# Search Smarter: How AI can change your Research

李箐
IEEE中國區資訊經理

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# 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

Advancing Technology for Humanity

# IEEE Intro

The Institute of Electrical and Electronics Engineers

# IEEE members are the technology leaders of today and tomorrow

## IEEE Medal of Honor Recipients

**2013**

**Irwin Jacobs**
Co-Founder
Qualcomm Inc

**2014**

**B. Jayant Baliga**
Transformed Power
Semiconductors

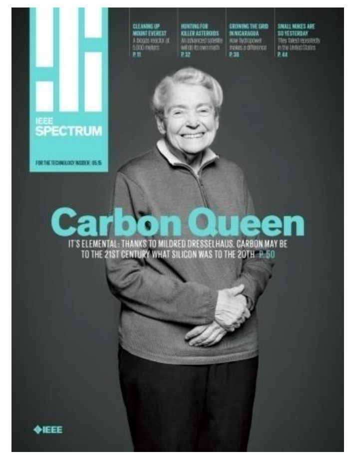
**2015**

**Mildred Dresselhaus**
Paved the way for the rise
of Nanotechnology

**2016**

**G. David Forney, Jr.**
Launched a Million Modems



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- IEEE Geoscience and Remote Sensing Society
- IEEE Industrial Electronics Society
- IEEE Industry Applications Society
- IEEE Information Theory Society
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- IEEE Magnetics Society
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- Smart Grid
- Wireless Broadband

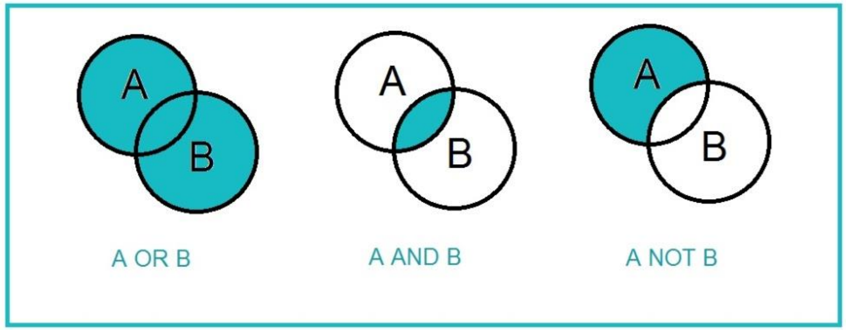
and many more

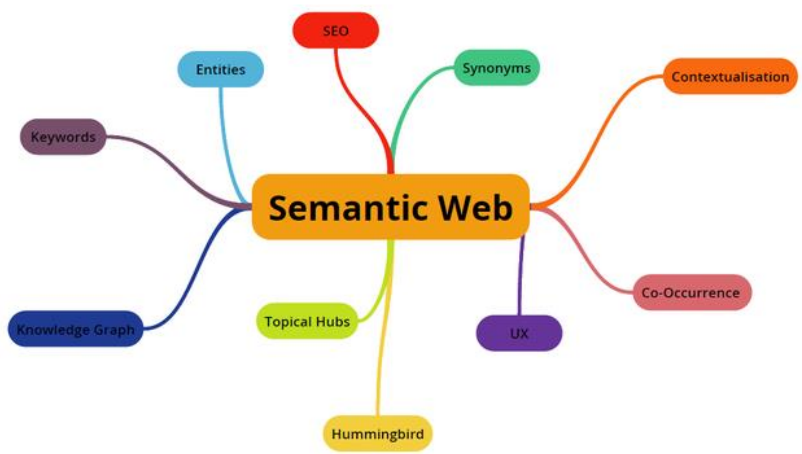
# The power of AI: search smarter; research smarter

# AI stories


THE ULTIMATE GO CHALLENGE
GAME 1 OF 5
9 MARCH 2016
AlphaGo
VS
Lee Sedol
RESULT
W+ Res
NUMBER OF MOVES
186
TIME WHITE
1h 55m
TIME BLACK
1h 32m

