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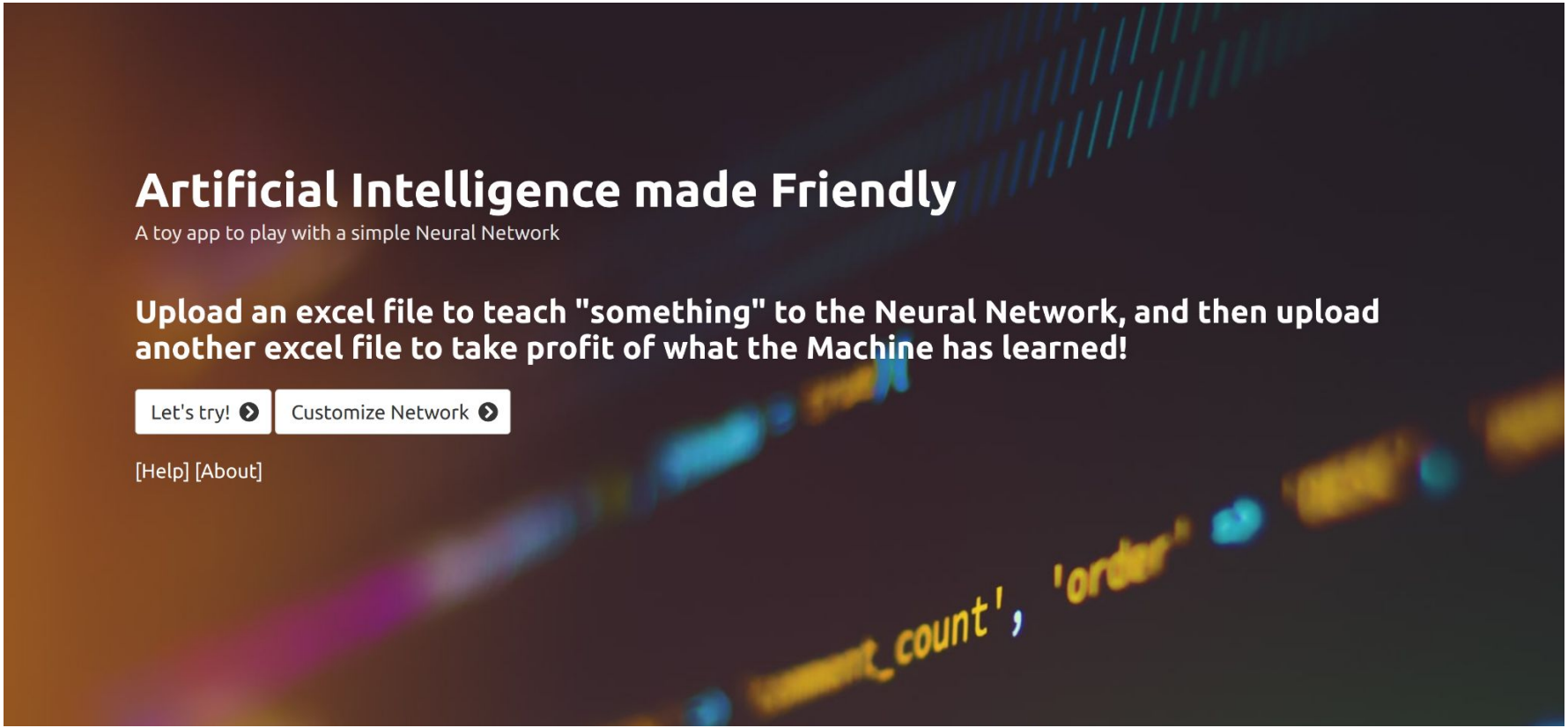

