# Deep Learning made in TM

# Deep Learning made in TM

DEMO
TIME !

# Main Points

1. Deep Learning in 5 minutes

2. Applications and Trends

3. The Deep Learning community in Timisoara

# Deep learning in 5 minutes

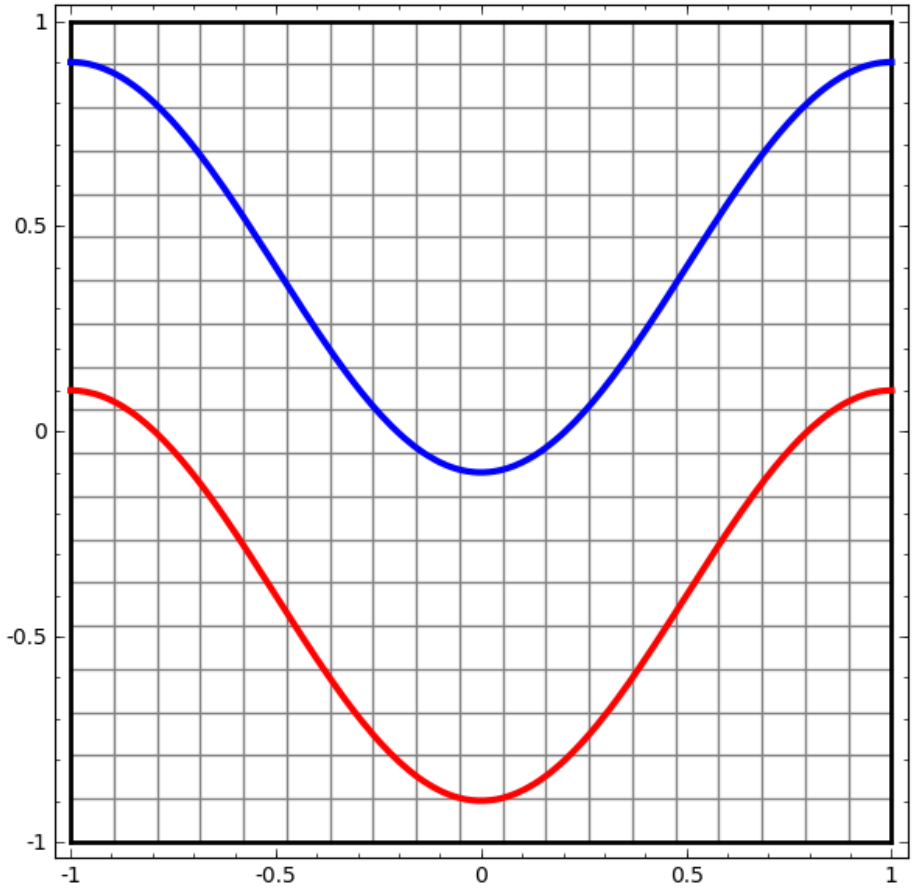
What is deep learning?

# Deep learning in 5 minutes

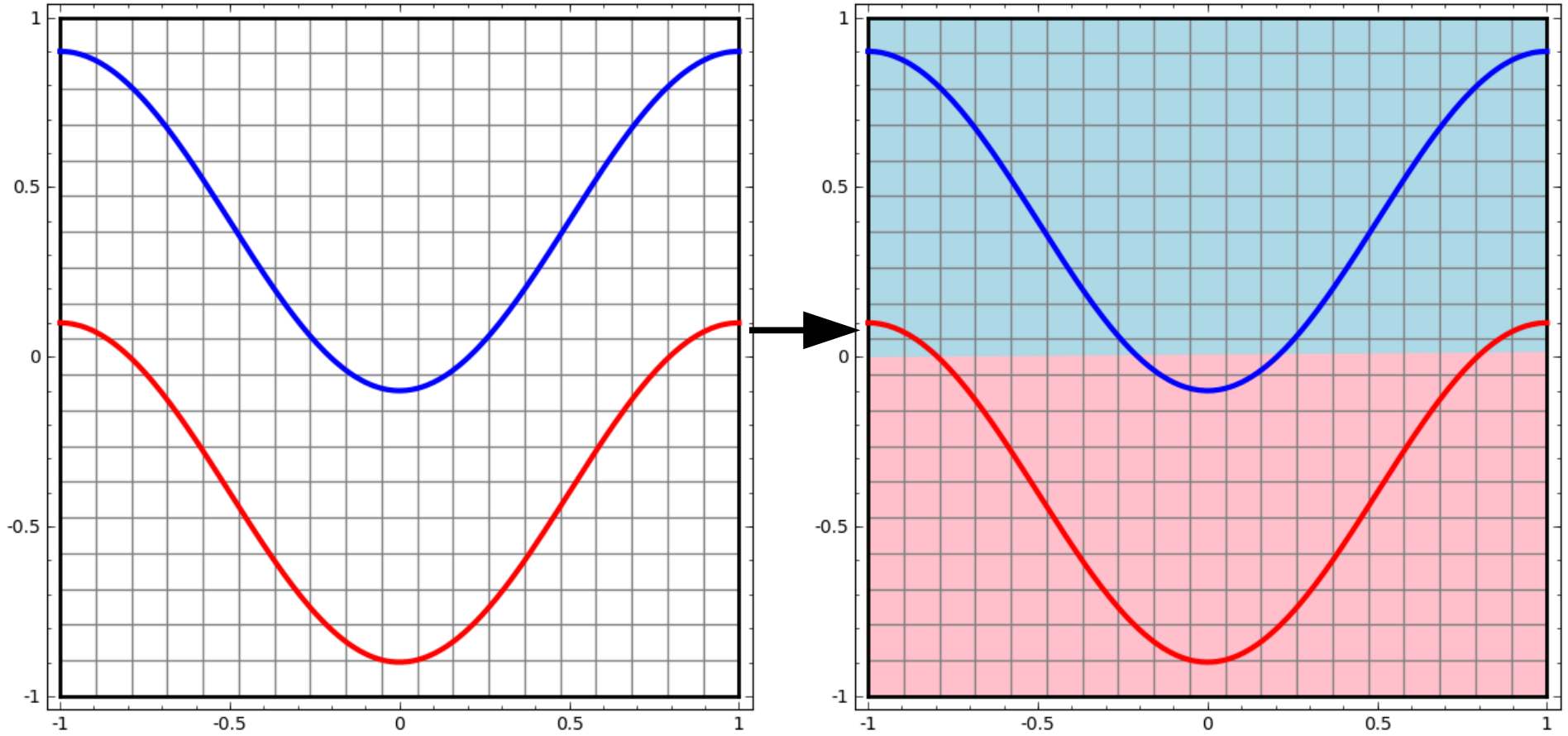
What is deep learning?

Deep learning is a rebranding of neural networks.

# Deep learning in 5 minutes



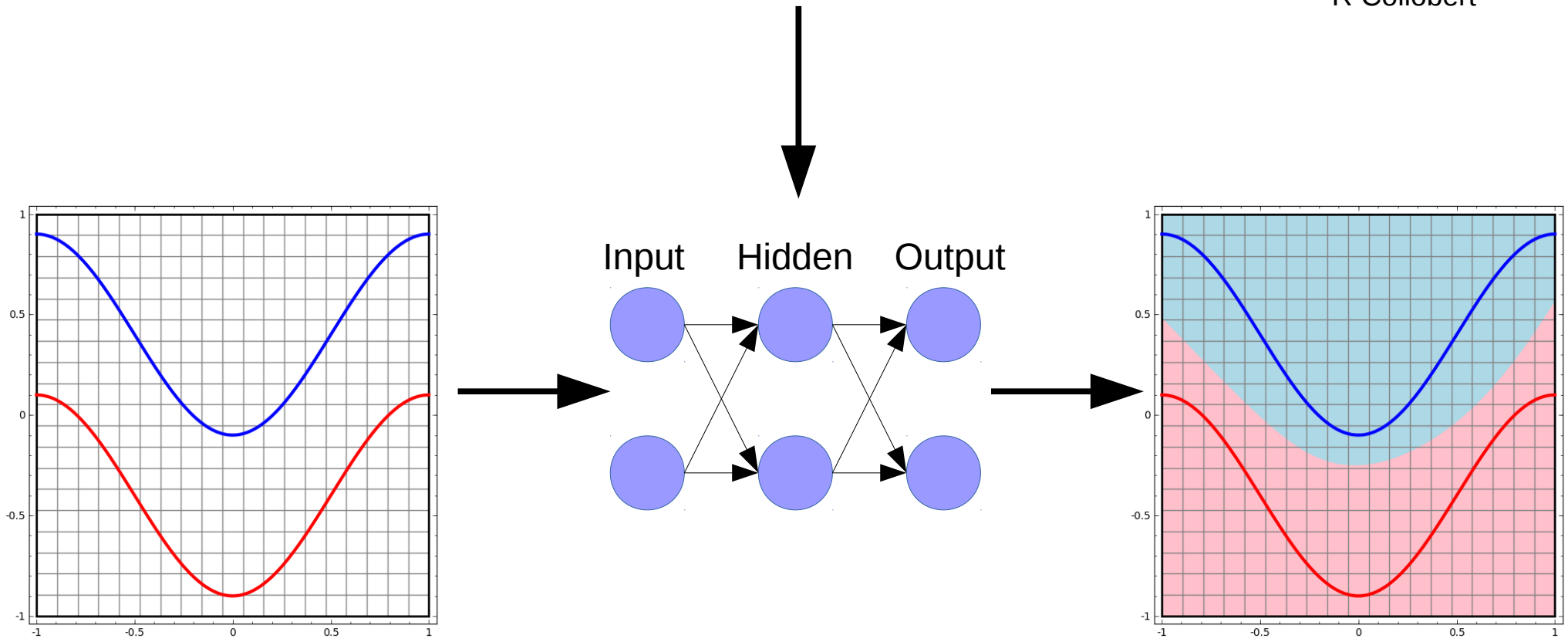

# Deep learning in 5 minutes



# Deep learning in 5 minutes

Deep learning = stack matrix-vector multiplications interleaved with non-linearities

