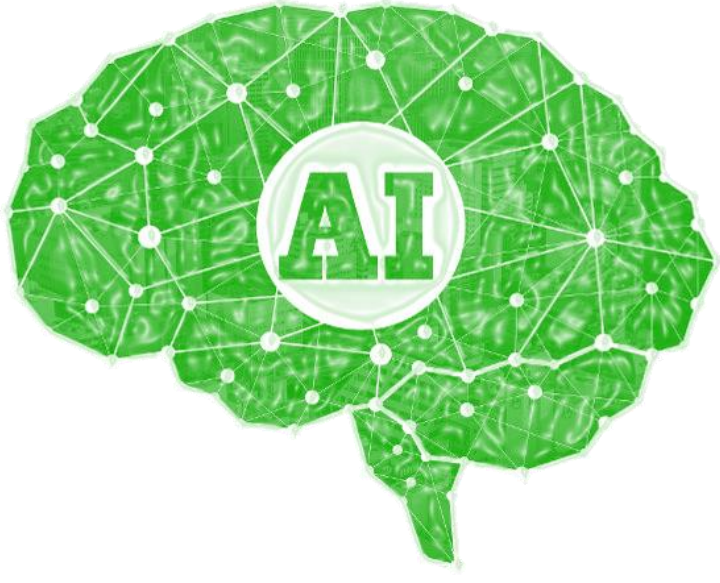
Qt day

Sebastiano Galazzo

Building an advanced A.I. from scratch



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Who am I?

Sebastiano Galazzo

- R&D manager at axélero spa
- Microsoft MVP for A.I. category

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Contents

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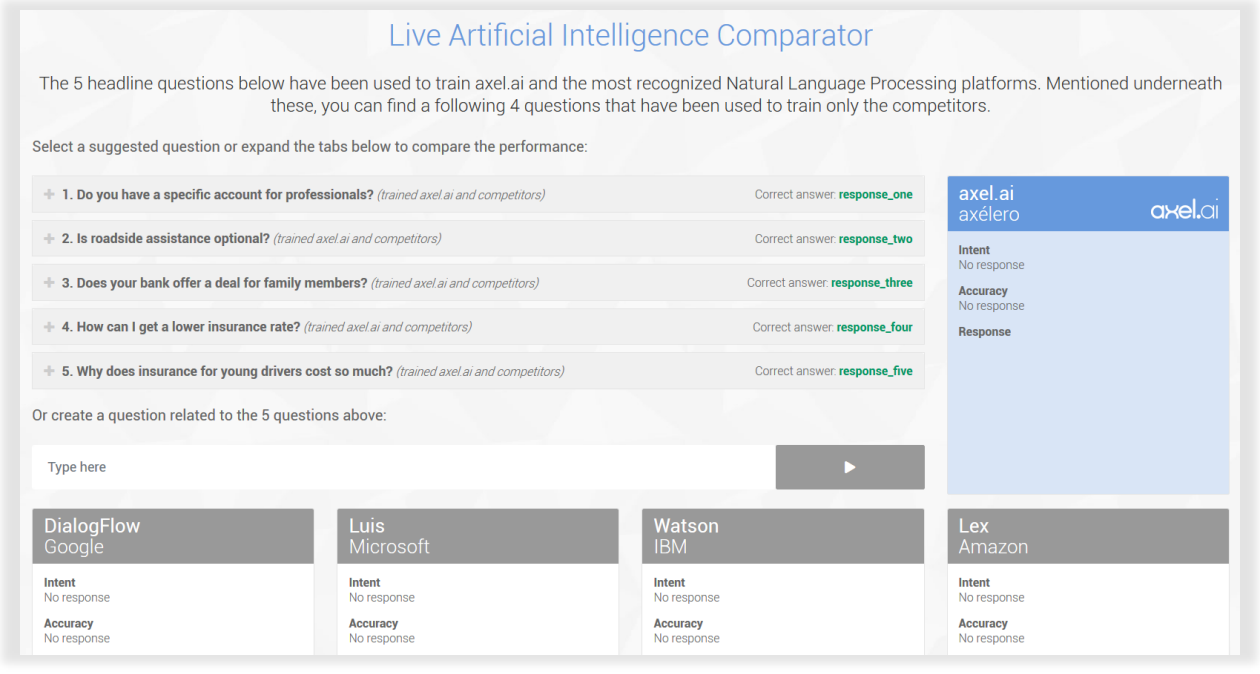
Demo



Try it for yourself at: **compare.axel.ai**

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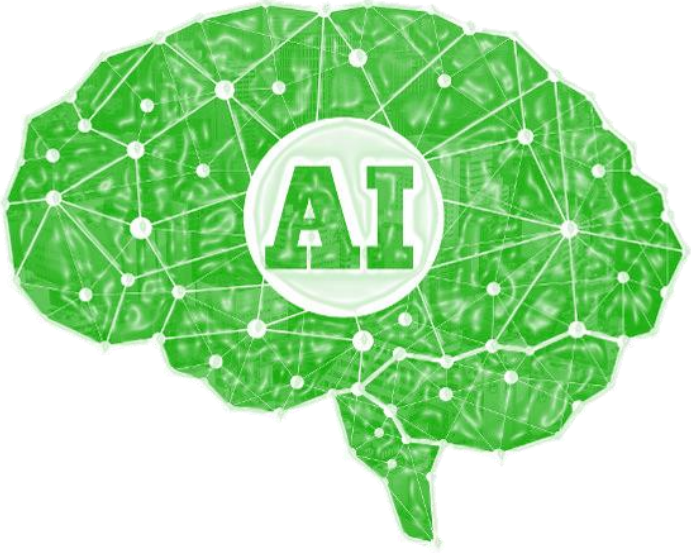
How was it done?