# When AI meets IP: From Boolean to Semantic

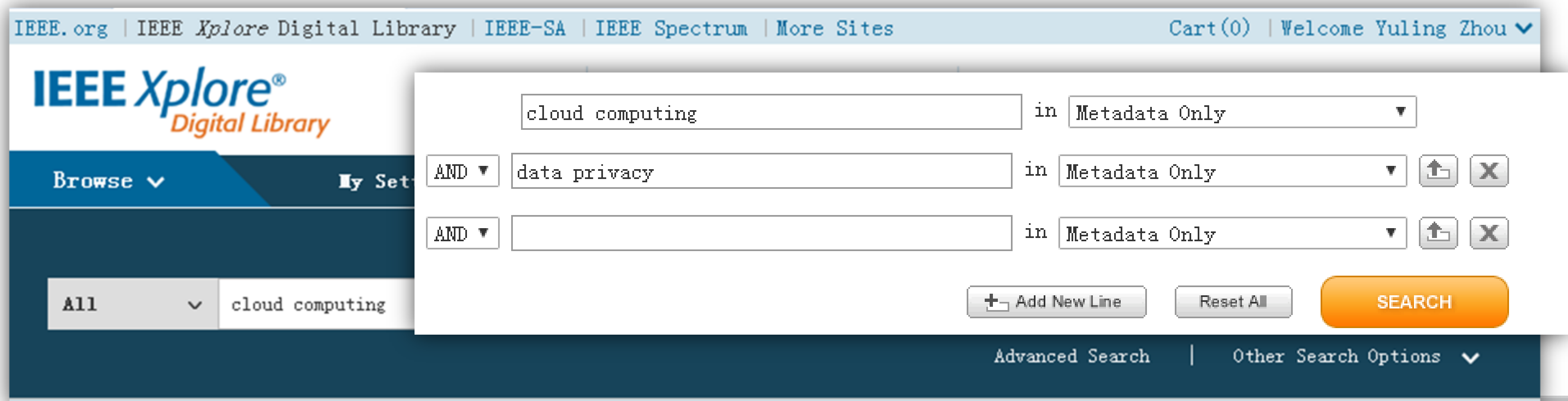


# Traditional Academic Searching

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)



# 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)

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# 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

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**Semantic Search:**

| | | |
|---|---|---|
| Autonomous vehicle | Navigation | Accelerator |
| Car | Network | Van |
| Automobile | Locomotive | Pilot |
| Driver | Fuel | Self driving |
| Truck | Transport | Wheels |
| Robot | Route | Tram |
| GPS | Passenger | Train |
| Transport | Brake | Bus |
| Satellite | Engine | Taxi |

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# Deciphering the mystery of AI via IEEE Xplore

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- 20 **IET conferences**, 26 **IET journals & magazines**

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- Backfile to 1988, select legacy data back to 1872