R Collobert



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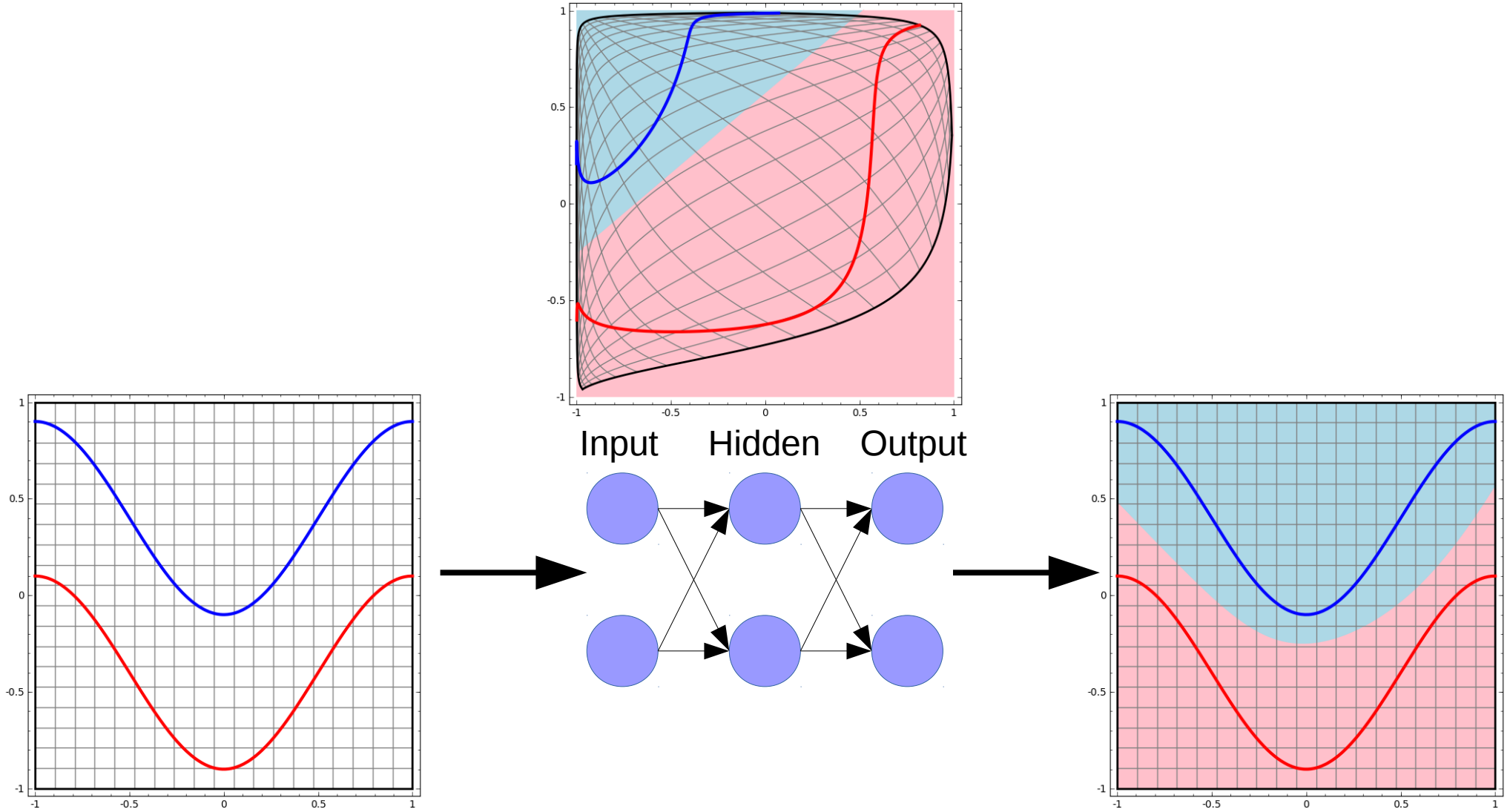
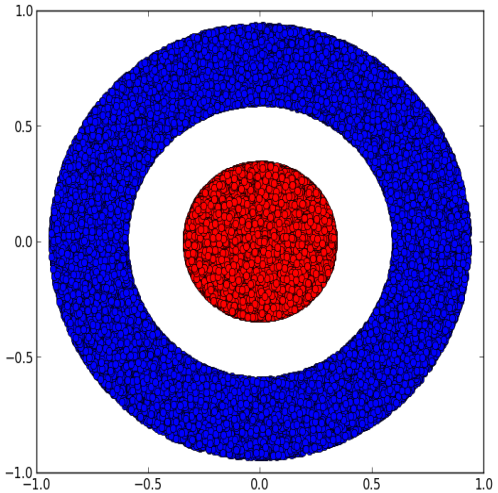
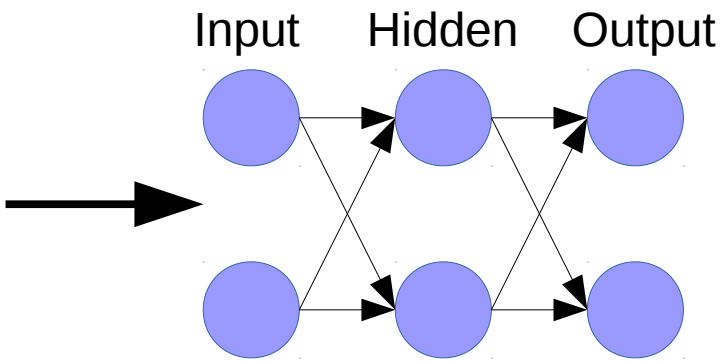


# Deep learning in 5 minutes

Can we classify this data ?



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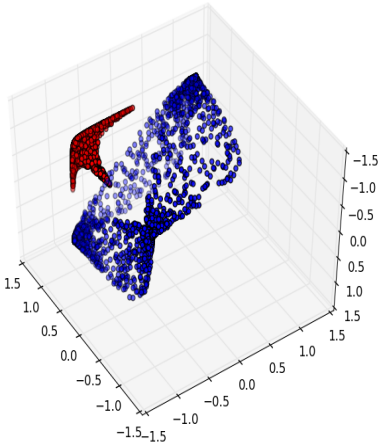
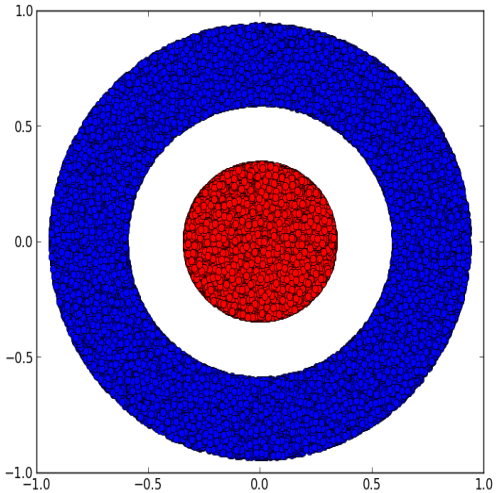
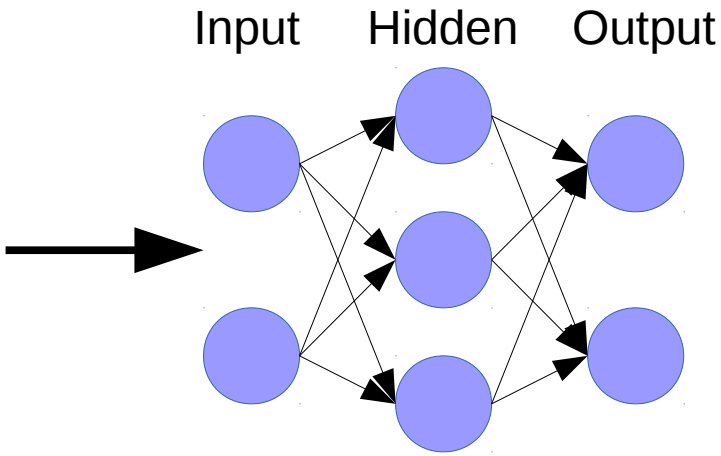
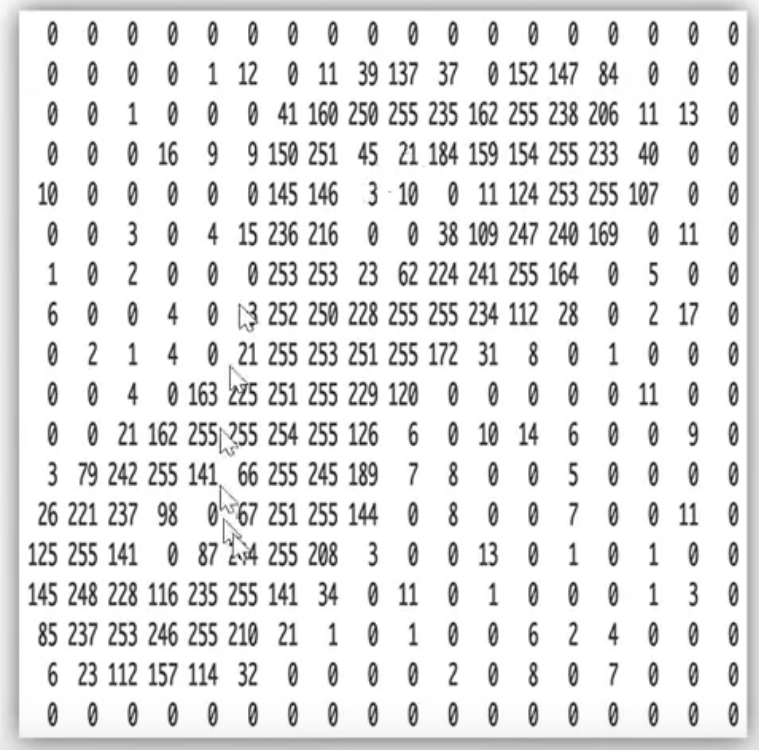


# Deep Learning: Tensor in, Tensor out

**In a nutshell**



| Number | Prob |
|---|---|
| 0 | 0.01 |
| 1 | 0.03 |
| 2 | 0.03 |
| 3 | 0.04 |
| 4 | 0.07 |
| 5 | 0.08 |
| 6 | 0.10 |
| 7 | 0.02 |
| 8 | 0.59 |
| 9 | 0.01 |

