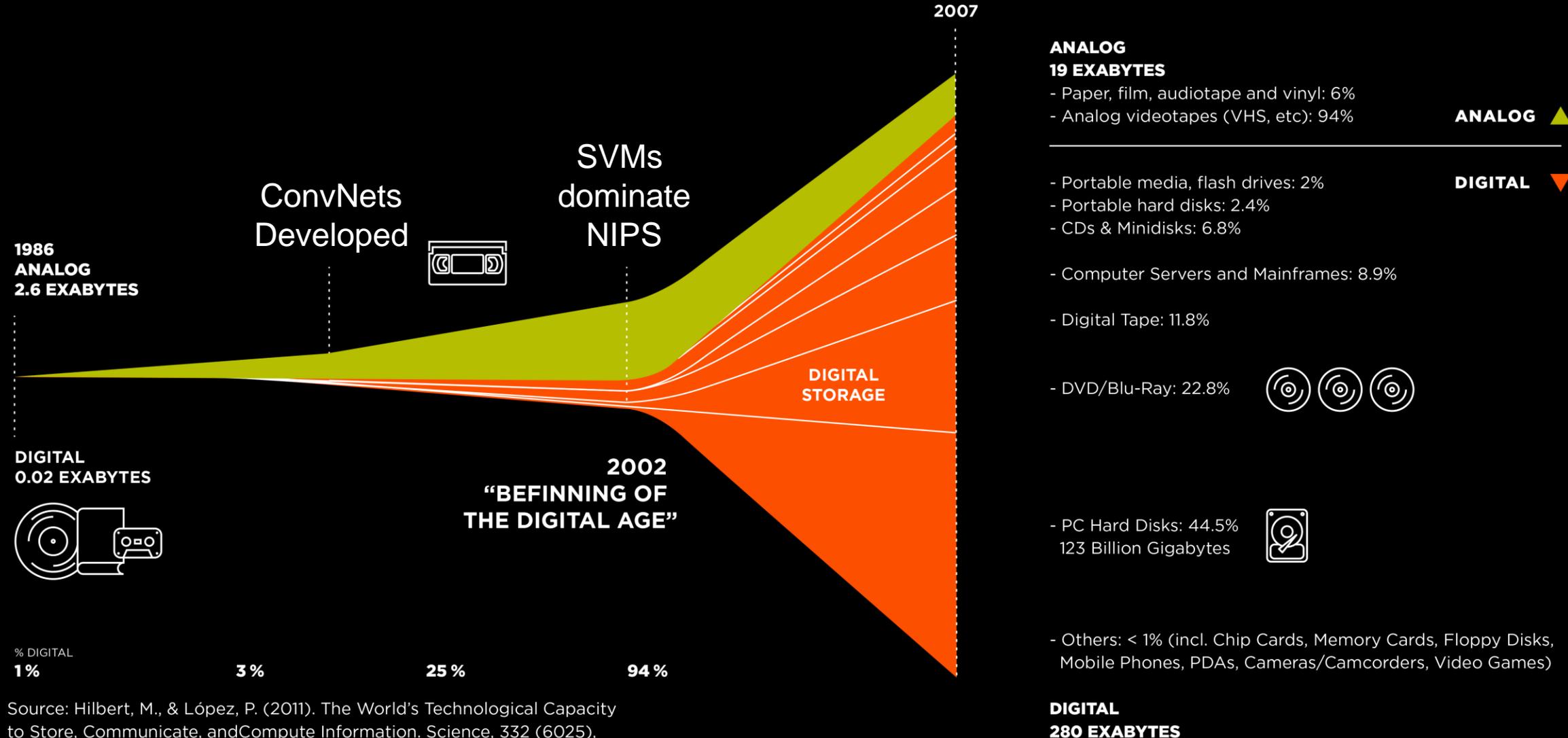


# The Data Delusion

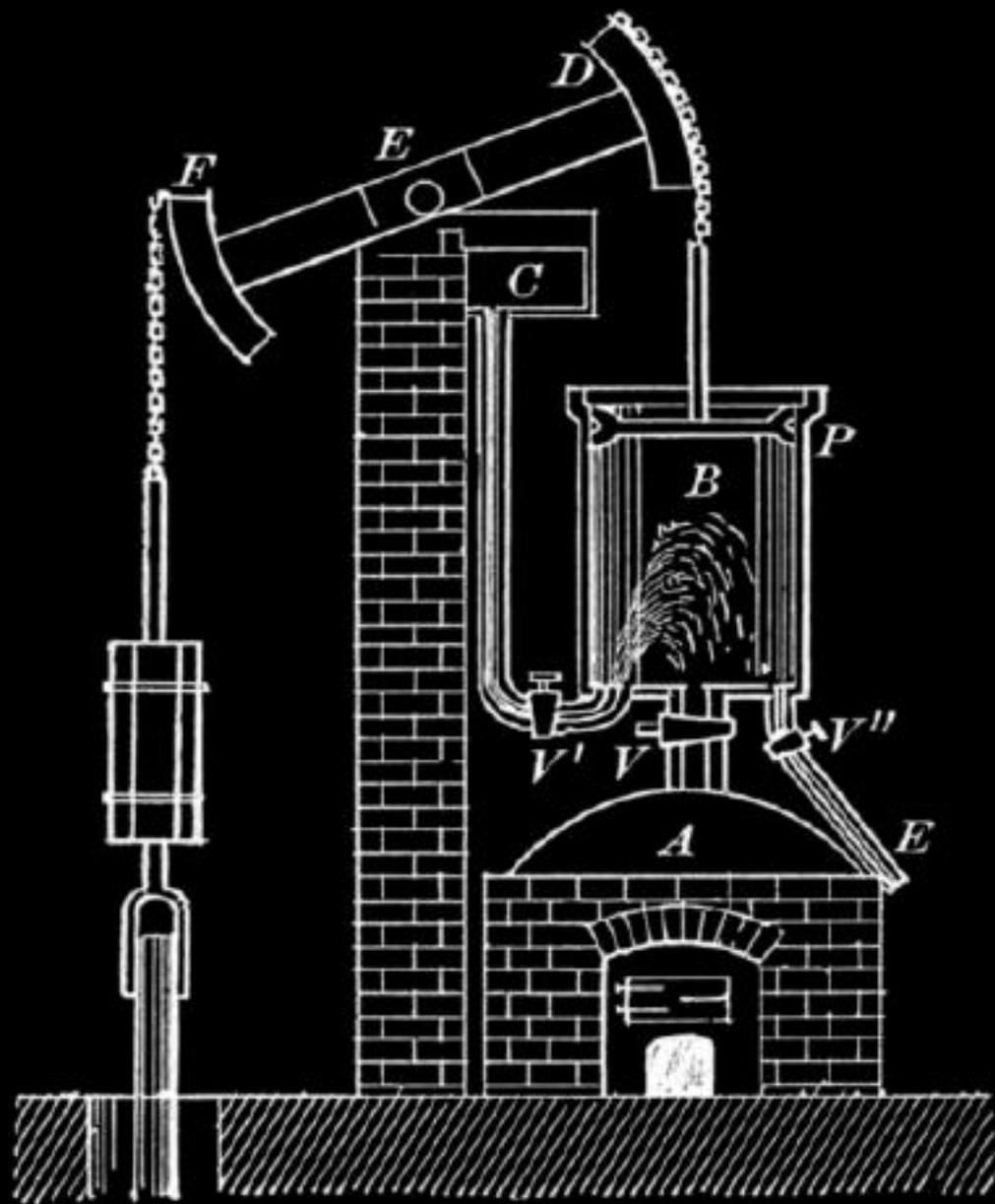
NEIL LAWRENCE

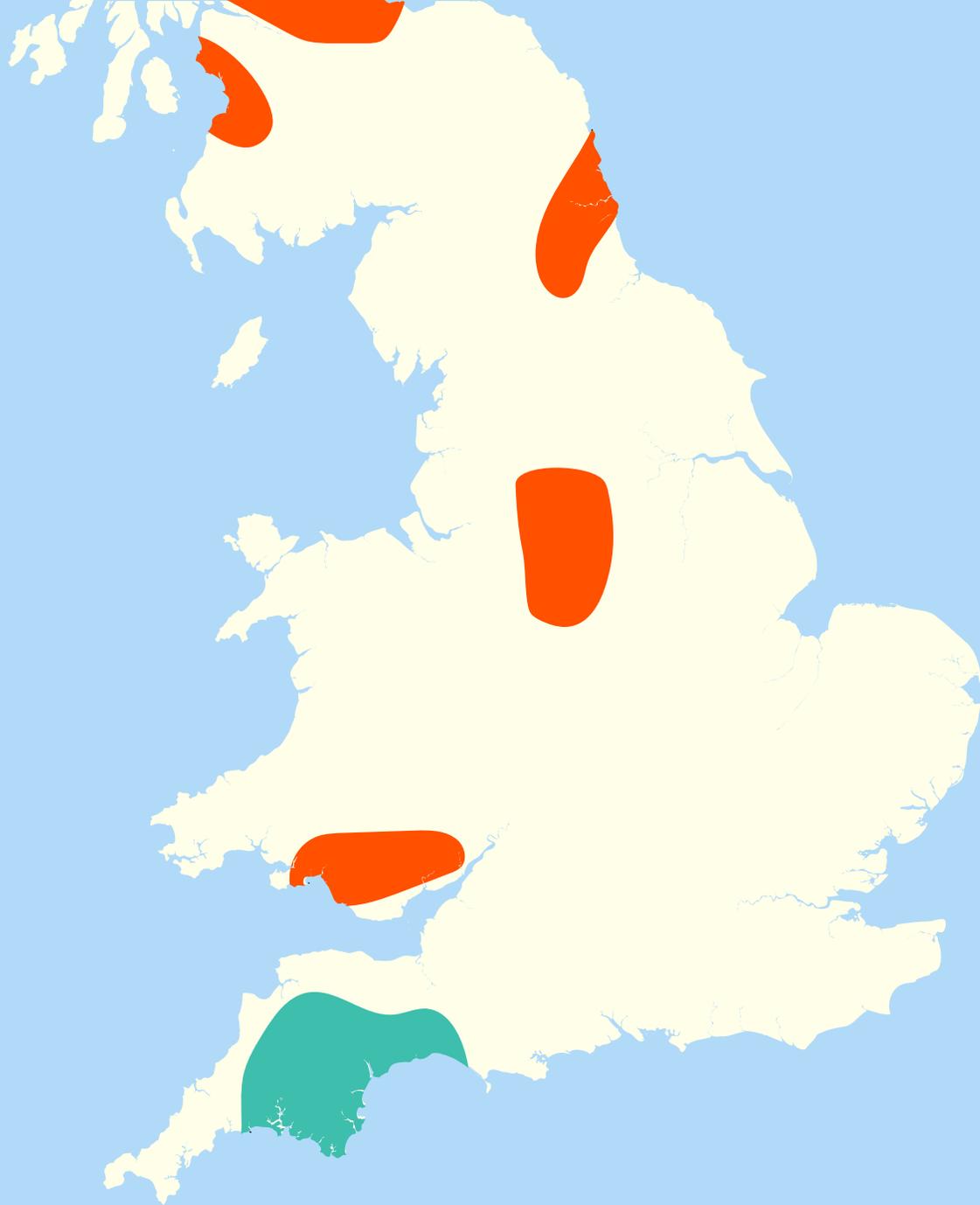
UNIVERSITY OF SHEFFIELD

# GLOBAL INFORMATION STORAGE CAPACITY IN OPTIMALLY COMPRESSED BYTES



Source: Hilbert, M., & López, P. (2011). The World's Technological Capacity to Store, Communicate, and Compute Information. Science, 332 (6025), 60-65. [martinhilbert.net/worldinfocapacity.html](http://martinhilbert.net/worldinfocapacity.html)



