WB-XIC, Lab2:

Wstęp do sieci neuronowych i PyTorch

Hubert Baniecki

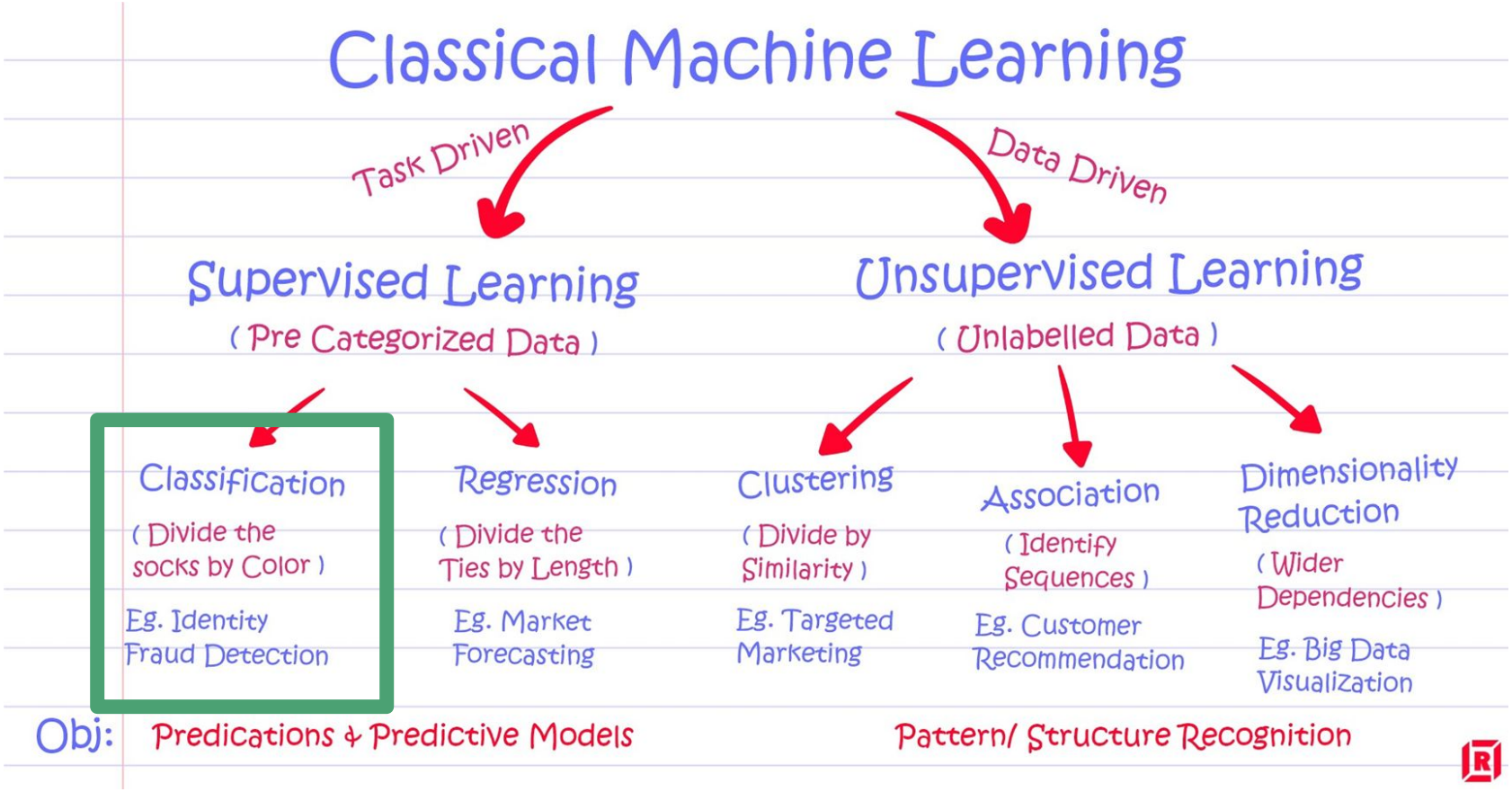
hbaniecki@gmail.com | http://hbaniecki.com