*np.argmax*

TensorFlow

# Deep learning is a tool

Researcher Developer Domain expert

# Deep learning is a tool

Deep Learning skills

Researcher Developer Domain expert

# Main Points

1. Deep Learning in 5 minutes

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# Applications and Trends

**Autoencoder based audio anomaly detection for SMD assembly**


**Figure 7.** SMD semiconductor assembly equipment.

https://www.mdpi.com/1424-8220/18/5/1308/pdf

# Applications and Trends

**Autoencoder based audio anomaly detection for SMD assembly**

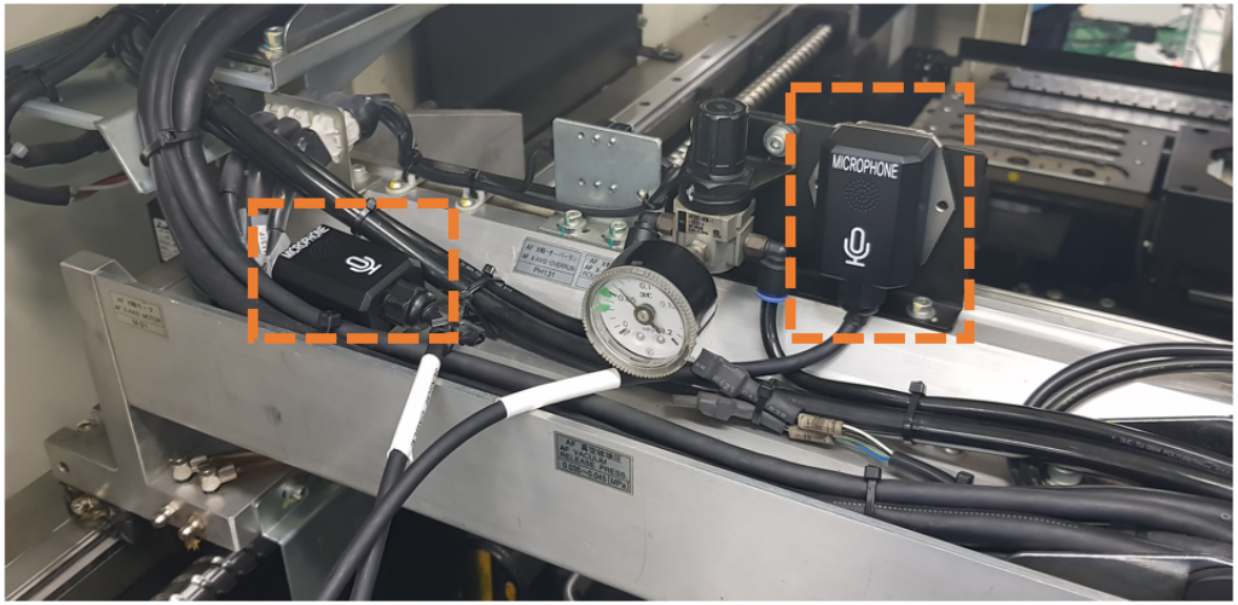
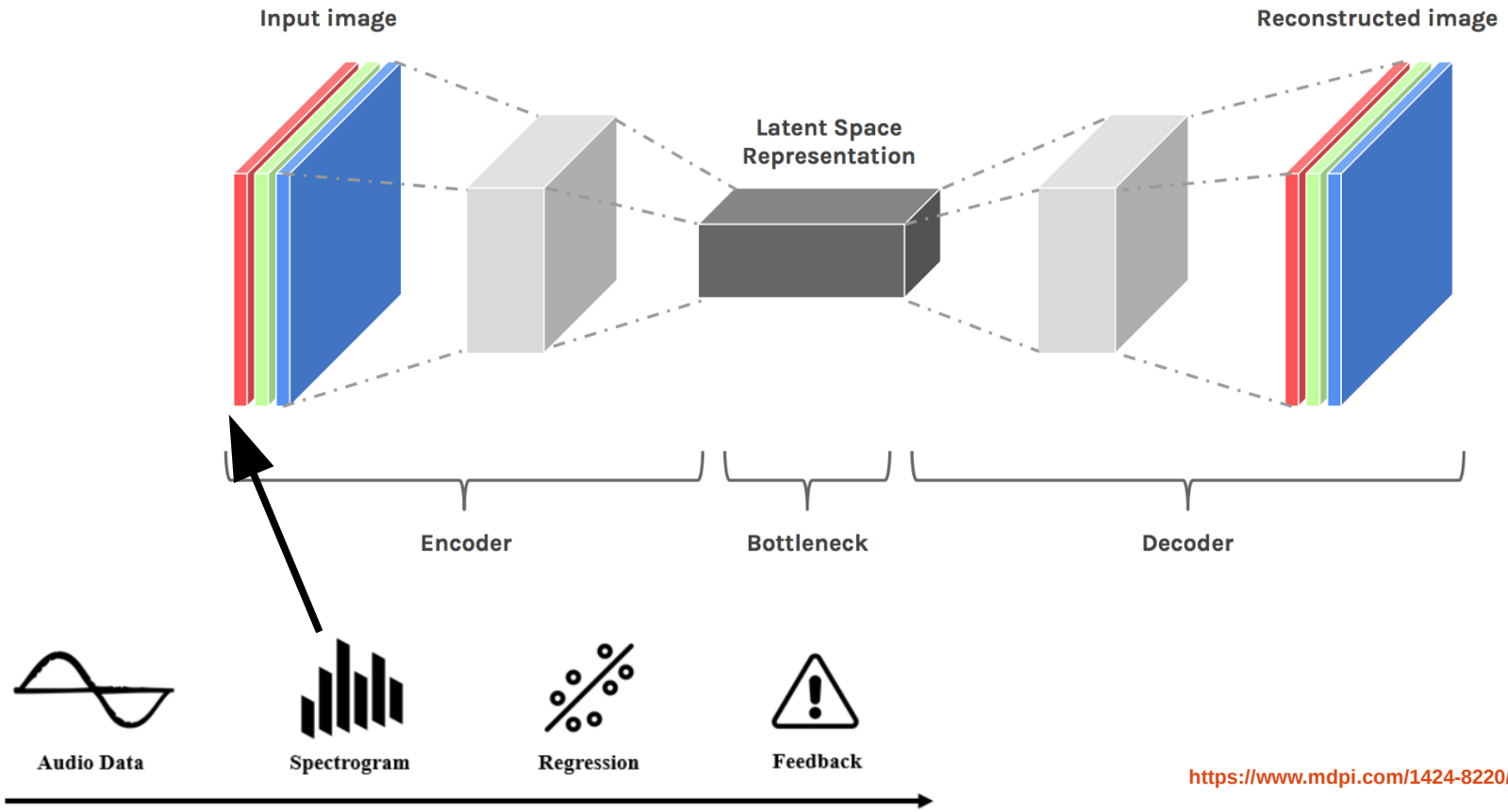



**Figure 8.** Data collection with microphones. They were attached to each side of the machine joint and the hydraulic cylinder.

https://www.mdpi.com/1424-8220/18/5/1308/pdf

# Applications and Trends

**Autoencoder based audio anomaly detection for SMD assembly**

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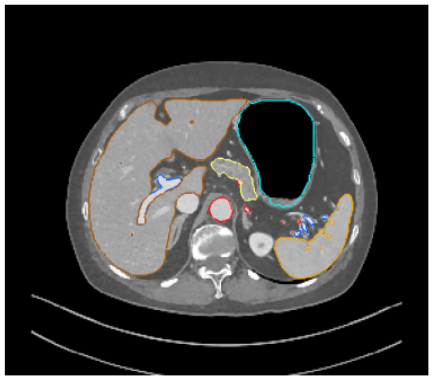
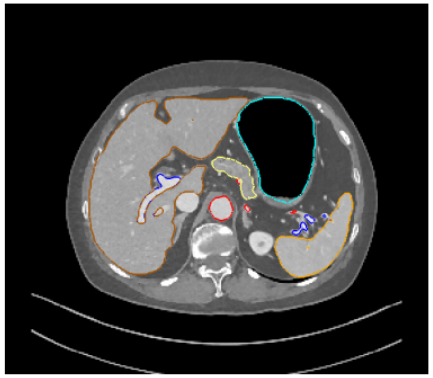
# Applications and Trends

**CT Scans semantic segmentation with 3D U-net**



(a) Ground truth (axial)

(b) Ground truth (3D)



(c) Segmentation (axial)

(d) Segmentation (3D)

https://arxiv.org/pdf/1803.08691.pdf

# Applications and Trends

**CT Scans semantic segmentation with 3D U-net**

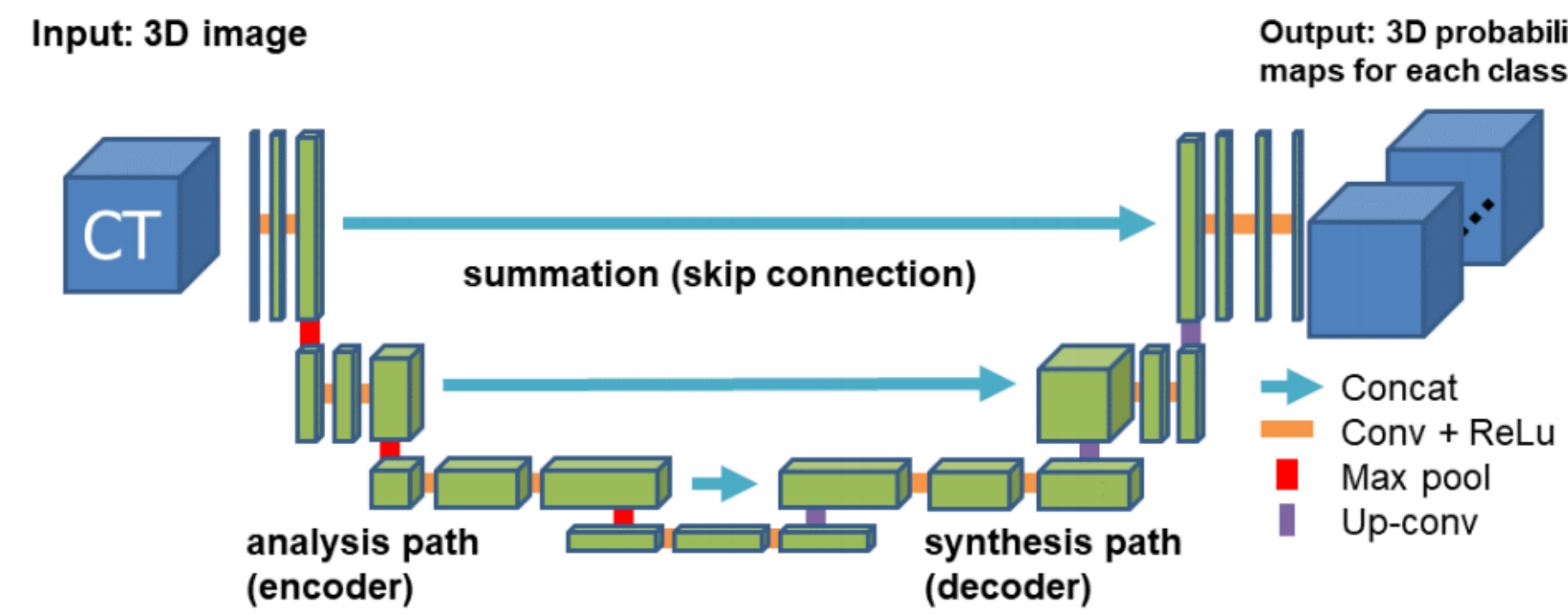
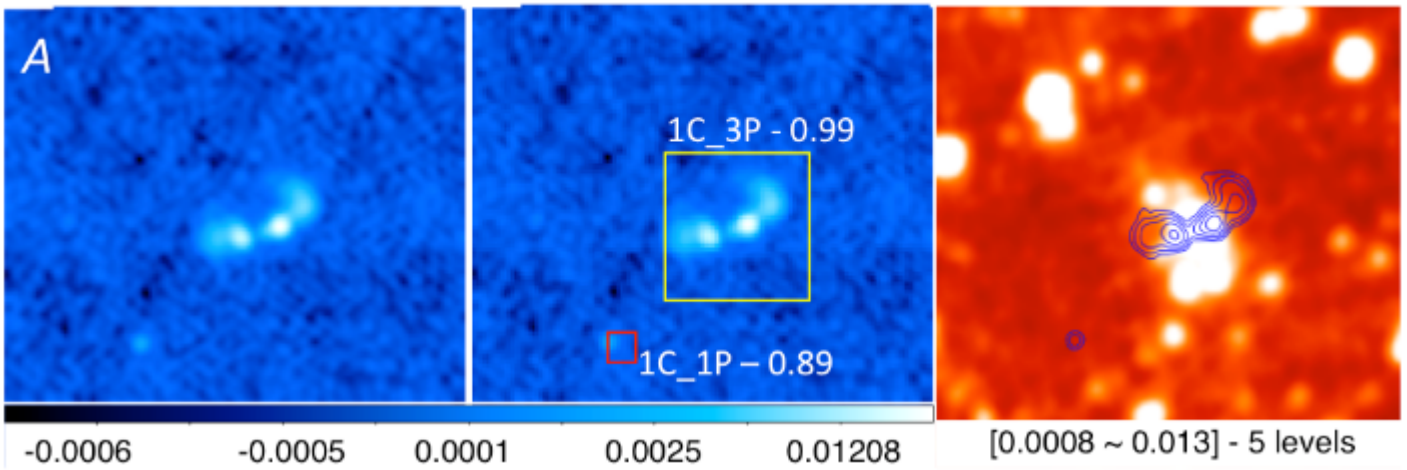



