A study on different neural network structure for eatable and poisonous mushroom classification

Big Data and Deep Learning 2018
April 16th, 2018

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***All members has equal contribution,** name order is based on student ID

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Overview

- Dataset
- Model
- Results & Discussion

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Dataset

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Dataset

The Mushroom Dataset
by Jeff Schlimmer

Details of the dataset

# of Sample	8124 [48.20% positive | 51.80% negative]
# of Attribute/Feature	22 [21 is used]
Classification Category	binary classification

Link: https://archive.ics.uci.edu/ml/datasets/Mushroom

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Dataset

The Mushroom Dataset by Jeff Schlimmer

Preprocessing

cap-shape

gill-spacing

gill-size

stalk-root

cap-surface

bruises?

ring-number

gill-color

odor

stalk-surface-below-ring

cap-color

Attribute

stalk-color-below-ring

stalk-shape

ring-type

population

gill-attachment

veil-color

stalk-color-above-ring

habitat

stalk-surface-above-ring

spore-print-color

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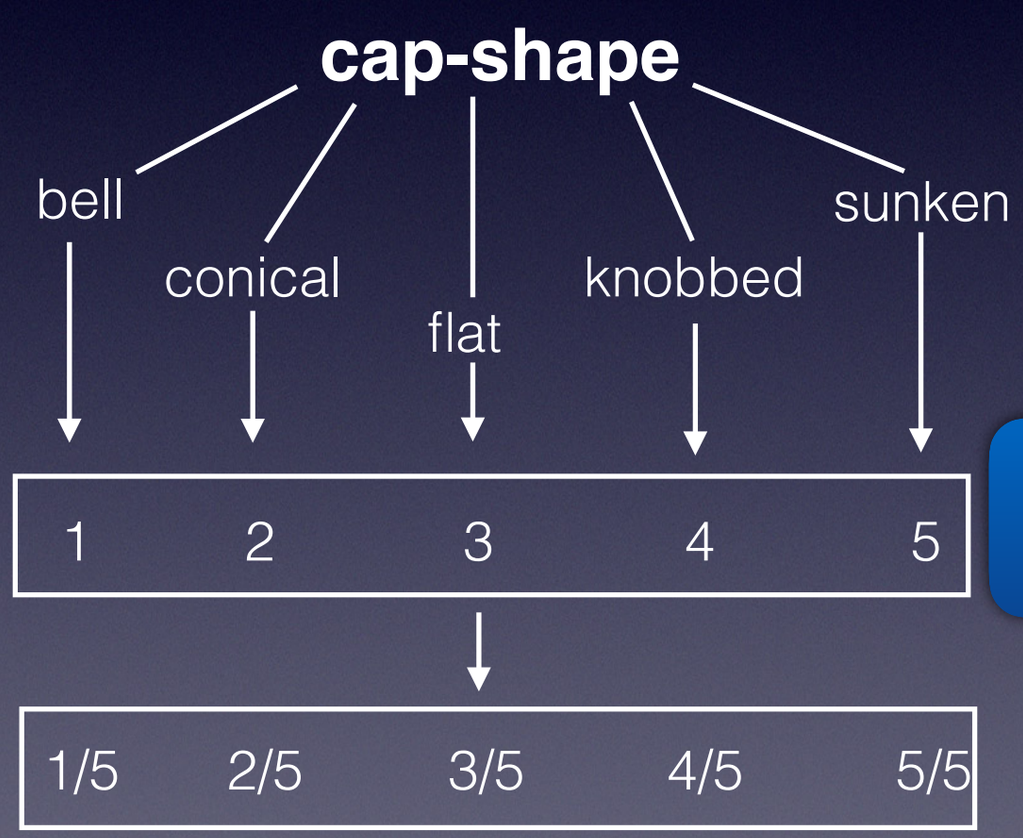
Dataset

The Mushroom Dataset by Jeff Schlimmer

Preprocessing



Attribute

gill-spacing

gill-size

bruises?

