

# Machine Learning to Predict Diabetic Retinopathy

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 @Ritwik\_G

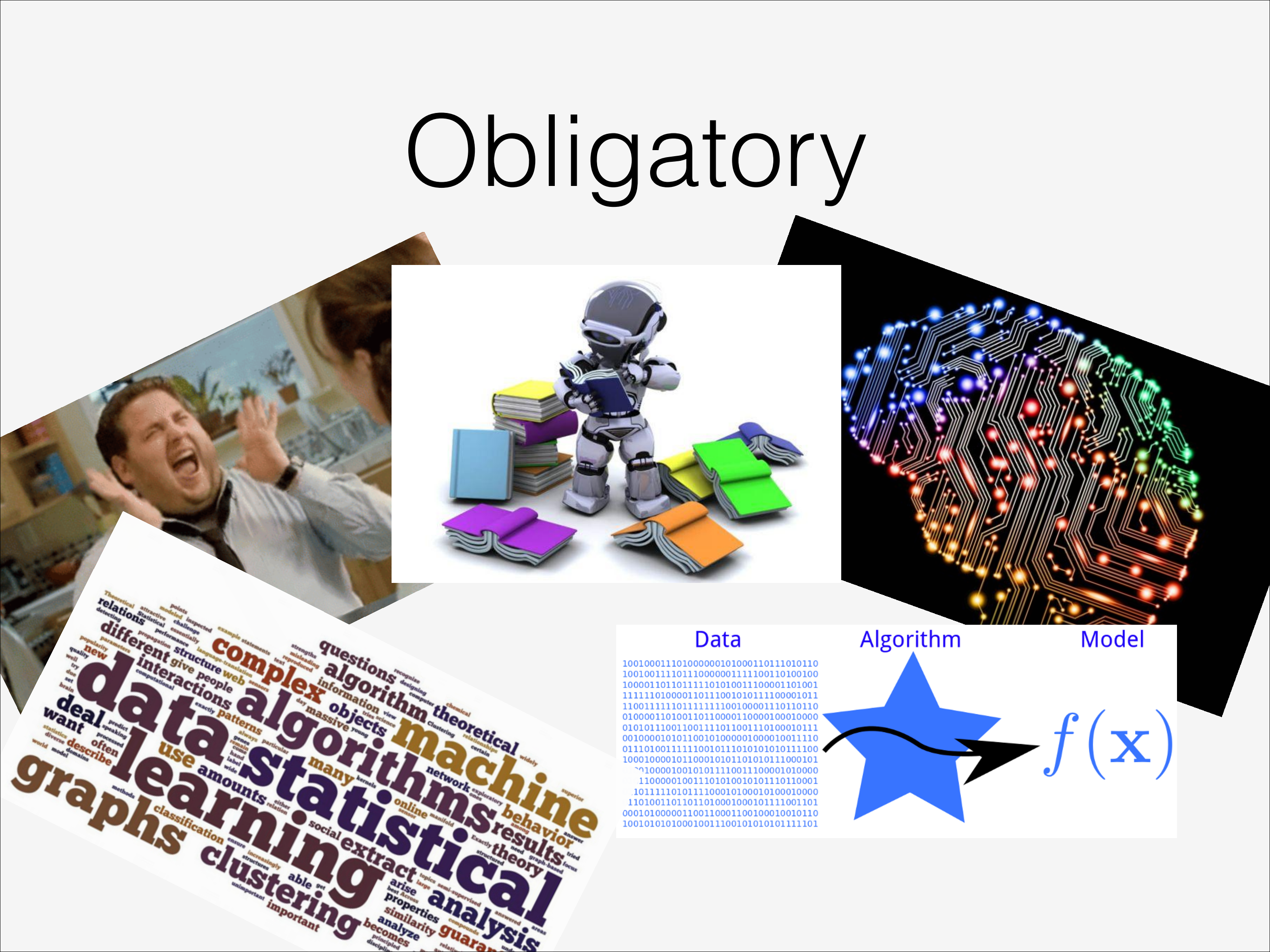
[illegible]

Diagram illustrating the relationship between Data, Algorithm, and Model:

**Data** (represented by a binary string) is input to an **Algorithm** (represented by a blue star), which produces a **Model** (represented by the function  $f(\mathbf{x})$ ).