Using A.I. techniques



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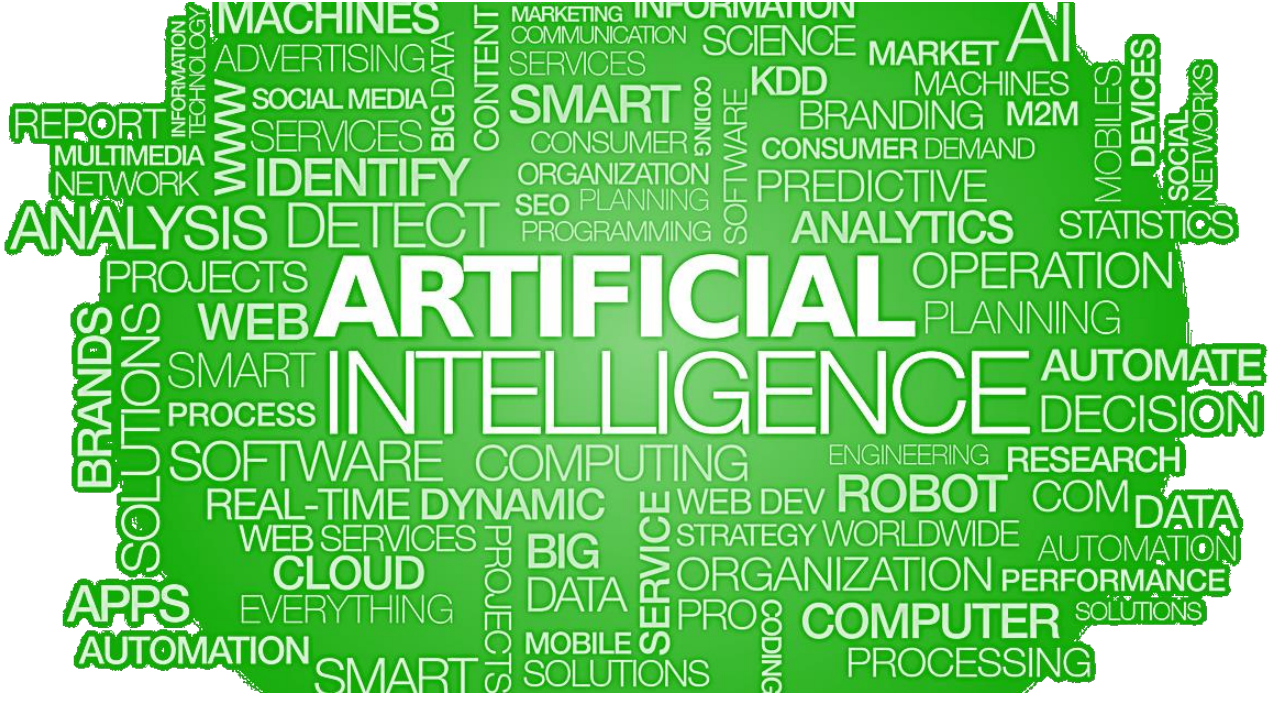
What is A.I.?

Let’s agree on what A.I. really means



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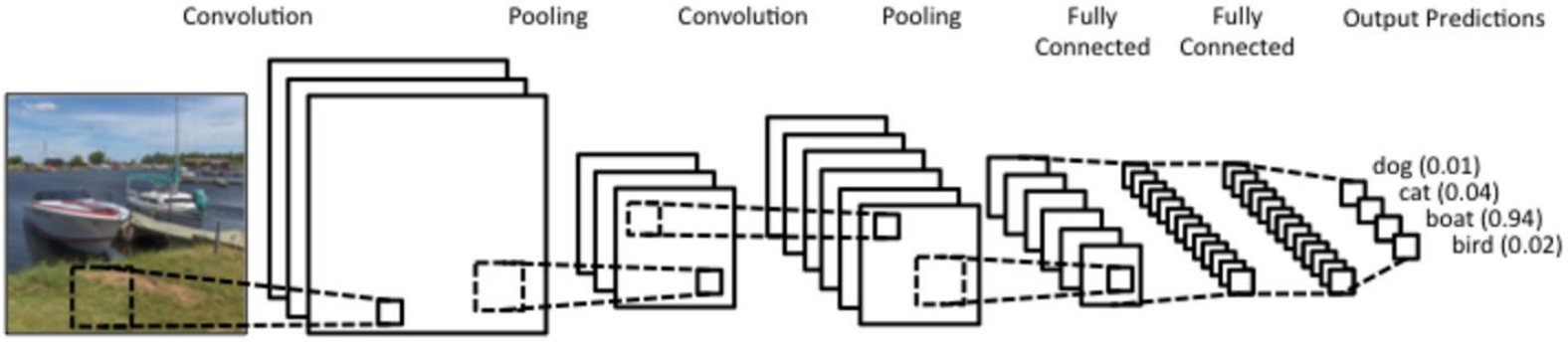
A.I.: Buzz words

- Machine Learning
  - Uses statistical techniques to "learn" with data

A.I.: Buzz words

- Deep Learning
  - Uses a cascade of multiple layers for feature extraction and transformation
  - Uses the output from the previous layer as input



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A.I.: Buzz words

- Artificial Intelligence
  - A combination of methodologies and technologies that allow a computer system to provide services which, to a common observer, would seem to be only realisable by human intelligence
  - #notmachinelearning

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A.I.: Buzz words

- Artificial Intelligence

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Neural Networks

What are they?

