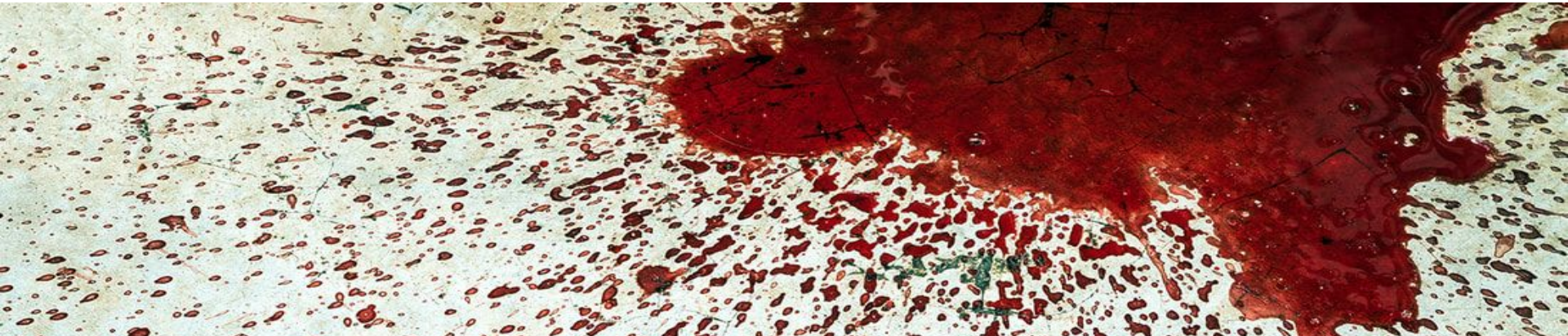
Blood Pattern Analysis (with neural networks!)

Team Splattern

Bloodstain Pattern Analysis (BPA)

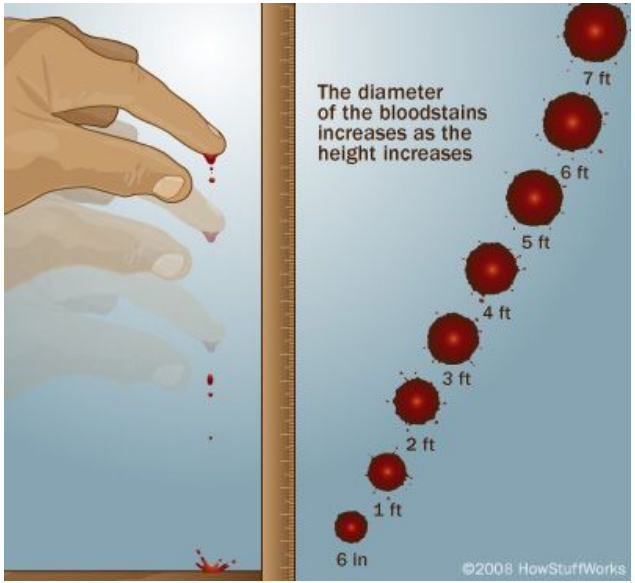
- Traditionally: only a few data sets available and reliant on human experience
- Our project explores what machine learning could do to help

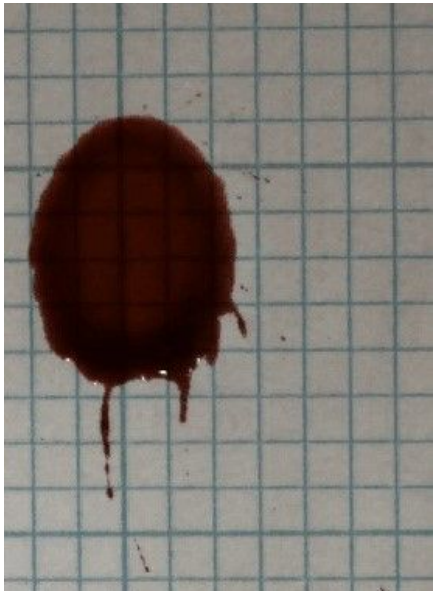


Focus on just predicting four types of blood pattern

1. Dropped
2. Impact spatter
3. Projection
4. Cast off

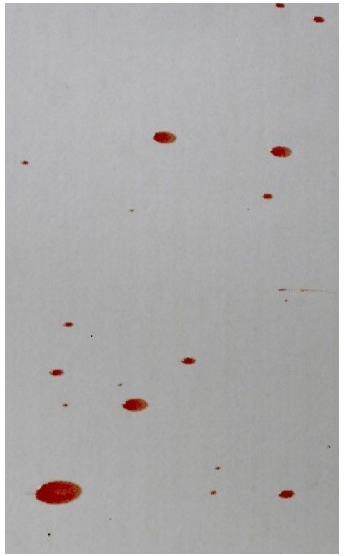
Dropped


The diameter of the bloodstains increases as the height increases
7 ft
6 ft
5 ft
4 ft
3 ft
2 ft
1 ft
6 in
©2008 HowStuffWorks