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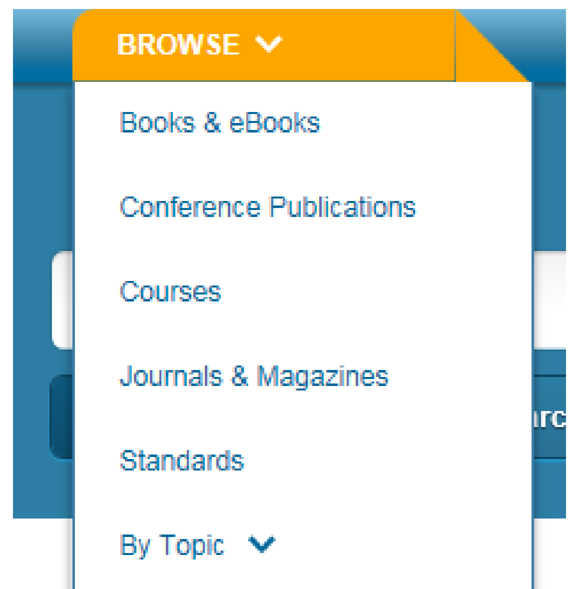
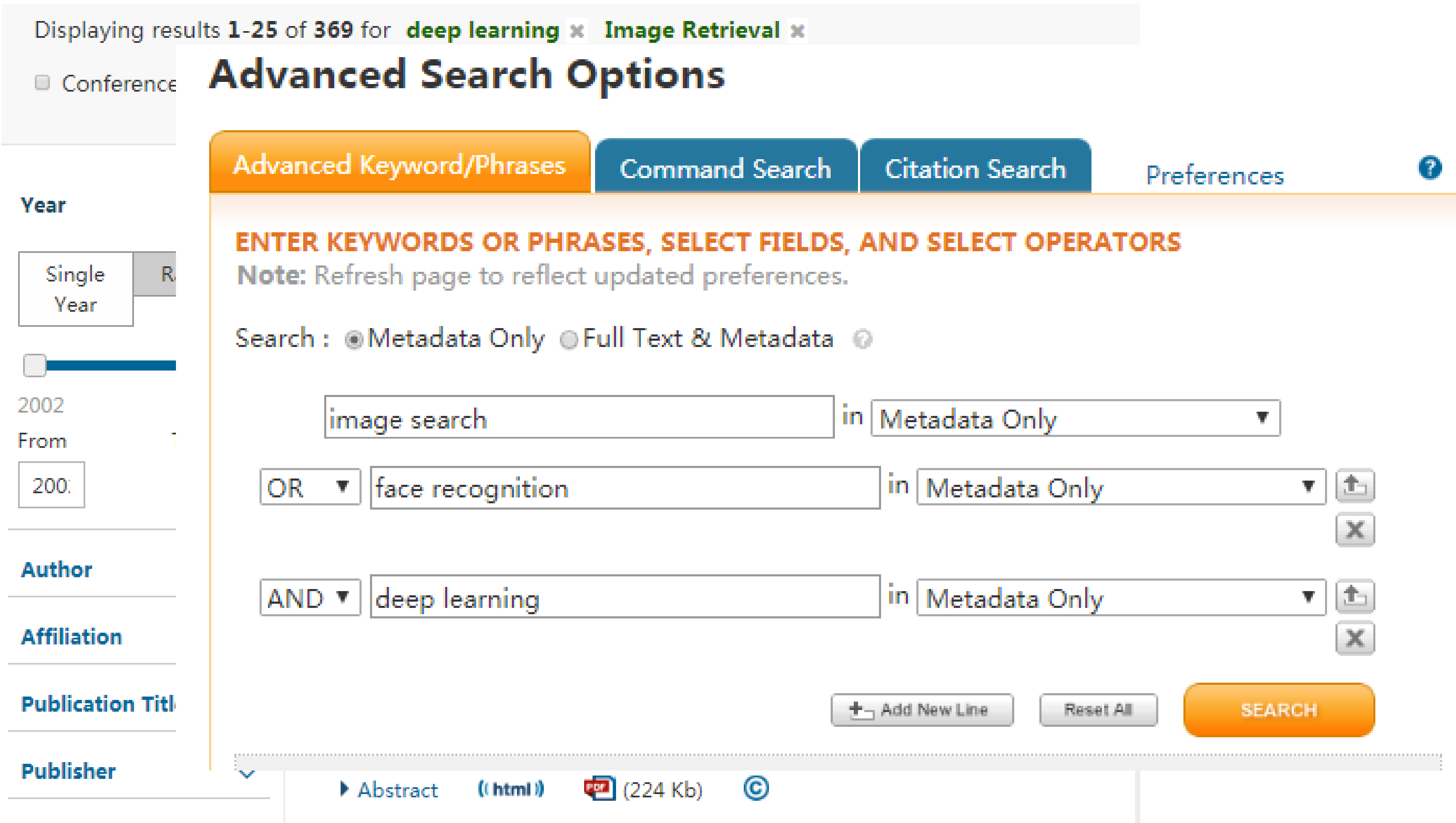


# Knowledge of AI

- Main research streams
- Top researchers
- Top affiliations
- Top journals
- Top conferences
- Other resources: e-learning courses, ebooks, videos etc
- …

# Multiple ways to start a search

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# Knowledge of the "art"

Displaying results **1-25** of **806** for **((deep learning) AND face recognition)**

**Publication Title**

Enter Title

- Automatic Face & Gesture Recognition (FG 2017), 2017 12th IEEE International Conference on (42)
- 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)
- Computer Vision Workshop (ICCVW), 2017 IEEE International Conference on (21)
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Journals & Magazines (101)   Early Access Artic