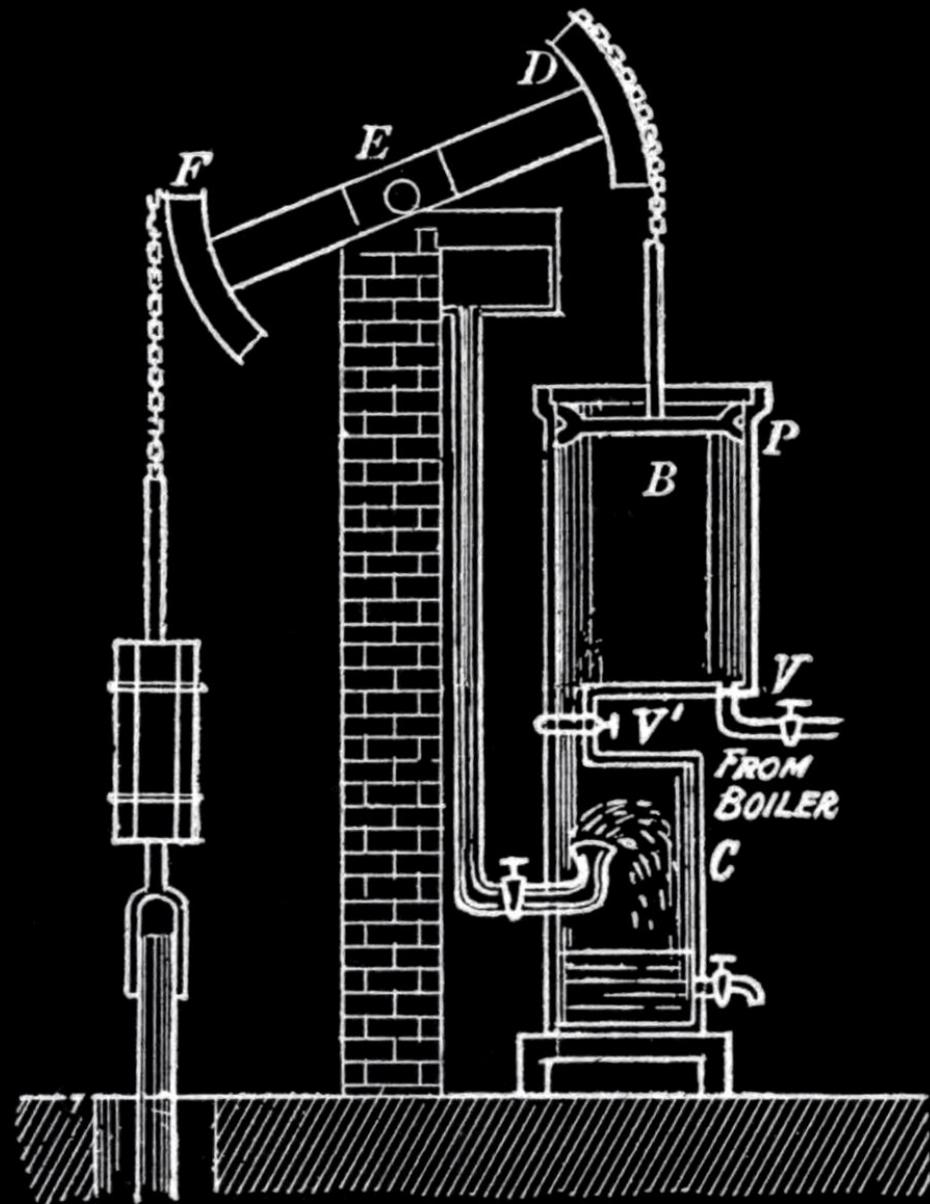


**Google**  
Facebook  
Amazon

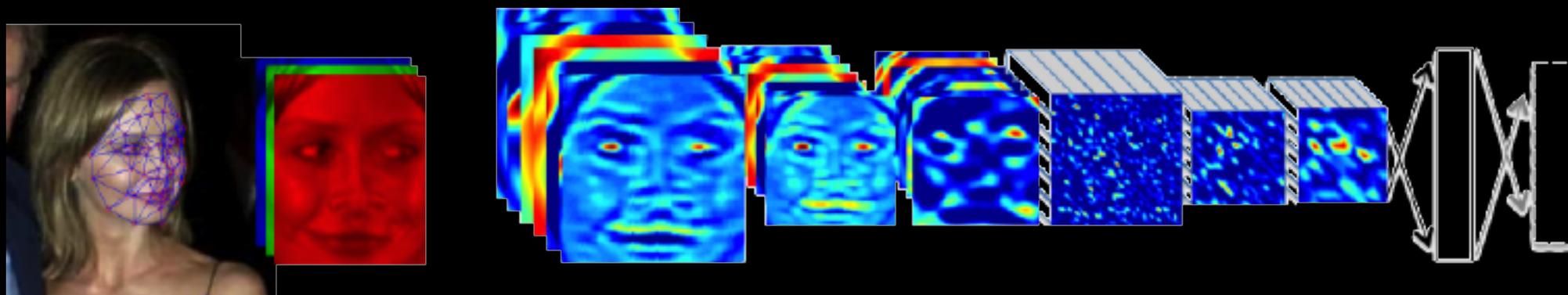


**Startups**



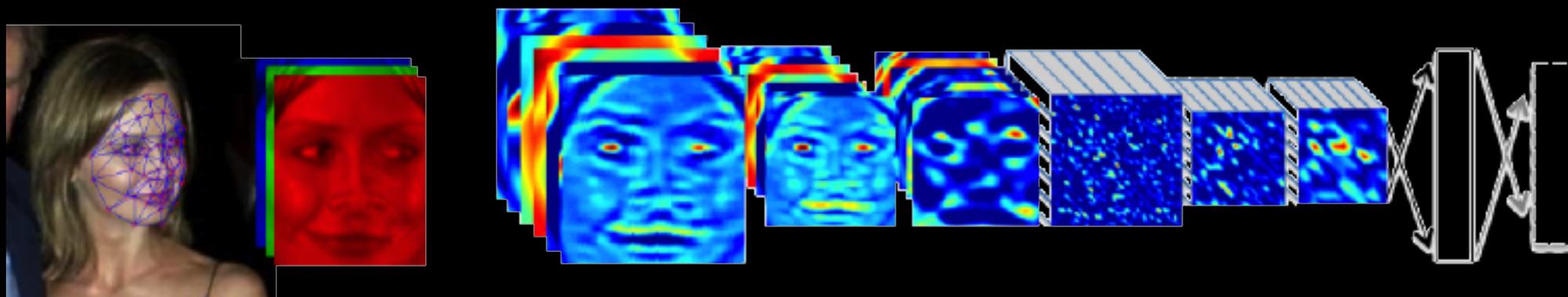


Outline of the DeepFace architecture. A front-end of a single convolution-pooling-convolution filtering on the rectified input, followed by three locally-connected layers and two fully-connected layers. Color illustrates feature maps produced at each layer. The net includes more than 120 million parameters, where more than 95% come from the local and fully connected layers.



Source: DeepFace

$g(x)$



$f_1(x)$     $f_2(\cdot)$     $f_3(\cdot)$     $f_4(\cdot)$     $f_5(\cdot)$     $f_6(\cdot)$     $f_7(\cdot)$     $f_8(\cdot)$     $f_9(\cdot)$