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100100111101110000001111100110100100
100001101101111101010011100001101001
111111010000110111001010111100001011
1100111110111111100100001110110110
010000110100110110000110000100010000
01010110011001111011001110100010111
001000010101100101000001000010011110
011101001111110010111010101010111100
100010000101100010101101010111000101
110000100101011110011100001010000
1100000100111010100101011101100001
101111101011100010100010100010000
1101001101101101010001000101111001101
000101000001100110001100100010010110
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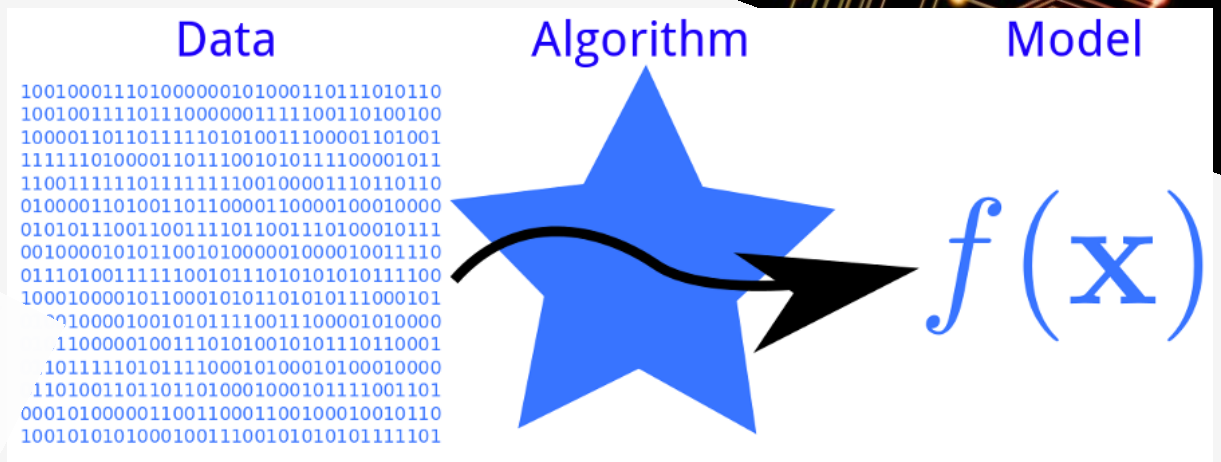