stalk-surface-below-ring

odor

stalk-color-below-ring

population

gill-attachment

stalk-color-above-ring

habitat

stalk-surface-above-ring

spore-print-color

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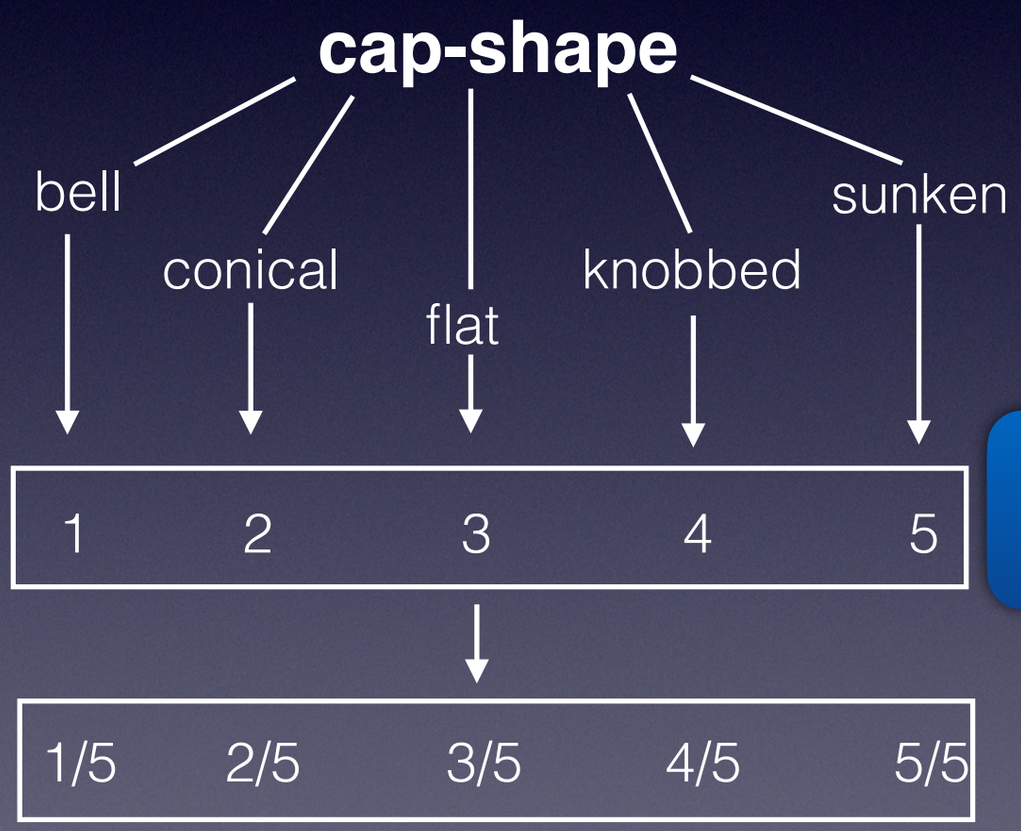
Dataset

UCI Machine Learning Repository

The Mushroom Dataset by Jeff Schlimmer

Preprocessing



Attribute

stalk-color-below-ring

population

gill-attachment

habitat

stalk-color-above-ring

stalk-surface-above-ring

spore-print-color

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Network Structure

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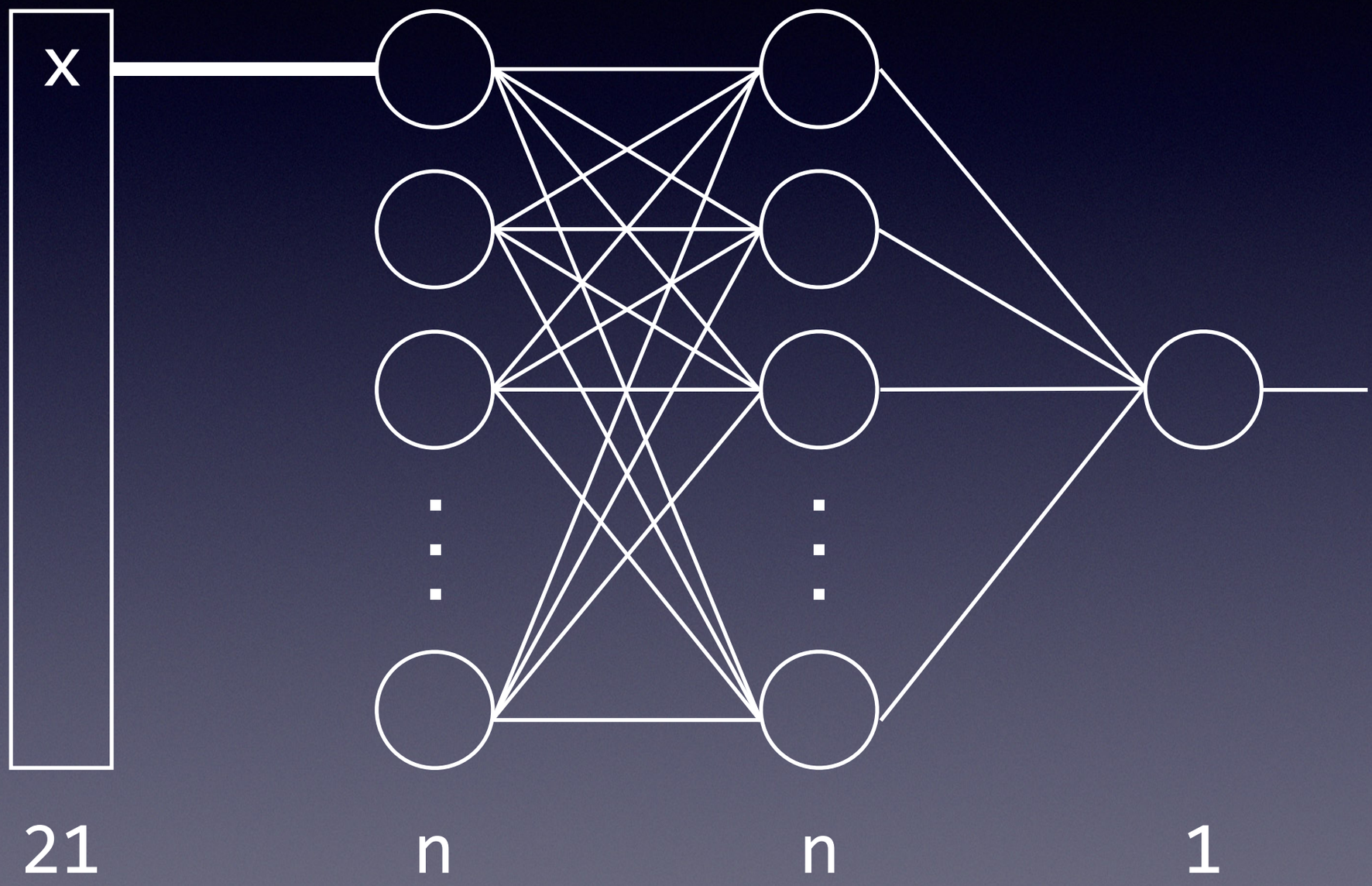
Network Structure