$$g(x) = f_9(f_8(f_7(f_6(\dots))))$$

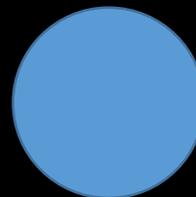
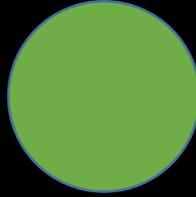
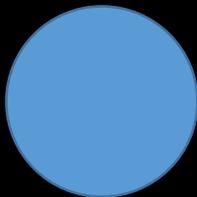


$$\mathbf{f}_g(\mathbf{h}) = \begin{bmatrix} \phi(\sum_i w_{1i} h_i) \\ \phi(\sum_i w_{2i} h_i) \\ \vdots \\ \phi(\sum_i w_{ki} h_i) \end{bmatrix}$$

$$\mathbf{f}_9(\mathbf{h}) = \phi(\mathbf{W}\mathbf{h})$$

$$\mathbf{W} \in \mathfrak{R}^{k_8 \times k_9}$$

$\mathbf{x}$



$\phi(\mathbf{W}_1 \mathbf{x}_1)$



$\phi(\mathbf{W}_2 \mathbf{h}_1)$



$\phi(\mathbf{W}_3 \mathbf{h}_2)$

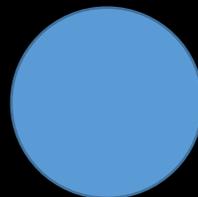
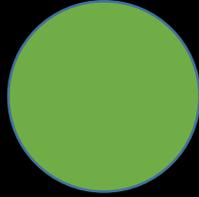
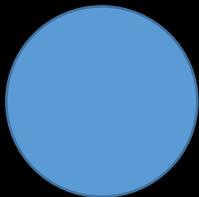