Fig. 3: The architecture of our 3D U-Net like fully convolutional network. It applies an end-to-end architecture using same size convolutions (via zero padding) with kernel sizes of $3 \times 3 \times 3$.

https://arxiv.org/pdf/1803.08691.pdf

# Applications and Trends

**Researchers from the University of Western Australia have developed a deep learning system that can identify galaxies in deep space**

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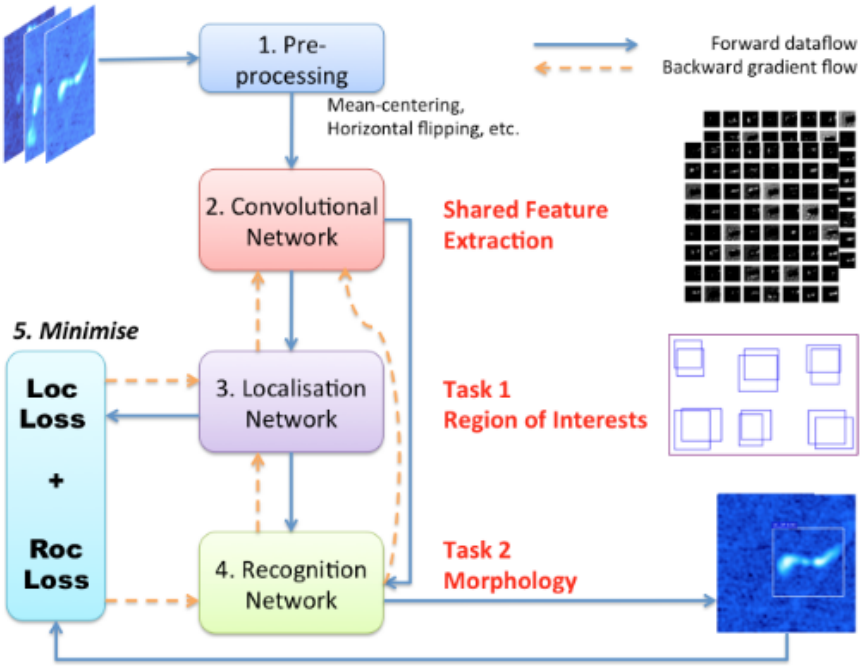
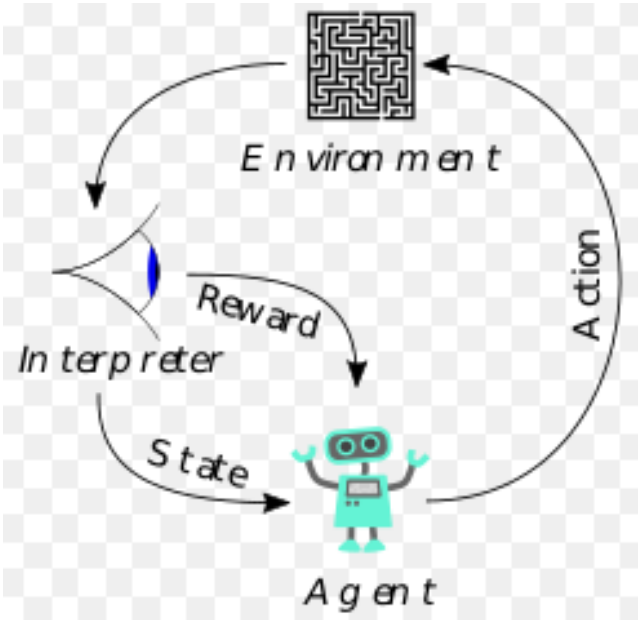



https://arxiv.org/pdf/1805.12008.pdf

**The code and dataset are publicly available at:**
**https://github.com/chenwuperth/rgz_rcnn**

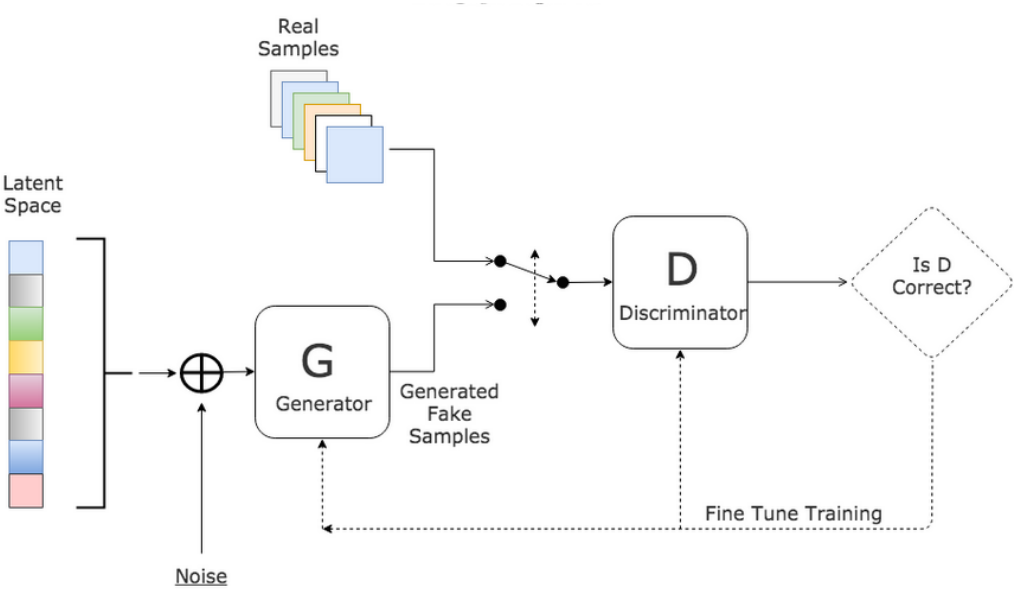
# Hot topics now

## Reinforcement Learning (RL)



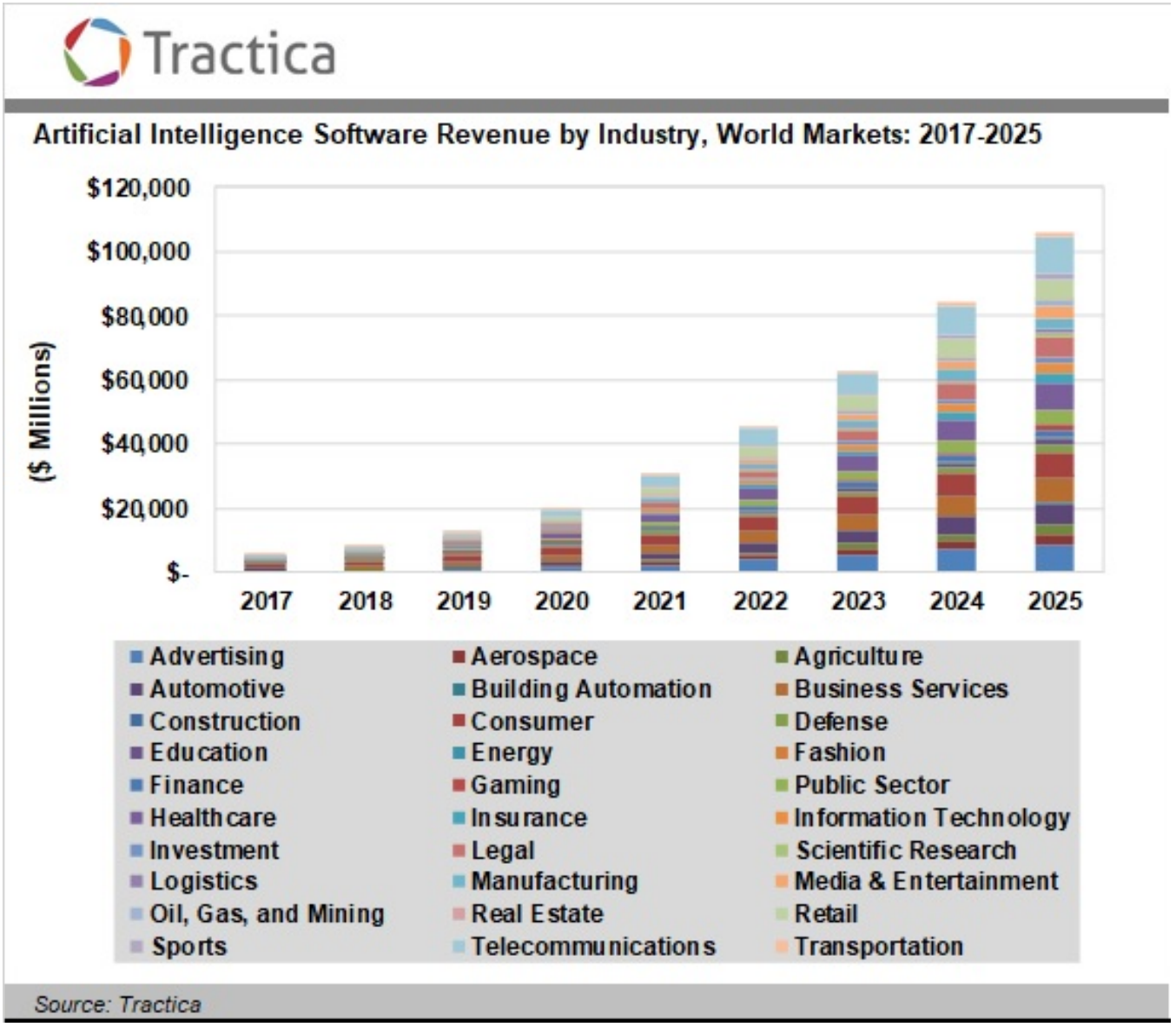

(1) https://www.youtube.com/watch?v=8IjAT-tEG-E

## Generative Adversarial Networks (GANs)




(1) https://www.youtube.com/watch?v=36lE9tV9vm0
(2) https://www.youtube.com/watch?v=tpr44-G5MbU#t=5m5s