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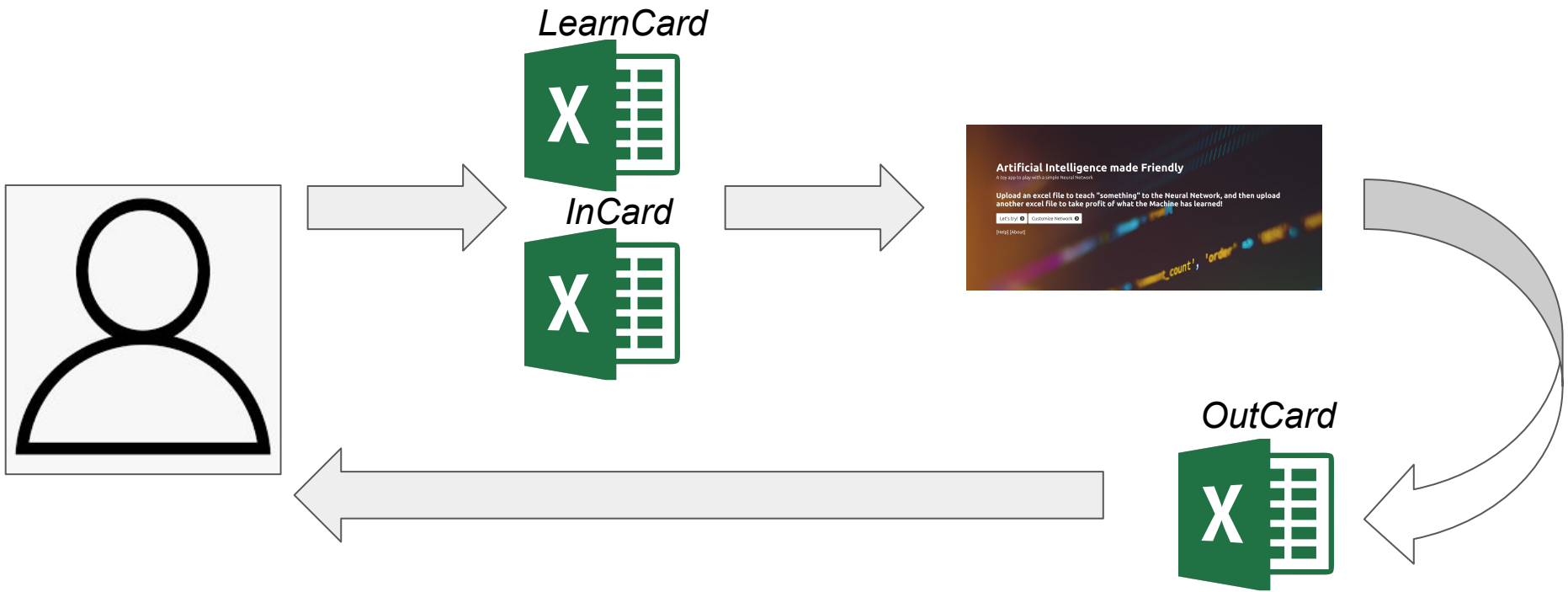

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Example Input: house prices

	A	B	C	D	E	F	G	H	I	J	K
1	LotArea	OverallQual	OverallCond	TotalBsmtSF	FullBath	HalfBath	BedroomAbvGr	TotRmsAbvGrd	Fireplaces	GarageArea	AboveMedianPrice
2	8450	7	5	856	2	1	3	8	0	548	1
3	9600	6	8	1262	2	0	3	6	1	460	1
4	11250	7	5	920	2	1	3	6	1	608	1
5	9550	7	5	756	1	0	3	7	1	642	0
6	14260	8	5	1145	2	1	4	9	1	836	1
7	14115	5	5	796	1	1	1	5	0	480	0
8	10084	8	5	1686	2	0	3	7	1	636	1
9	10382	7	6	1107	2	1	3	7	2	484	1
10	6120	7	5	952	2	0	2	8	2	468	0
11	7420	5	6	991	1	0	2	5	2	205	0

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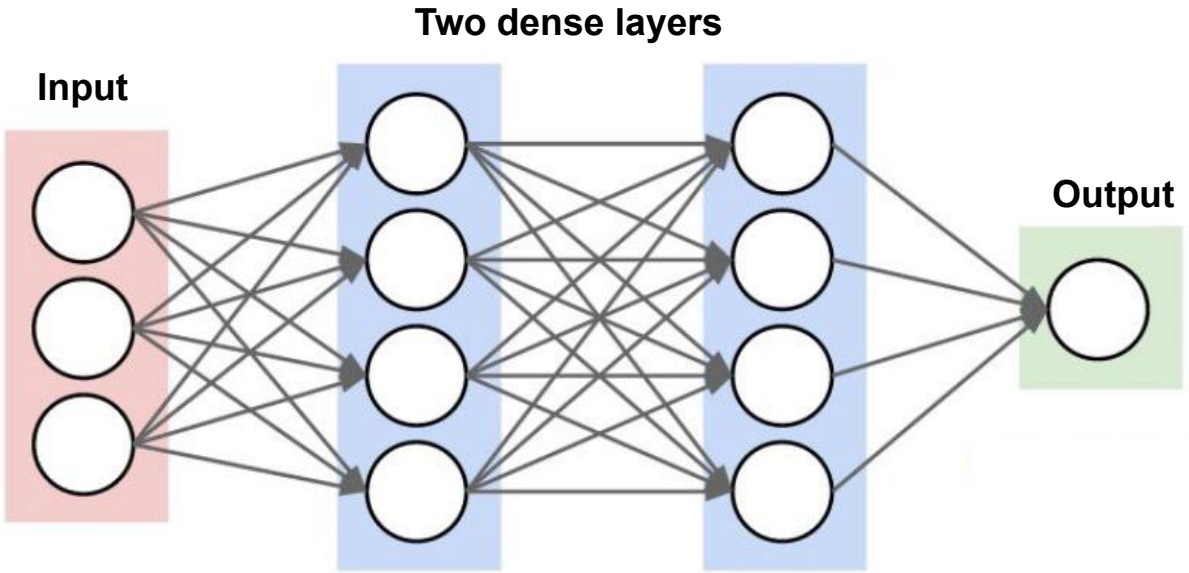
What type of problems? Binary classification