$\mathbf{y}$

Yes

No

$\mathbf{x}$



$\phi(\mathbf{W}_1 \mathbf{x}_1)$



$\phi(\mathbf{W}_2 \mathbf{h}_1)$



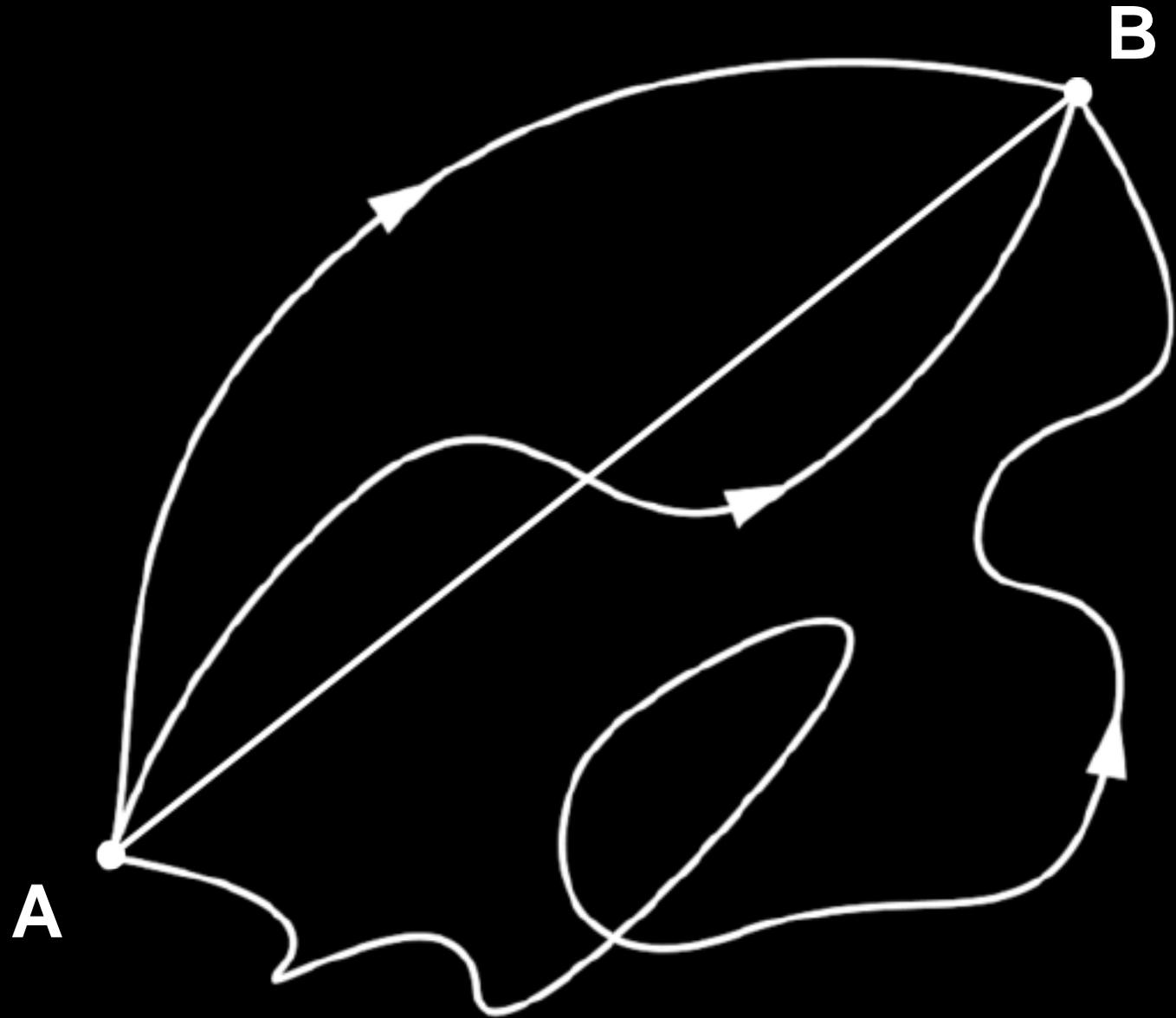
$\phi(\mathbf{W}_3 \mathbf{h}_2)$

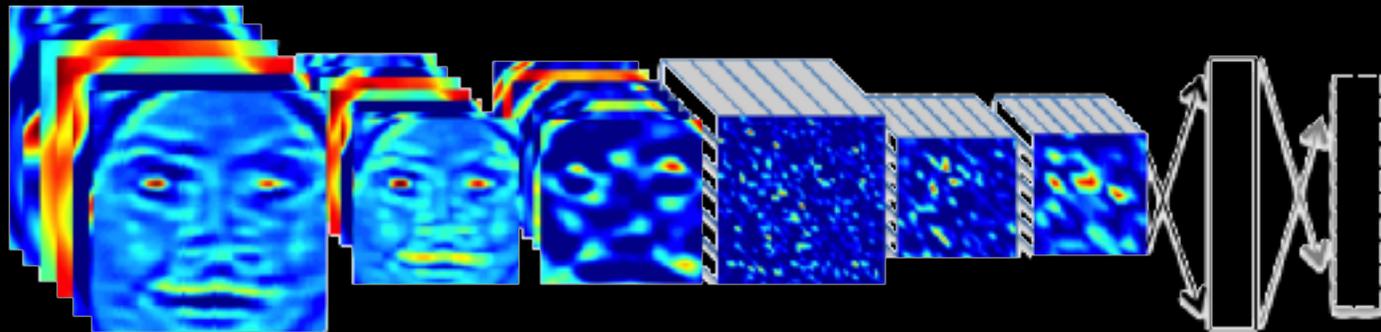
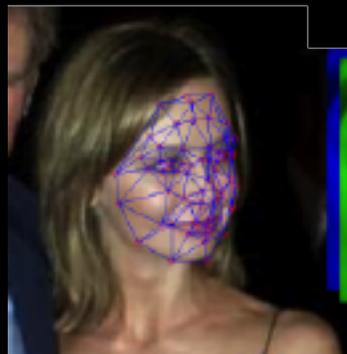


