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New Neural Network *Alternative*

" From Arithmetic to Logic Based AI:
a Comparative Analysis
of Neural Networks
and Tsetlin Machine "

Architecture Differences

Tsetlin Machine	Neural Network
Reinforcement learning	Gradient descent
Propositional logic	Arithmetic
Highly Parallel	Limited

Methodology

To Train and Test the machine learning on C code
for target Test accuracy then obtain performance

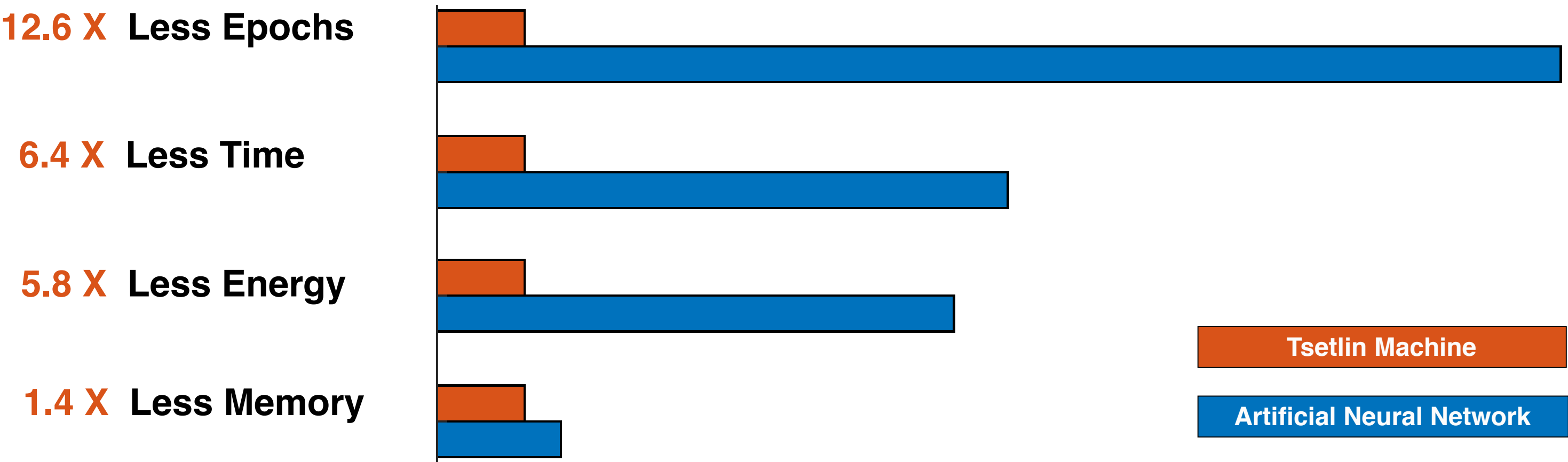## Machine Learning Problems

- Congressional Voting Records
- Breast Cancer (Diagnostic)
- Sonar
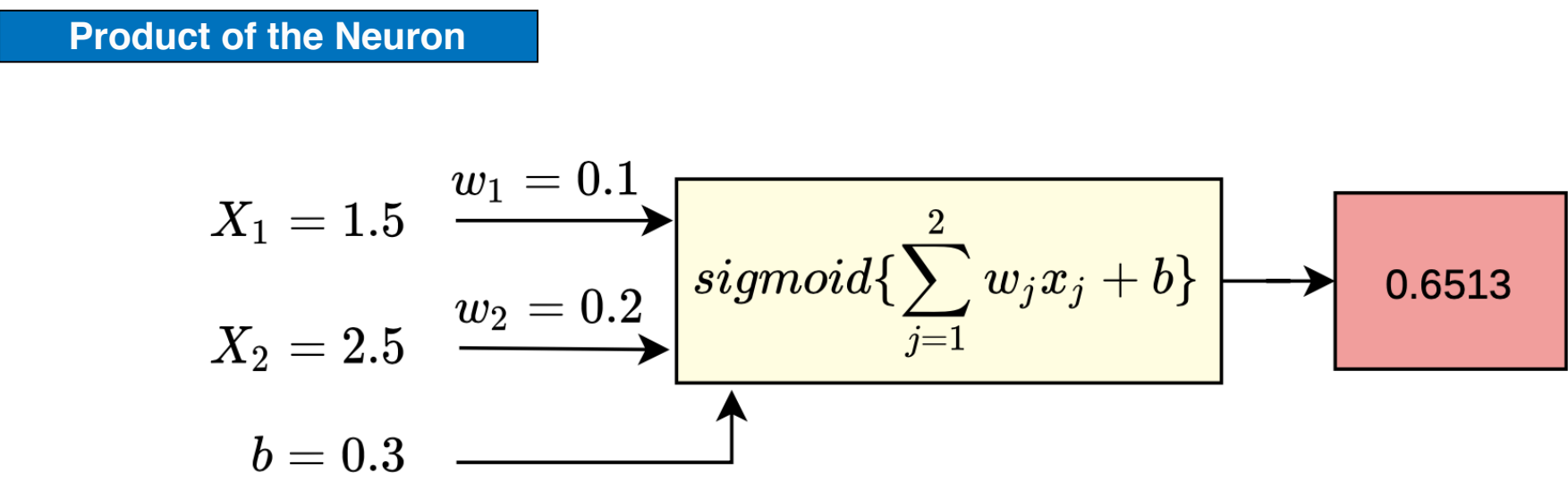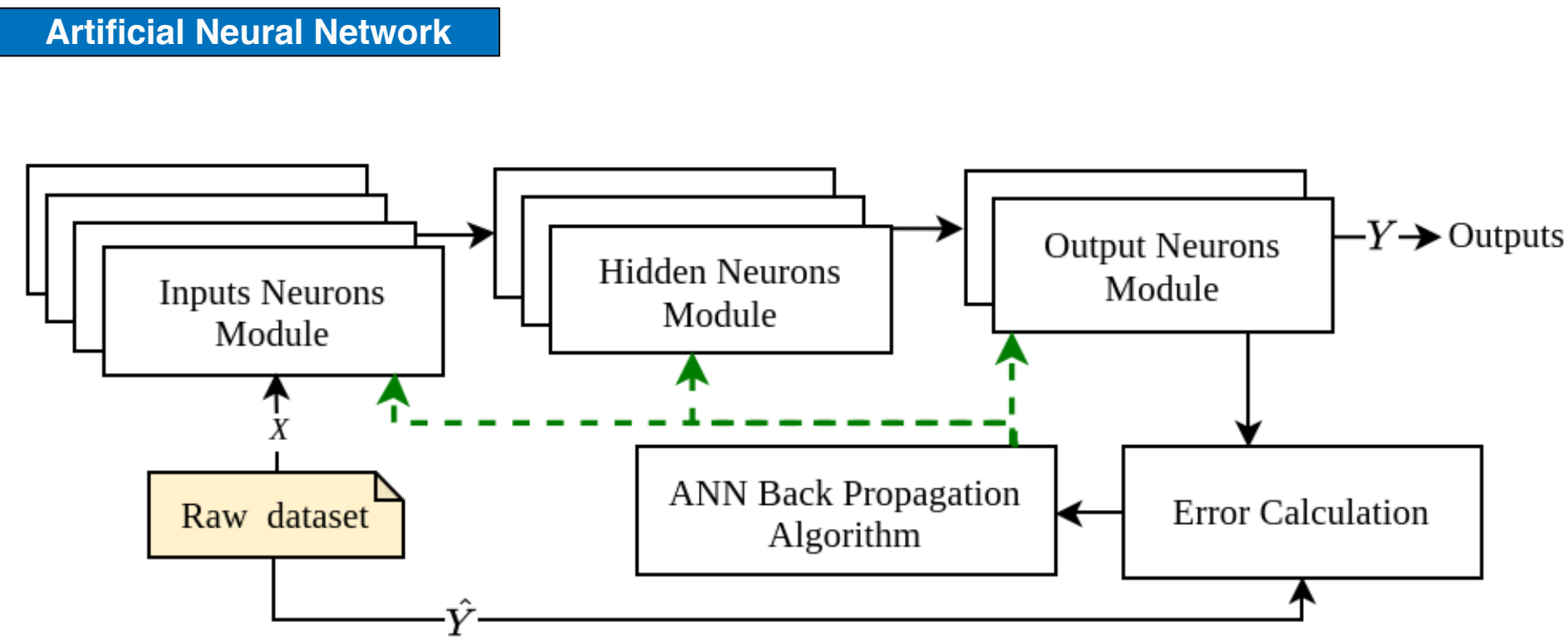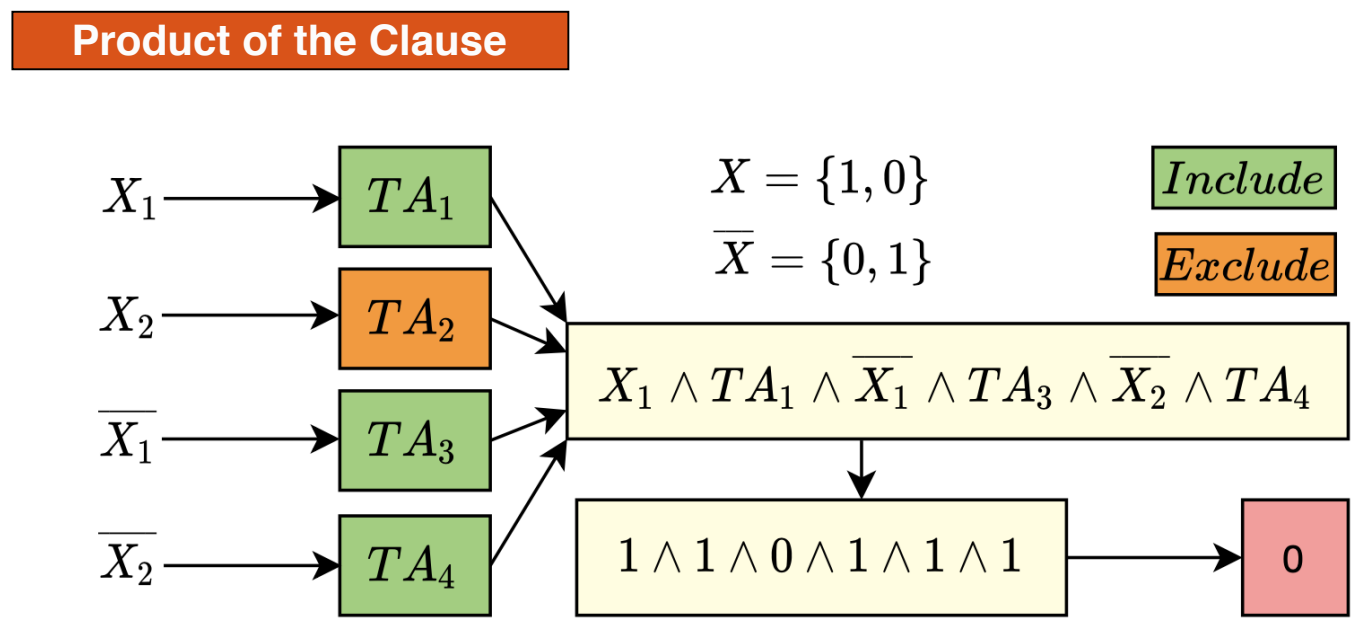- MNIST

