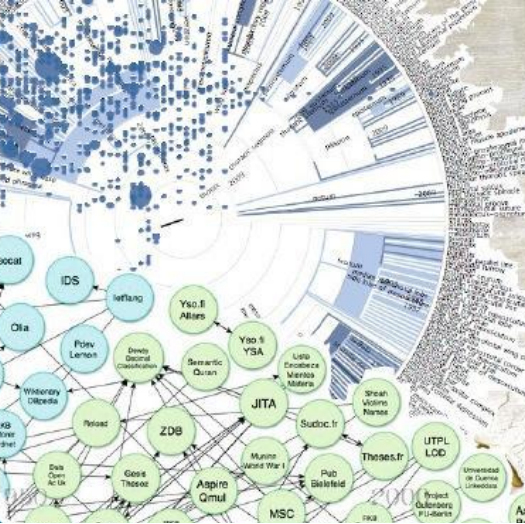




5.1 A Brief History of AI



HPI Hasso Plattner Institut



1

Information Service Engineering

Lecture 5: Basic Machine Learning

5.1 A Brief History of AI

5.2 Introduction to Machine Learning

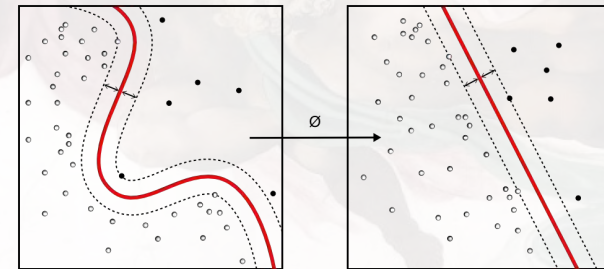
5.3 Evaluation and Generalization Problems

5.4 Basic ML Algorithms

5.5 Basic ML Algorithms II

5.6 Unsupervised Learning

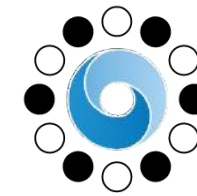
5.7 Deep Learning



AlphaGo Zero: Google DeepMind supercomputer learns 3,000 years of human knowledge in 40 days



17



AlphaGo



<http://www.telegraph.co.uk/science/2017/10/18/alphago-zero-google-deepmind-supercomputer-learns-3000-years/>



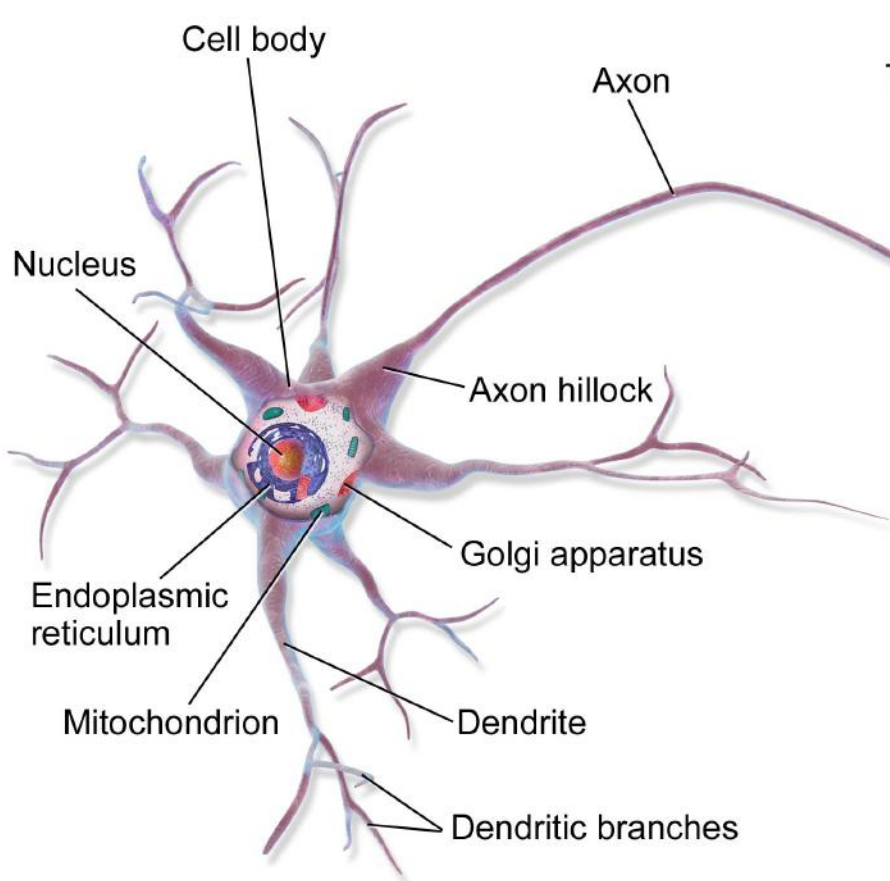
"in from three to eight years we will have a machine with the general intelligence of an average human being", Marvin Minsky (1970)

