

Search Smarter: How AI can change your Research

李箐

IEEE中國區資訊經理



Agenda

- The power of AI: search smarter; research smarter
- Deciphering the mystery of AI via IEEE Xplore
- Enjoy the beauty of AI via InnovationQ Plus

IEEE Intro





**The Institute of Electrical
and Electronics Engineers**



IEEE members are the technology leaders of today and tomorrow

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2013

Irwin Jacobs
Co-Founder
Qualcomm Inc



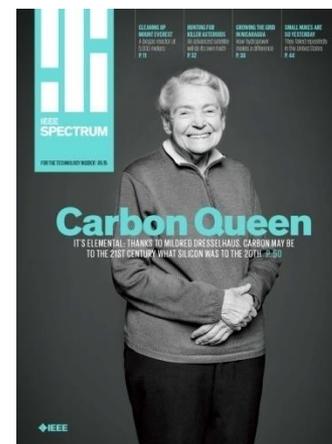
2014

B. Jayant Baliga
Transformed Power
Semiconductors



2015

Mildred Dresselhaus
Paved the way for the rise
of Nanotechnology



2016

G. David Forney, Jr.
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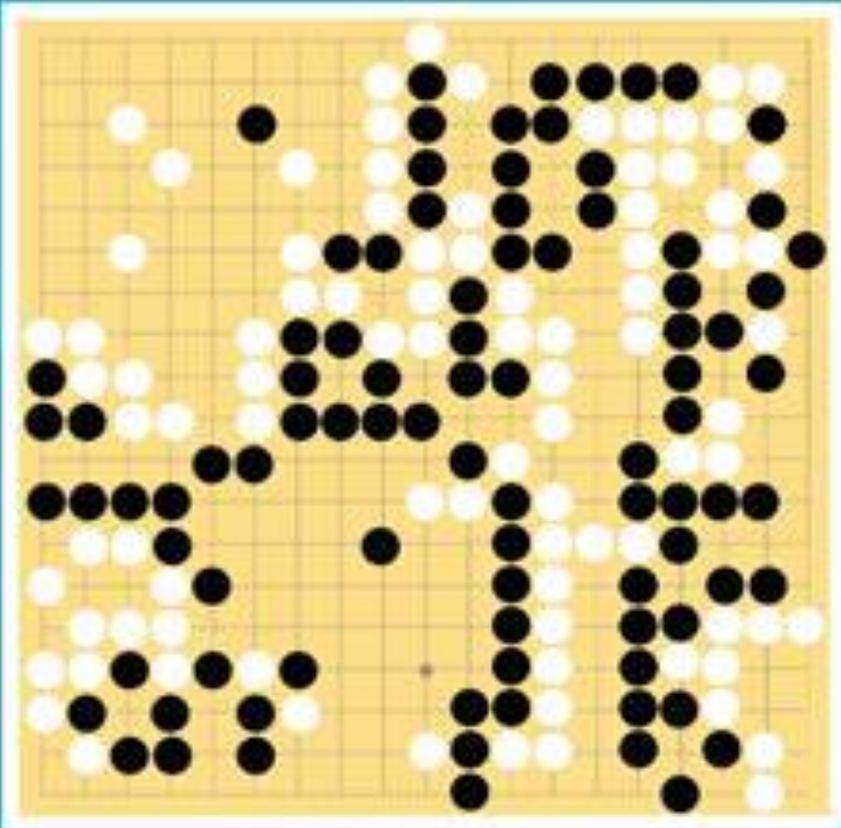
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The power of AI: search smarter; research smarter



AI stories



THE ULTIMATE GO CHALLENGE
GAME 1 OF 5
9 MARCH 2016

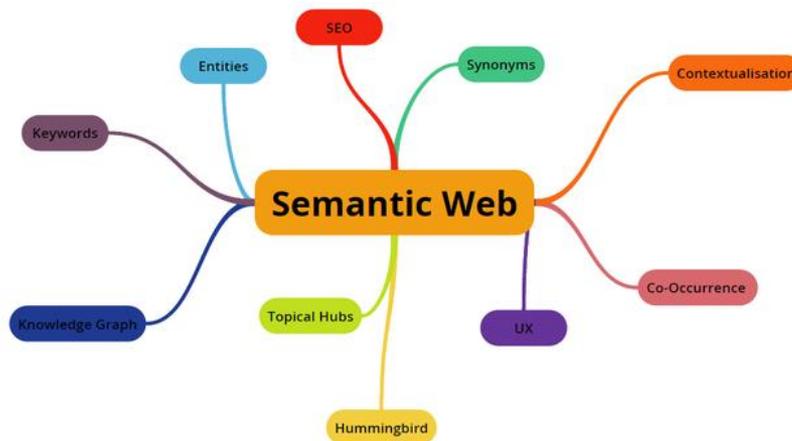
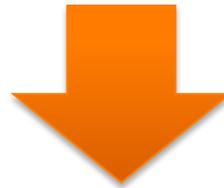
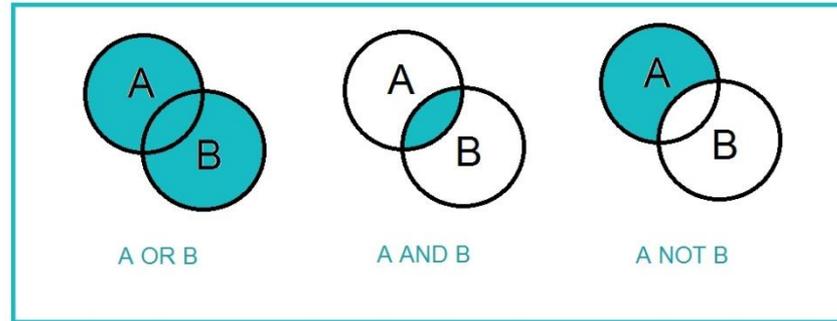
AlphaGo vs Lee Sedol