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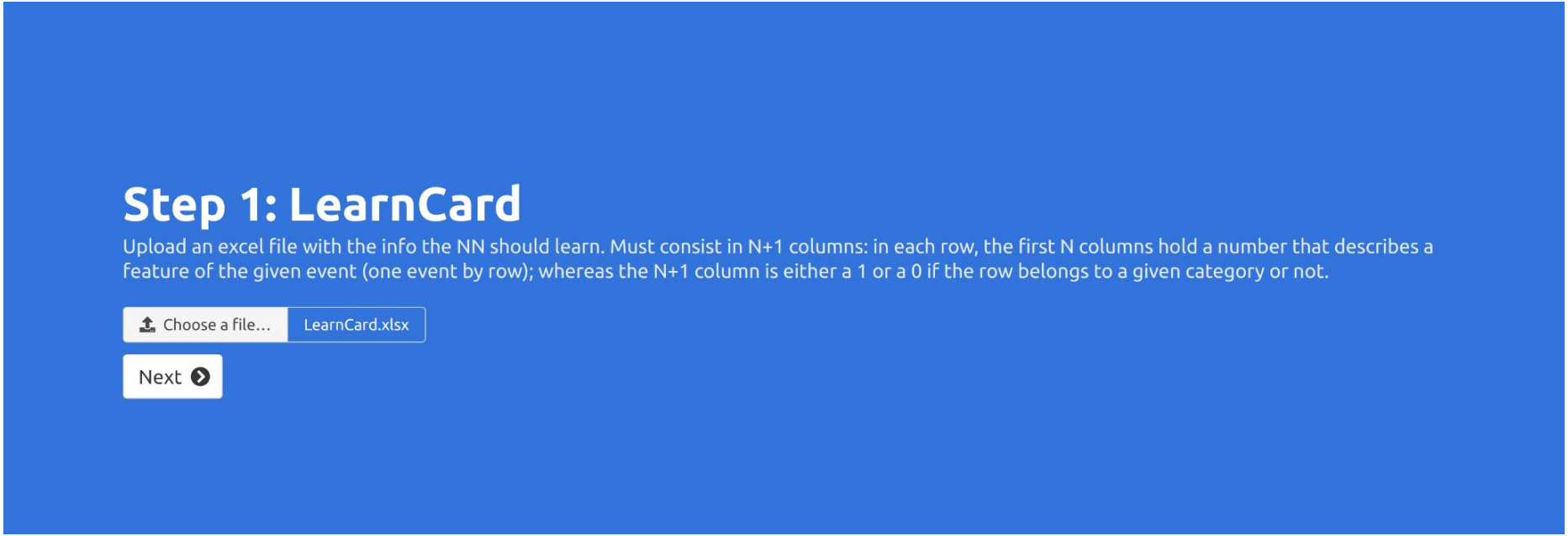
Basic usage (1/3)