The Futile Tries of “Strong” AI

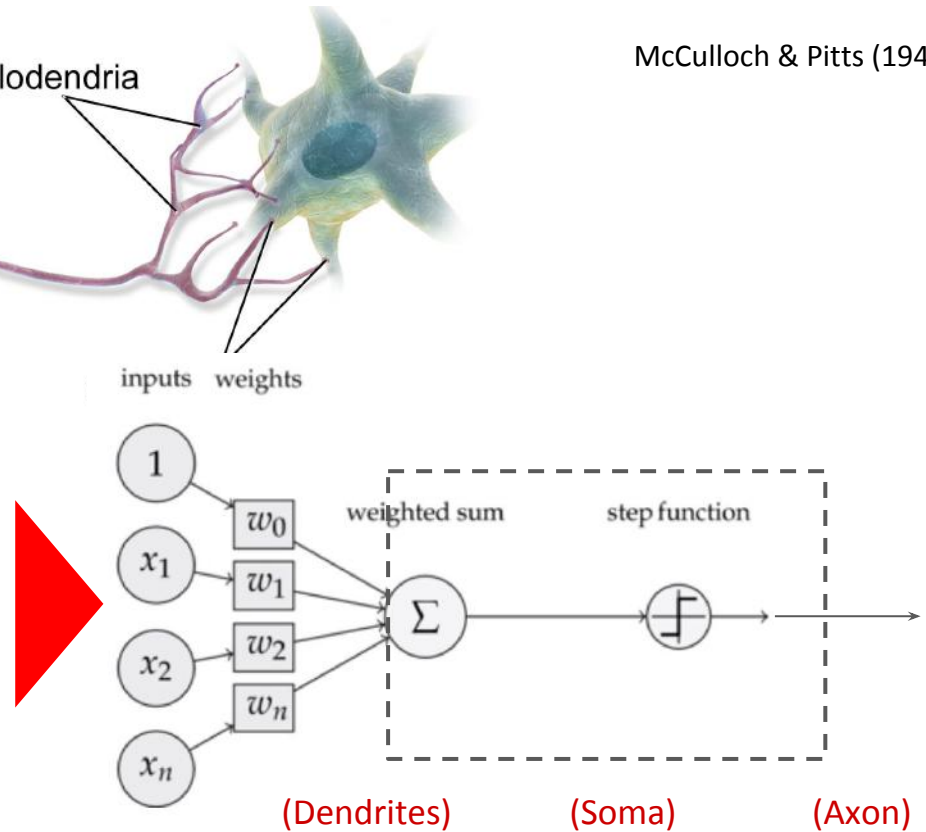
20 years of “AI Winter”...

From Biological Neuron to the Artificial Neuron Model

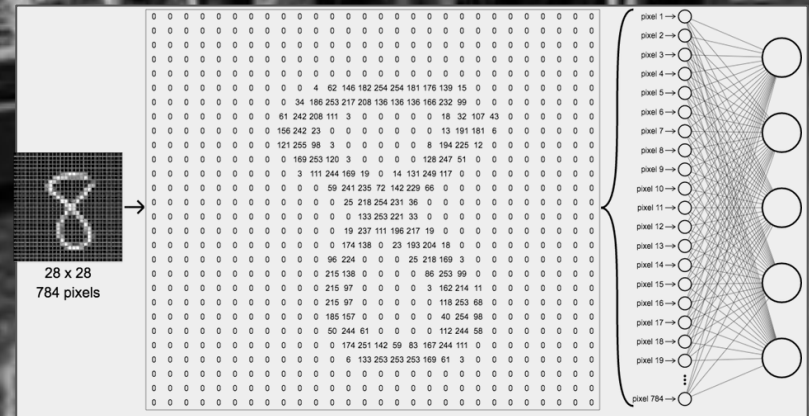
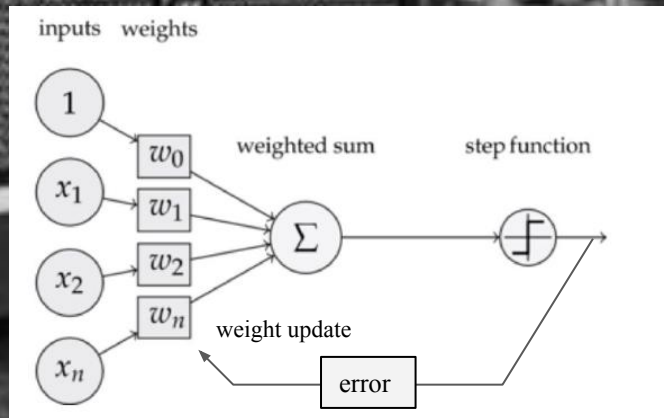
Information Service Engineering - Lecture 5 Basic Machine Learning - 5.1 A Brief History of AI



McCulloch & Pitts (1943)

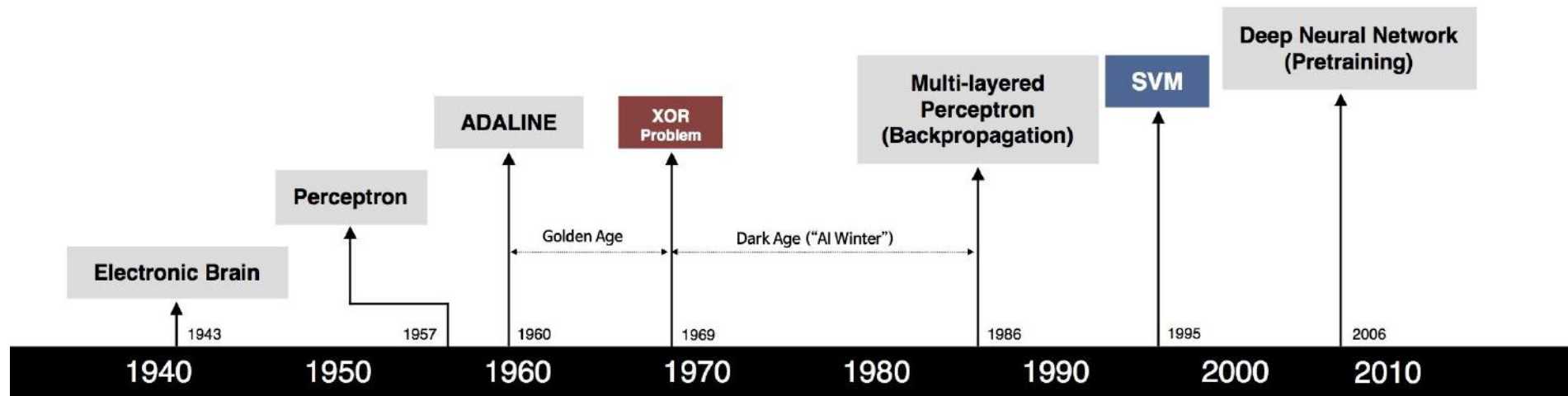


Cognitive Computing - The MARK 1 Perceptron (1957)