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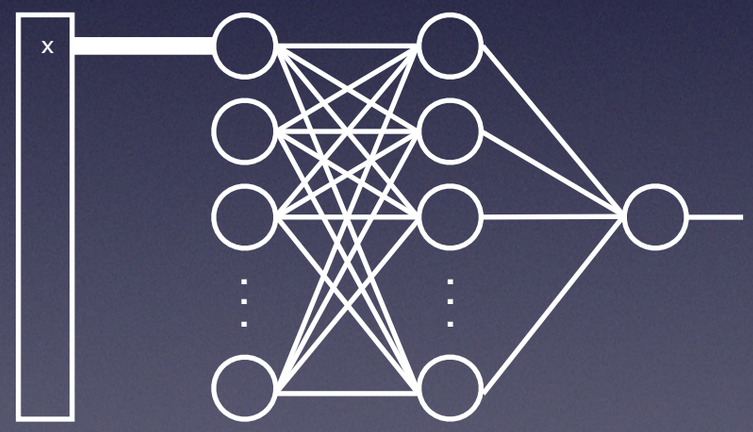
Network Structure

Network type	Fully connected network
# of layers	3 [1 Input | 1 Hidden | 1 Output]

Hyperparameters

Train-Test	80% / 20%
Batch size	25 samples
Iterations	<3000
Learning Rate	0.01
Optimizer	Adamax
Loss function	MSE



Activation function: tanh()

$$y = f(Wx + b)$$

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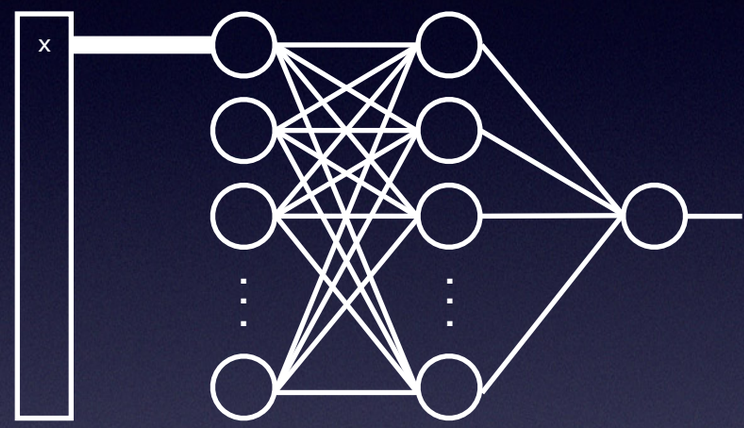
Results and Discussions