$\mathbf{y}$

Yes

No

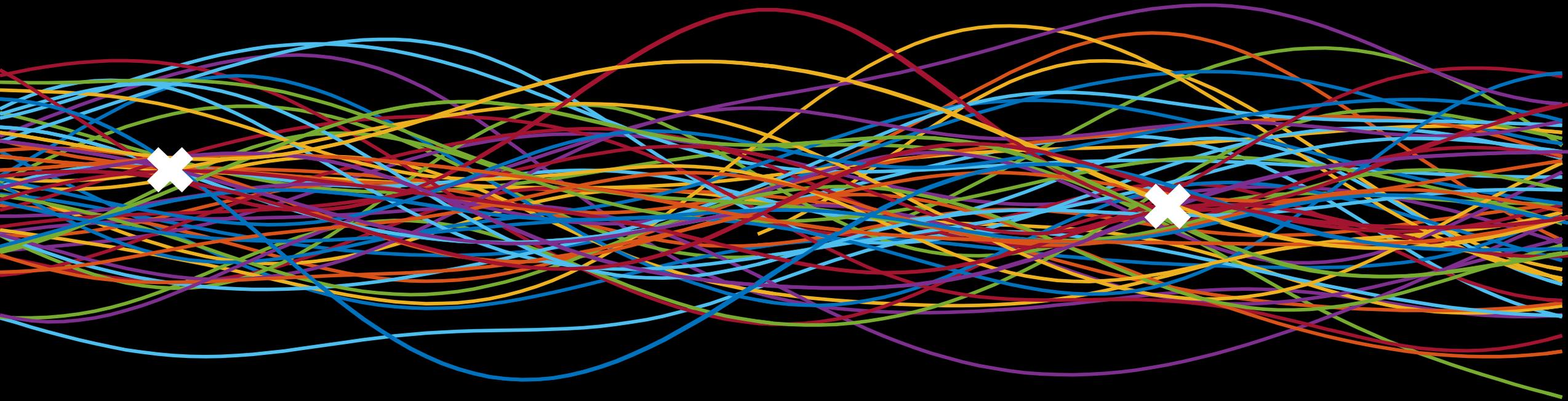


$g(x)$ 

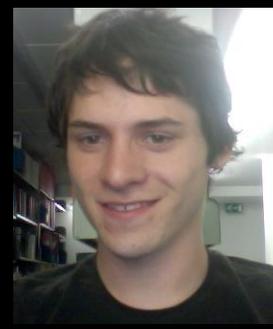
$$\frac{dg(x)}{dx}$$

$$\int g(x)p(x)dx$$

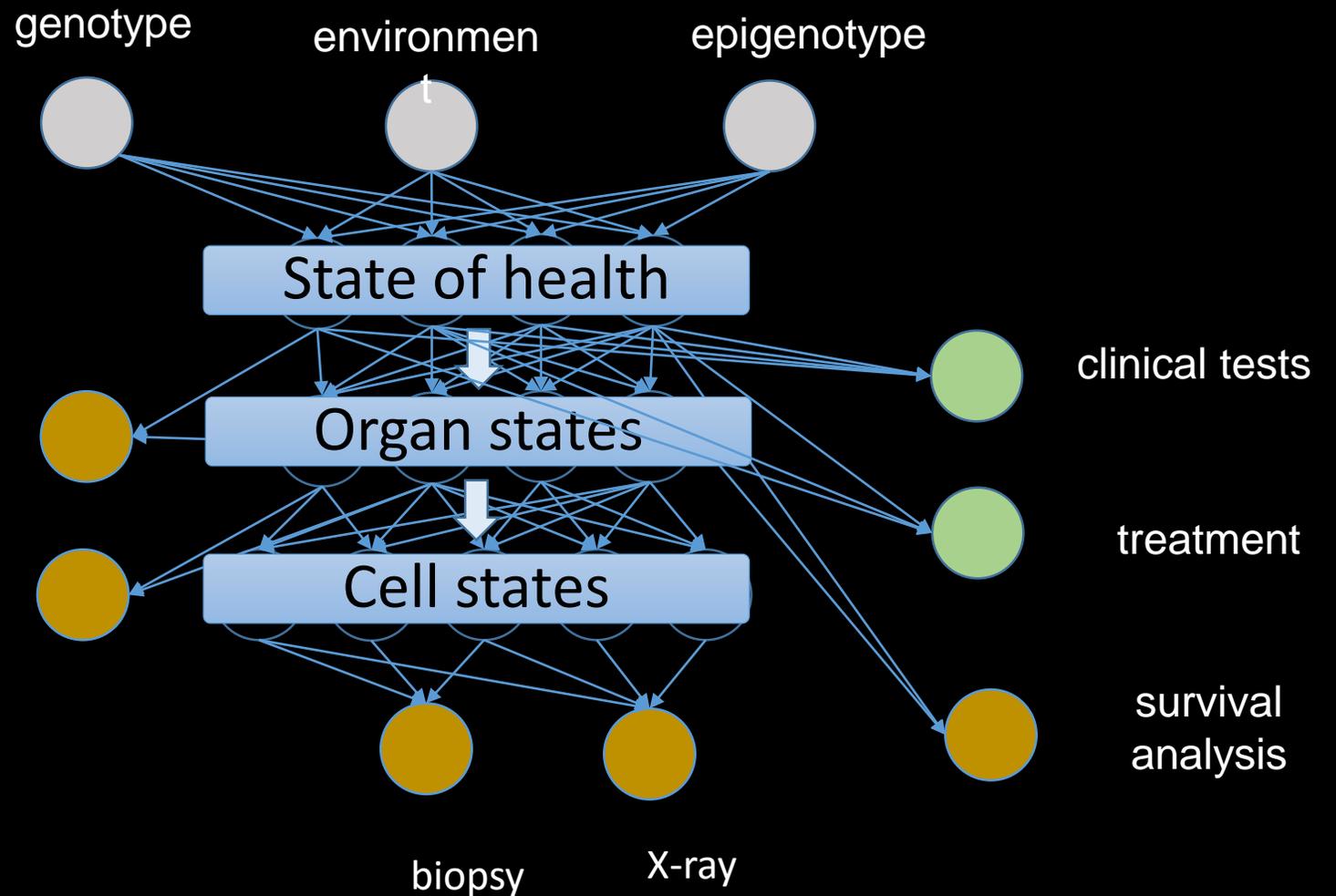
# Gaussian Processes

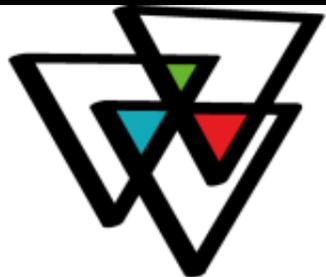


# Health



- Complex system
- Scarce data
- Different modalities
- Poor understanding of mechanism
- Large scale