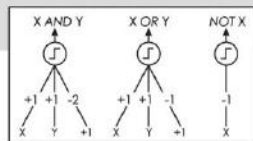


Timeline of Neural Networks

Information Service Engineering - Lecture 5 Basic Machine Learning - 5.1 A Brief History of AI



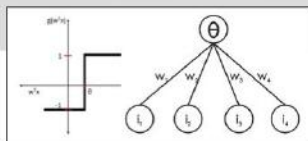
S. McCulloch – W. Pitts



- Adjustable Weights
- Weights are not Learned



F. Rosenblatt



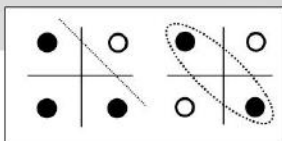
- Learnable Weights and Threshold



B. Widrow – M. Hoff



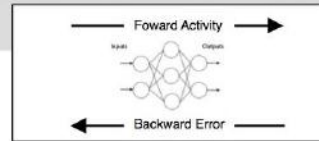
M. Minsky – S. Papert



- XOR Problem



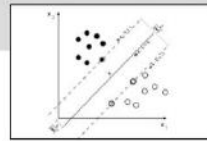
D. Rumelhart – G. Hinton – R. Williams



- Solution to nonlinearly separable problems
- Big computation, local optima and overfitting