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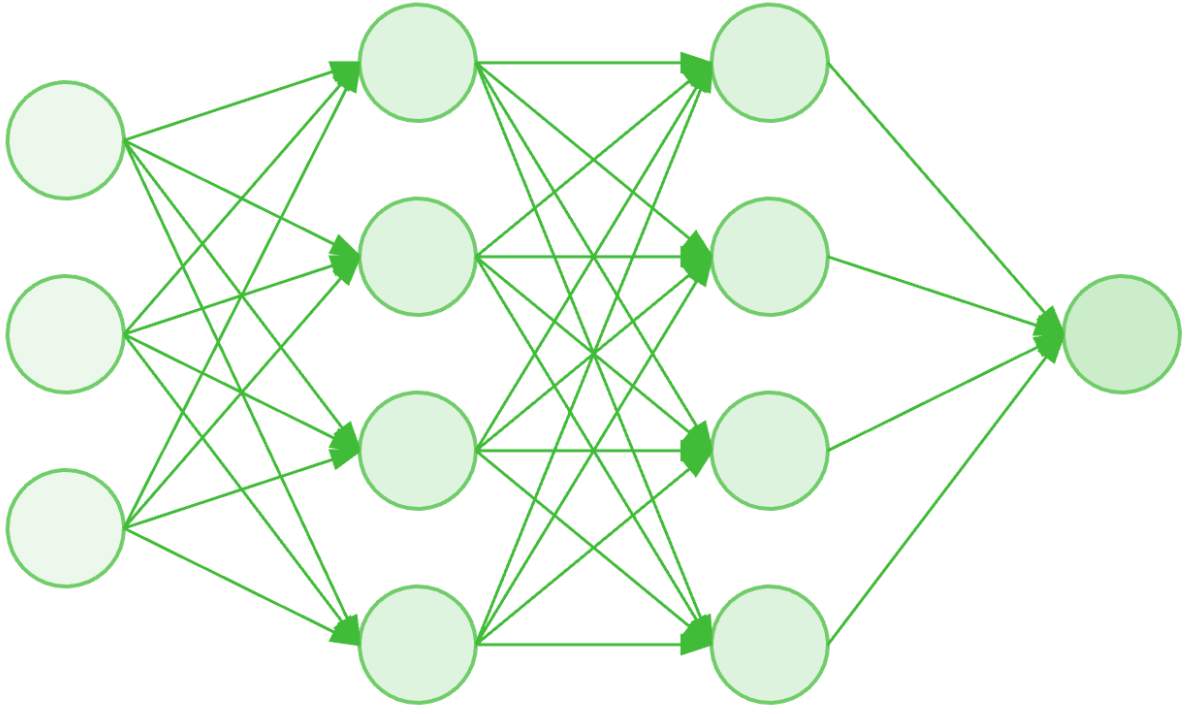
Neural Networks

What are they?



input layer hidden layer 1 hidden layer 2 output layer

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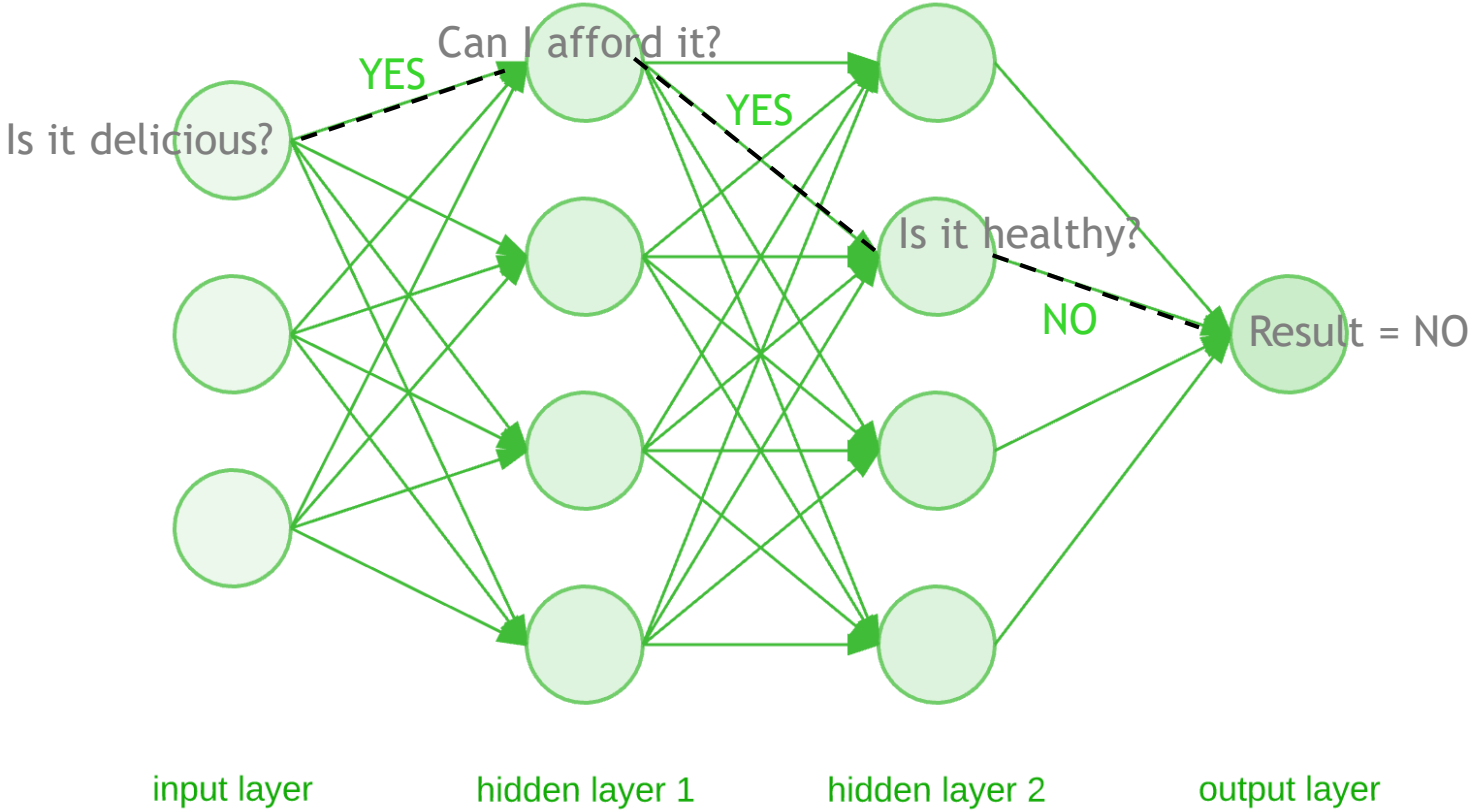
Neural Networks

What are they?

