face, sign)
 - User input

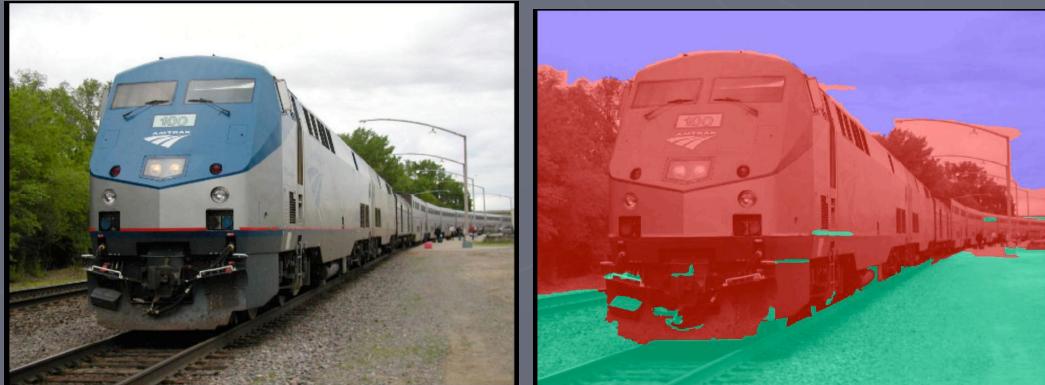
- ▶ Regions of Importance
 - Grow segments based on image intensity



Classification & Reasoning

► Classification via training

- Color
- Location
- Shape

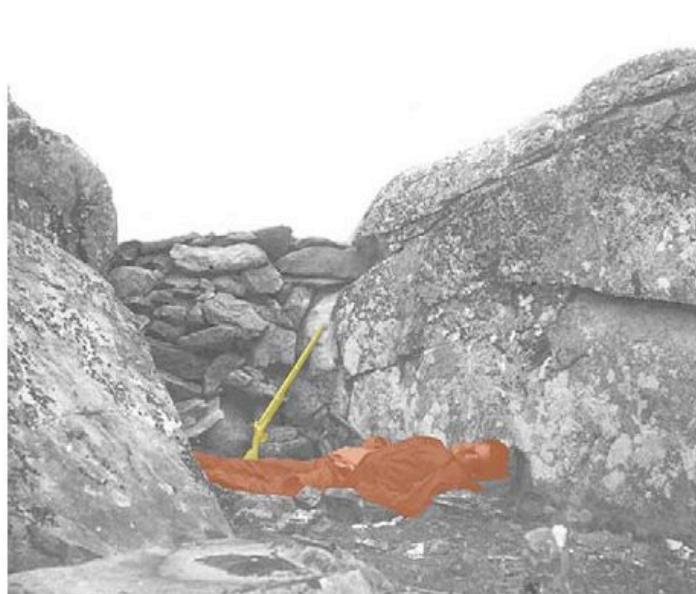


► Common-sense knowledge base

- Sky is above the sea
- Buildings are larger than cars
- Planes are runways or in the air

Author	Knowledge
anaitis	You can use a theater ticket to enter a show
push	You can use paper to write a letter
jlquelch	Something you might do while drowning is gasp for air
TedSwart	You are likely to find butterflies in a butterfly bush
JakeNelson	Something you find at a train station is schedules
phraughy	If you want to see something new then you should go to an innovative store.
Motev	An activity a bird can do is feed worms to its young

Example



More problems



Thank you!