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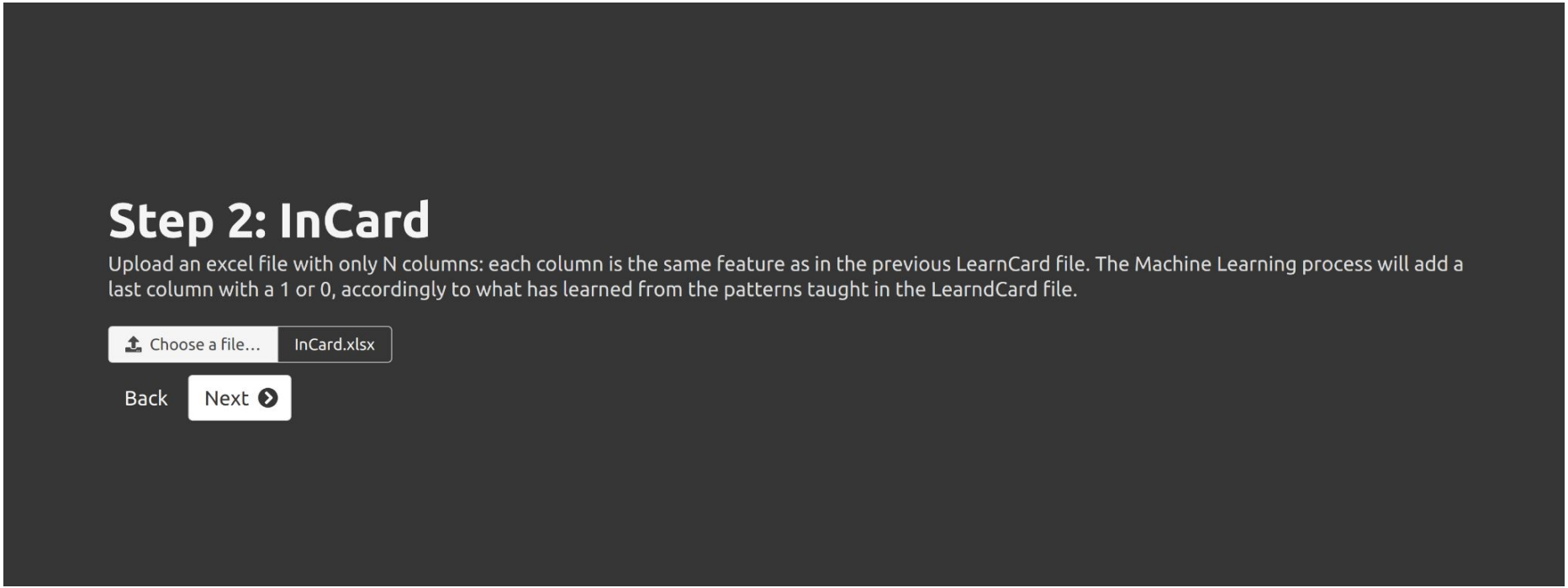
Basic usage (2/3)



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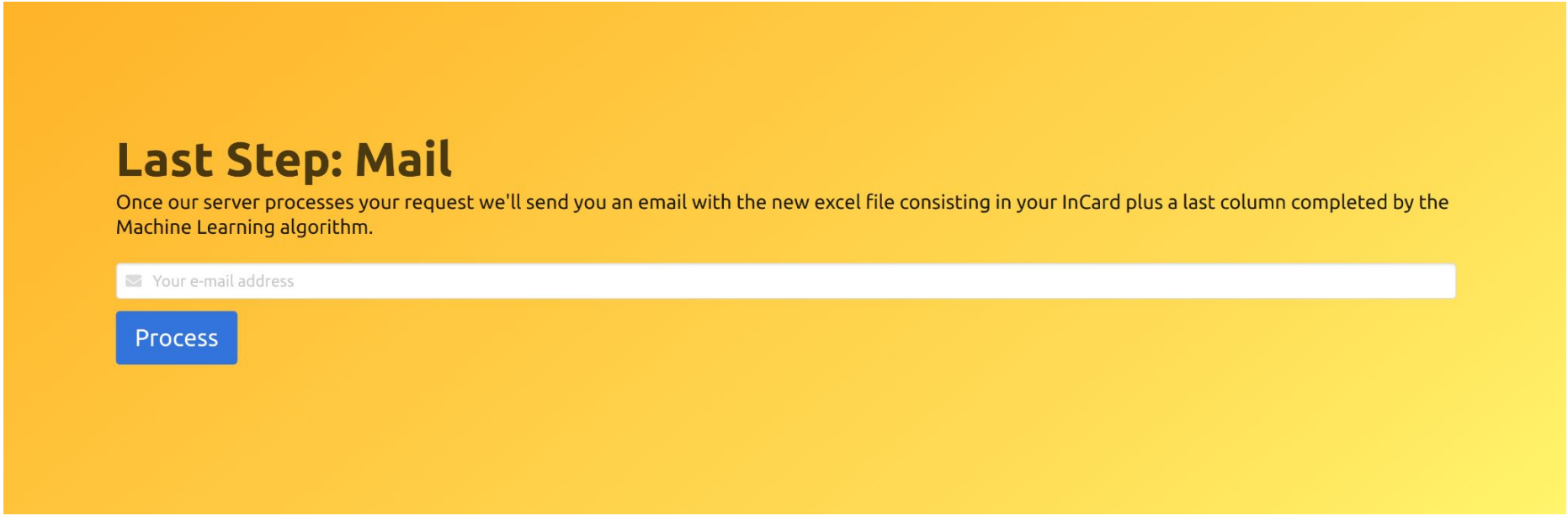
Basic usage (3/3)