Should I buy a soda??



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Neural Networks

How they work

- Learns with data
- Without training a network, the output is completely random
- To train a neural network to add you would input 2+2=4 and 1+6=7 and so on

(Repeating the input and result often enough, the algorithm learns how to add numbers alone)

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Neural Networks

How they work

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Neural Networks

How they work

- Every neuron in a neural network has two properties: ‘weight’ and ‘bias’

  (sometimes also called ‘threshold’)

- These two properties determine the output value and what the neuron will pass on to the neurons in the next layer, based on its inputs.

2 + 2 = 4
1 + 6 = 7

2 + 2 = 4
1 + 6 = 7
2 + 2 = 4
1 + 6 = 7

2 + 6 = ?

2 + 6 = 8

Neural Networks

Limitations

1. Training time and effort
2. Rigid model

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Neural Networks

Limitations

1. Training time and effort
   - Vast amounts of data needed for training

My resolution?

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axel.ai Inspiration

Qubit

axel.ai Inspiration

Qubit

- Similar to the neurons of a neural network: ‘bits’ are the smallest units of computational information
- A classical bit holds a specific value: either 0 or 1
- A qubit can operate in both 0 and 1 states at the same time

Classical bit Qubit

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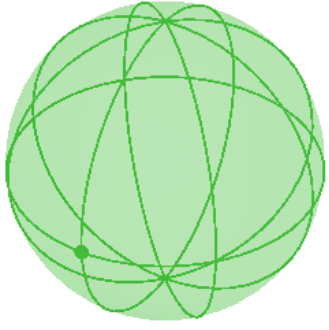
axel.ai Inspiration

Qubit

- Imagine a sphere that turns between the state of 0 and the state of 1
- I can stop the sphere from spinning when it is in the state of 0, the state 1 or (for example) even the state of 0.3984621117231
- In this sense the potential values between 0 and 1 are infinite



Qubit

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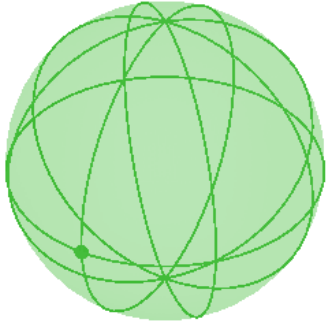
Qubit

- The algorithm is more potent and flexible
- Able to conduct multiple calculations at once and with a much higher accuracy



Qubit

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Neural Networks

Limitations

2. Rigid model
    - If you edit the data you will need to change and retrain the model

My resolution?

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Graph Network

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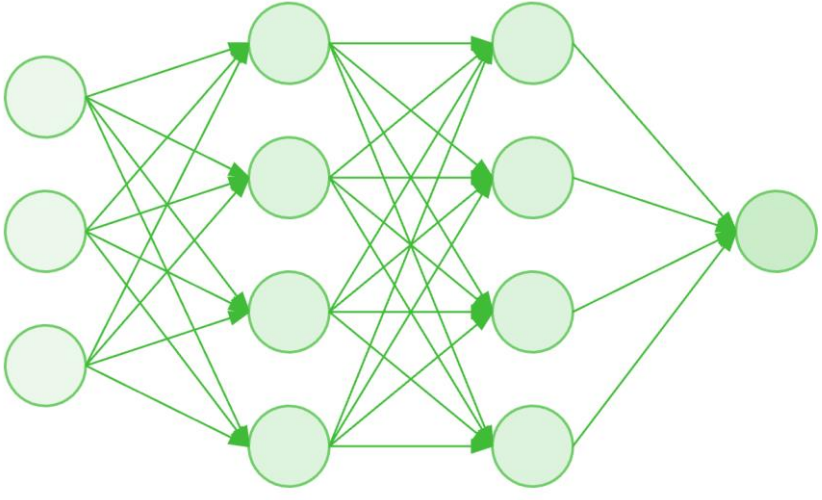
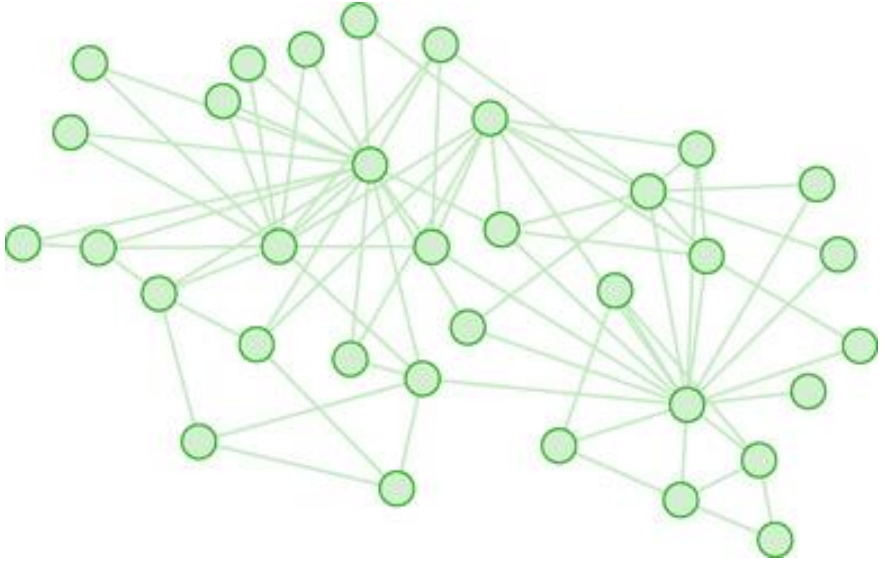
Graph Network