Cel:

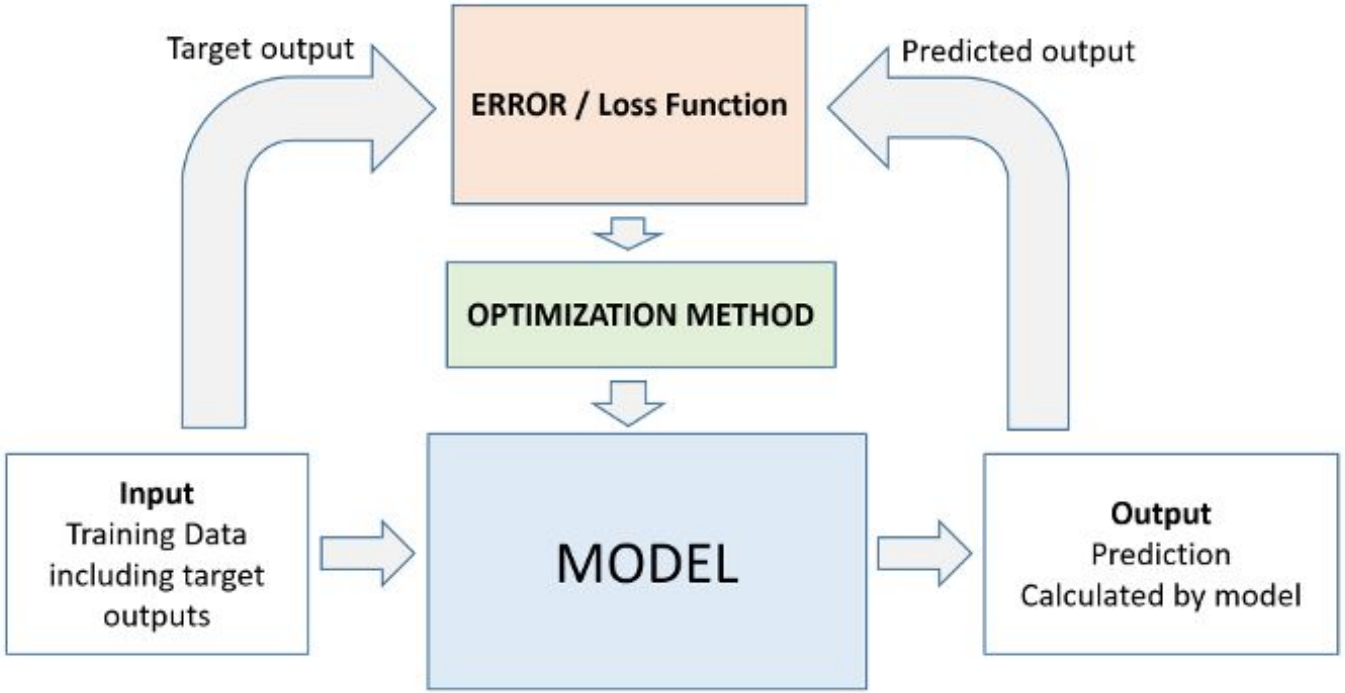
1. Zrozumienie **istoty** działania sieci neuronowej
2. ~~Pierwsze kroki w **Google Colab**~~
3. Zaznajomienie się z pakietem **torch** w Python
4. Zaimplementowanie algorytmu regresji liniowej

\+ omówienie pracy domowej na 16 marca (8pkt, 2 tygodnie)