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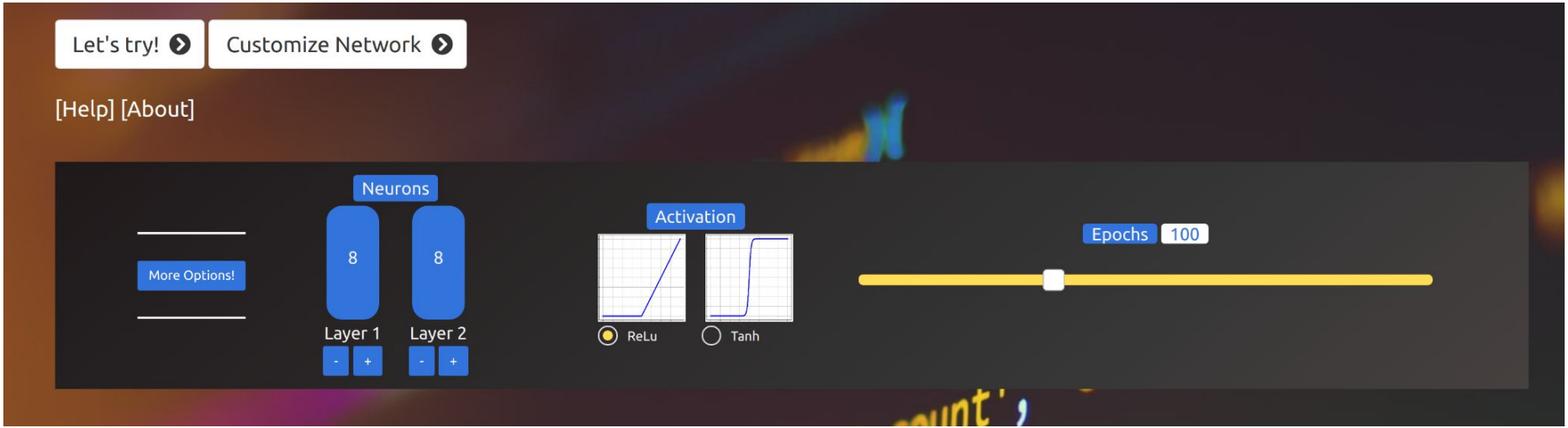
Network Customization (1/2)



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Network Customization (2/2)

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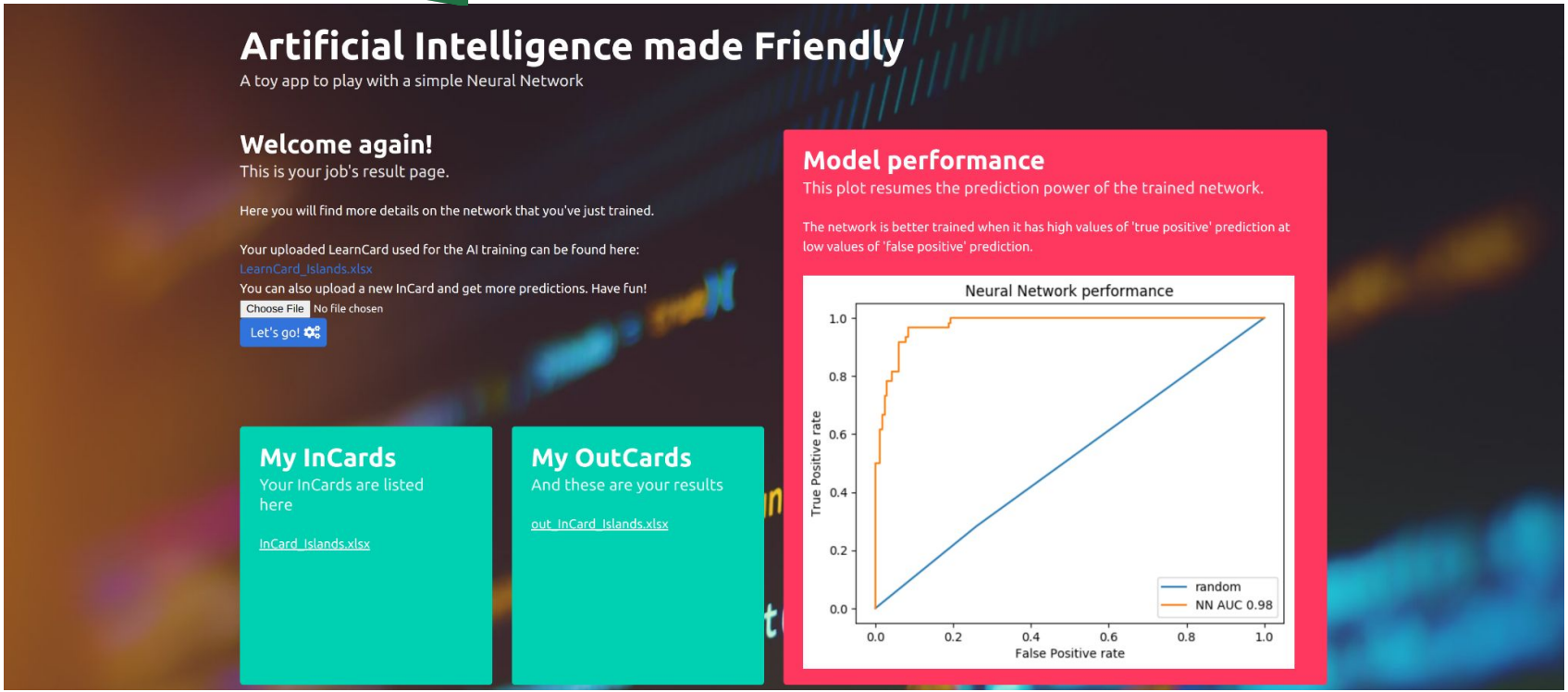
Results (1/2)