RESULT	NUMBER OF MOVES	TIME WHITE	TIME BLACK
W+ Res	186	1h 55m	1h 32m

The image displays a Go board on the left with a complex arrangement of black and white stones. On the right, a graphic provides details about the match between AlphaGo and Lee Sedol. The match title is 'THE ULTIMATE GO CHALLENGE', Game 1 of 5, held on 9 March 2016. AlphaGo is represented by a white circle and Lee Sedol by a black circle. The result is a win for White (W+ Res) with a resignation. The total number of moves is 186. White's playing time was 1 hour and 55 minutes, while Black's was 1 hour and 32 minutes.



When AI meets IP: From Boolean to Semantic



Traditional Academic Searching

Keyword/Boolean search

- Controlled language search
- Ability to combine sets
- Can refine search set by limiters such as AND, OR & NOT
- Some databases support nesting (combining long search strings)

The screenshot displays the IEEE Xplore Digital Library search interface. At the top, there is a navigation bar with links to IEEE.org, IEEE Xplore Digital Library, IEEE-SA, IEEE Spectrum, and More Sites. On the right, it shows 'Cart(0)' and 'Welcome Yuling Zhou'. The main search area features the IEEE Xplore Digital Library logo and a search bar. Below the search bar, there are three search criteria: 'cloud computing' in 'Metadata Only', 'AND data privacy' in 'Metadata Only', and 'AND' in 'Metadata Only'. There are buttons for 'Add New Line', 'Reset All', and a prominent orange 'SEARCH' button. At the bottom, there are links for 'Advanced Search' and 'Other Search Options'.

Example of Boolean Search

ALL=(surgical OR curve OR segment) AND suture
AND
(((intervertebral OR cutting OR member OR
arcuate OR guide)
NEAR5 (bone OR seal)) SAME (tissure OR jaw*))
AND (Instrument OR
cannula*1) AND DP >=(19930101) AND IC=(H01L
39/02 OR H01L
39/12 OR H01F 38/14)

Semantic Search: The Way Forward

- semantic search relies on natural language queries to reduce search complexity while returning concepts (and thus, prior art) the researcher may have otherwise missed

A surgical cannula with curved segments used to guide a medical instrument through a curved or bowed path

How does Semantic Search work?

- a Deep Belief neural network extracts concepts and meanings from patent and related literature. Neural networks are named for their similarity to processes of the human brain. A neural network enables machine learning, which is when a computer examines a large amount of data and derives meaning from that data.
- A neural network is a semantic model, where complex topics are expressed as mathematical vectors of the common concepts found during the AI analysis. The neural network is the engine that classifies concepts within bodies of rich data — similar to the human brain.

Computational Meaning (Concept)

Boolean Search:

Autonomous vehicle



Semantic Search:



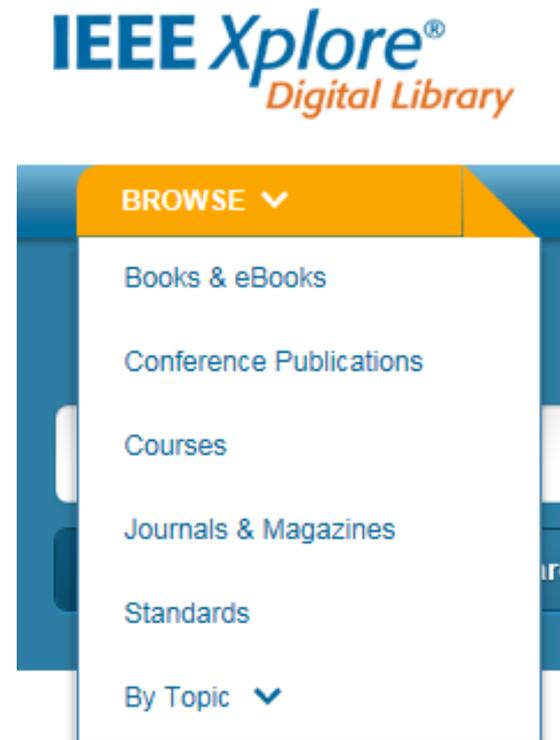
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Deciphering the mystery of AI via IEEE Xplore



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- Main research streams
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- Image Processing (ICIP), 2017 IEEE International Conference on (26)
- Computer Vision and Pattern Recognition Workshops (CVPRW), 2016 IEEE Conference on (22)
- Computer Vision and Pattern Recognition (CVPR), 2017 IEEE Conference on (22)
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Beyond Planar Symmetry: Modeling Human Perception of Reflection and Rotation Symmetries in the Wild 

Christopher Funk; Yanxi Liu

2017 IEEE International Conference on Computer Vision (ICCV)

Year: 2017

Pages: 793 - 803

IEEE Conferences

▶ Abstract [\(html\)](#)  (2802 Kb) 

Machine learning on FPGAs to face the IoT revolution 

Xiaofan Zhang; Anand Ramachandran; Chuanhao Zhuge; Di He; Wei Zuo; Zuofu Cheng; Kyle Rupnow; Deming Chen