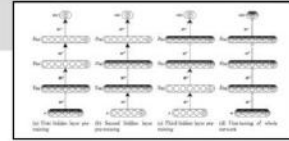
V. Vapnik – C. Cortes



- Limitations of learning prior knowledge
- Kernel function: Human Intervention

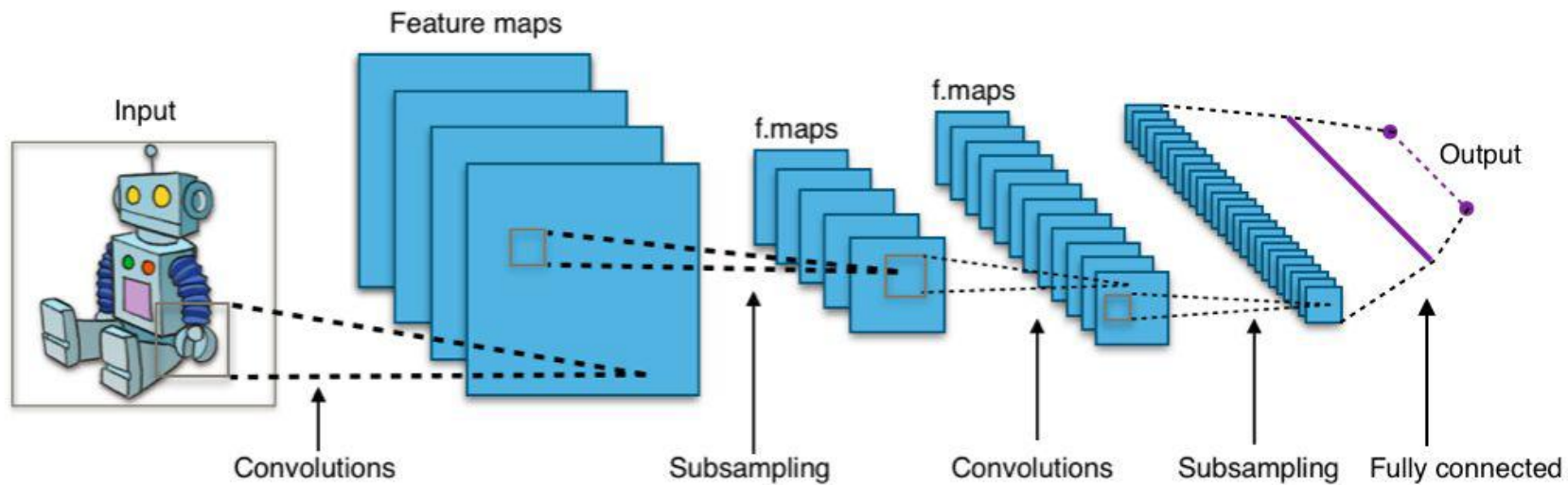


G. Hinton – S. Ruslan



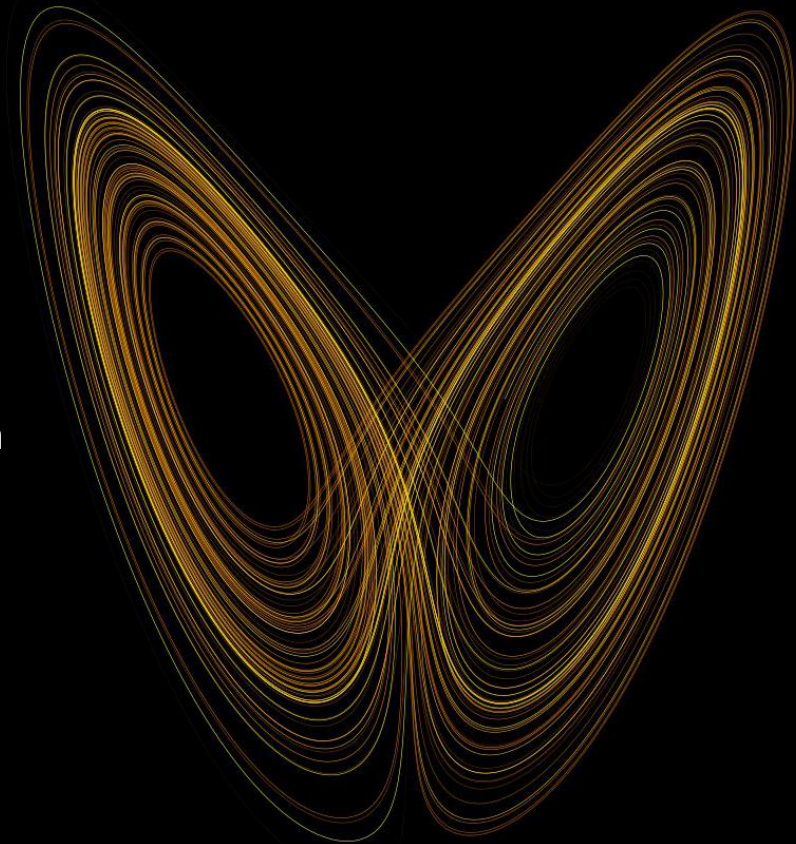
- Hierarchical feature Learning

Deep Convolutional Neural Networks on GPU Supercomputers

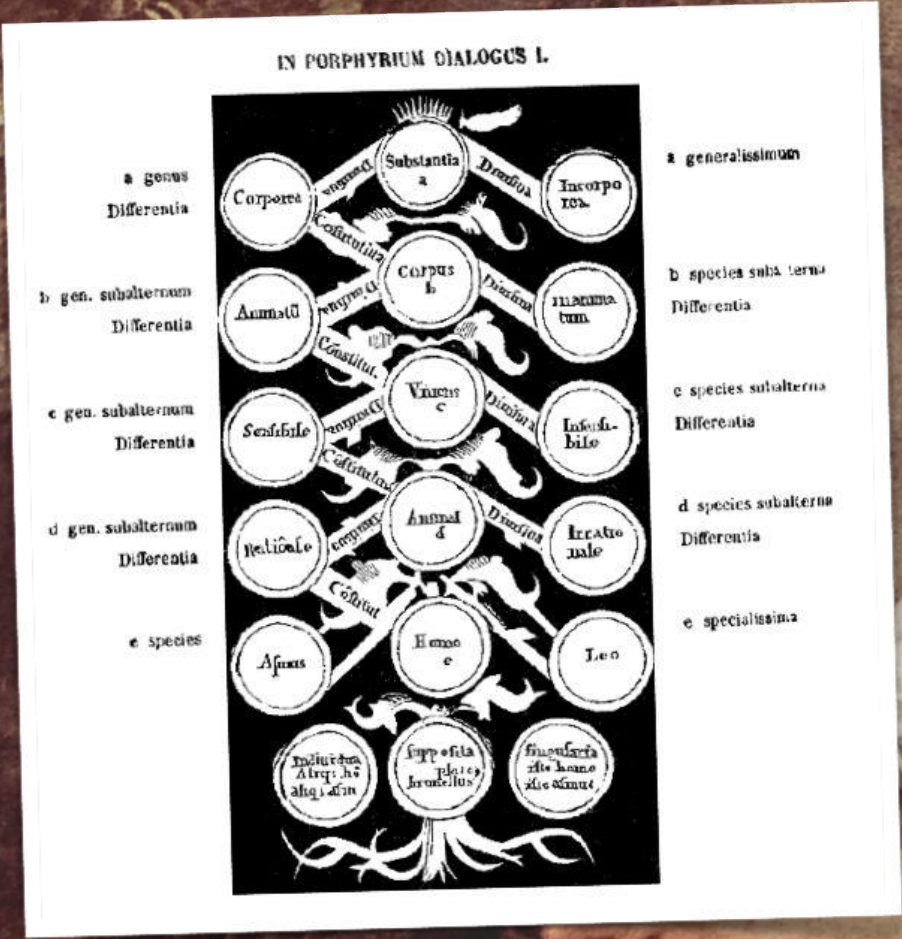


What Deep Learning has achieved so far

- Near-human level **image classification**
- Near-human level **speech recognition**
- Near-human level **handwriting transcription**
- Improved **machine translation**
- Improved **text-to-speech conversion**
- **Digital assistants** such as Google Now or Amazon Alexa
- Near-human level **autonomous driving**
- Superhuman Go playing