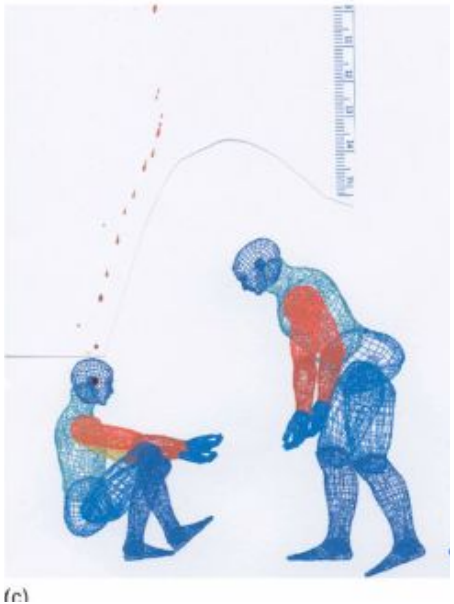


Impact Spatter

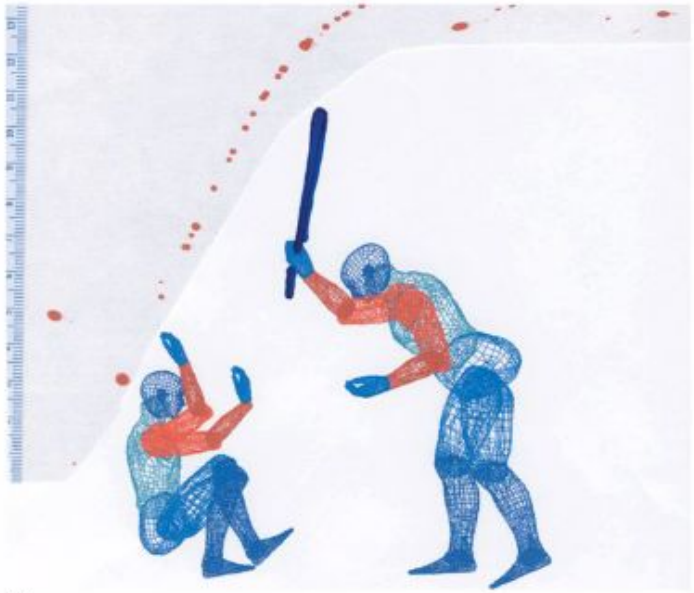
(a)



Projection (arterial spurt)



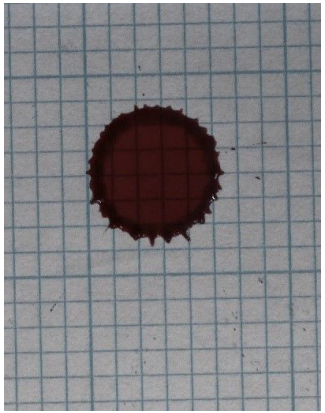
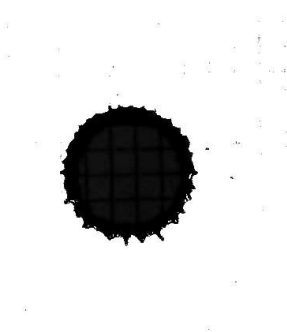
Cast Off



(b)

Data & Image Pre-Processing

- Open source video from academic research on bloodletting mechanisms - cast off, projections, gunshot, impact, spatter, airblow, drop, drop on drop
- Took the last frame of each video as our raw data
- Manual selection/cropping + automated image preprocessing

The Model

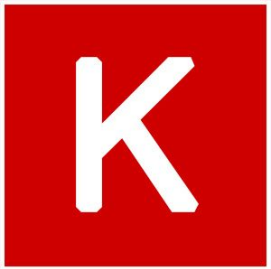
We used an image classifier model trained on million of images to tell the difference between cats and dogs.