# Applications and Trends



# Main Points

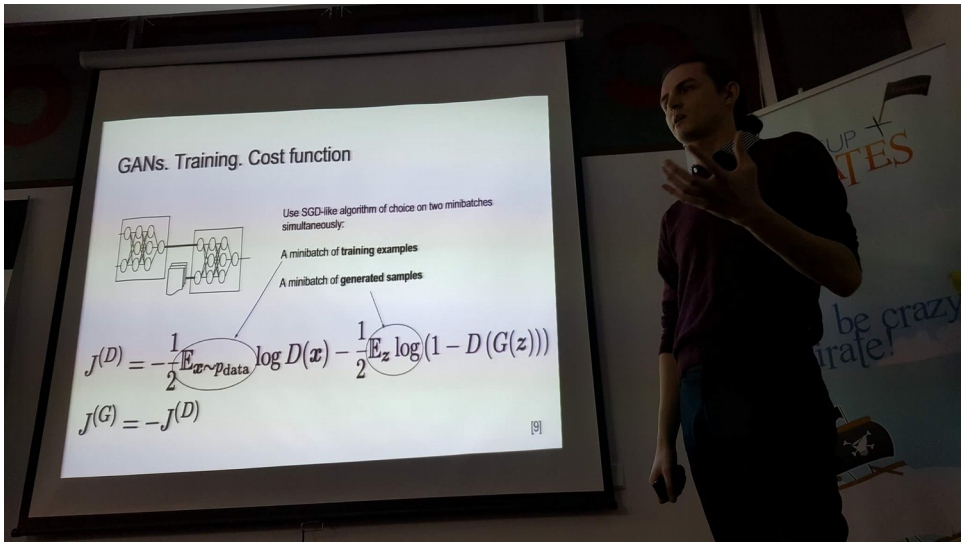
1. Deep Learning in 5 minutes

2. Applications and Trends

3. The Deep Learning community in Timisoara

# The deep learning community in Timisoara

**Who we are:**




A group of ~ 20 DL / ML passionates

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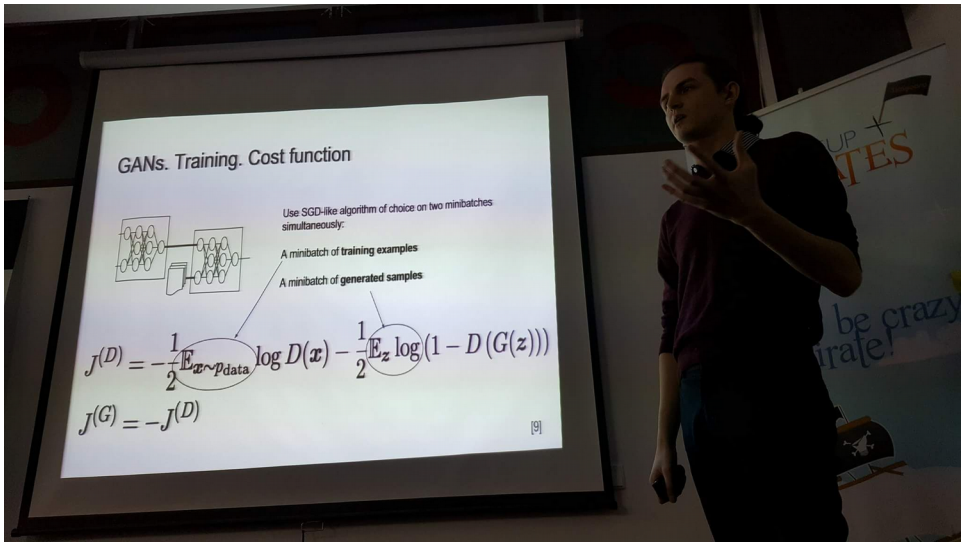


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**Why we meet:**

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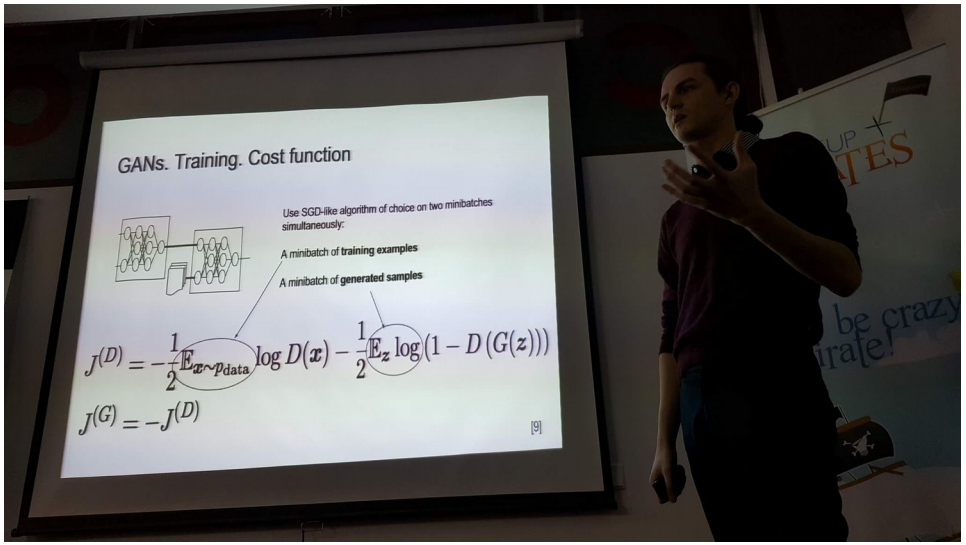


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**Why we meet:**

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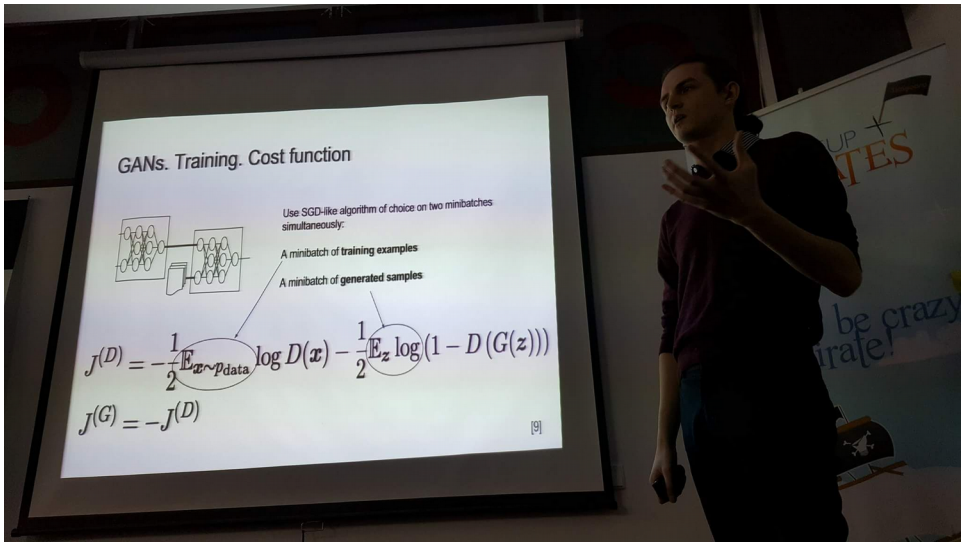


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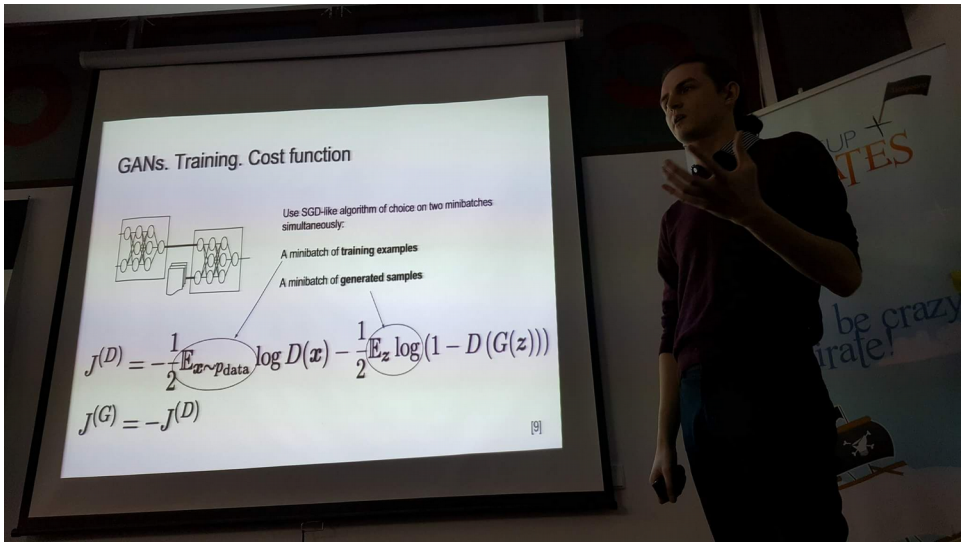


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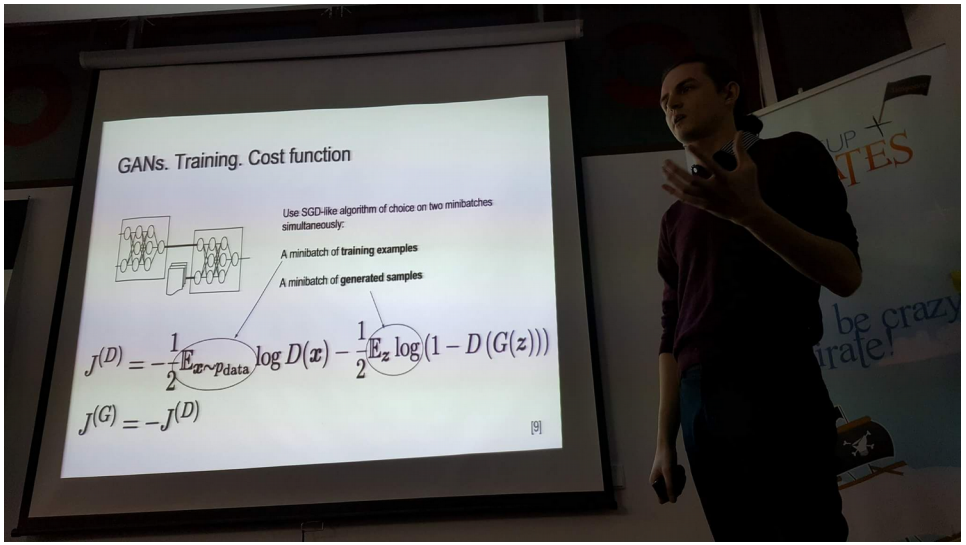


A group of ~ 20 DL / ML passionates

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To discuss scientific articles