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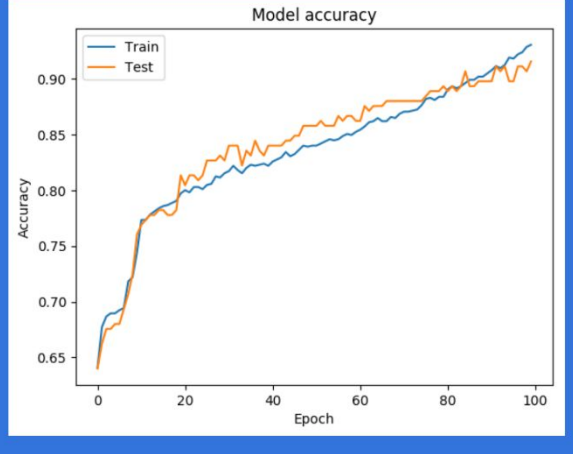
Results (2/2)

Accuracy

In this plot you can see the accuracy of the trained model after each learning step (epoch).

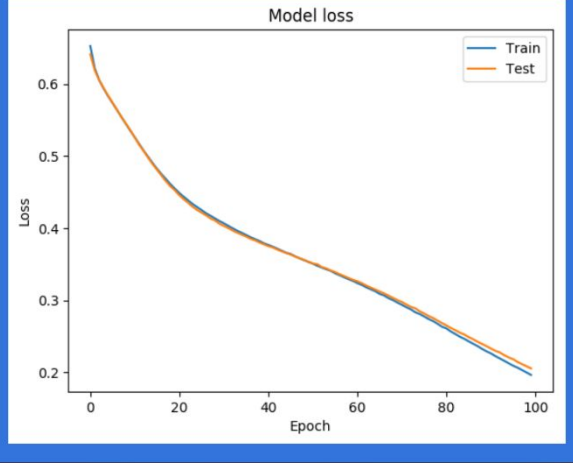
Given a subset of 'N' examples taken from the LearnCard, the accuracy is the ratio of the number of correct answers predicted by the neural network to N. From the net number of examples in the LearnCard, the Train curve takes into account those used for training, while the Test curve is a small subset reserved for testing only.



Loss

This plot shows the computation of the loss function (a quantity that is used to optimize the network) as the learn step (epoch) increases.

The network is better trained when it has lower 'loss' values. Beware that a big separation between the 'Train' and 'Test' curves could indicate a case of model overfitting.



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main | **ai-friendly.com** / **applications** /

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..

- LHC
- circuits
- complex-dynamics
- exoplanets
- group-theory
- ising
- quantum-tunneling

More examples are welcome!

- Physics
- Mathematics
- Others?

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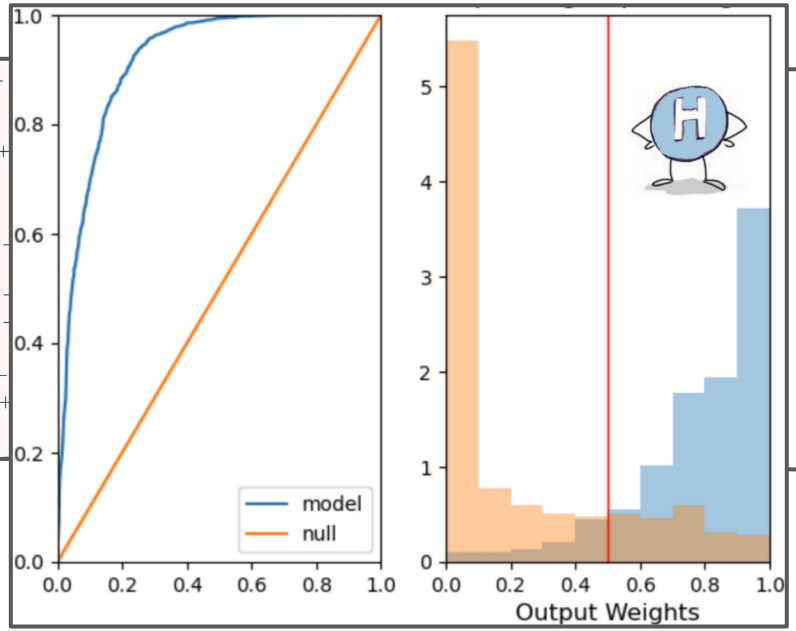
Applications (1/2) : Creation and Annihilation of Higgs Bosons