Standard Neural Network



Graph Network

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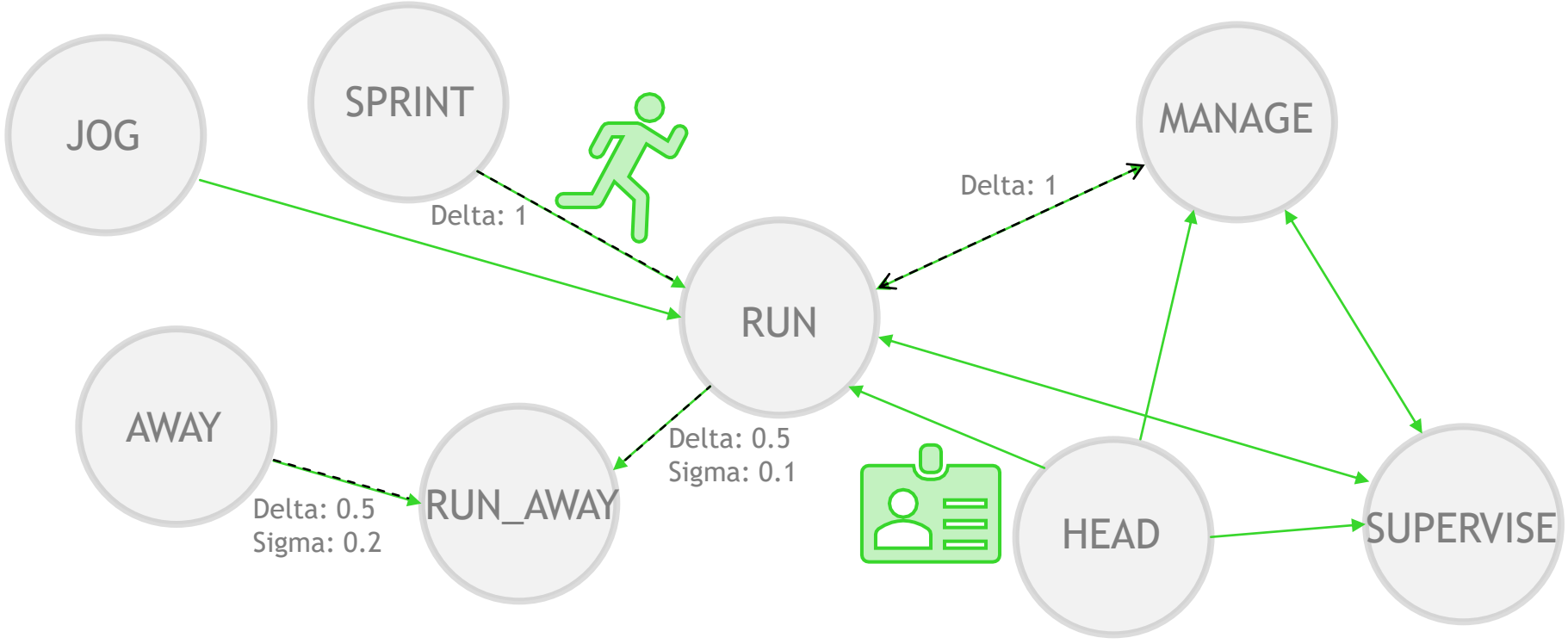
Graph Network



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So how does all of this work within axel.ai?

axel.ai Inspiration

1. Do you have a specific account for professionals? *(trained axel.ai and competitors)*
Correct answer: **response_one**

Questions:

- **Is there an offer for people who manage their own vat? (trained only competitors)**
- **If I run a private company do I need a business account (trained only competitors)**
- **I am a lawyer and I would like to open an account. What deals do you have? (trained only competitors)**
- **I run a family business and I would like to open an account. Do you have any promotions? (trained only competitors)**

Suggested alternative questions:

- If I manage my own vat, can I apply for a discount? (not trained)
- What is the best deal you can offer for an entrepreneur? (not trained)
- Do you offer any discounts for professionals? (not trained)
- My father is a freelance designer. What discounts can he apply for? (not trained)

axel.ai
axélero

Intent
response_one

Accuracy
100%

Response
For our self-employed clients, we can offer a host of exclusive banking and financial services with our Professional Account. For more information just simply ask in your local branch.