Training and Testing

	Training Set	Test Set
Accuracy	100%	100%
Error	0%	0%



*number of nodes ≥3

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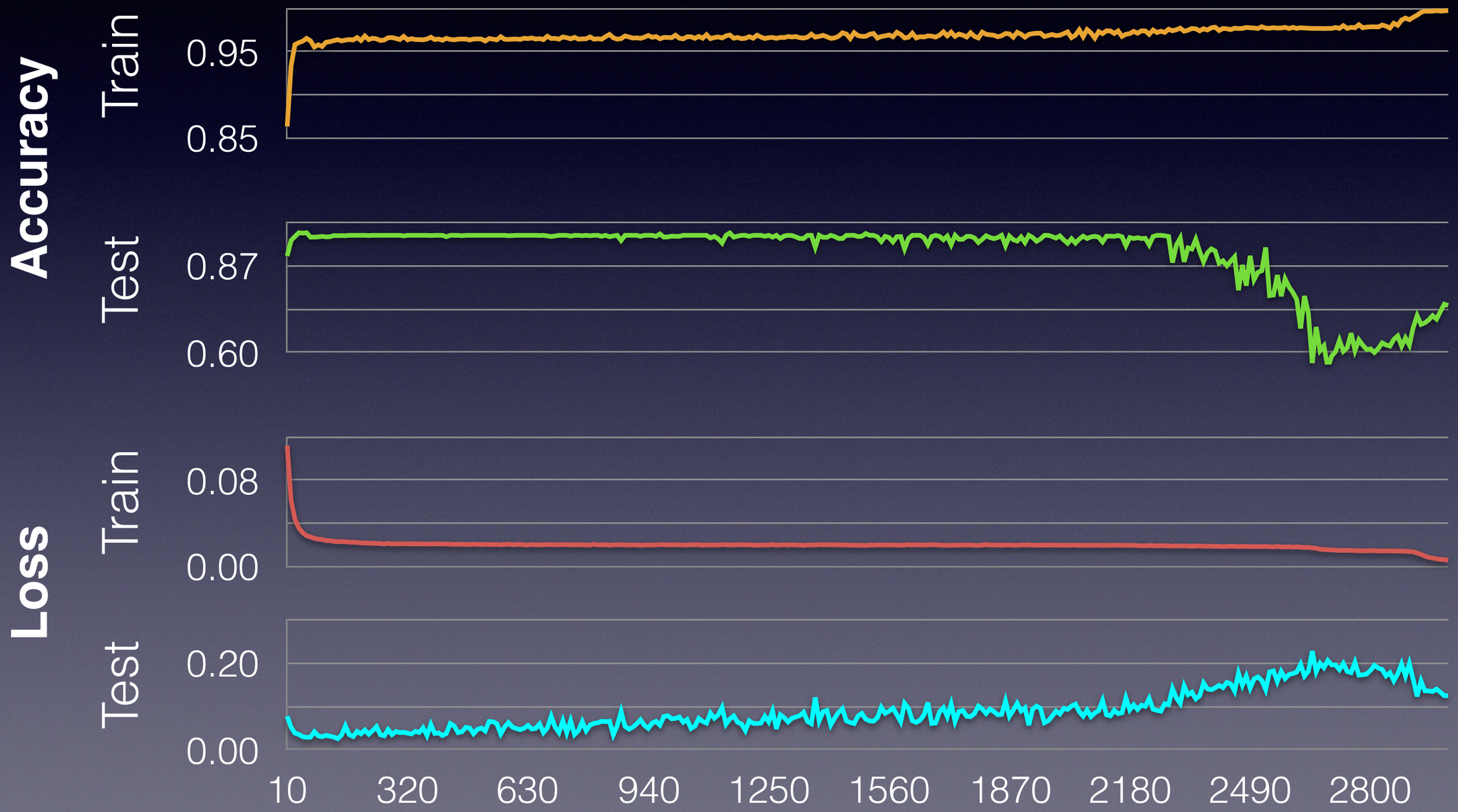
Results and Discussions



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Results and Discussions

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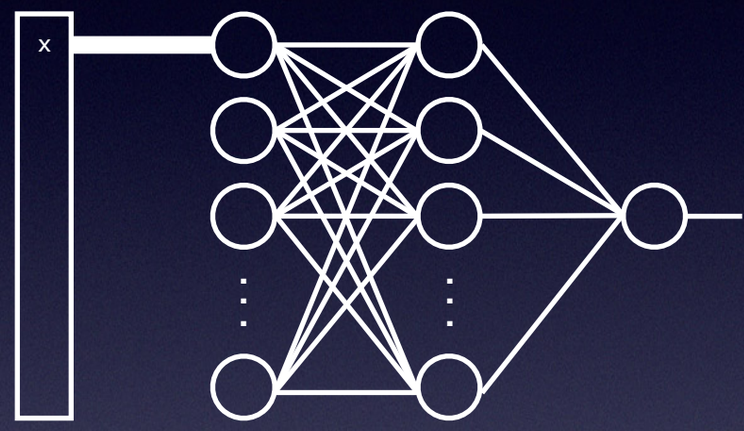

*number of nodes ≥3

Which model is the best?