To code together

To associate for projects

To develop close personal relations between the members

# The deep learning community in Timisoara

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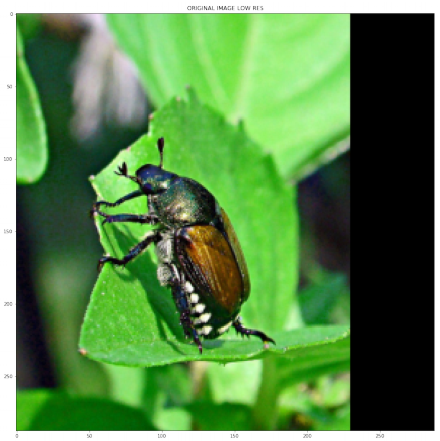
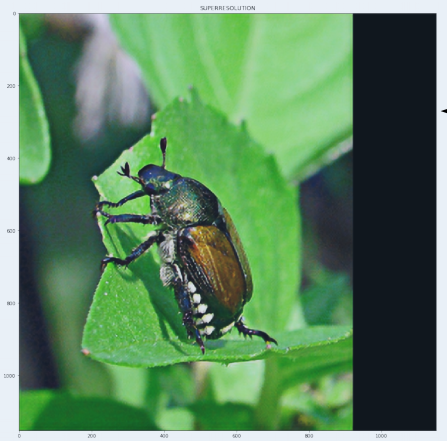
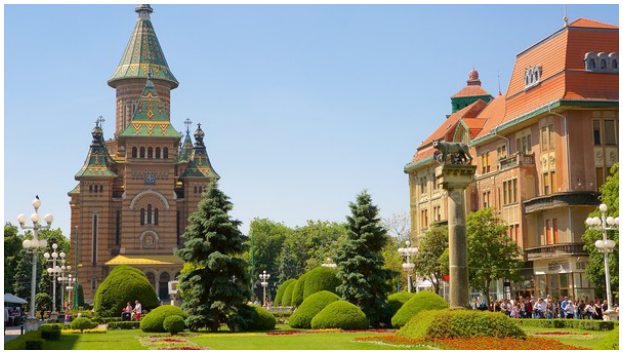




Neural super resolution

Neural style transfer



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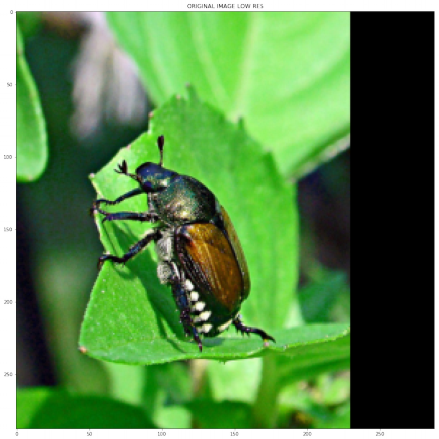
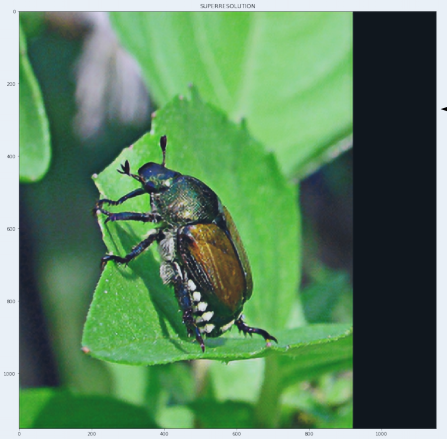




Neural super resolution

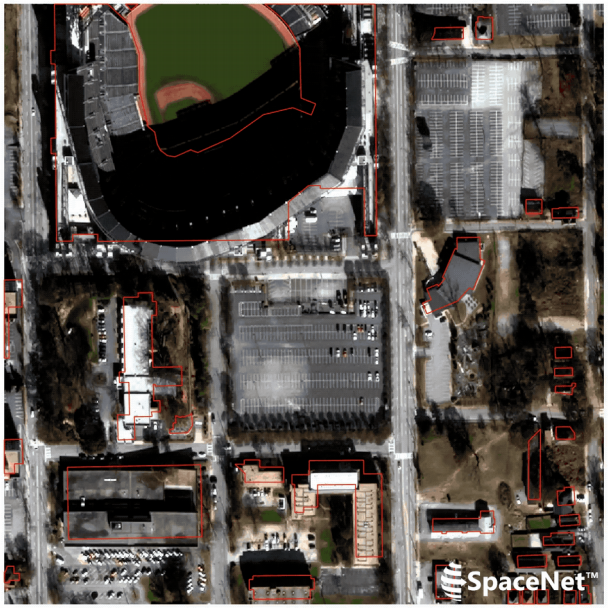
Neural style transfer

# The deep learning community in Timisoara

fast.ai

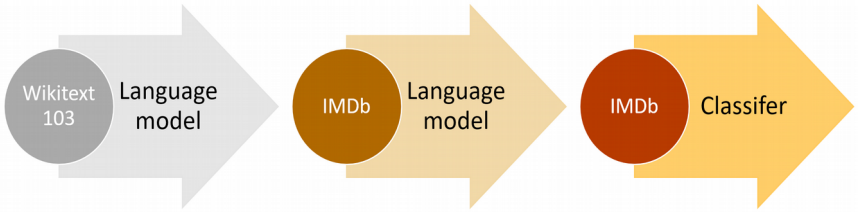
Making neural nets uncool again

- Spacenet v4 competition




- Now :
  - Weekly study groups
  - 6th largest group in Europe !
  - Collaborate on projects

- ULMFit Romanian Language Model + text classification tasks




https://arxiv.org/pdf/1801.06146.pdf

# The deep learning community in Timisoara

## Future meetups

- YOLO: an algorithm for fast object detection
  - Presenter : Codrin-Andrei Rîpă , 2nd year Informatics UVT student
  - November 28th 2018, Bulevardul Antenei nr9, Timișoara – cladirea UBC2 – etaj 5 – sala Sunspear

- Reinforcement Learning Workshop based on TMLSS RL Course and Lab
  - Presenter : Ioana Veronica Chelu, Research Engineer, Arnia Software
  - Date TBD
  - Introductory workshop for the frameworks used (TF, Sonnet)

- Your DL research result/paper/topic of choice, presented by you :)

# The deep learning community in Timisoara

## Workshop with researchers from DeepMind

- Deep Learning related topics covered
- TBD, around end of February

# The deep learning community in Timisoara

**Join us!**

Facebook:
Machine Learning Timisoara

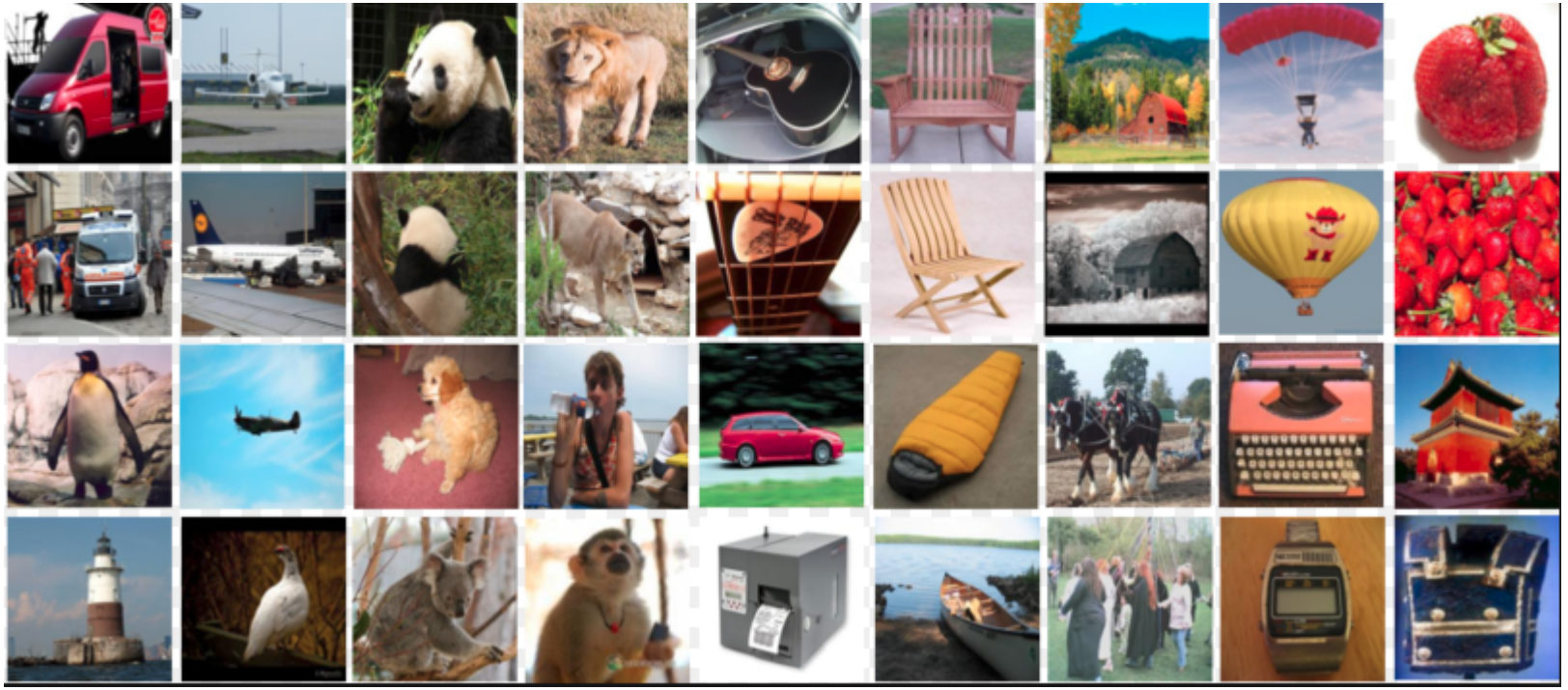
Meetup:
https://www.meetup.com/Timisoara-Deep-Learning-Meetup/