Sorry Liz, these ain't Iris

bit.ly/TMVSANN

0% Iris
0% Iris

Better than Artificial Neural Network in ALL aspects*

12.6 X Less Epochs

6.4 X Less Time

5.8 X Less Energy

1.4 X Less Memory

Tsetlin Machine
Artificial Neural Network

Simpler in Every* Computations
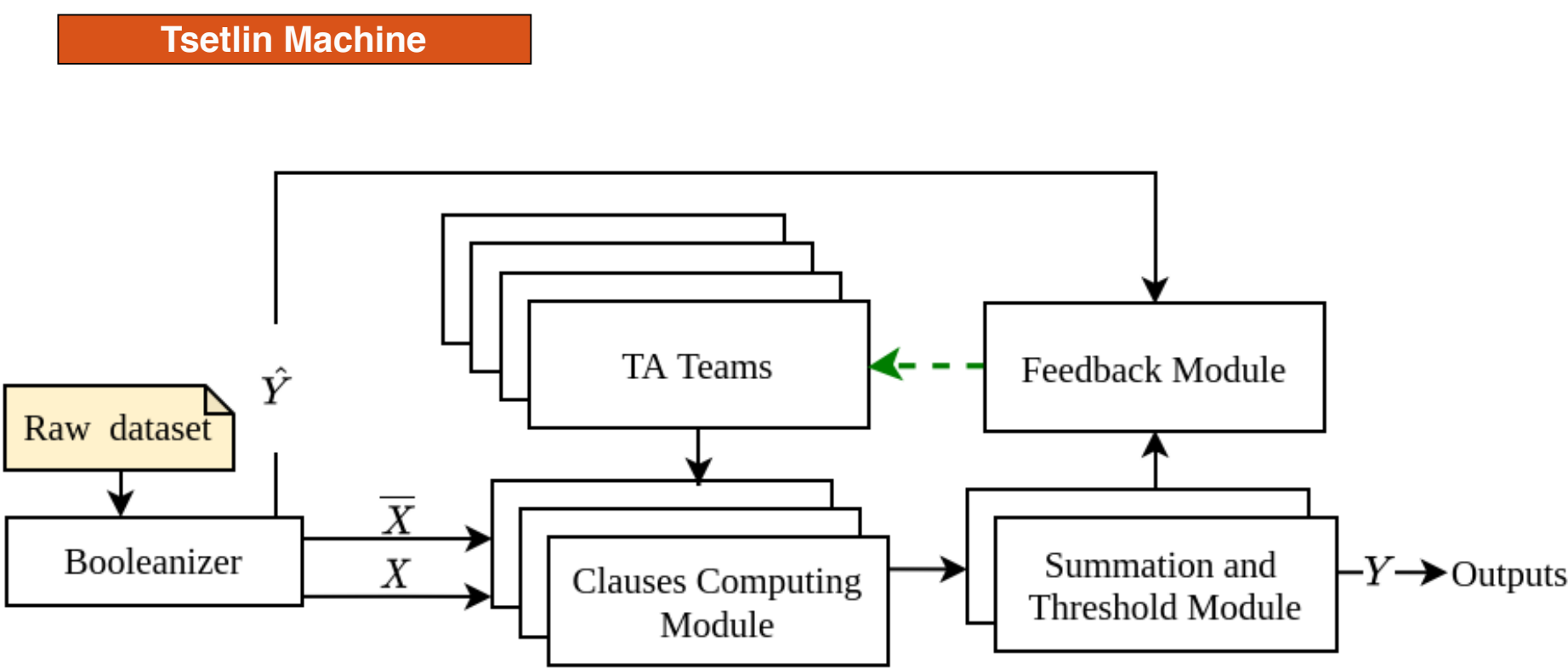
Tsetlin Machine

Raw dataset → Booleanizer → $\overline{X}$, X → Clauses Computing Module → Summation and Threshold Module → Y → Outputs
TA Teams ← Feedback Module
$\hat{Y}$

Artificial Neural Network

Inputs Neurons Module → Hidden Neurons Module → Output Neurons Module → Y → Outputs
Raw dataset → X
ANN Back Propagation Algorithm ← Error Calculation
$\hat{Y}$

Product of the Clause

$X_1 \rightarrow TA_1$
$X_2 \rightarrow TA_2$
$\overline{X_1} \rightarrow TA_3$
$\overline{X_2} \rightarrow TA_4$

$X = \{1, 0\}$ *Include*
$\overline{X} = \{0, 1\}$ *Exclude*

$X_1 \wedge TA_1 \wedge \overline{X_1} \wedge TA_3 \wedge \overline{X_2} \wedge TA_4$

$1 \wedge 1 \wedge 0 \wedge 1 \wedge 1 \wedge 1$ 0

Product of the Neuron

$X_1 = 1.5$ $w_1 = 0.1$
$X_2 = 2.5$ $w_2 = 0.2$
$b = 0.3$

$sigmoid\{\sum_{j=1}^{2} w_j x_j + b\}$ 0.6513

* Comparisons conducted under limited number of ML problems and aspects.