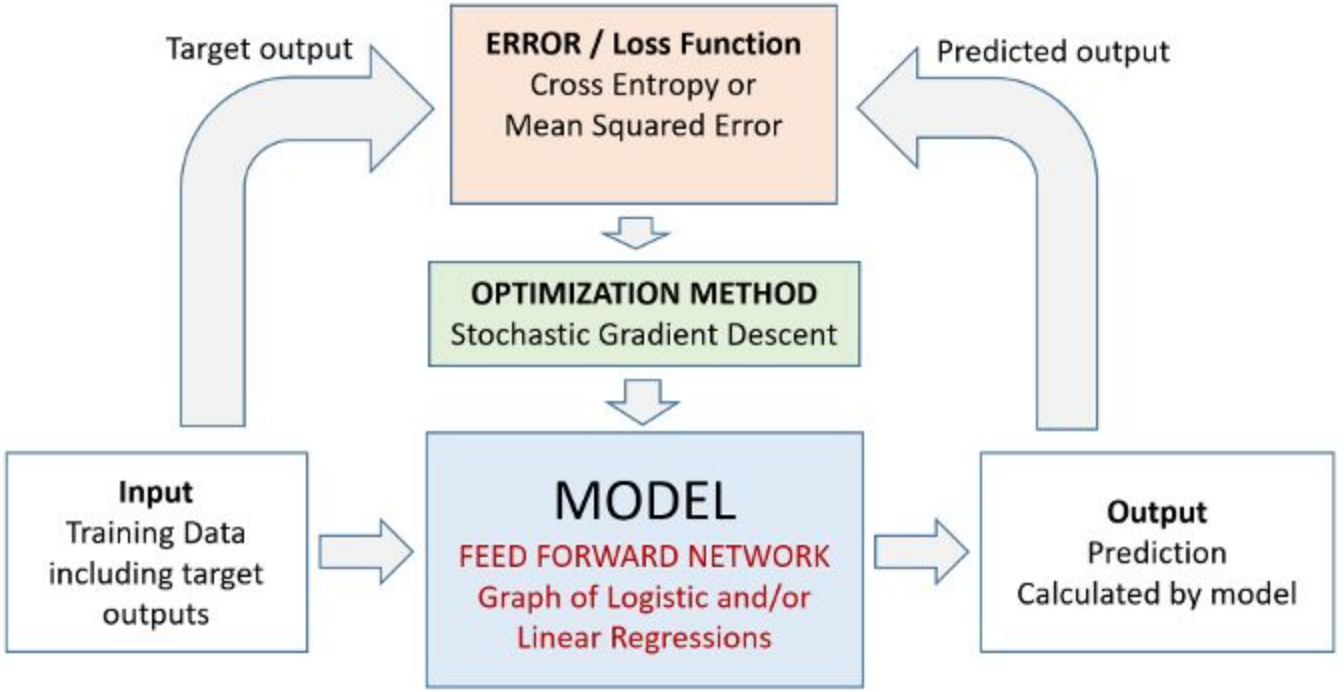
Komu udało się obejrzeć
Neural networks by 3Blue1Brown?



https://medium.com/@recrosoft.io/supervised-vs-unsupervised-learning-key-differences-cdd46206cdcb



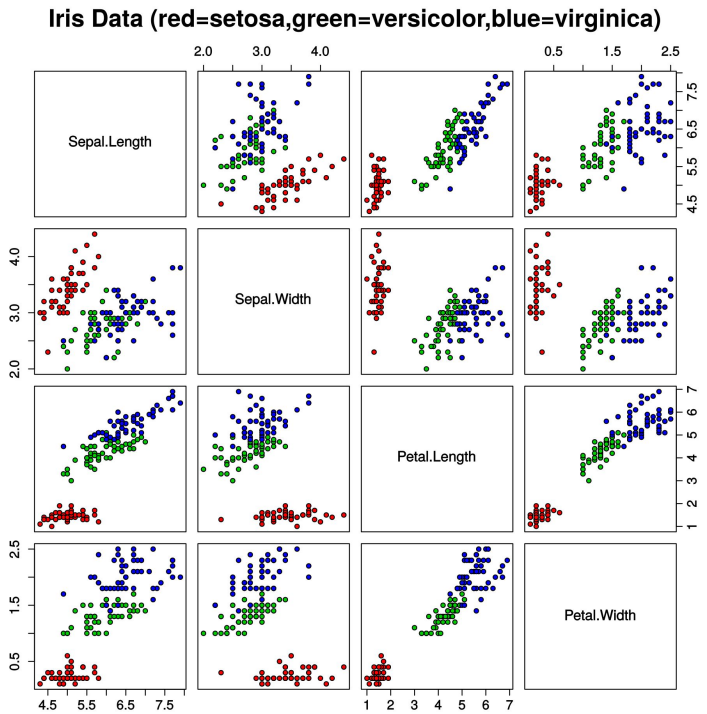
https://www.deepnetts.com/blog/from-basic-machine-learning-to-deep-learning-in-5-minutes.html