- Number of **parameters**
- Speed of **convergence**

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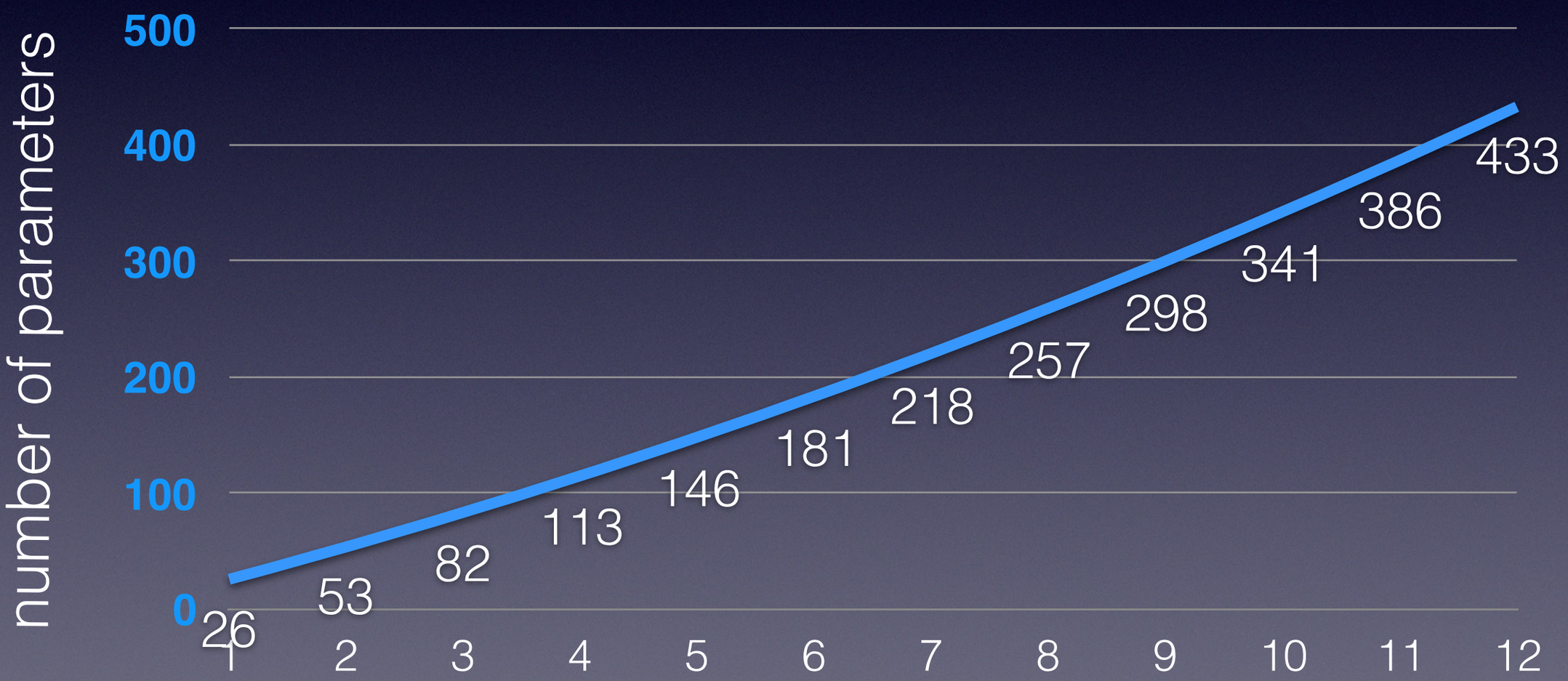
Results and Discussions