2017 IEEE/ACM International Conference on Computer-Aided Design (ICCAD)

Year: 2017

Pages: 819 - 826

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Transferred Deep Convolutional Neural Network Features for Extensive Facial Landmark Localization 

Shaohua Zhang; Hua Yang; Zhou-Ping Yin

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FaceNet: A unified embedding for face recognition
Florian Schroff; Dmitry Kalenichenko; James Phil
2015 IEEE Conference on Computer Vision and
(CVPR)
Year: 2015
Pages: 815 - 823
Cited by: Papers (259) | Patents (7)
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Deep Learning Face Representation from Predicting 10,000 Classes 🔒
Yi Sun; Xiaogang Wang; Xiaoou Tang
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Abstract:

Despite significant recent advances in the field of face recognition [10, 14, 15, 17], implementing face verification and recognition efficiently at scale presents serious challenges to current approaches. In this paper we present a system, called FaceNet, that directly learns a mapping from face images to a compact Euclidean space where distances directly correspond to a measure of face similarity. Once this space has been produced, tasks such as face recognition, verification and clustering can be easily implemented using standard techniques with FaceNet embeddings as feature vectors. Our method uses a deep convolutional network trained to directly optimize the embedding itself, rather than an intermediate bottleneck layer as in previous deep learning approaches. To train, we use triplets of roughly aligned matching / non-matching face patches generated using a novel online triplet mining method. The benefit of our approach is much greater representational efficiency: we achieve state-of-the-art face recognition performance using only 128-bytes per face. On the widely used Labeled Faces in the Wild (LFW) dataset, our system achieves a new record accuracy of 99.63%. On YouTube Faces DB it achieves 95.12%. Our system cuts the error rate in comparison to the best published result [15] by 30% on both datasets.

Published in: Computer Vision and Pattern Recognition (CVPR), 2015 IEEE Conference on

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Gerhard Florian; Kalenichenko,
Dmitry
» Patent No. 9836641
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2. MacMillan, Timothy; Newman,
David A.; Adsumilli, Balineedu
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3. Turley, Logan; Grove, Stephen
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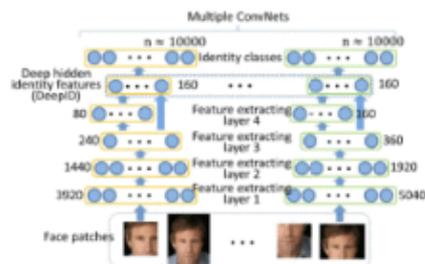
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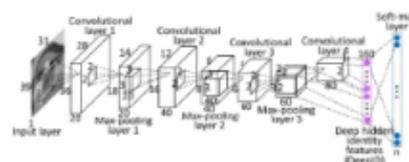
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Figure 1.



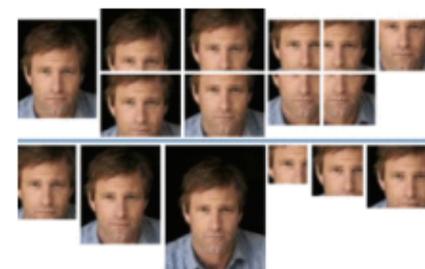
An illustration of the feature extraction process. Arrows indicate forward propagation directions. The number of neurons in each layer of the multiple deep convnets are labeled beside each layer. The deepid features are taken from the last hidden layer of each convnet, and predict a large number of identity classes. Feature numbers continue to reduce along the feature extraction cascade till the deepid layer

Figure 2.



Convnet structure. The length, width, and height of each cuboid denotes the map number and the dimension of each map for all input, convolutional, and max-pooling layers. The inside small cuboids and squares denote the 3d convolution kernel sizes and the 2d pooling region sizes of convolutional and max-pooling layers, respectively. Neuron numbers of the last two fully-connected layers are marked beside each layer

Figure 3.



Top: ten face regions of medium scales. The five regions in the top left are global regions taken from the weakly aligned faces, the other five in the top right are local regions centered around the five facial landmarks (two eye centers, nose tip, and two mouse corners). Bottom: three scales of two particular patches

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Bo Yang; William Cheung; Jiming Liu
IEEE Transactions on Knowledge and Data Engineering
Year: 2007, Volume: 19, Issue: 10
Pages: 1333 - 1348, DOI: 10.1109/TKDE.2007.1061
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Sensing Matrix Optimization for Block-Sparse Decoding
Lihi Zelnik-Manor; Kevin Rosenblum; Yonina C. Eldar
IEEE Transactions on Signal Processing
Year: 2011, Volume: 59, Issue: 9
Pages: 4300 - 4312, DOI: 10.1109/TSP.2011.2159211
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```
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Code
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sources.list
Data
crime.dat 12.11 KB