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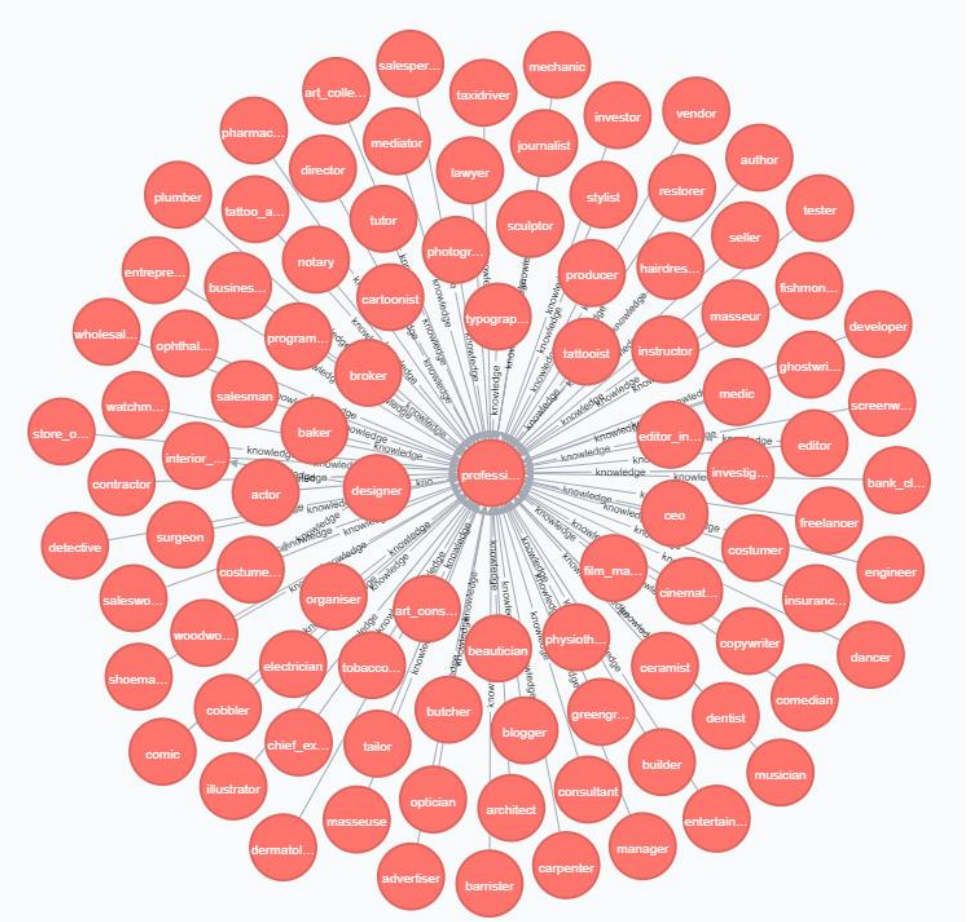

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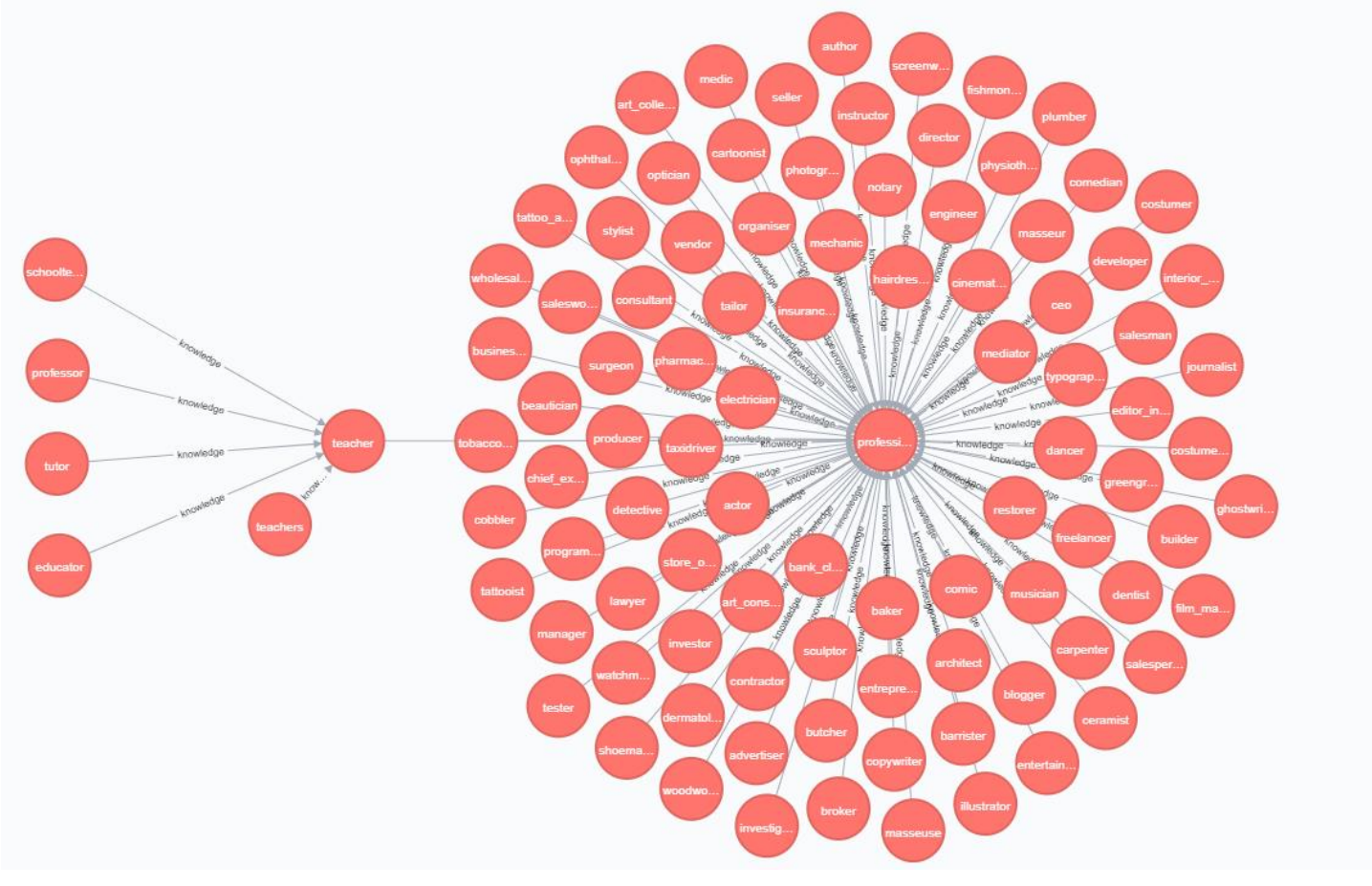