Performance of the network



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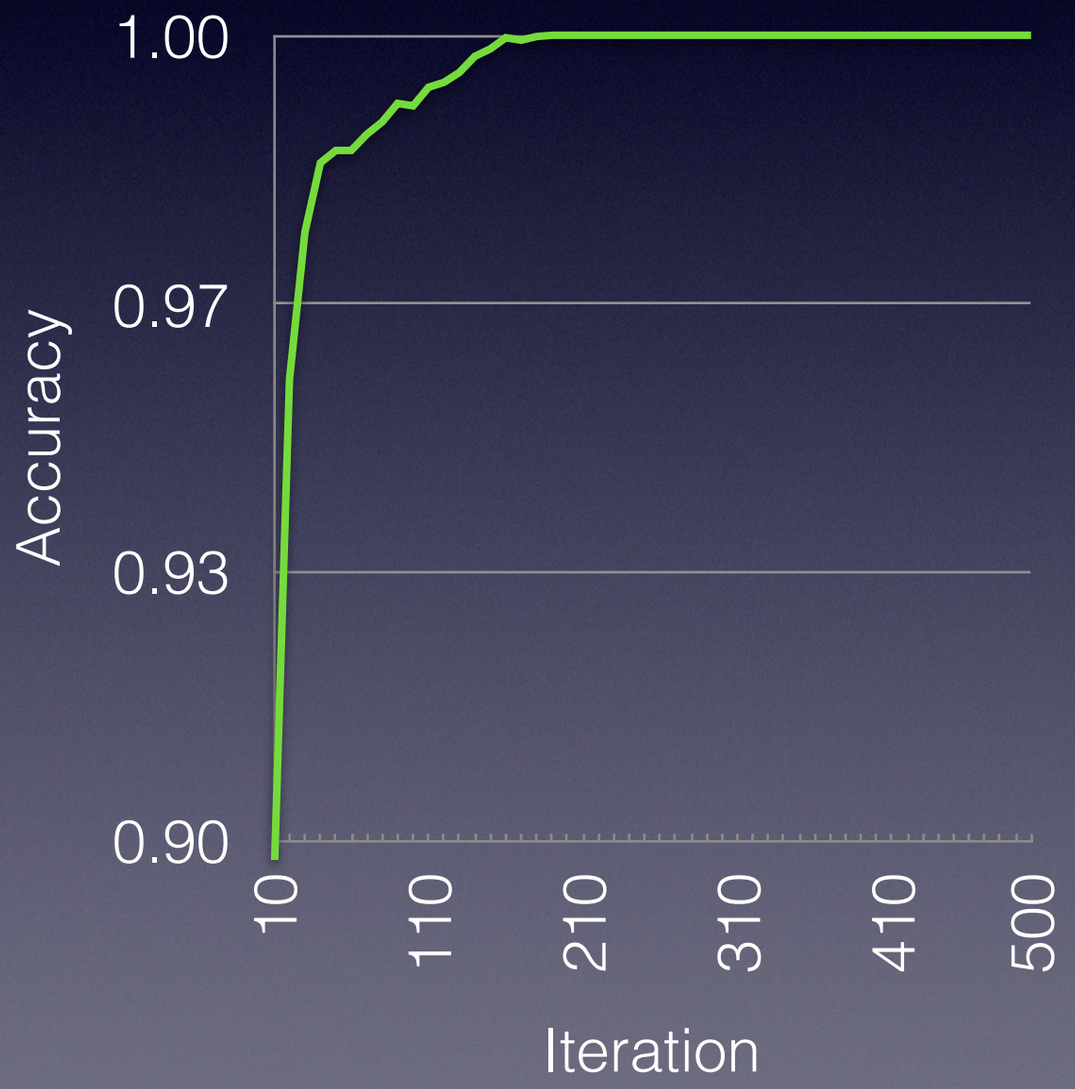
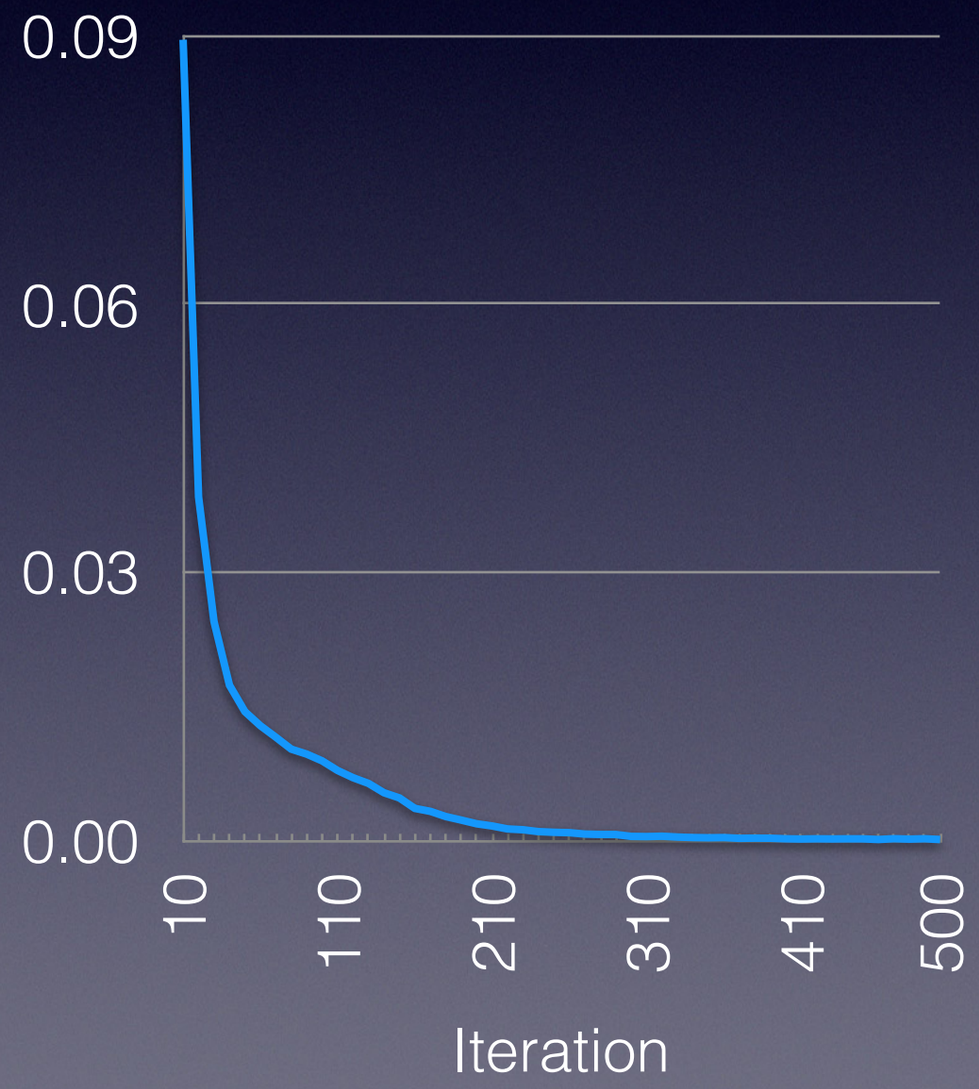
Results and Discussions