$$\frac{2M}{g}H + \frac{1}{2}(H^2 + \phi^0\phi^0 + 2\phi^+\phi^-)] + \frac{2M^4}{g^2}\alpha_h - igc_w[\partial_\nu Z^0_\mu(W^+_\mu W^-_\nu - W^+_\nu W^-_\mu) - Z^0_\nu(W^+_\mu \partial_\nu W^-_\mu - W^-_\mu \partial_\nu W^+_\mu) + Z^0_\mu(W^+_\nu \partial_\nu W^-_\mu - W^-_\nu \partial_\nu W^+_\mu)] - igs_w[\partial_\nu A_\mu(W^+_\mu W^-_\nu - W^+_\nu W^-_\mu) - A_\nu(W^+_\mu \partial_\nu W^-_\mu - W^-_\mu \partial_\nu W^+_\mu) + A_\mu(W^+_\nu \partial_\nu W^-_\mu - W^-_\nu \partial_\nu W^+_\mu)] - \frac{1}{2}g^2 W^+_\mu W^-_\mu W^+_\nu W^-_\nu + \frac{1}{2}g^2 W^+_\mu W^-_\nu W^+_\mu W^-_\nu + g^2 c^2_w(Z^0_\mu W^+_\mu Z^0_\nu W^-_\nu - Z^0_\mu Z^0_\mu W^+_\nu W^-_\nu) + g^2 s^2_w(A_\mu W^+_\mu A_\nu W^-_\nu - A_\mu A_\mu W^+_\nu W^-_\nu) + g^2 s_w c_w[A_\mu Z^0_\nu(W^+_\mu W^-_\nu - W^+_\nu W^-_\mu) - 2A_\mu Z^0_\mu W^+_\nu W^-_\nu] - g\alpha[H^3 + H\phi^0\phi^0 + 2H\phi^+\phi^-] - \frac{1}{8}g^2\alpha_h[H^4 + (\phi^0)^4 + 4(\phi^+\phi^-)^2 + 4(\phi^0)^2\phi^+\phi^- + 4H^2\phi^+\phi^- + 2(\phi^0)^2H^2] - gMW^+_\mu W^-_\mu H - \frac{1}{2}g\frac{M}{c^2_w}Z^0_\mu Z^0_\mu H - \frac{1}{2}ig[W^+_\mu(\phi^0\partial_\mu\phi^- - \phi^-\partial_\mu\phi^0) - W^-_\mu(\phi^0\partial_\mu\phi^+ - \phi^+\partial_\mu\phi^0)] + \frac{1}{2}g[W^+_\mu(H\partial_\mu\phi^- - \phi^-\partial_\mu H) - W^-_\mu(H\partial_\mu\phi^+ - \phi^+\partial_\mu H)] + \frac{1}{2}g\frac{1}{c_w}(Z^0_\mu(H\partial_\mu\phi^0 - \phi^0\partial_\mu H) - ig\frac{s^2_w}{c_w}MZ^0_\mu(W^+_\mu\phi^- - W^-_\mu\phi^+) - igs_wMA_\mu(W^+_\mu\phi^- - W^-_\mu\phi^+) - ig\frac{1-2c^2_w}{2c_w}Z^0_\mu(\phi^+\partial_\mu\phi^- - \phi^-\partial_\mu\phi^+) + igs_wA_\mu(\phi^+\partial_\mu\phi^- - \phi^-\partial_\mu\phi^+) - \frac{1}{4}g^2W^+_\mu W^-_\mu[H^2 + (\phi^0)^2 + 2\phi^+\phi^-] - \frac{1}{4}g^2\frac{1}{c^2_w}Z^0_\mu Z^0_\mu[H^2 + (\phi^0)^2 + 2(2s^2_w - 1)^2\phi^+\phi^-] - \frac{1}{2}g^2\frac{s^2_w}{c_w}Z^0_\mu\phi^0(W^+_\mu\phi^- + W^-_\mu\phi^+) - \frac{1}{2}ig^2\frac{s^2_w}{c_w}Z^0_\mu H(W^+_\mu\phi^- - W^-_\mu\phi^+) + \frac{1}{2}g^2s_wA_\mu\phi^0(W^+_\mu\phi^- + W^-_\mu\phi^+) + \frac{1}{2}ig^2s_wA_\mu H(W^+_\mu\phi^- - W^-_\mu\phi^+) - g^2s_wc_wZ^0_\mu A_\mu\phi^+\phi^-$$