Or, for any information:
virgil.e.petcu@gmail.com maria11robert@gmail.com

# Backup

# Deep Learning: ImageNet competition

**How to classify between 1000 classes**

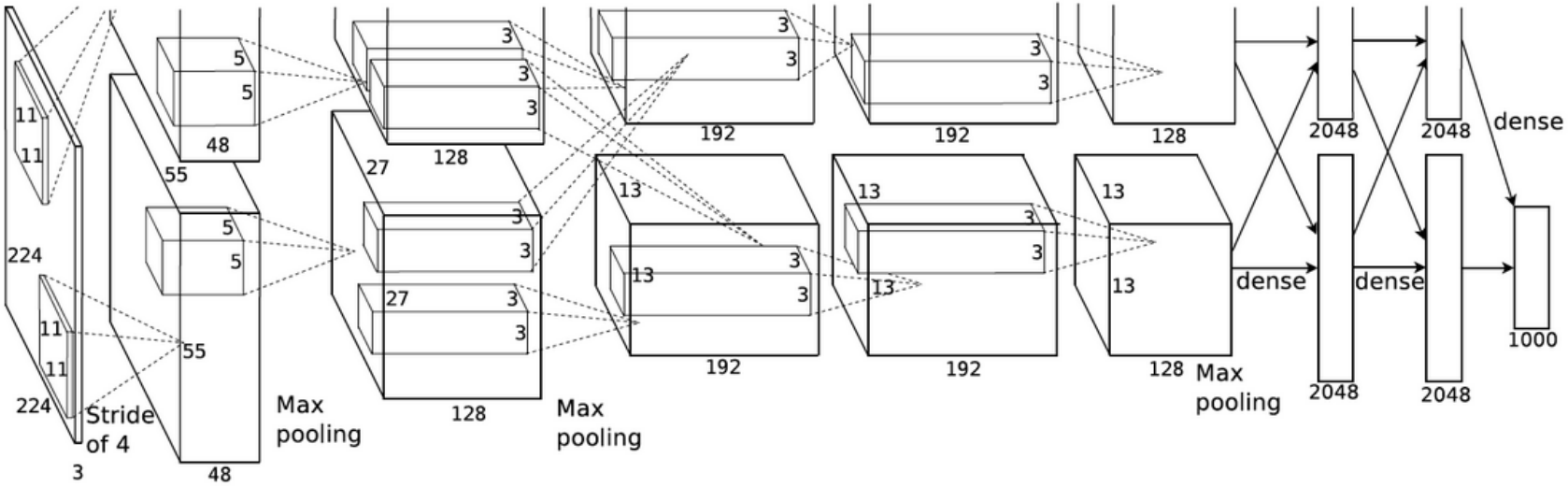


**Feed 1.5 M images to a neural network.**

**And train a neural network to find the parameters.**

# Deep Learning: Tensor in, Tensor out

**How to classify between 1000 classes**




**Feed 1.5 M images to a neural network.**

**And train a neural network to find the parameters.**

# Deep learning in 5 minutes

Great visualization for internal layers of simple NNs

- https://cs.stanford.edu/people/karpathy/convnetjs/demo/classify2d.html

# Why use DL

Deep Learning skills

AutoML

Researcher Developer Domain expert

# Why use DL


TensorFlow
mxnet
The Microsoft Cognitive Toolkit
Caffe
torch
PYTORCH
theano
Caffe2

# Why use DL


TensorFlow mxnet The Microsoft Cognitive Toolkit Caffe

torch PYTORCH theano Caffe2

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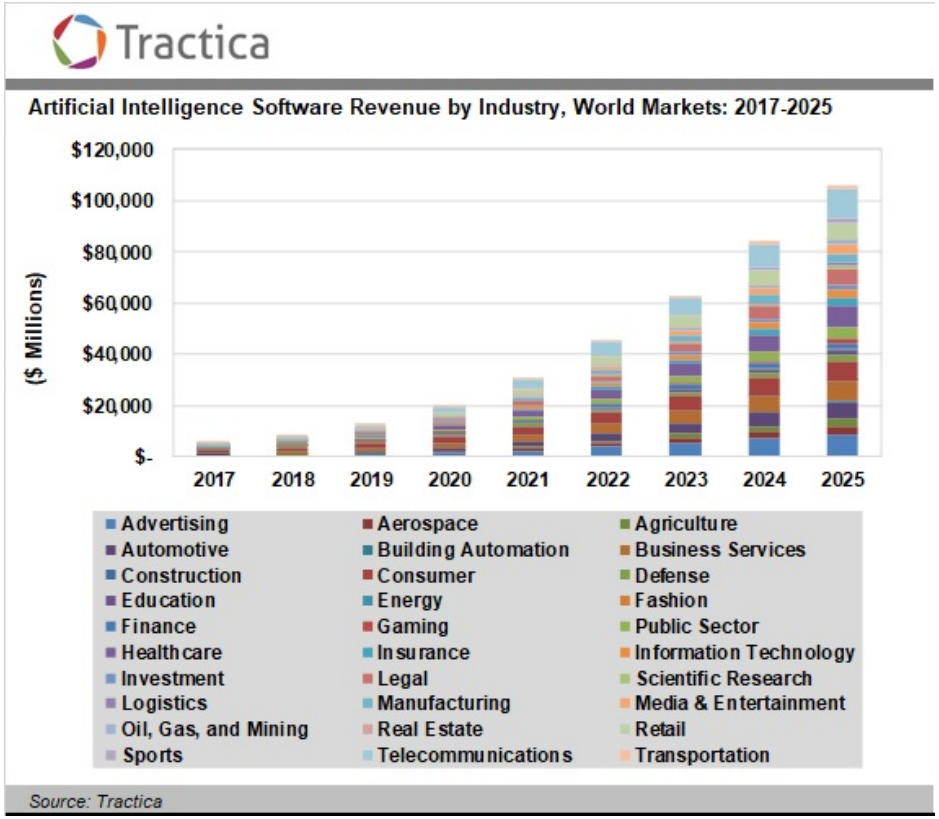
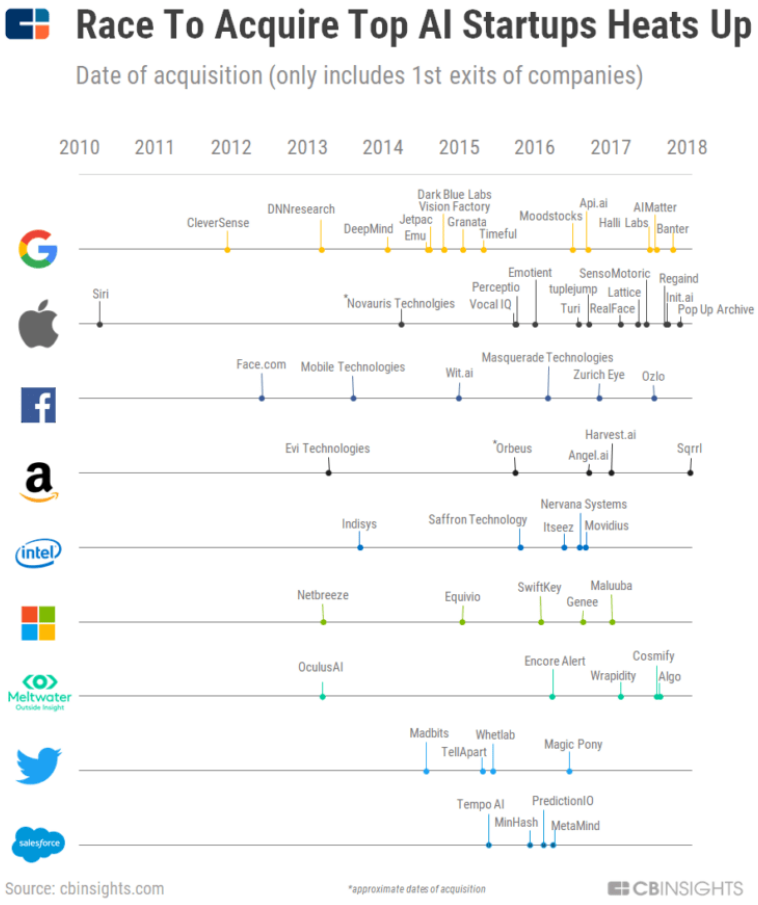
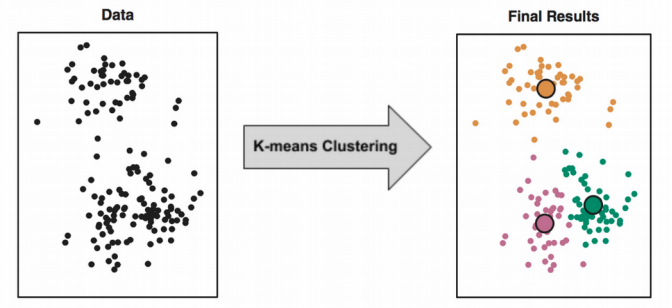

Tractica
Artificial Intelligence Software Revenue by Industry, World Markets: 2017-2025
($ Millions)
$120,000
$100,000
$80,000
$60,000
$40,000
$20,000
$-
2017
2018
2019
2020
2021
2022
2023
2024
2025
Advertising
Aerospace
Agriculture
Automotive
Building Automation
Business Services
Construction
Consumer
Defense
Education
Energy
Fashion
Finance
Gaming
Public Sector
Healthcare
Insurance
Information Technology
Investment
Legal
Scientific Research
Logistics
Manufacturing
Media & Entertainment
Oil, Gas, and Mining
Real Estate
Retail
Sports
Telecommunications
Transportation
Source: Tractica


Race To Acquire Top AI Startups Heats Up
Date of acquisition (only includes 1st exits of companies)
2010
2011
2012
2013
2014
2015
2016
2017
2018
CleverSense
DNNresearch
DeepMind
Jetpac
Emu
Dark Blue Labs
Vision Factory
Granata
Timeful
Moodstocks
Api.ai
Halli Labs
AIMatter
Banter
Siri
*Novauris Technolgies
Perceptio
Vocal IQ
Emotient
tuplejump
Turi
SensoMotoric
Lattice
RealFace
Regaind
Init.ai
Pop Up Archive
Face.com
Mobile Technologies
Wit.ai
Masquerade Technologies
Zurich Eye
Ozlo
Evi Technologies
*Orbeus
Harvest.ai
Angel.ai
Sqrrl
Indisys
Saffron Technology
Nervana Systems
Itseez
Movidius
Netbreeze
Equivio
SwiftKey
Genee
Maluuba
OculusAI
Encore Alert
Wrapidity
Cosmify
Algo
Madbits
TellApart
Whetlab
Magic Pony
Tempo AI
MinHash
PredictionIO
MetaMind
Source: cbinsights.com
*approximate dates of acquisition
CBINSIGHTS

# Types of Learning

**Unsupervised**



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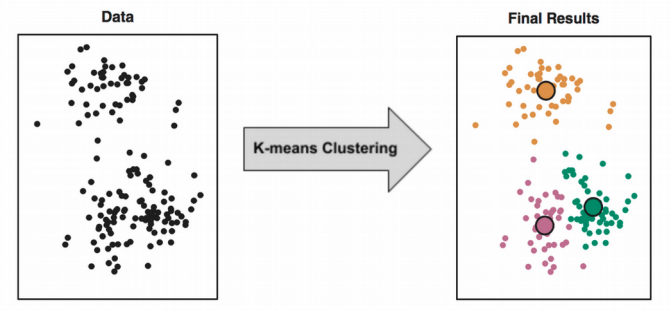


Very hot topic: Generative Adversarial Neural Networks (**GANs**):
(1) https://www.youtube.com/watch?v=36lE9tV9vm0
(2) https://www.youtube.com/watch?v=tpr44-G5MbU#t=5m5s