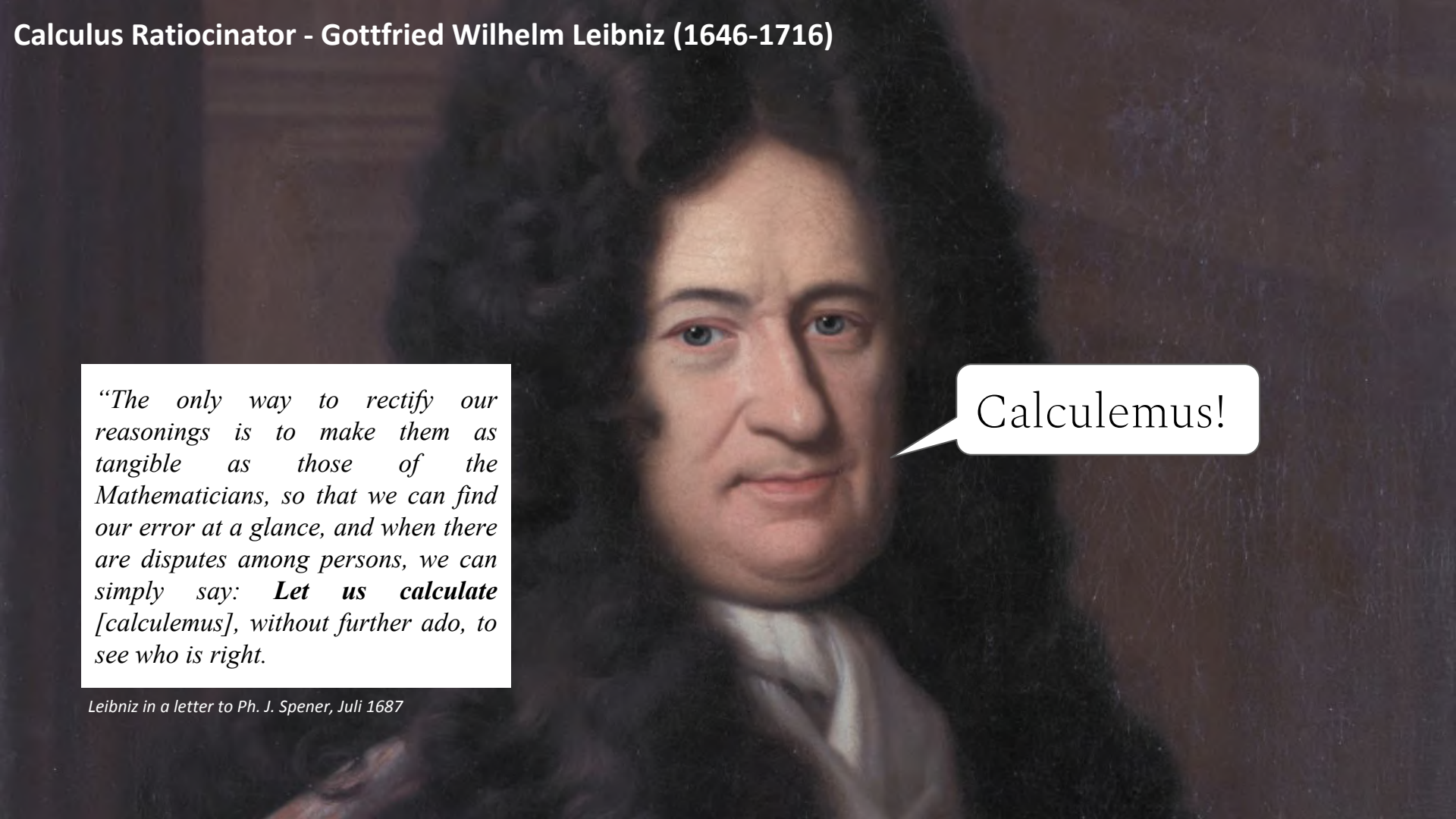
The Universal Categories - Aristotle (384–322 BC)



Calculus Ratiocinator - Gottfried Wilhelm Leibniz (1646-1716)