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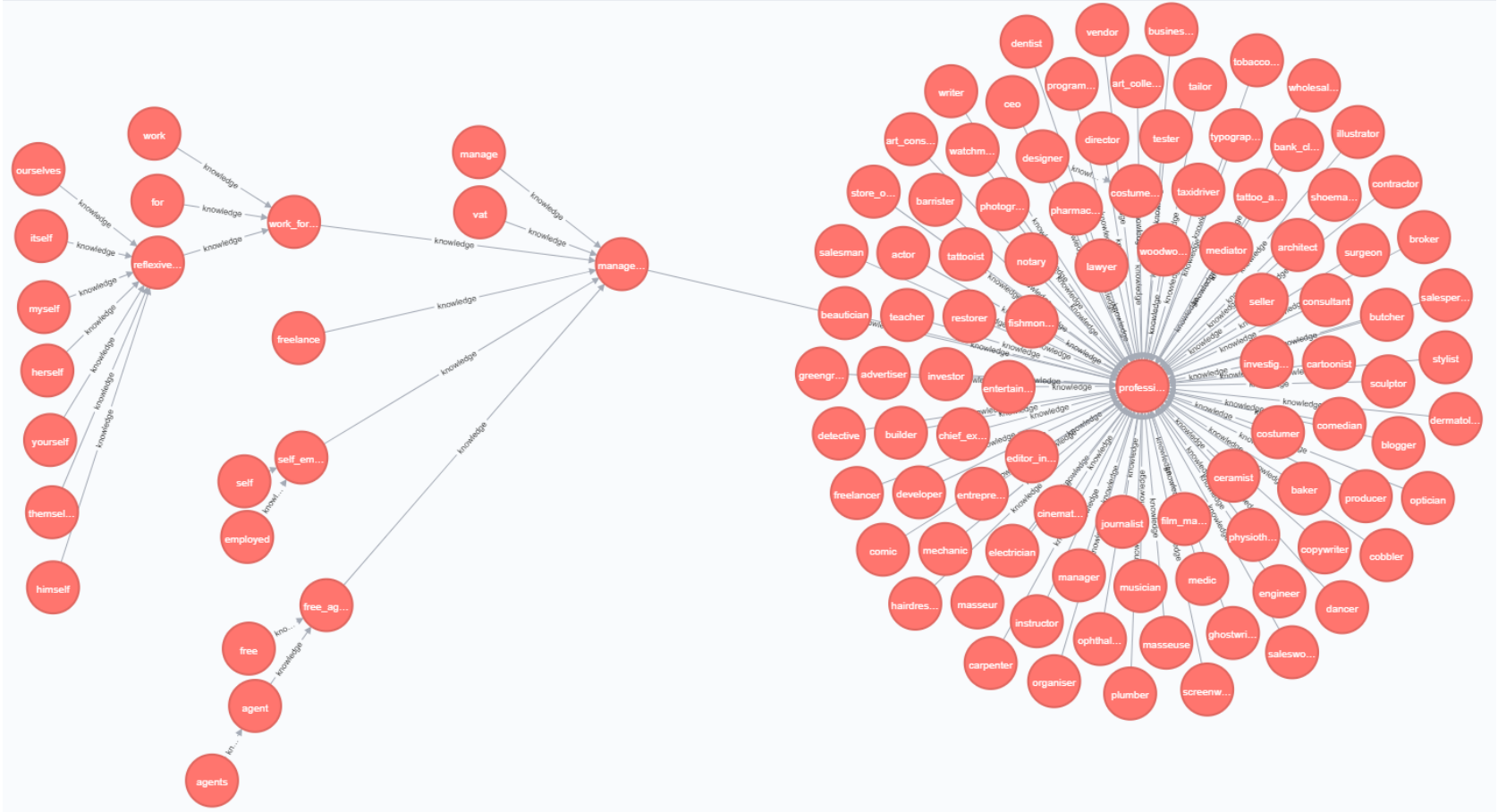

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Flow
Analysis

To understand a full sentence text the algorithm conducts three analytical steps:

- POS tagging
- Node index detailing
- Grammatical analysis

Flow

POS tagging

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Flow

POS tagging

determiner (DT)

verb (VB)
noun (NN)

verb (VPZ)
noun (NNS)

preposition (IN)

verb (VB)
noun (NN)

Qt day

Flow

POS tagging

determiner (DT)

verb (VB)
noun (NN)

verb (VPZ)
noun (NNS)

preposition (IN)

verb (VB)
noun (NN)

Qt day

Flow

POS tagging

```
{
 if ((index > 0 && index < gp_size_less_one) && (result[index - 1].Any(x => x.Type == "DT")
   {result.Update(index, noun); }
}
```

THE	FLOWER	FLOWERS	IN	SPRING
determiner (DT)	verb (VB) noun (NN)	verb (VPZ) noun (NNS)	preposition (IN)	verb (VB) noun (NN)

Qt day

Flow

POS tagging

```
{
 if ((index > 0 && index < gp_size_less_one) && (result[index - 1].Any(x => x.Type == "DT")
   {result.Update(index, noun); }
}
```

determiner (DT)

noun (NN)

verb (VPZ)
noun (NNS)

preposition (IN)

verb (VB)
noun (NN)