run.sh
1 require('SQLite')
2 require('plotly')
3
4
5 make_plot=function(drugA,
6 query=paste('select drug
7 drugA, " ", drug
8 cell, " " order by drugA_conc, drugB_conc, sep=" "
9
10 data=db.query(db.query)
11
12 if (dim(data)[2]>0) {
13 drug_conc=unique(data[, "drugA_conc"])
14 drugB_conc=unique(data[, "drugB_conc"])
15 a_conc=rep(c(0,1,2,3),each=4)
16 b_conc=rep(c(0,1,2,3),4)
17
18 observed.data=matrix(data[, "x2d"], nrow=4, ncol=4, byrow=TRUE)
19 hsa=matrix(data[, "hSA"], nrow=4, ncol=4, byrow=TRUE)
20 h2iss=matrix(data[, "h2iss"], nrow=4, ncol=4, byrow=TRUE)
21
22 p=plot_ly(z=observed.data, type="surface", colors="blue", opacity=0.59, show
23 add_trace=b_conc, y=a_conc, z=data2d, type="scatter3d", marker=list(color
24 add_trace=h2iss, showfourZeros=FALSE, color="red", opacity=0.59, showcale=10)
25 }
```

Algorithm Name: Nullam in Est Nec Metus Facilisis Vehicula (Mauris Blandit) Matlab

Algorithm Name: Donec Vitae Lacus in Lorem Porta Volutpat C Plus Plus

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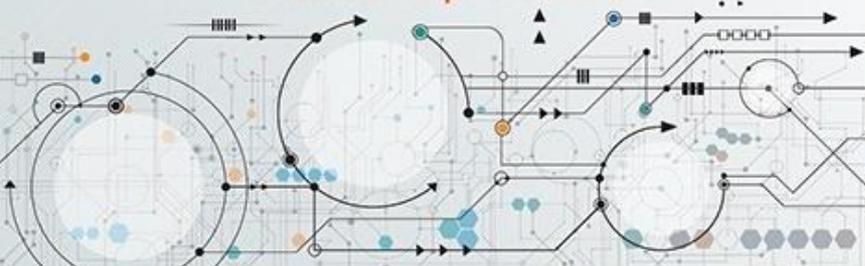


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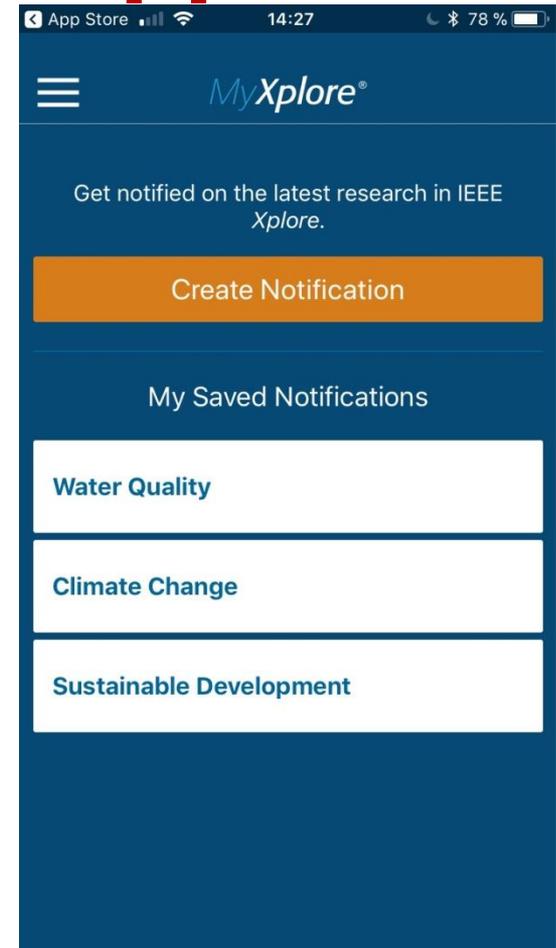
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Abstract:

Deep learning methods, especially convolutional neural networks have achieved significant success in the area of computer vision including the difficult face recognition problems. Training of deep models shows exceptional performance with large datasets, but they are not suitable for learning from few samples. This paper proposes a modified deep learning neural network to learn face representation from a smaller dataset. The proposed network is composed of a set of elaborately designed CNNs, RELUs and fully connected layers. The training dataset is augmented with synthetically generated samples by applying Gaussian and Poisson noise to each sample of the training set, thus doubling the size of the training set. We experimentally demonstrate that the augmented training dataset actually improves the generalization power of CNNs. The network is trained using the standard AT&T face database. Using the proposed approach for limited training data, substantial improvement in recognition rate is achieved.

Published in: Computing, Communication and Networking Technologies (ICCCNT), 2017 8th International Conference on

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 - 3. Learning face recognition from limited training data using deep neural networks** ★★★★★
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ISBN (ELECTRONIC): 978-1-5090-3038-5 PUBLICATION DATE: 01-七月-2017
DIGITAL OBJECT IDENTIFIER: 10.1109/ICCNT.2017.8203981 ELECTRONIC PUBLICATION DATE: 13-十二月-2017
CONFERENCE ACRONYM: ICCNT

Published in: 2017 8th International Conference on Computing, Communication and Networking Technologies (ICCNT) (Page(s): 1-5)

Authors:
Umme Aiman • Virendra P. Vishwakarma [+details]

Affiliations:
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Abstract :
Deep learning methods, especially convolutional neural networks have achieved significant success in the area of computer vision including the difficult face recognition problems. Training of deep models shows exceptional performance with large datasets, but they are not suitable for learning from few samples. This paper proposes a modified deep learning neural network to learn face representation from a smaller dataset. The proposed network is composed of a set of elaborately designed CNNs, RELUs and fully connected layers. The training dataset is augmented with synthetically generated samples by applying Gaussian and Poisson noise to each sample of the training set, thus doubling the size of the training set. We experimentally demonstrate that the augmented training dataset actually improves the generalization power of CNNs. The network is trained using the standard AT&T face database. Using the proposed approach for limited training data, substantial improvement in recognition rate is achieved.

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```
ALL=((face recognition OR face representation) AND (deep learning OR neural network))
```