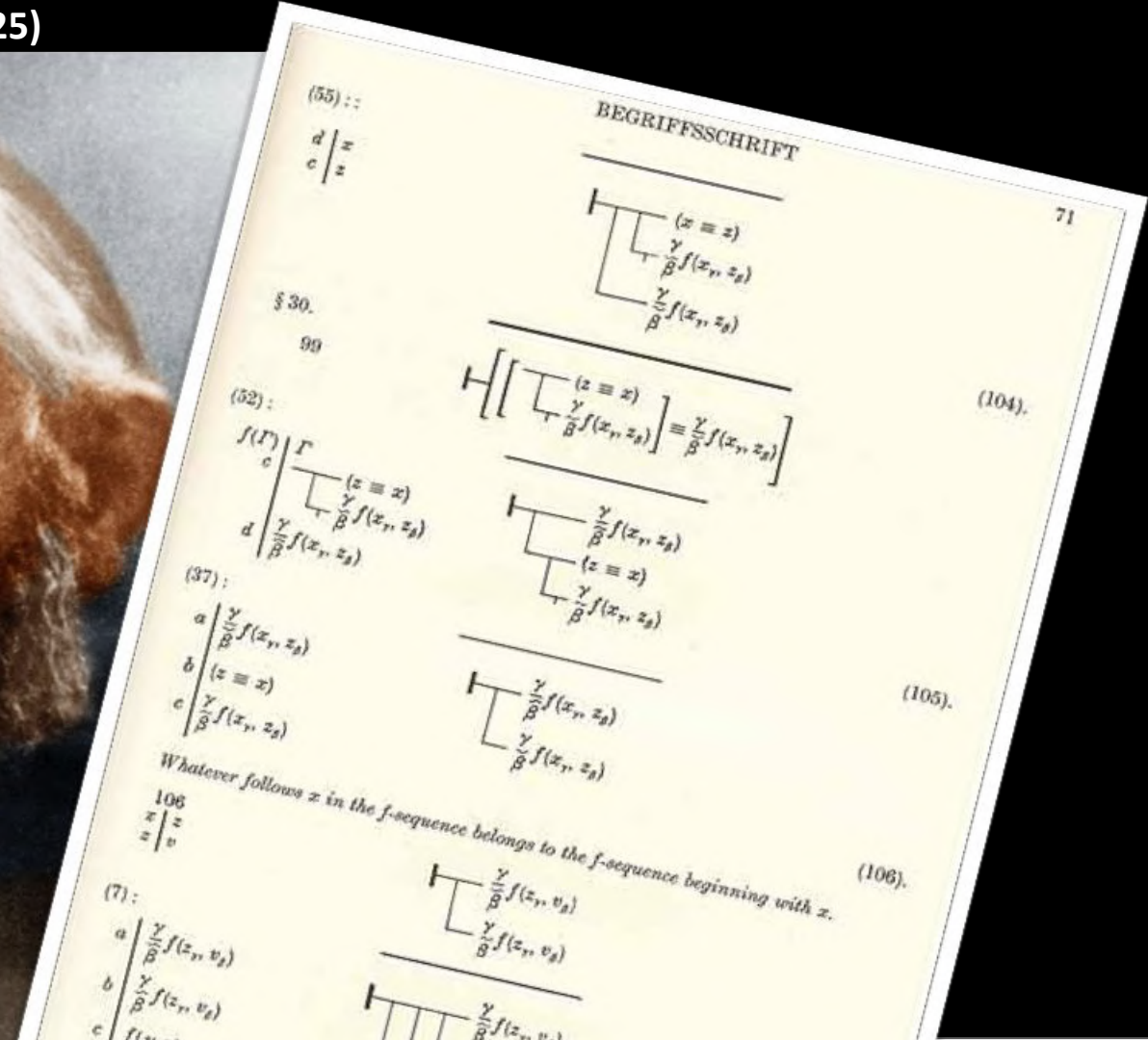
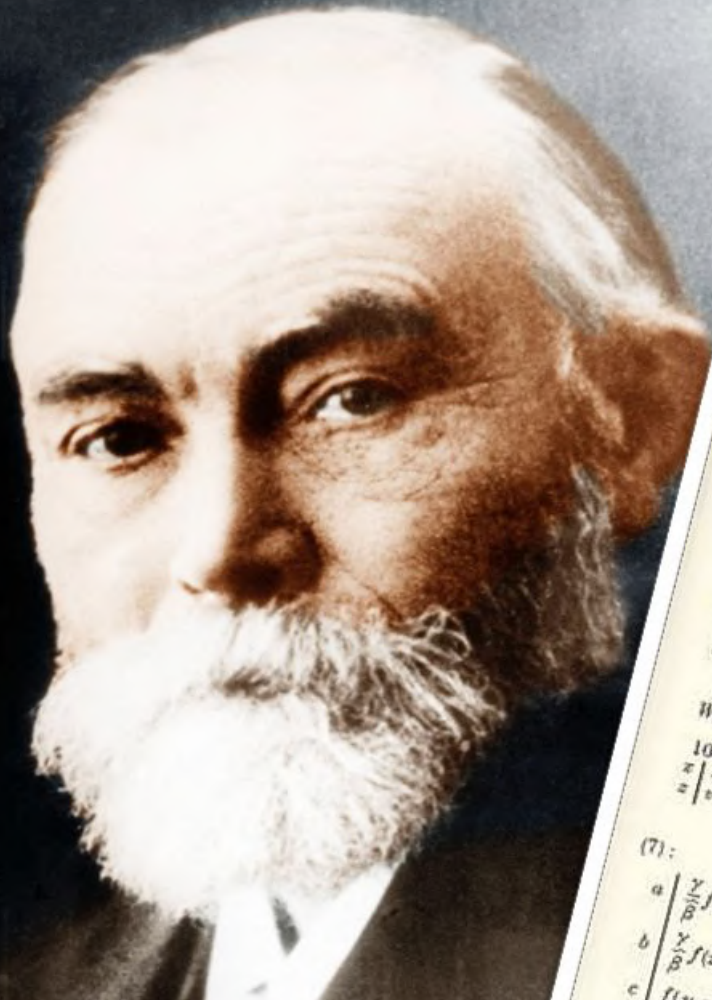
*“The only way to rectify our reasonings is to make them as tangible as those of the Mathematicians, so that we can find our error at a glance, and when there are disputes among persons, we can simply say: **Let us calculate** [calculemus], without further ado, to see who is right.*

Leibniz in a letter to Ph. J. Spener, Juli 1687

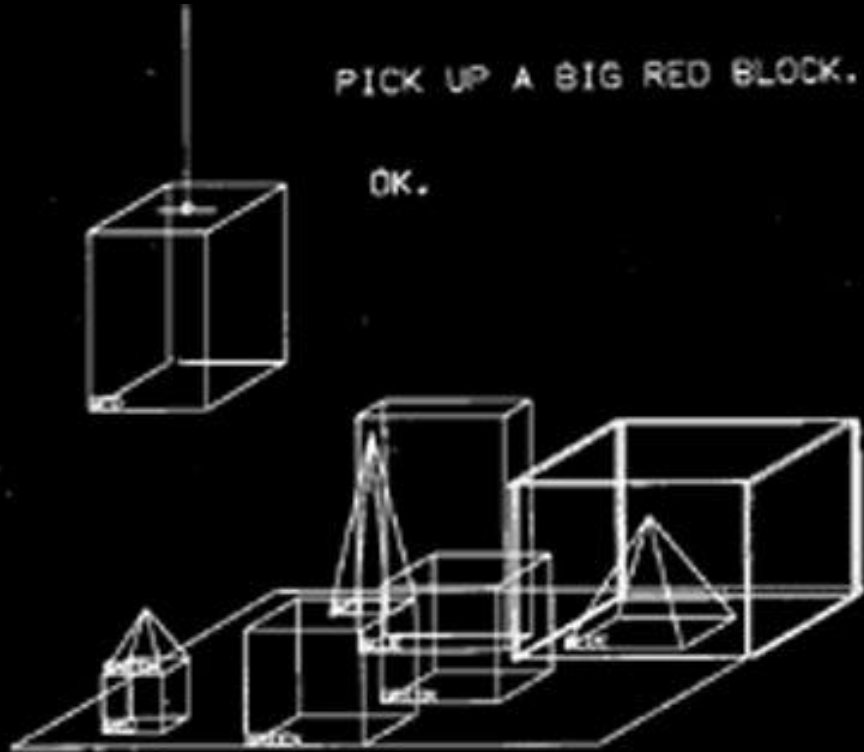
A portrait of Gottfried Wilhelm Leibniz, showing him with long, dark, curly hair, wearing a white cravat and a dark coat. He is looking slightly to the right with a gentle expression.