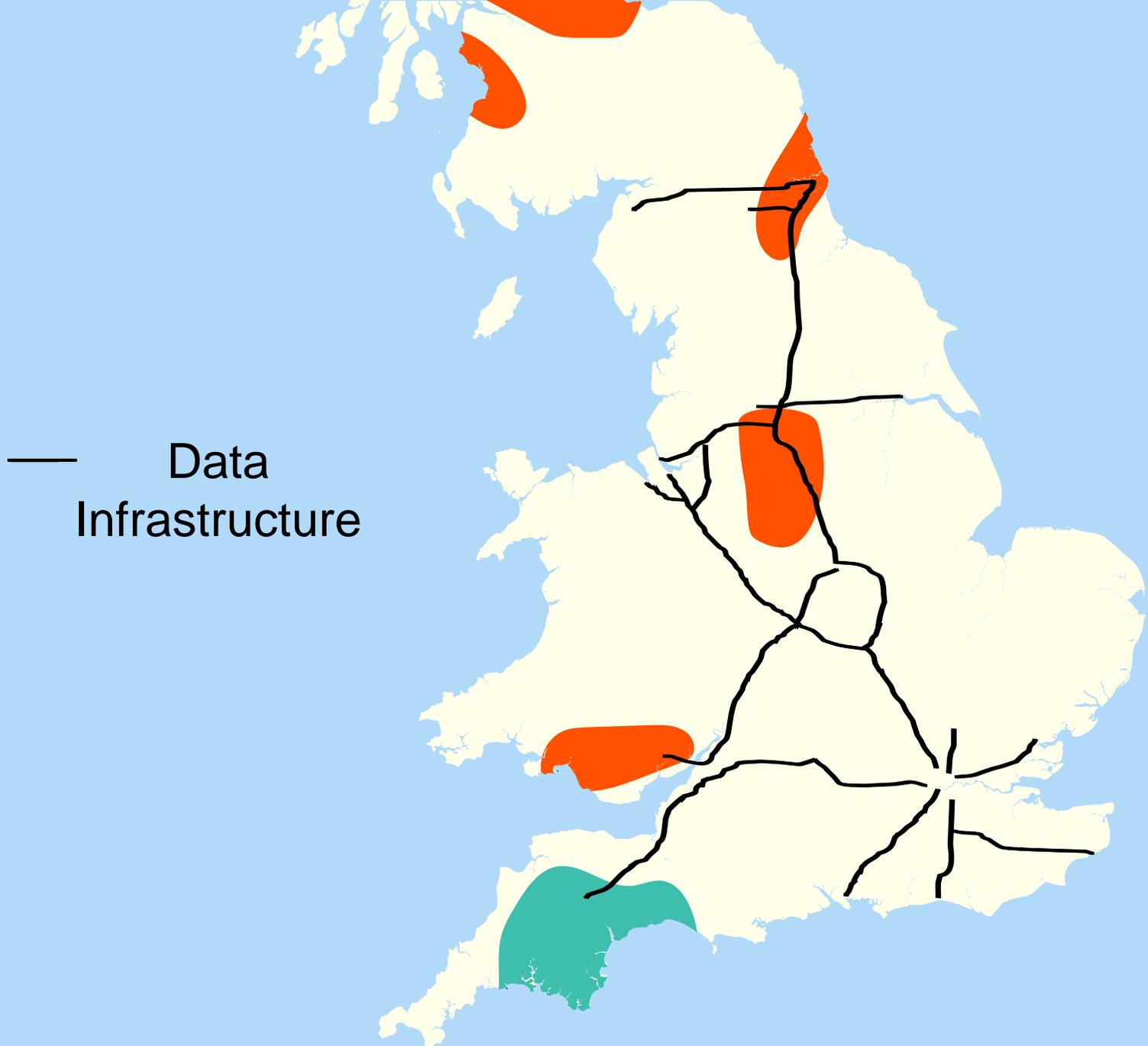




# Inferentia

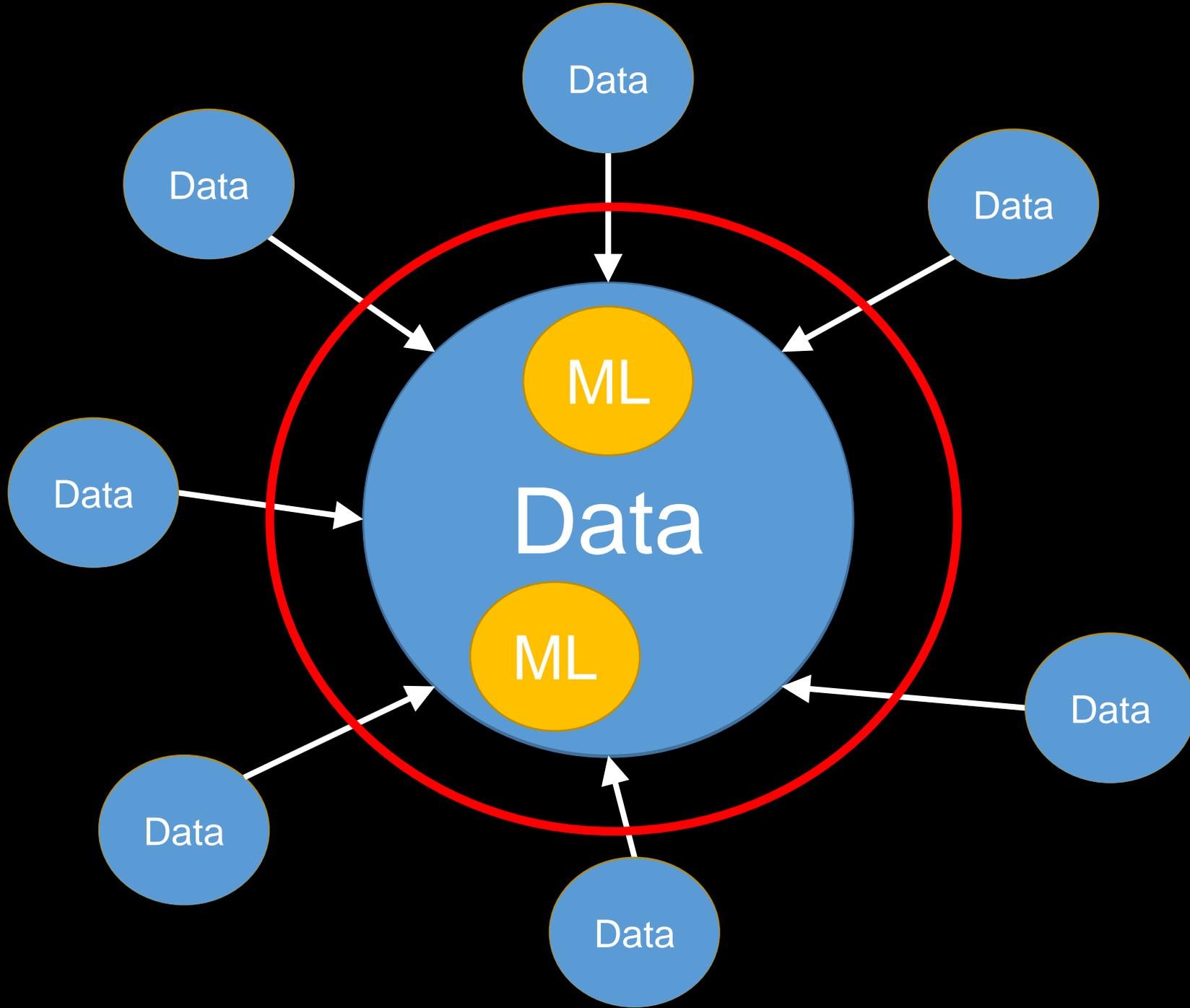
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Challenging Uncertainty



— Data Infrastructure

- Google  
Facebook  
Amazon
- Startups



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TRUST**

Thank you

Neil Lawrence

<http://inverseprobability.com>

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