https://www.deepnetts.com/blog/from-basic-machine-learning-to-deep-learning-in-5-minutes.html

We need

1. Data for classification: X, Y



We need

1. Data for classification: X, Y
2. Loss function: L(Y, Y^)

Mean

Error

Squared

$$\text{MSE} = \frac{1}{n}\sum_{i=1}^{n}(Y_i - \hat{Y}_i)^2$$

Indicator variable

Prob of class *j*

$$-\sum_{j=1}^{M} y_j log(p(y_j))$$

Sum over trials

Sum over classes

$$-\sum_{i=1}^{N} y_i log(p(y_i)) + (1 - y_i) log(1 - p(y_i))$$

Label

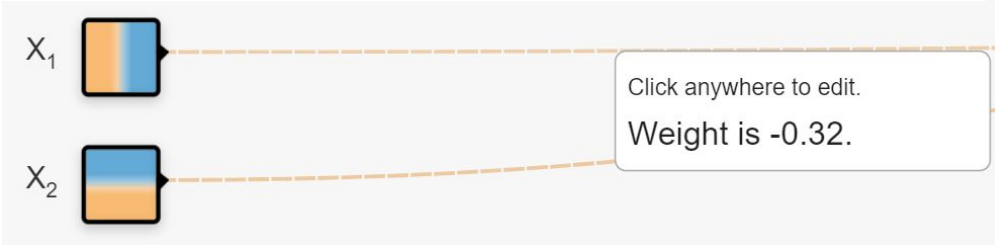
Prob of positive class

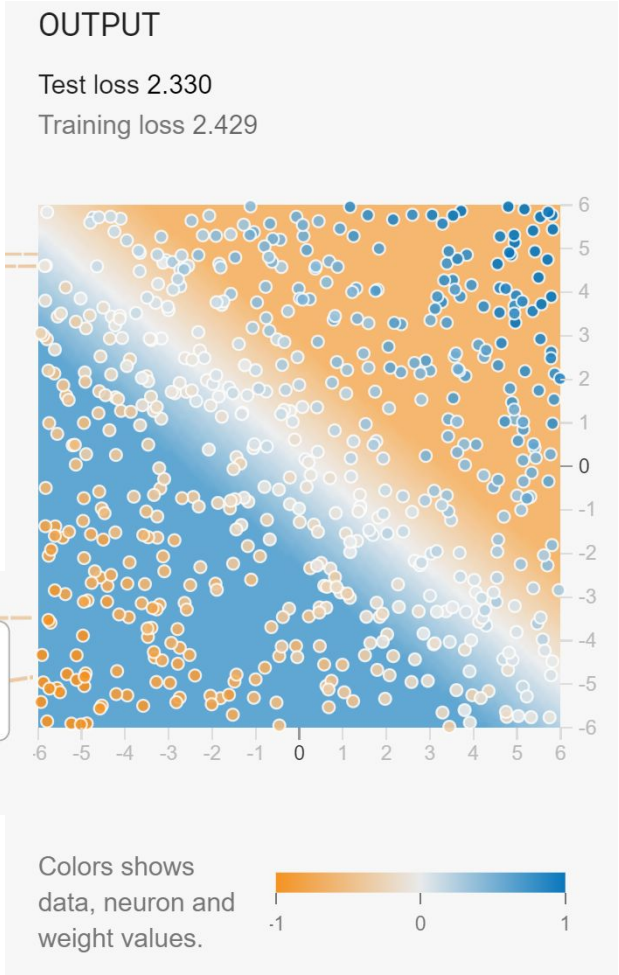
Label

Prob of positive class

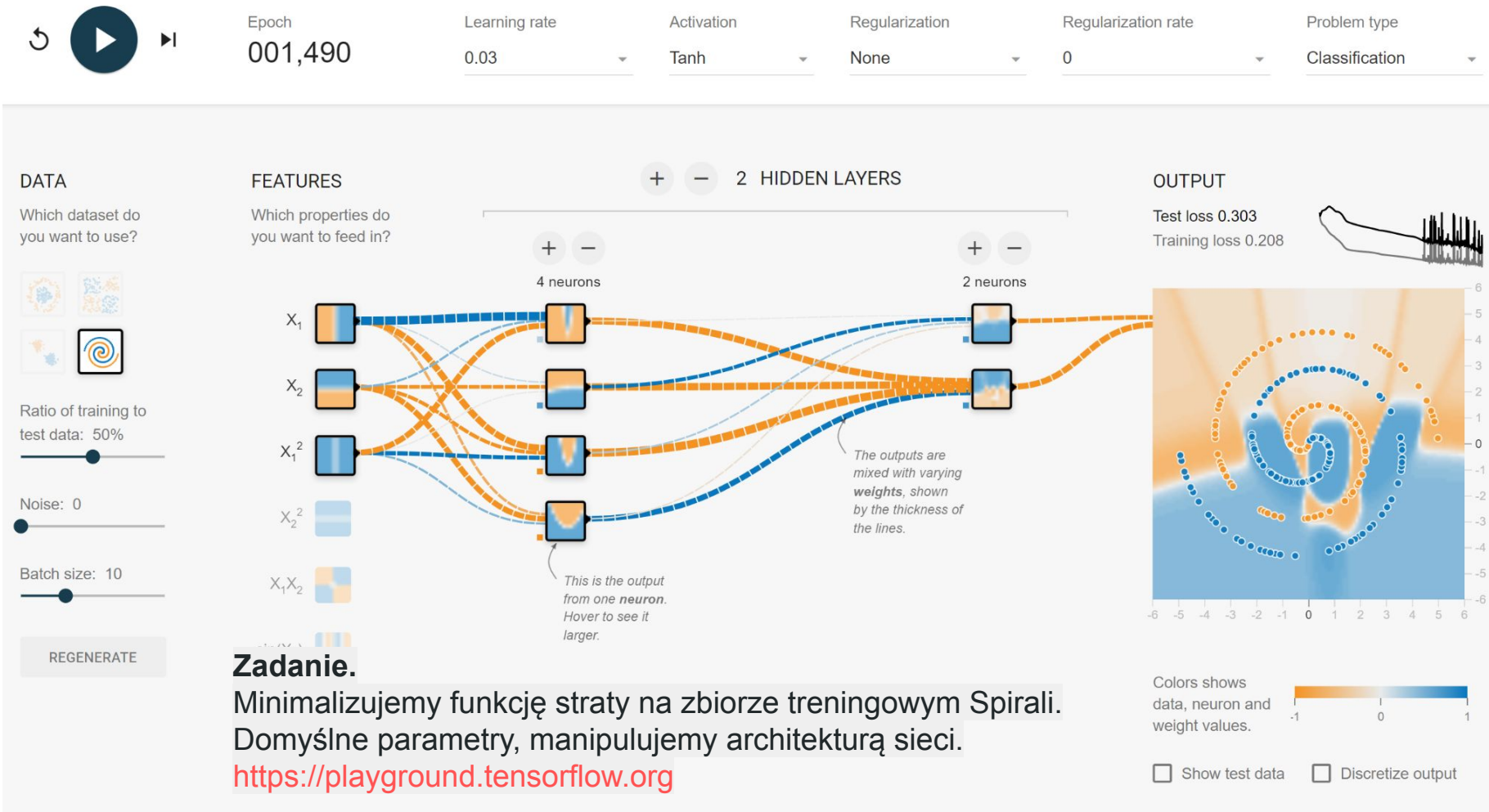
We need

1. Data for classification: X, Y
2. Loss function: L(Y, Y^)
3. Statistical model: f(X) = Y^





1. A Neural Network Playground (tensorflow.org)
2. A Neural Network Playground (tensorflow.org)
3. A Neural Network Playground (tensorflow.org)



Zadanie.
Minimalizujemy funkcję straty na zbiorze treningowym Spirali.
Domyślne parametry, manipulujemy architekturą sieci.