Those models identify features in those images and associate features to either cats or dogs.

We ignore the classification and just take the features.

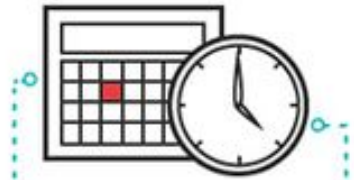
We do this for known blood splatter images and then compare them to unknown splatters to find the most similar.

Demo



WHAT BPA CAN DETERMINE

fig. 1

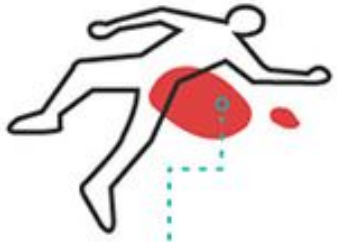


Date and time of crime

fig. 2

Type and velocity of weapon

fig. 3



Movements/position of those involved

fig. 4

If the assailant was left or right handed

fig. 5

Types of injuries dealt

fig. 6

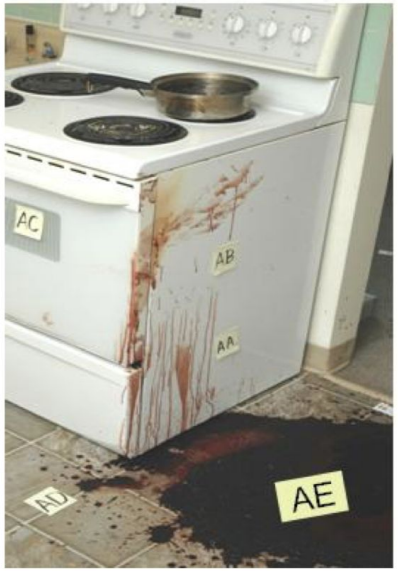
Whether death was immediate

Future prospect

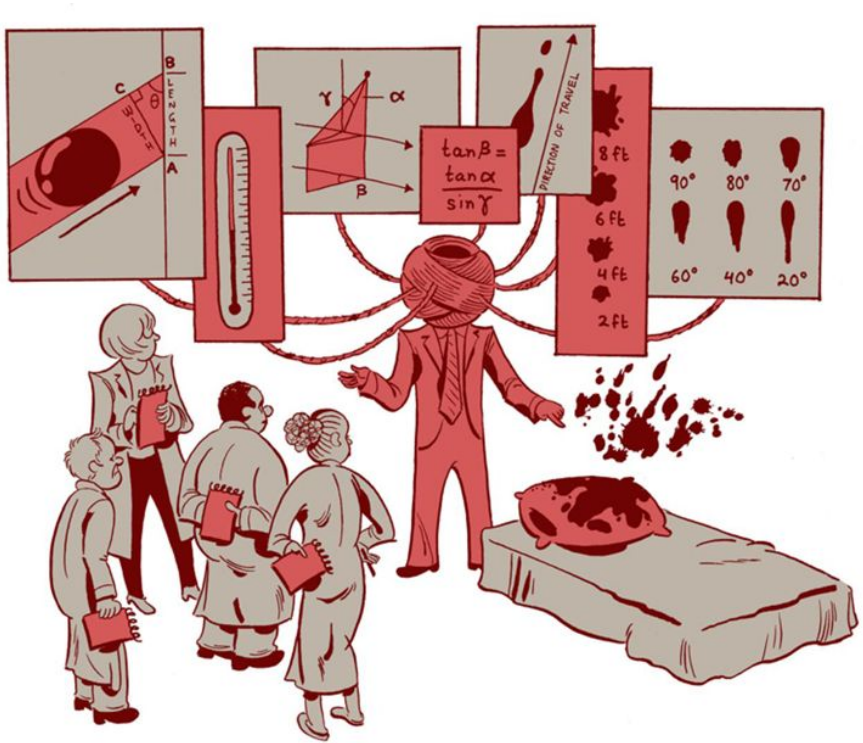
- Data projection
- Machine learning
- Fluid dynamics
- Improvement on BPA

Paper: ***Fluid dynamics topics in bloodstain pattern analysis: Comparative review and research opportunities***

https://core.ac.uk/download/pdf/38936183.pdf



Thank you.



Team
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code == open_source
https://github.com/john-sandall/splatterns/