Usual training accuracy and loss [10 10 1]





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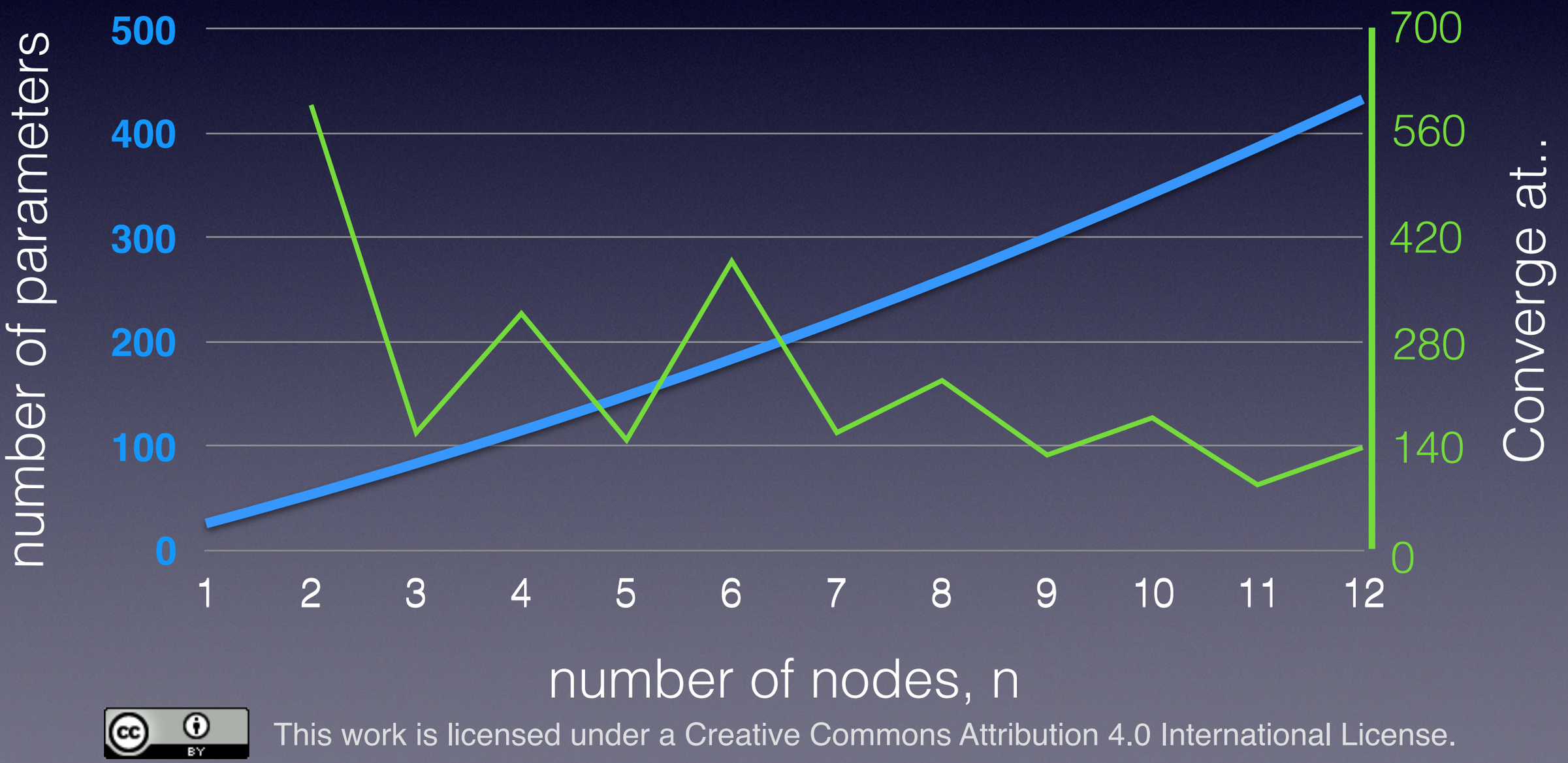
Results and Discussions