https://playground.tensorflow.org

We need

1. Data for classification
2. Loss function
3. Statistical model
4. Optimization method

Stochastic gradient descent

a.k.a. Analiza Matematyczna 1

- Choose an initial vector of parameters w and learning rate η.
- Repeat until an approximate minimum is obtained:
  - Randomly shuffle samples in the training set.
  - For $i = 1, 2, \ldots, n$, do:
    - $w := w - \eta \nabla Q_i(w)$.

Iterate data in a loop through:

1. Feedforward
multiply input by parameters to obtain a prediction

2. Backpropagation
update parameters with gradient descent

An Introduction to Statistical Learning, Chapter 10

From neural networks to **deep learning**

Published: 27 May 2015

Deep learning

Yann LeCun ✉, Yoshua Bengio & Geoffrey Hinton

Nature **521**, 436–444 (2015) | Cite this article

w.youtube.com/watch?v=HzilDIhWhrE

Wojciech Zaremba
OpenAI, GPT-3, Codex
https://youtu.be/CV856uXQXnU

Ian Goodfellow
Generative Adversarial Networks (GANs),
Deep Learning book (MIT press)
https://youtu.be/Z6rxFNMGdn0?t=1039

Ilya Sutskever
OpenAI, AlexNet won the
ImageNet Challenge 2012
https://youtu.be/13CZPWmke6A?t=2480

Neural networks 1989-2021

Convolutional Network Demo by Yann LeCun
https://www.youtube.com/watch?v=FwFduRA_L6Q

Tesla Full Self Driving explained by Andrej Karpathy
https://youtu.be/3SypMvnQT_s?t=480
https://youtu.be/3SypMvnQT_s?t=1445

https://people.idsia.ch/~juergen/scientific-integrity-turing-award-deep-learning.html

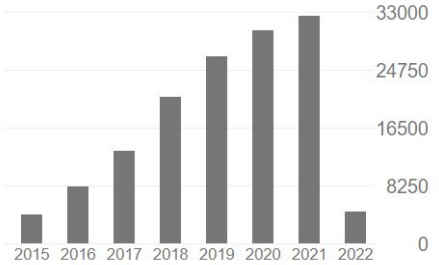
FOLLOW

neural networks physics

CITED BY	YEAR
61763	1997
15119	2015
5292 *	2012
5252	2000

Cited by VIEW ALL

	All	Since 2017
Citations	156501	128600
h-index	108	84
i10-index	391	243



Public access VIEW ALL

3 articles 144 articles

Jupyter Notebook

Cel:

1. Zrozumienie **istoty** działania sieci neuronowej
2. ~~Pierwsze kroki w **Google Colab**~~
3. Zaznajomienie się z pakietem **torch** w Python
4. Zaimplementowanie algorytmu regresji liniowej

\+ omówienie pracy domowej na 16 marca (8pkt, 2 tygodnie)