Standard model Lagrangian



Classification Results

	phi	pt	jmas	ntrk	btag	had/em	dum1	dum2
0								
2.896	69.48	0.00	0.0	0.0	0.00	0.0	0.0	
-1.189	57.64	0.00	0.0	0.0	0.00	0.0	0.0	
0.451	29.94	8.03	4.0	0.0	2.47	0.0	0.0	
0.243	25.93	4.98	9.0	0.0	0.63	0.0	0.0	
2.869	23.62	0.00	0.0	0.0	0.00	0.0	0.0	
0								
-1.056	73.44	14.01	2.0	0.0	0.05	0.0	0.0	
1.949	61.59	2.35	0.0	0.0	0.01	0.0	0.0	
2.358	28.22	6.57	4.0	0.0	0.00	0.0	0.0	
-0.435	23.75	0.00	0.0	0.0	0.00	0.0	0.0	
0								
3.074	89.89	0.00	0.0	0.0	0.00	0.0	0.0	
-0.001	48.14	3.88	1.0	0.0	0.00	0.0	0.0	
0.264	34.79	5.59	9.0	0.0	1.17	0.0	0.0	
0.210	15.72	0.00	0.0	0.0	0.00	0.0	0.0	
0								
1.406	92.08	0.00	0.0	0.0	0.00	0.0	0.0	
0.047	77.44	15.17	11.0	0.0	0.35	0.0	0.0	
-2.329	66.83	16.81	6.0	0.0	0.39	0.0	0.0	
3.106	34.30	6.51	6.0	0.0	0.00	0.0	0.0	
-1.577	23.91	6.85	6.0	0.0	0.00	0.0	0.0	

Particle Collision Simulations

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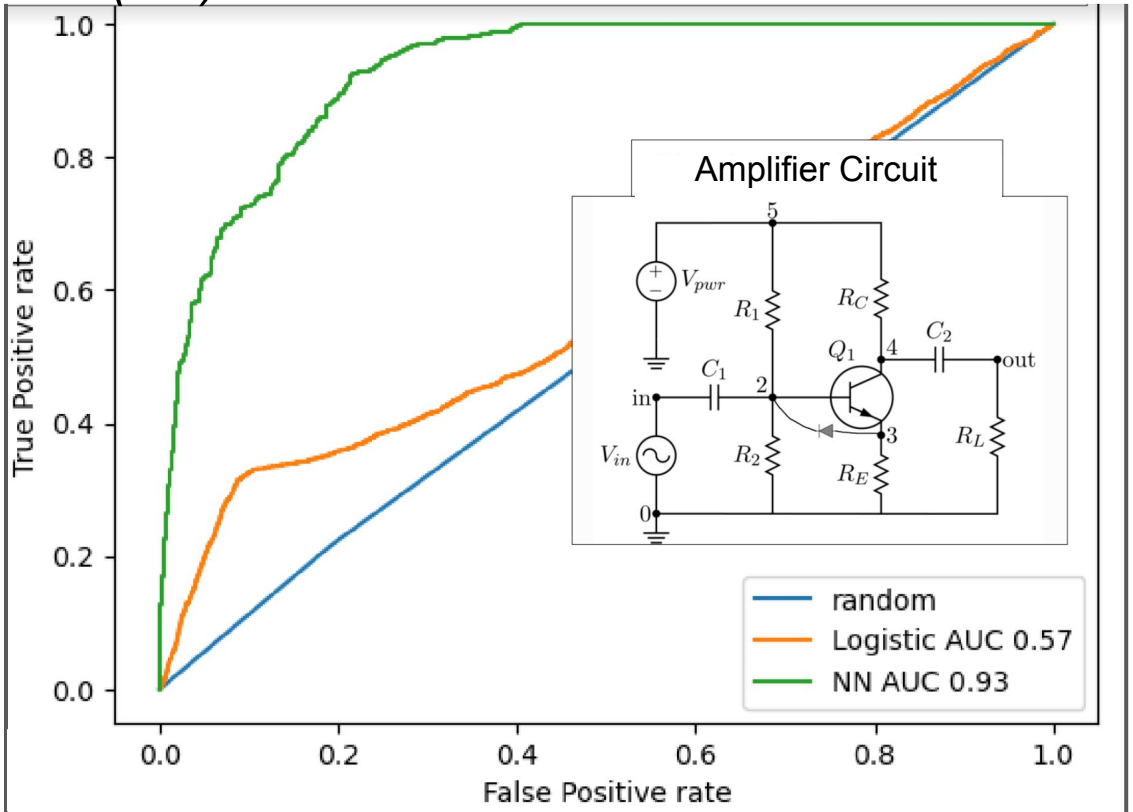
Applications (2/2): Threshold Currents in Circuit Simulations



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Thank you for your time!

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Contributions are welcome at: https://github.com/GastonMazzei/ai-friendly.com