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100010000101100010101101010111000101
110000100101011110011100001010000
1100000100111010100101011101100001
101111101011100010100010100010000
1101001101101101010001000101111001101
000101000001100110001100100010010110
100101010100010011100101010101111101
```

# What is ML

Do the activity

# What is ML (cont.)

$$F \begin{bmatrix} \text{blue} & \text{red} \\ \text{orange} & \text{blue} \\ \text{blue} & \text{orange} \\ \text{blue} & \text{blue} \\ \text{blue} & \text{green} \\ \text{orange} & \text{red} \end{bmatrix} = \begin{bmatrix} 6 \\ 2 \\ 3 \\ 1 \end{bmatrix}$$

# What is ML (cont.)

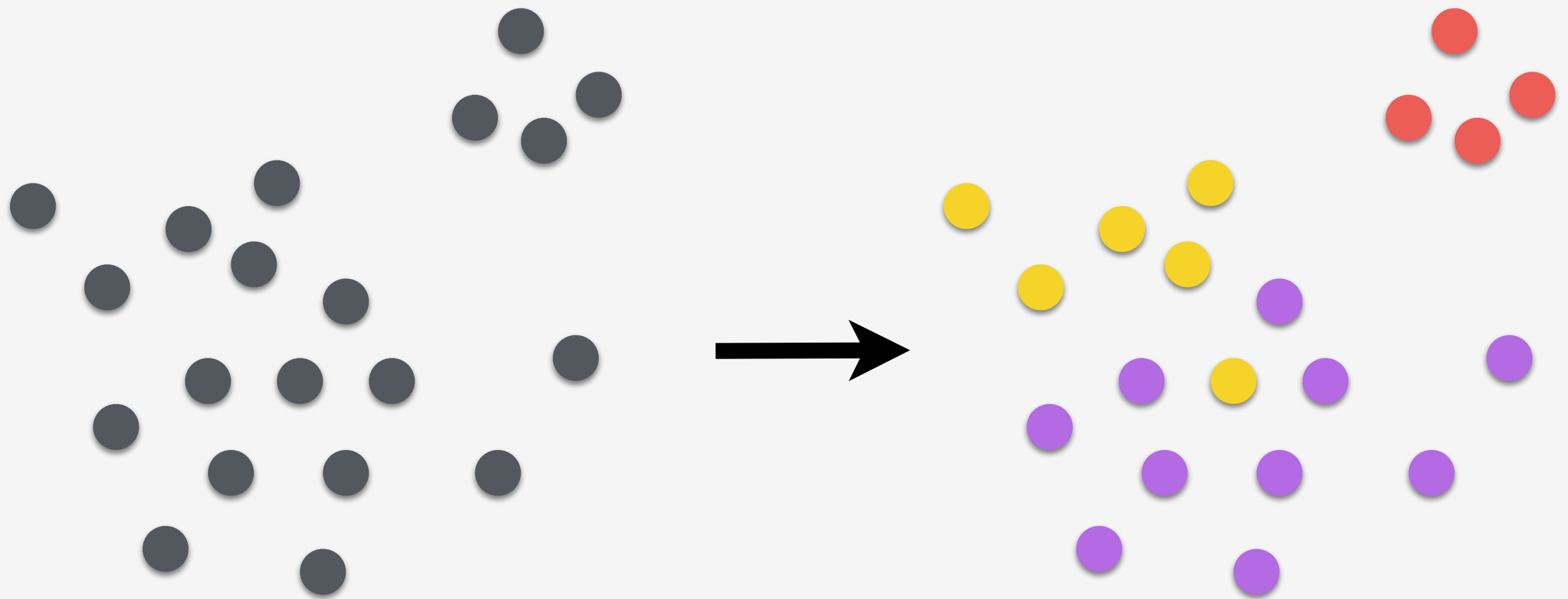
$$\hat{F} \left[ \begin{array}{c} 3 \\ 7 \\ 2 \\ 0 \end{array} , \begin{array}{cc} \begin{array}{c} \text{blue} \\ \text{orange} \\ \text{red} \\ \text{red} \\ \text{blue} \\ \text{red} \end{array} & \begin{array}{c} \text{red} \\ \text{blue} \\ \text{red} \\ \text{red} \\ \text{orange} \\ \text{red} \end{array} \end{array} \right] \cong F$$