**Select All on Page**   Sort By: **Relevance**

**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
**IEEE Conferences**
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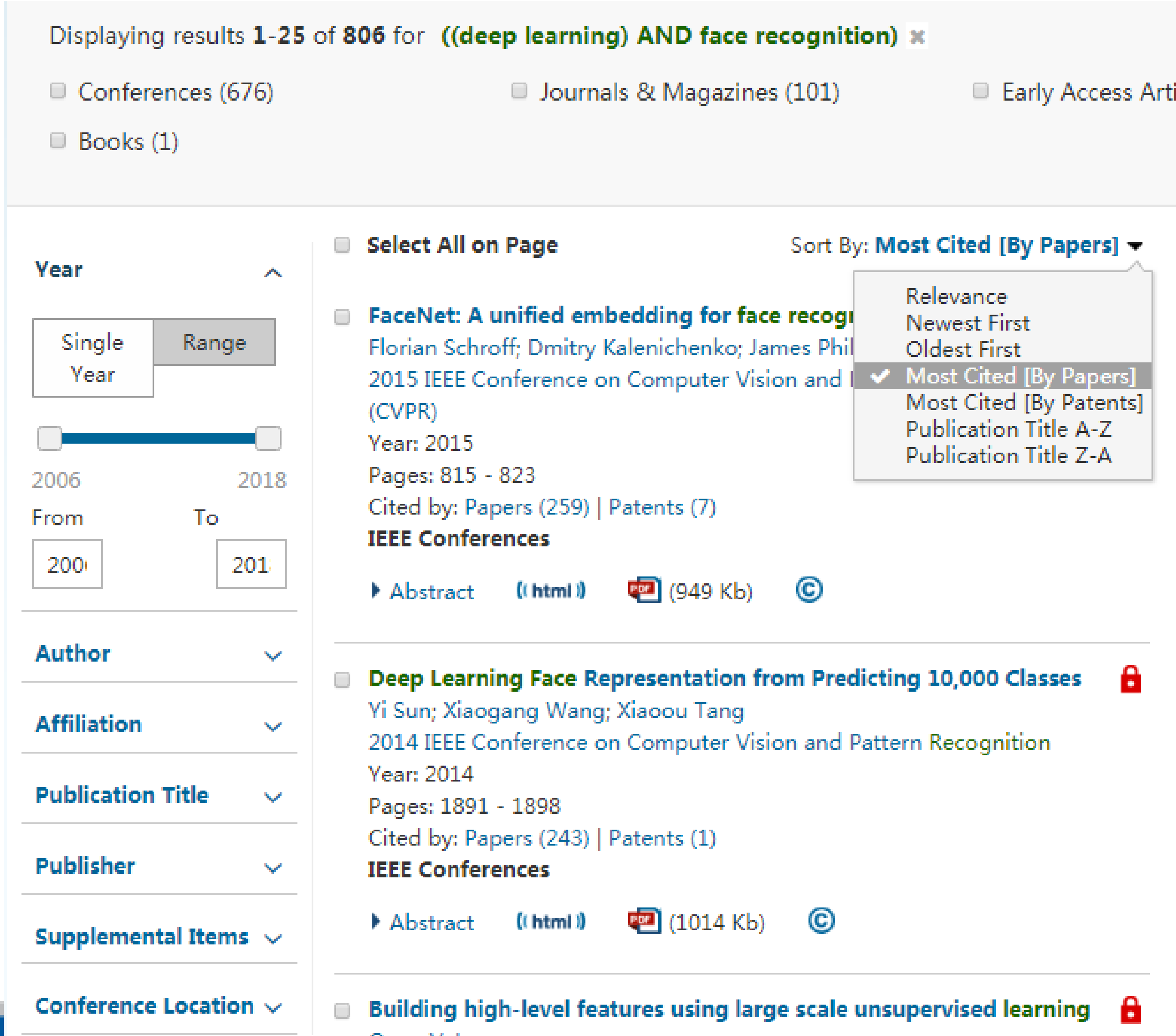
**Transferred Deep Convolutional Neural Network Features for Extensive Facial Landmark Localization**
Shaohua Zhang; Hua Yang; Zhou-Ping Yin

# Identify most cited papers



# Follow the lead, deep dive

Browse Conferences > Computer Vision and Pattern R...