Calculemus!

Begriffsschrift - Gottlob Frege (1848-1925)

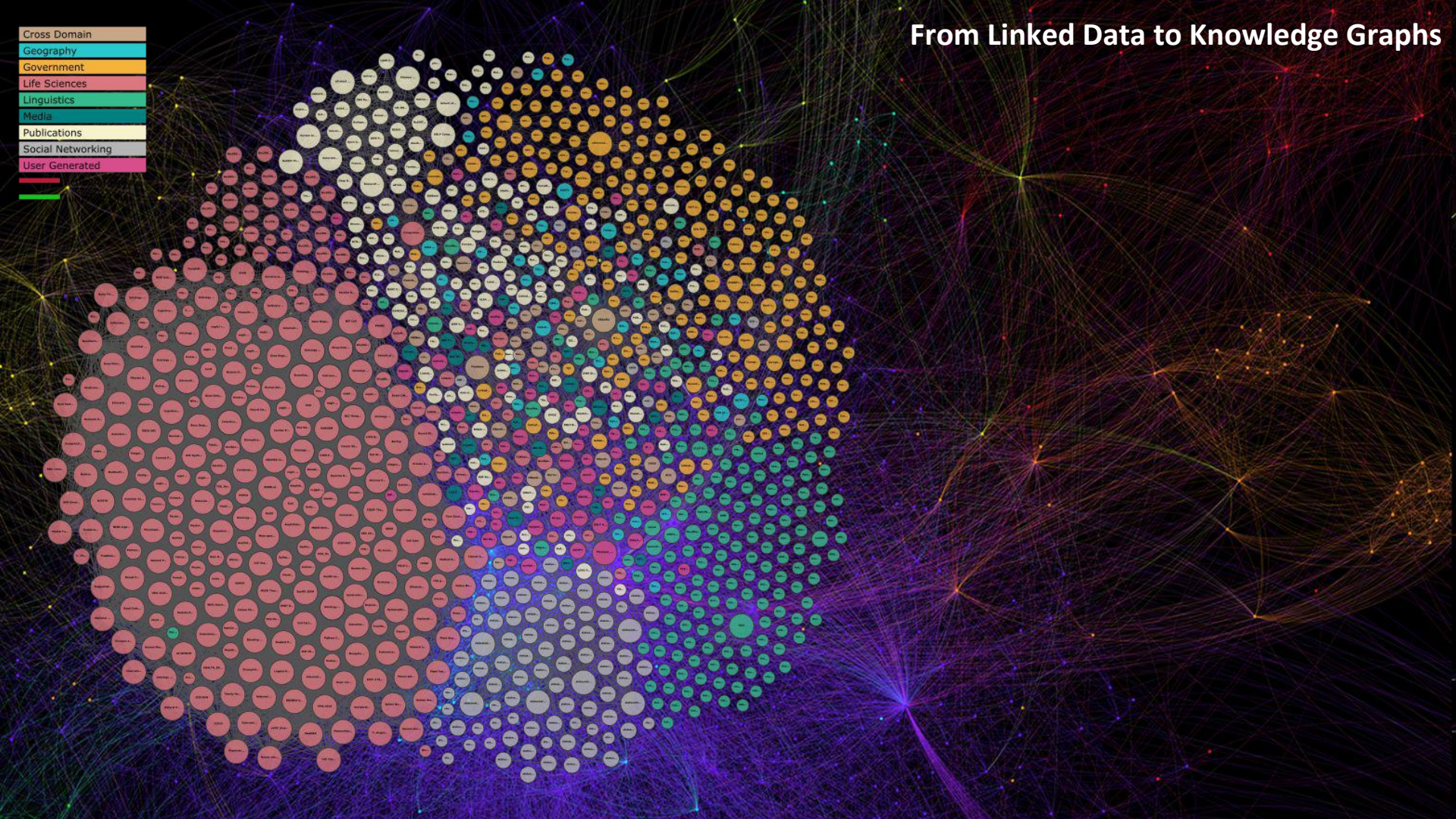


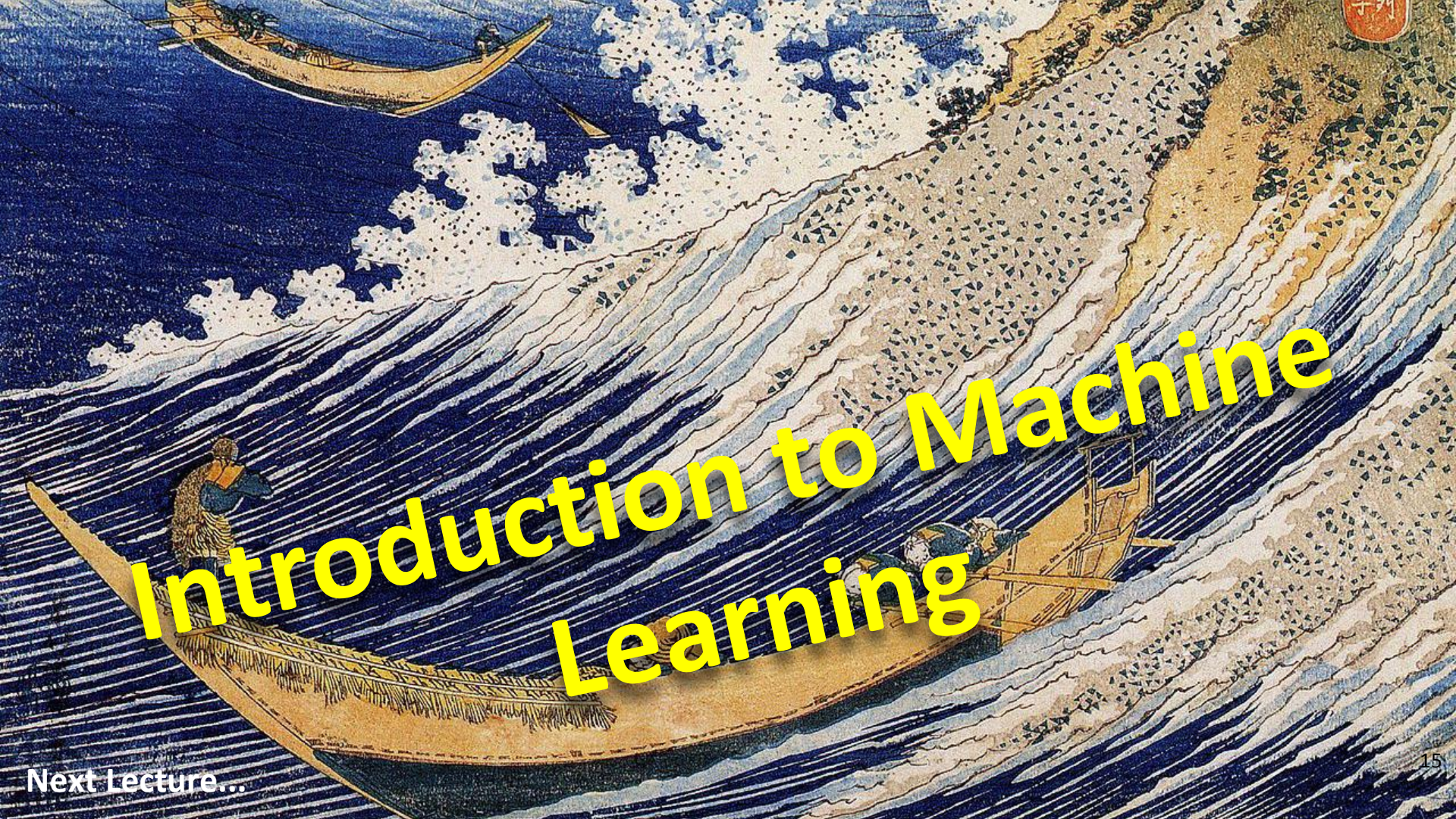
Symbolic Manipulation to Rule the World



- **SHRDLU** by Terry Winograd (1968-1970)

From Linked Data to Knowledge Graphs





Introduction to Machine Learning

Next Lecture...

Picture References:

- P.4: James Vaughan, 1968- "2001" - Hal's eye, https://www.flickr.com/photos/x-ray_delta_one/4128131032
- P.5: Bruce Blaus, Multipolar Neuron, https://commons.wikimedia.org/wiki/File:Blausen_0657_MultipolarNeuron.png
- P.6: <http://techgenix.com/tgwordpress/wp-content/uploads/2017/01/perceptron.jpg>
- P.7: <https://www.slideshare.net/deview/251-implementing-deep-learning-using-cu-dnn/4>
- P.8: https://www.flickr.com/photos/x-ray_delta_one/4128131032
- P.9: A plot of Lorenz's strange attractor for values $\rho=28$, $\sigma = 10$, $\beta = 8/3$., https://commons.wikimedia.org/wiki/File:Lorenz_attractor_yb.svg
- P.10: Francesco Hayez, Aristoteles, 1811, https://commons.wikimedia.org/wiki/File:Francesco_Hayez_001.jpg
- P.11: Chrisoph Bernhard Francke, Portrait of Gottfried Leibniz (1646-1716), German philosopher, c. 1729, https://commons.wikimedia.org/wiki/File:Gottfried_Wilhelm_Leibniz,_Bernhard_Christoph_Francke.jpg
- P.12: Emil Tesch, Friedrich Ludwig Gottlob Frege (1848-1925), German mathematician and philosopher, c. 1905 [https://commons.wikimedia.org/wiki/File:Gottlob_Frege_\(Emil_Tesch\).png](https://commons.wikimedia.org/wiki/File:Gottlob_Frege_(Emil_Tesch).png)
- P.14: The Linking Open Data Cloud Diagram, <http://lod-cloud.net/>
- P.15: Hokusai, « Choshi dans la province de Soshu », série : Mille images de la mer. Vers 1832-34. Estampe nishiki-e https://commons.wikimedia.org/wiki/File:Hokusai_1760-1849_Ocean_waves.jpg