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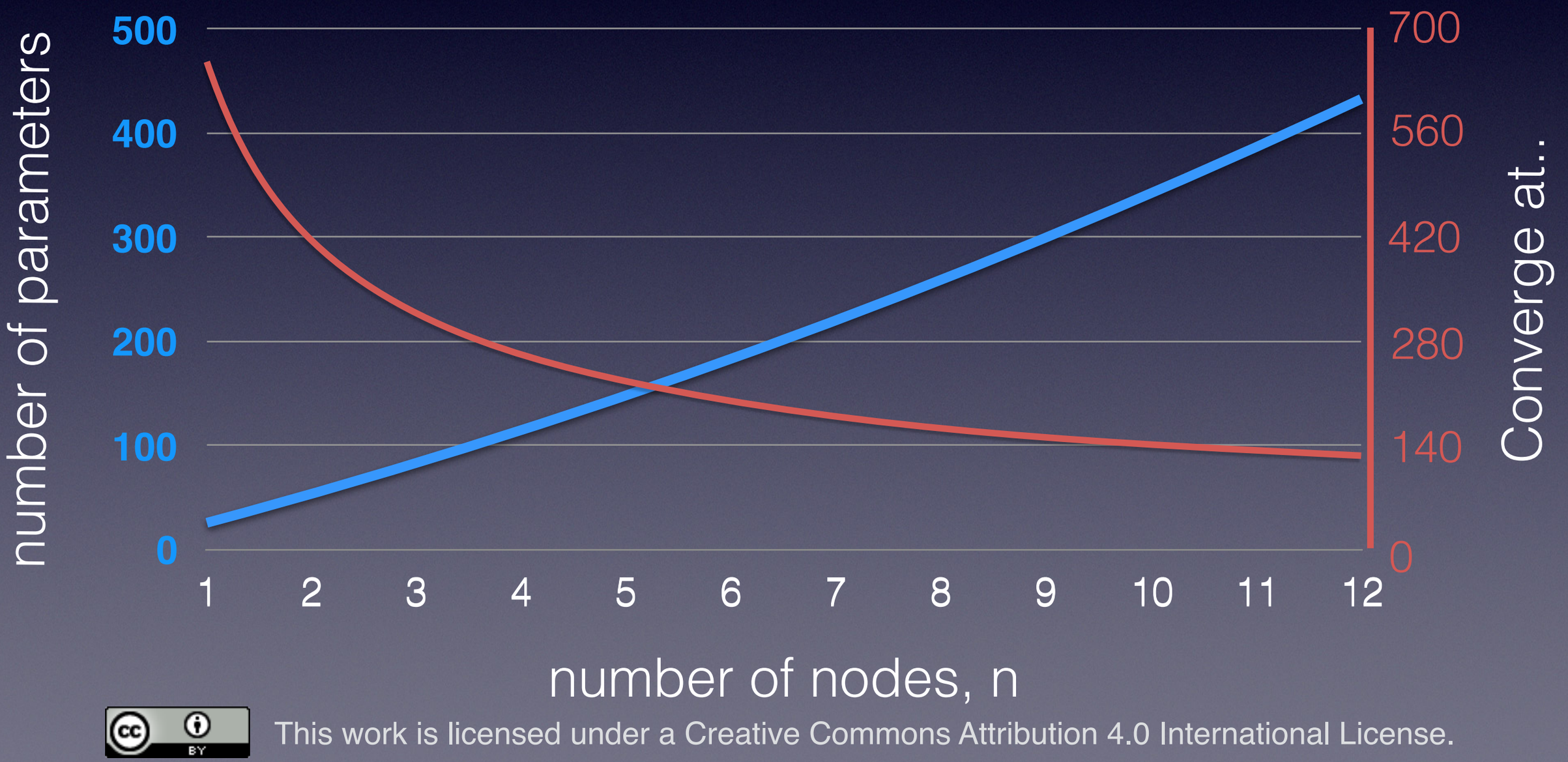
Results and Discussions



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Results and Discussions

- The simplest network structure that can generalize is [3 3 1] (82 parameters).
  - Overfitting can be seen in [2 2 1].

- Reducing number of features
  can reduce complexity of the network.

- Some features can be transformed into one-hot feature vector.

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Thanks ...