# Types of Problems

# Supervised Learning

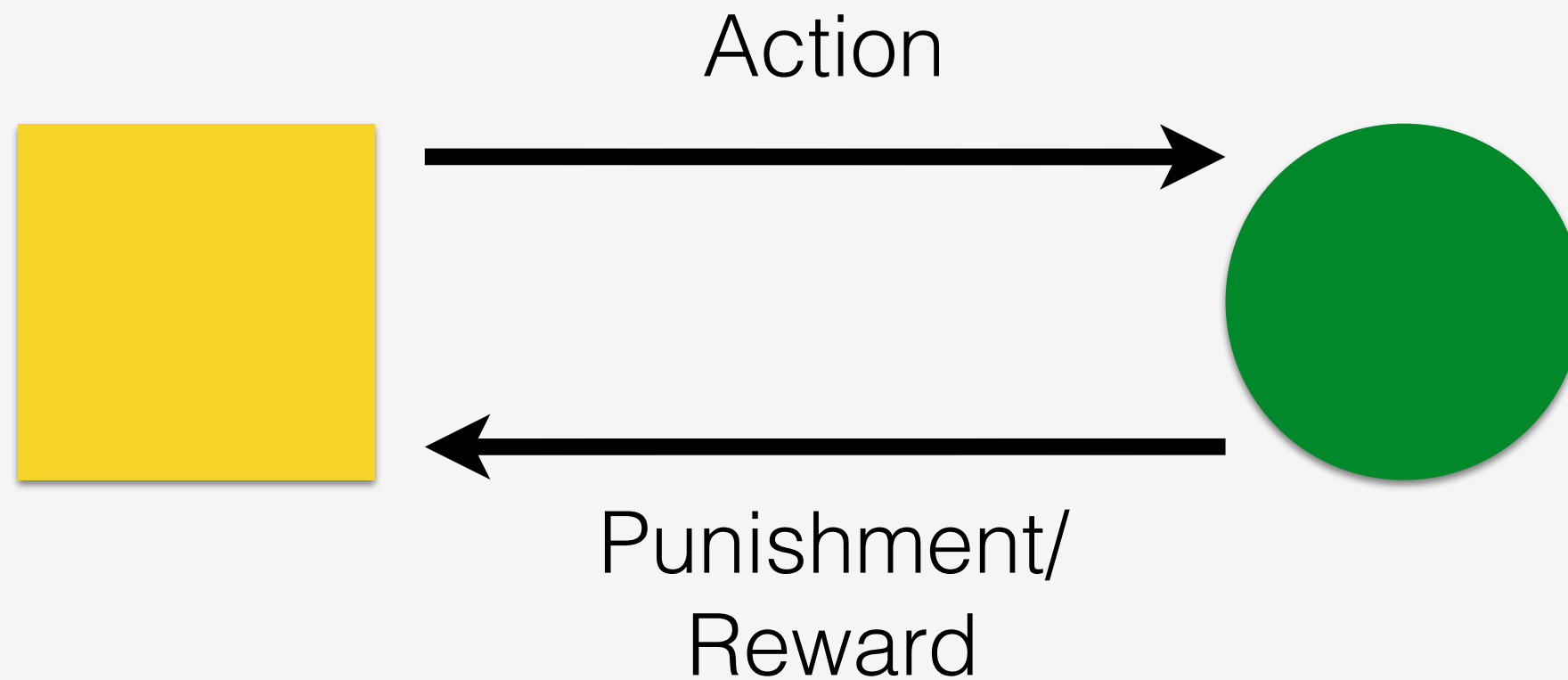


# Unsupervised Learning



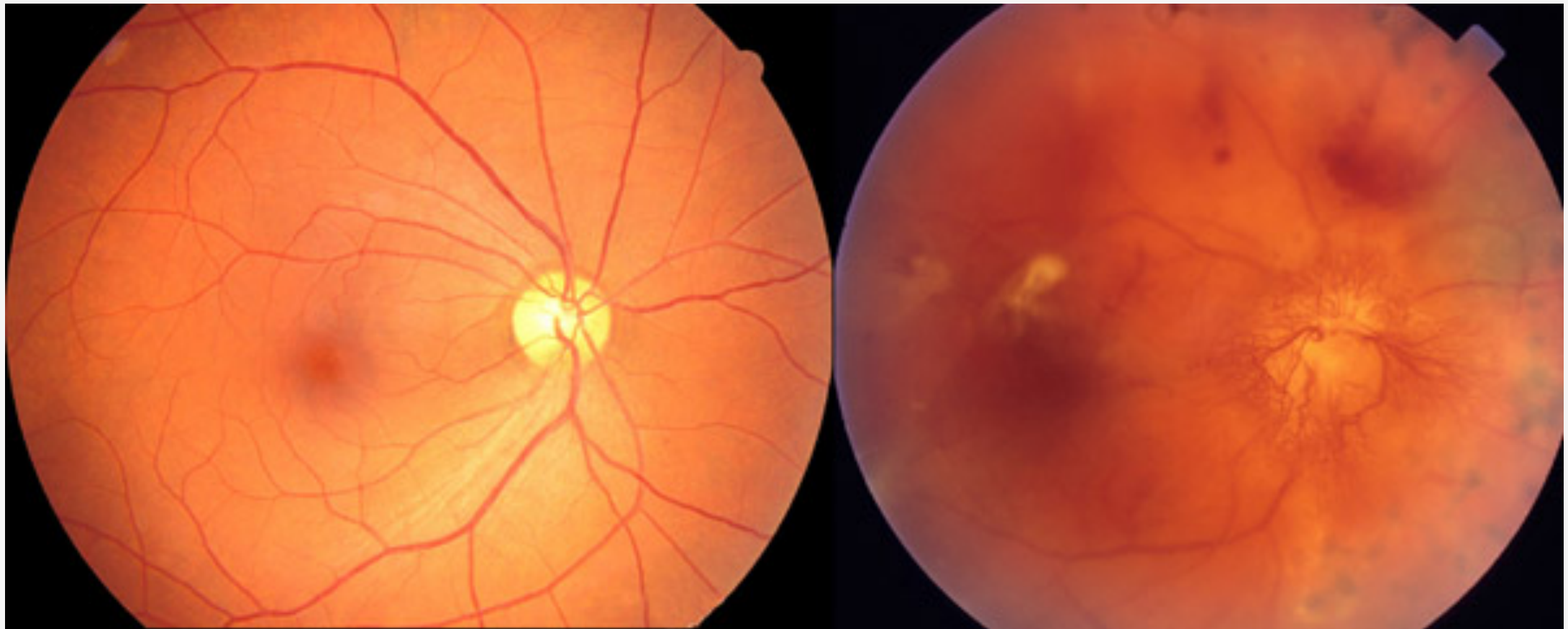


# Reinforcement Learning



\*very simplistic image

# Diabetic Retinopathy



# Diabetic Retinopathy



Mild/Moderate



Proliferative

No DR

Mild DR

Moderate DR

Severe DR

Proliferative DR

# Diabetic Retinopathy



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## Development and Validation of a Deep Learning Algorithm for Detection of Diabetic Retinopathy in Retinal Fundus Photographs

Venue

*JAMA* (2016)

Publication Year

2016

Abstract



Importance: Deep learning is a family of computational methods that allow an algorithm to program itself by learning from a large set of examples that demonstrate the desired behavior, removing the need to specify rules explicitly. Application of these methods to medical imaging

# Acknowledgements

- Thanks to the UCI Machine Learning Repository for the DR data
- All images from Google Images