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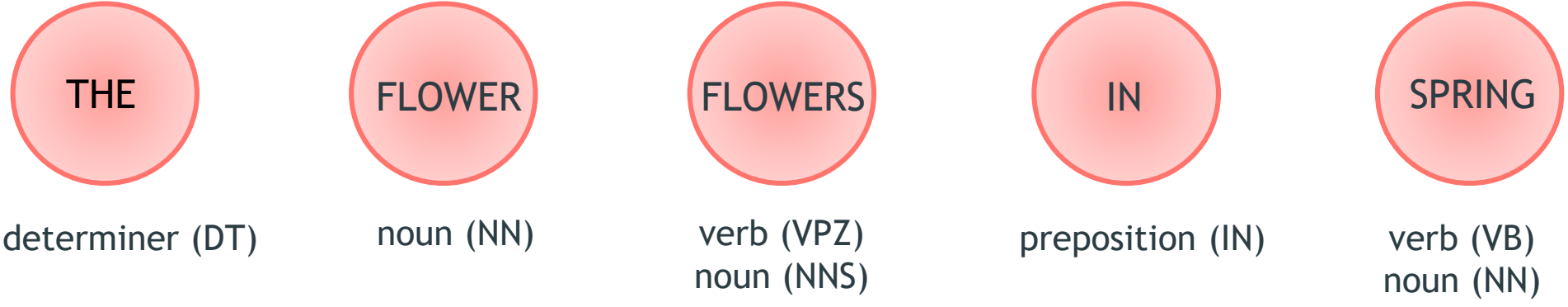
Flow

POS tagging



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Flow

POS tagging

Node index

Qt day

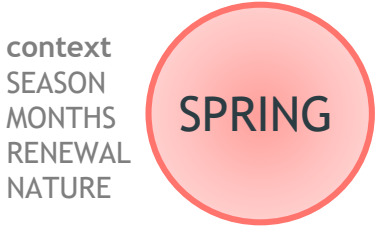
Flow

Node index

Qt day

Flow

Node index



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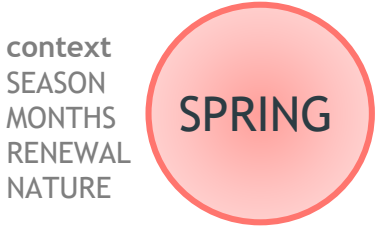
Flow

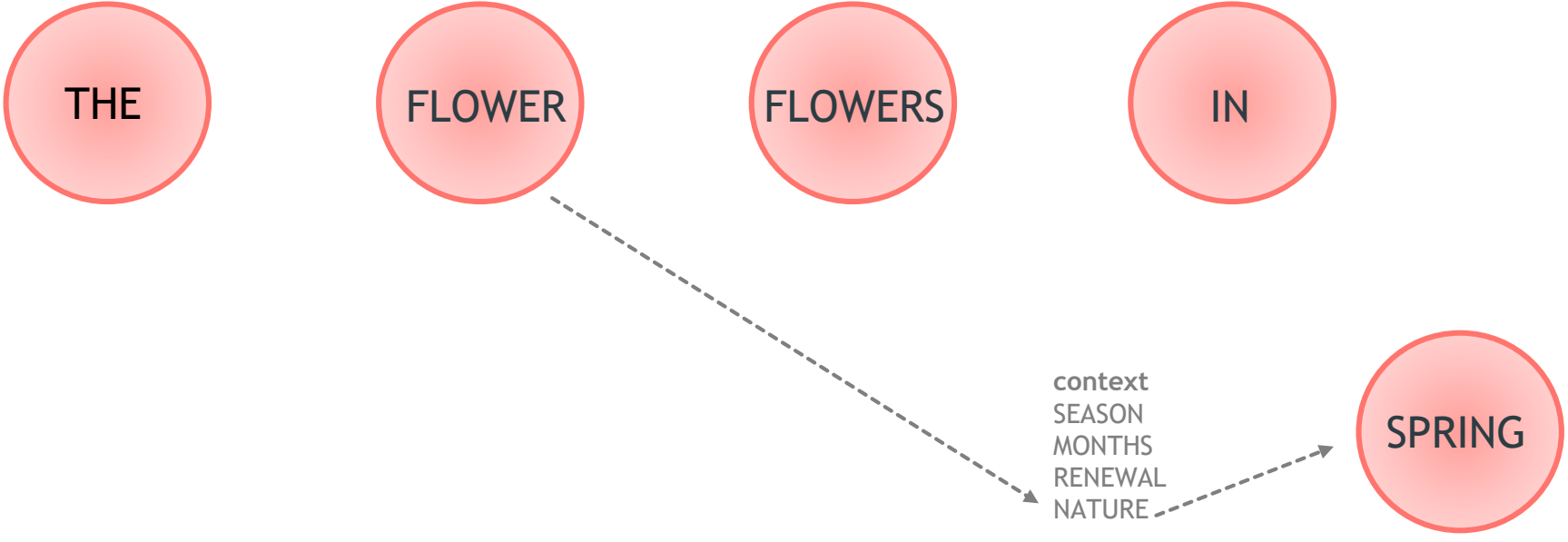
Node index



Qt day

Flow

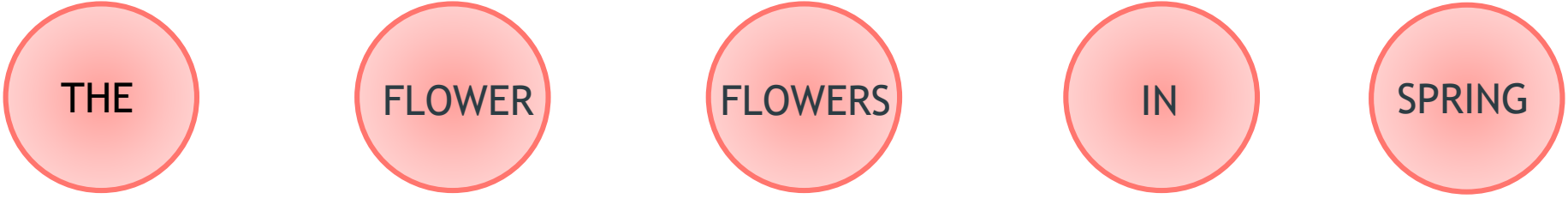
Node index



Qt day

Flow

Node index



Grammar

Qt day

Flow

Grammar

Qt day

Conclusion

So, what does all this mean?

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Conclusion

Go to: **compare.axel.ai**