Back to Results | Next >

## FaceNet: A unified embedding for face recognition and clustering

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**Related Articles**

Fast motion planning for multiple moving robots

Inverse kinematics of redundant robots using genetic algorithms

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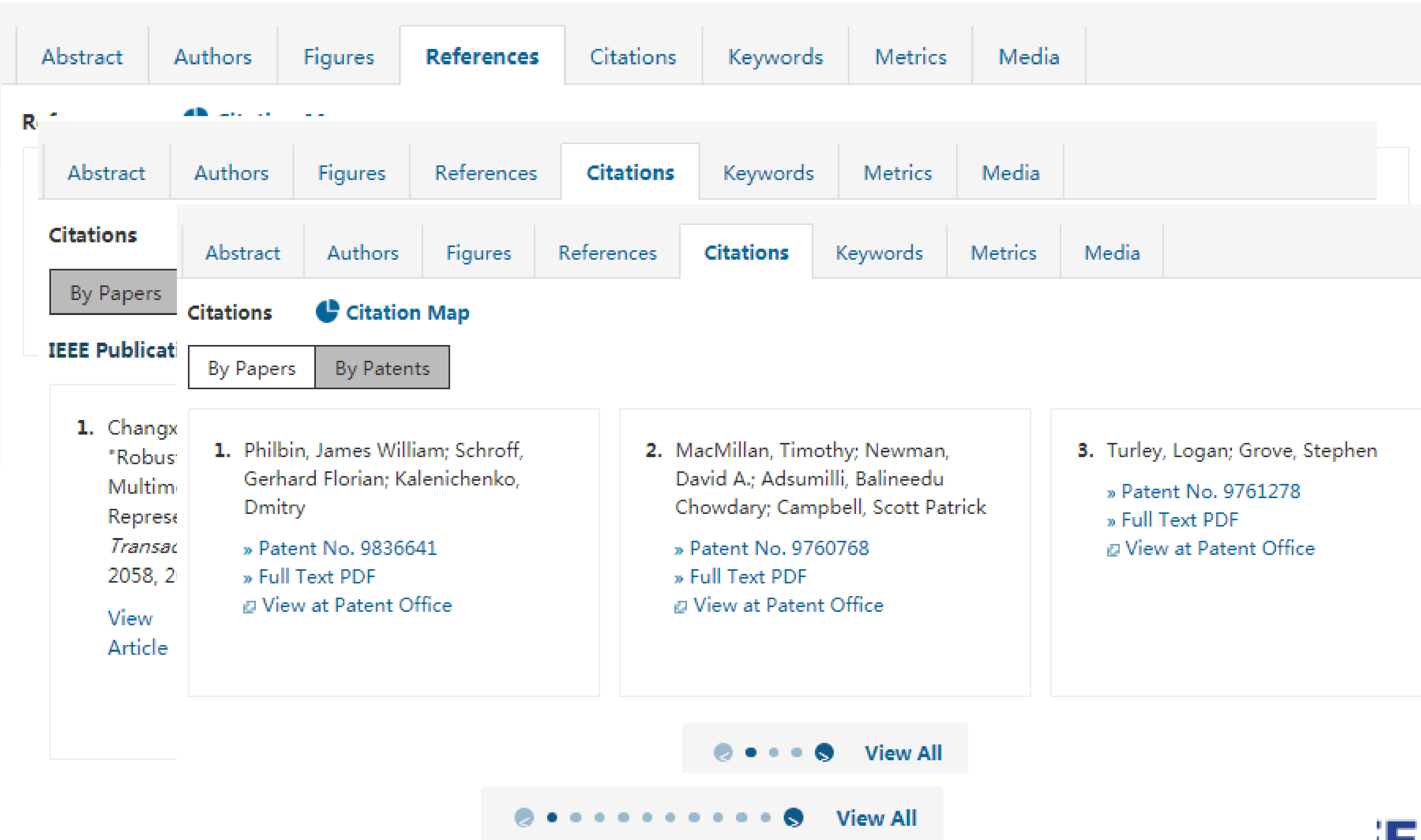
3 Author(s) | Florian Schroff ; Dmitry Kalenichenko ; James Philbin | View All Authors

**Abstract** | Authors | Figures | References | Citations | Keywords | Metrics | Media

**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 offace 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 asfeature 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-artface recognition performance using only 128-bytes perface. 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

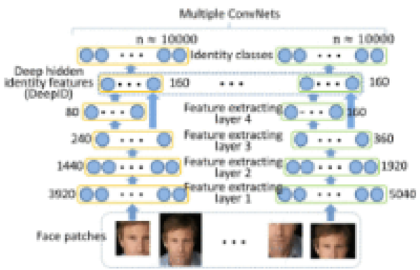
# Track references and citations



# View graphs

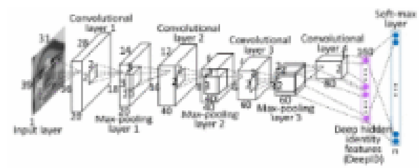
Abstract | Authors | **Figures** | References | Citations | Keywords | Metrics | Media