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TI= Title

AB= Abstract

DE= Description

CL= Claims

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UP= Ult Parents

CA= Curr Asgns

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NOT – must include left operand but not the right

OR – must include at least one operand (boolean)

Boolean / Positional Operators

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1 – () – use parenthesis to set the precedence

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Text Fields	Description
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US20160307072 | US APPLICATIONS | 20-OCT-2016
- 19. Pyramid match kernel and related techniques ★4
CURRENT ASSIGNEES: MASSACHUSETTS INST TECH
US7949186 | US PATENTS | 24-MAY-2011
- 20. System and method for improving the prediction accuracy of a neural network ★4
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- 21. Face recognition method based on aggregate loss deep metric learning ★4
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CN107103281A | CHINA APPLICATIONS | 29-AUG-2017
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- 23. Large-scale face recognition method based on depth convolution neural network model ★4
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DOCUMENT ACTION

Front Page Family (1) Citations Description Claims Figures (5) Pages (0)

Legal Litigation (0) Notes

CHINA INVENTION APPLICATION PUBLICATION [EPO](#)

PUBLICATION NUMBER: CN 107103281 A PUBLICATION DATE: 29-八月-2017
APPLICATION NUMBER: CN 201710141763 A FILING DATE: 10-三月-2017
SIMPLE FAMILY NUMBER: 59675519 EARLIEST PRIORITY DATE: 10-三月-2017

PRIMARY INFORMATION (SOURCE: IFI)

Title (Chinese):
基于聚集损失深度度量学习的人脸识别方法

Abstract (English):
The invention claims a base for collecting the loss of depth measurement learning of human face identifying method comprises following steps: To training of pre-processing images; By using pre-processed image to the depth of convolutional neural network to carry out training using softmax loss as the loss of function is introduced into the key point pool technology; 3 divides all the training image input the trained model for counting each type of the initial type centre; Making use of collecting loss to the trained model for carrying out fine adjustment via

FIGURES



Term Highlighting

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18. Fine-grained image classification by Exp
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23. Large-scale face recognition method ba
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output train value features
identification extract pixel parameter
user class display database video

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Manual (10)

accuracy	x
convolution	x
deep	x
learning	x
image	x
recognition	x
neural network	x
face	x
identification	x
video	x

Patent Research: Q&A

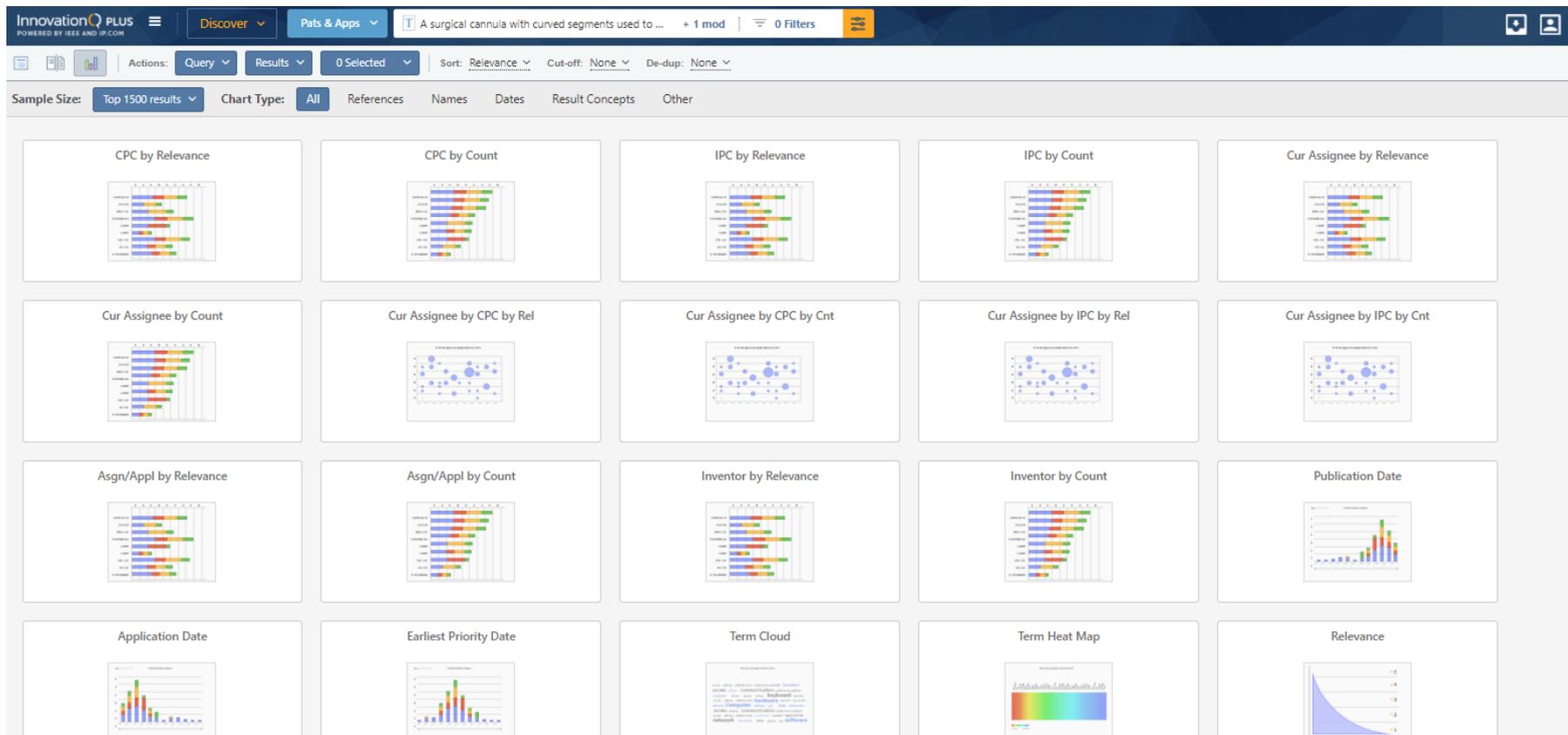
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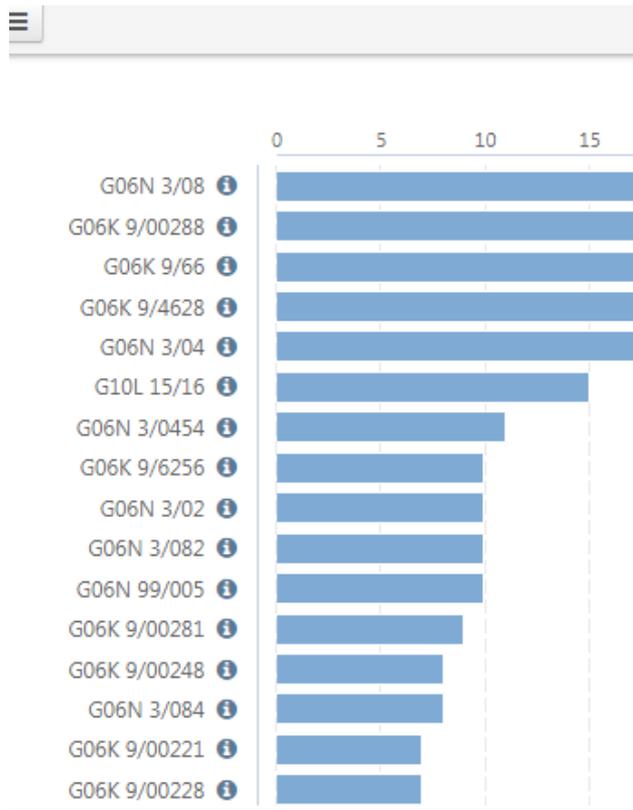
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4. What are they doing?
5. How are they doing it? (patent claims)
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Visualizations: Knowledge of the “art” (subject matter)