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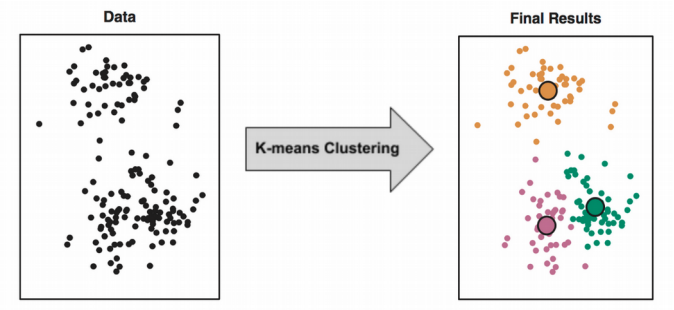
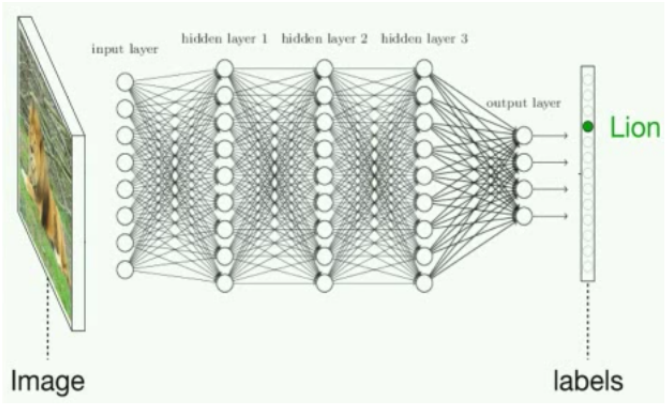
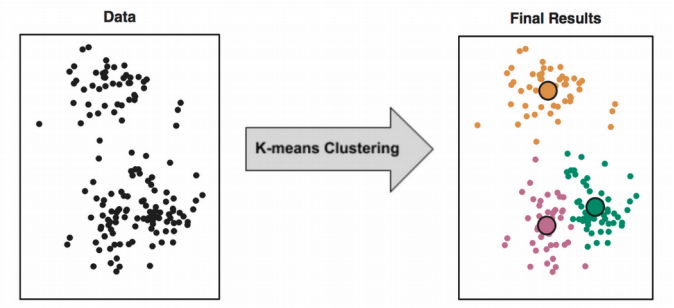



**Supervised**

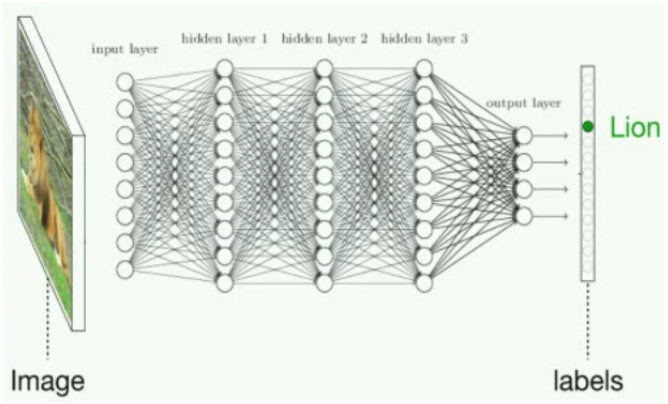


# Types of Learning

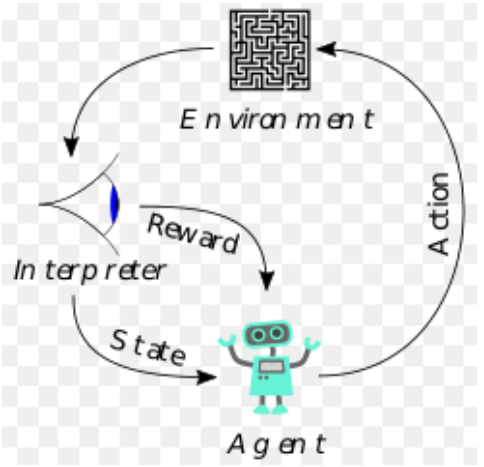
## Unsupervised



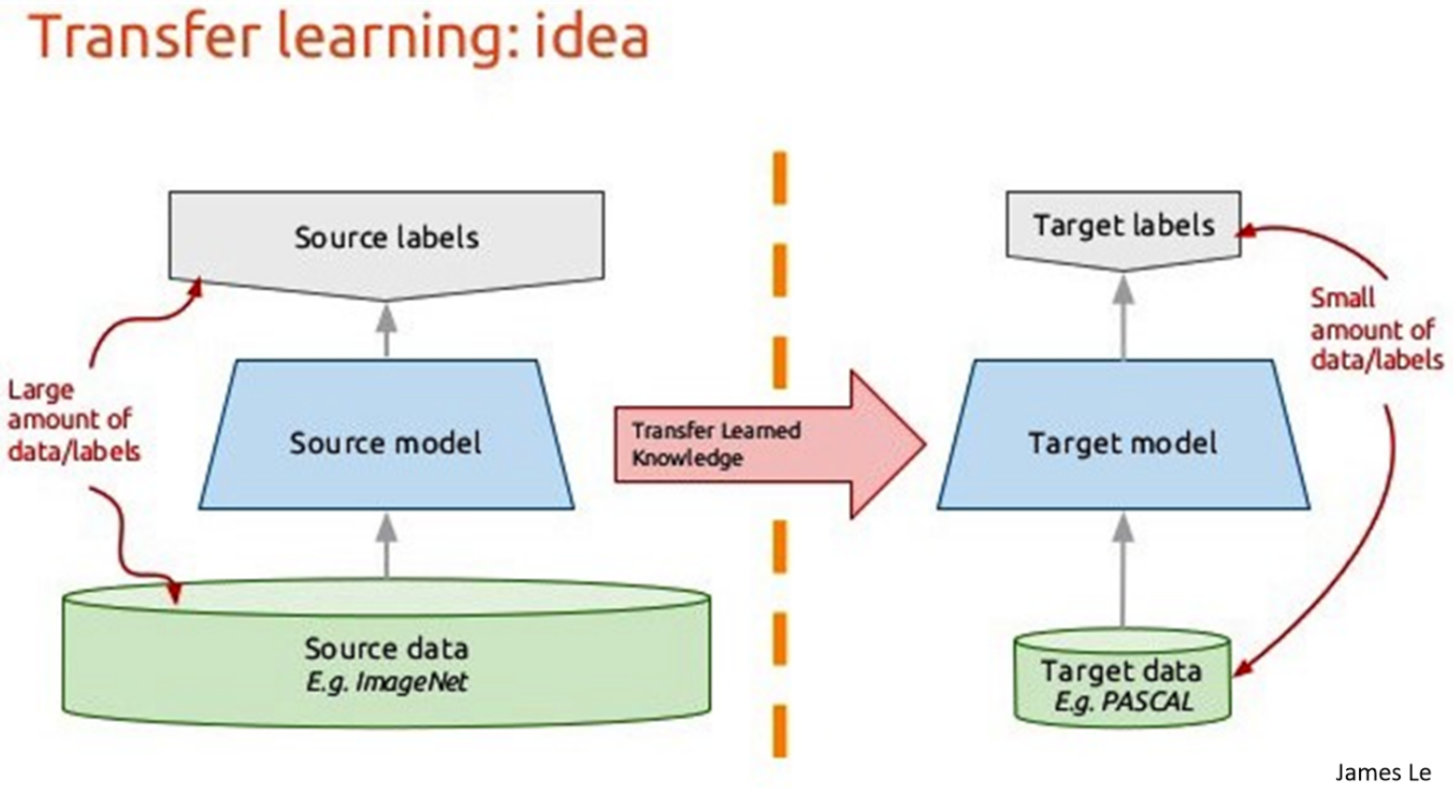

## Supervised



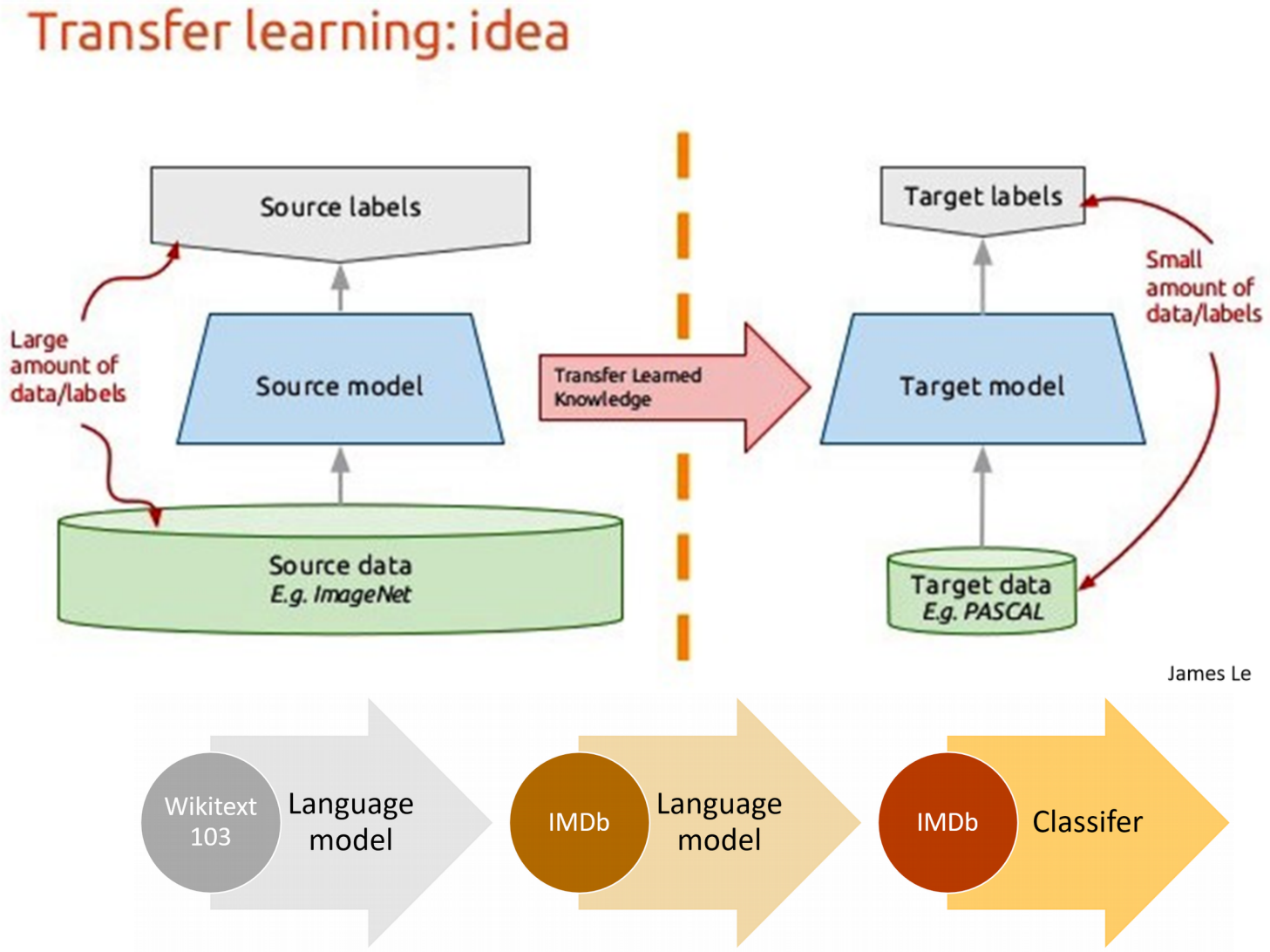

## Reinforcement



# Transfer learning



# Transfer learning




https://arxiv.org/pdf/1801.06146.pdf