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CPC CODE	INFO	
G	PHYSICS	
	INSTRUMENTS	
G06	COMPUTING CALCULATING COUNTING (score computers for games A63B71/06, A63D15/20, A63F1/18; combinations of writing implements with computing devices B43K29/08)	75
G06N	COMPUTER SYSTEMS BASED ON SPECIFIC COMPUTATIONAL MODELS	
G06N3/00	Computer systems based on biological models (analogue computers simulating functional aspects of living beings G06G7/60)	
G06N3/02	<ul style="list-style-type: none"> using neural network models (for adaptive control G05B13/00; for image pattern matching G06K9/00; for image data processing G06T1/20; for phonetic pattern matching G10L15/16) 	
G06N3/08	<ul style="list-style-type: none"> Learning methods 	

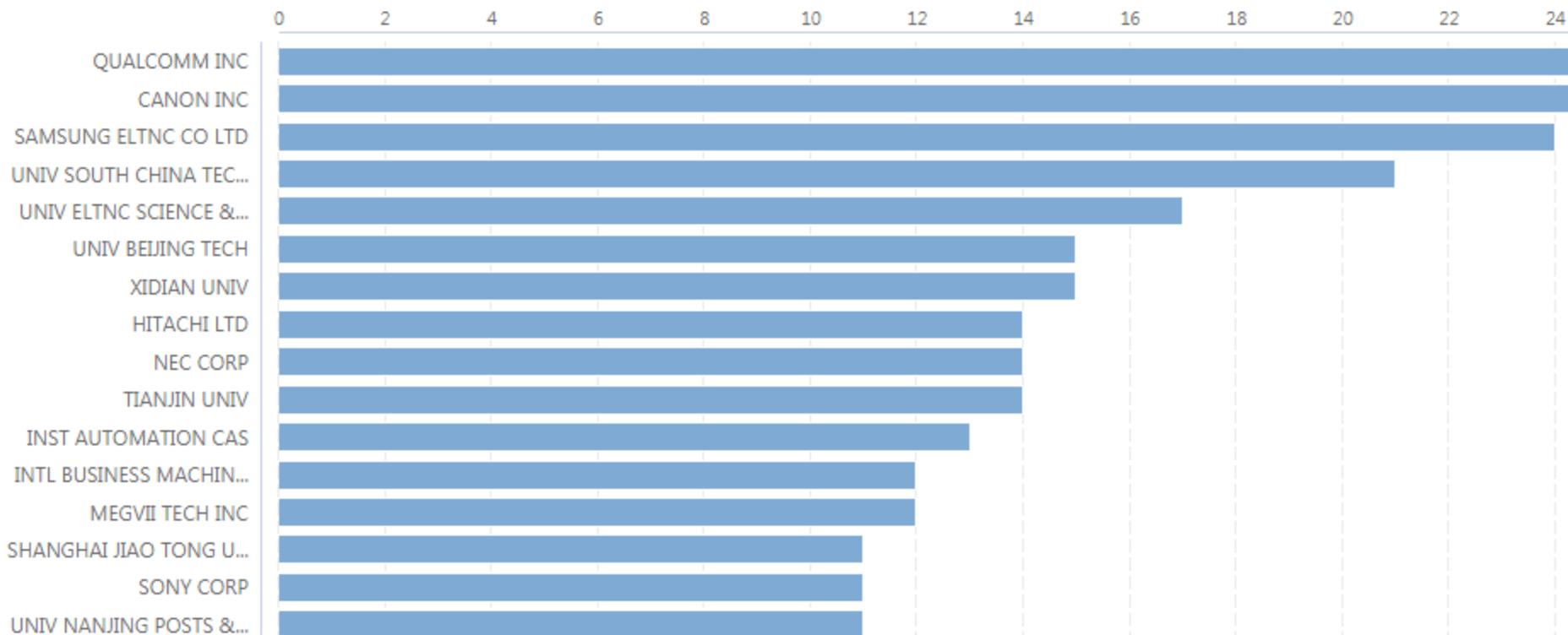
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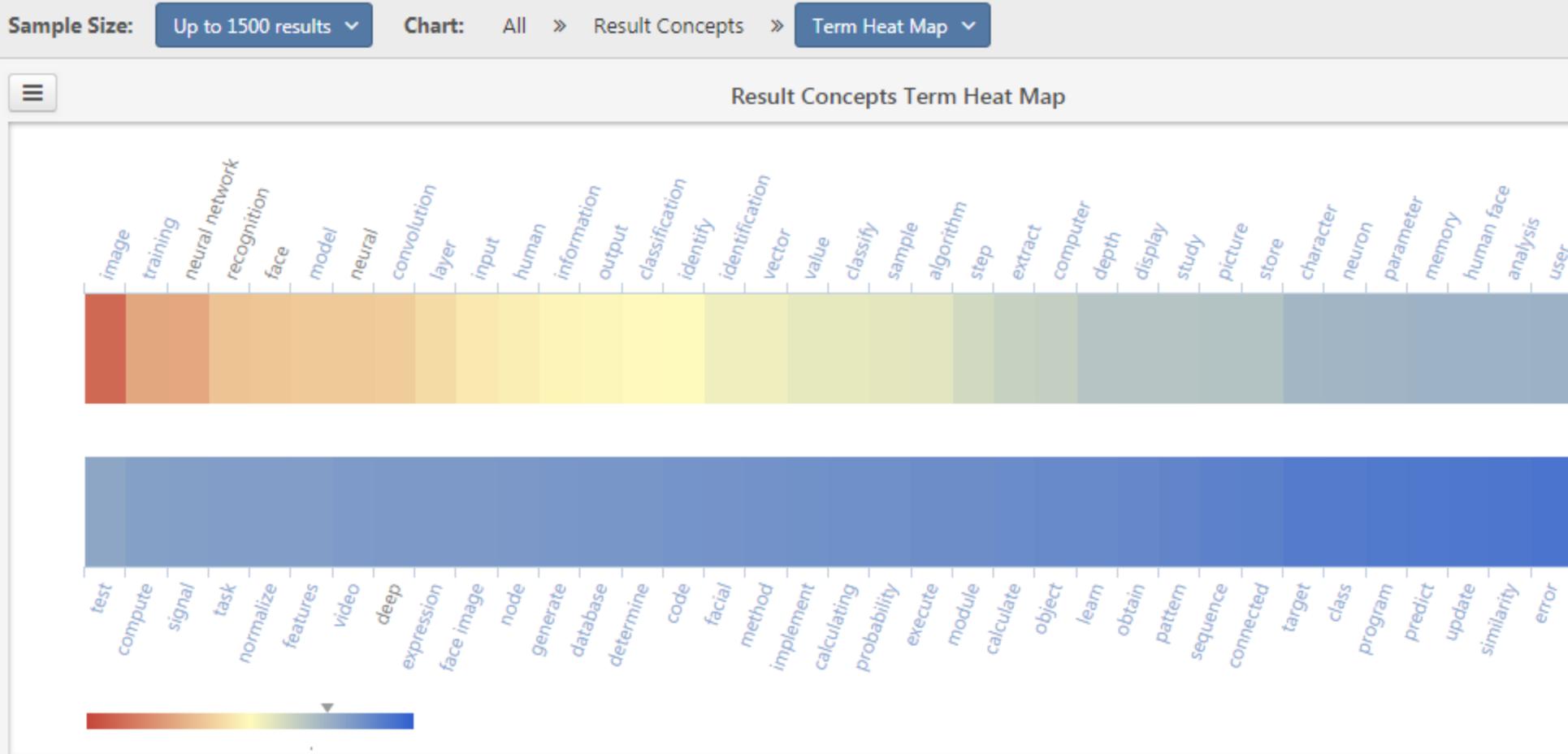
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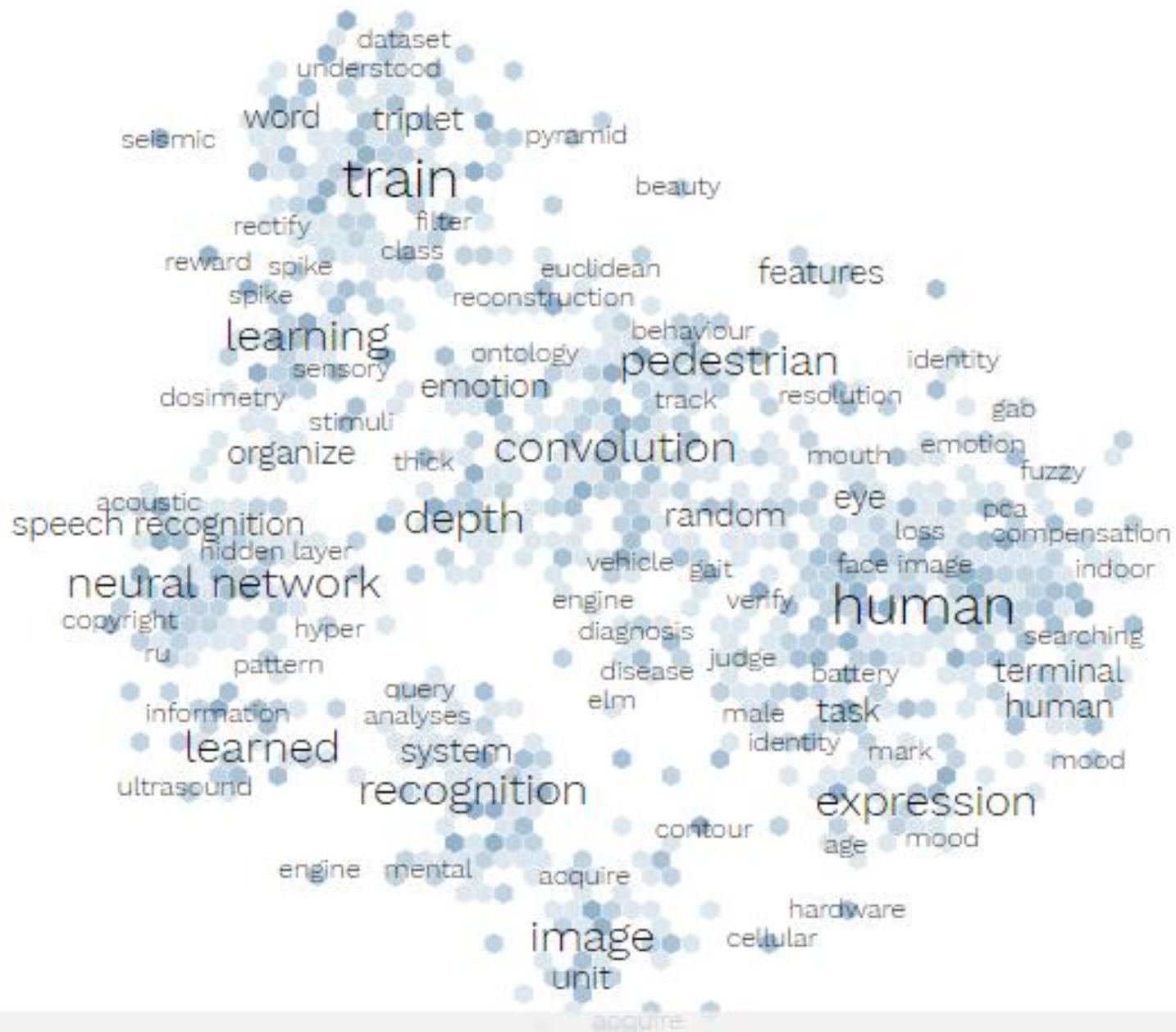
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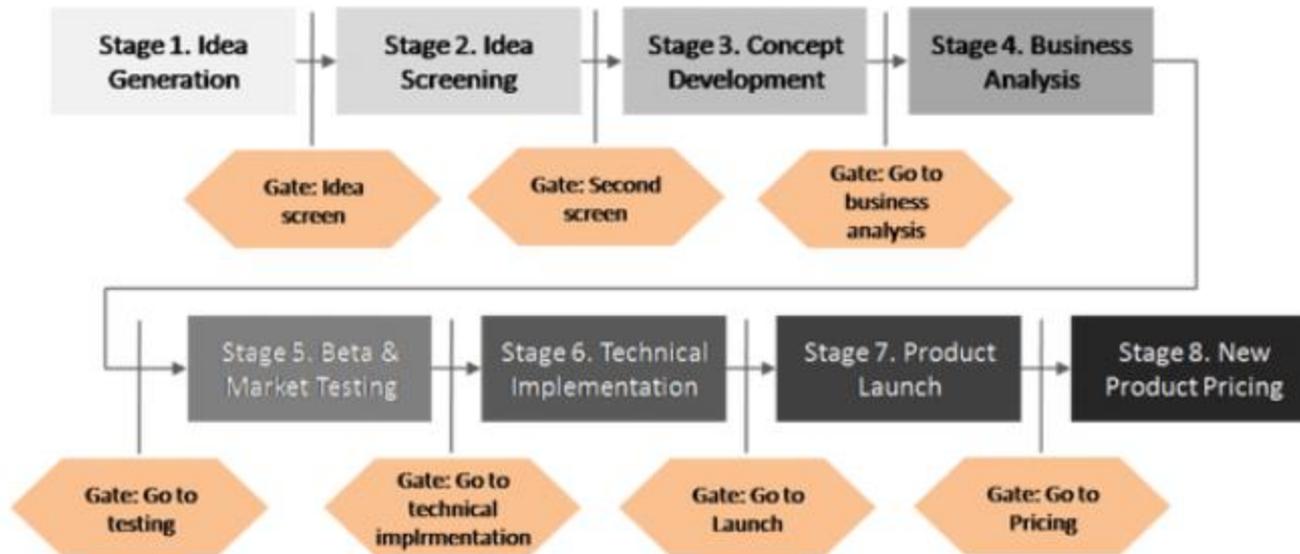
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