**Figure 1.**



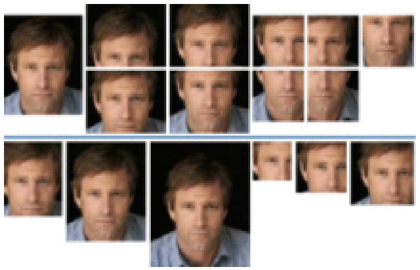

An illustration of the feature extraction process. Arrows indicate forward propagation directions. The number of neurons in each layer of the multiple deep convnets are labeled beside each layer. The deepid features are taken from the last hidden layer of each convnet, and predict a large number of identity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

.js

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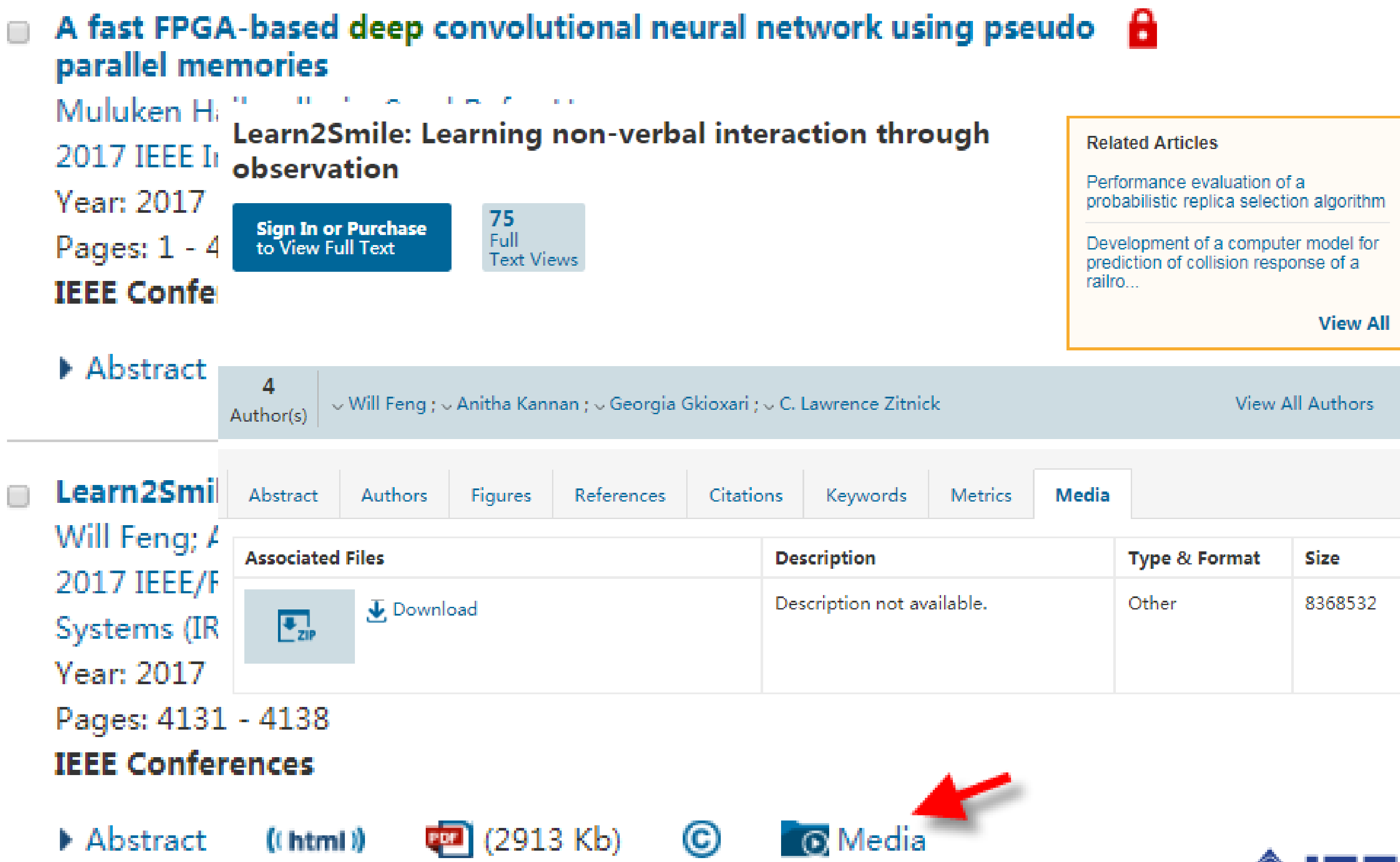
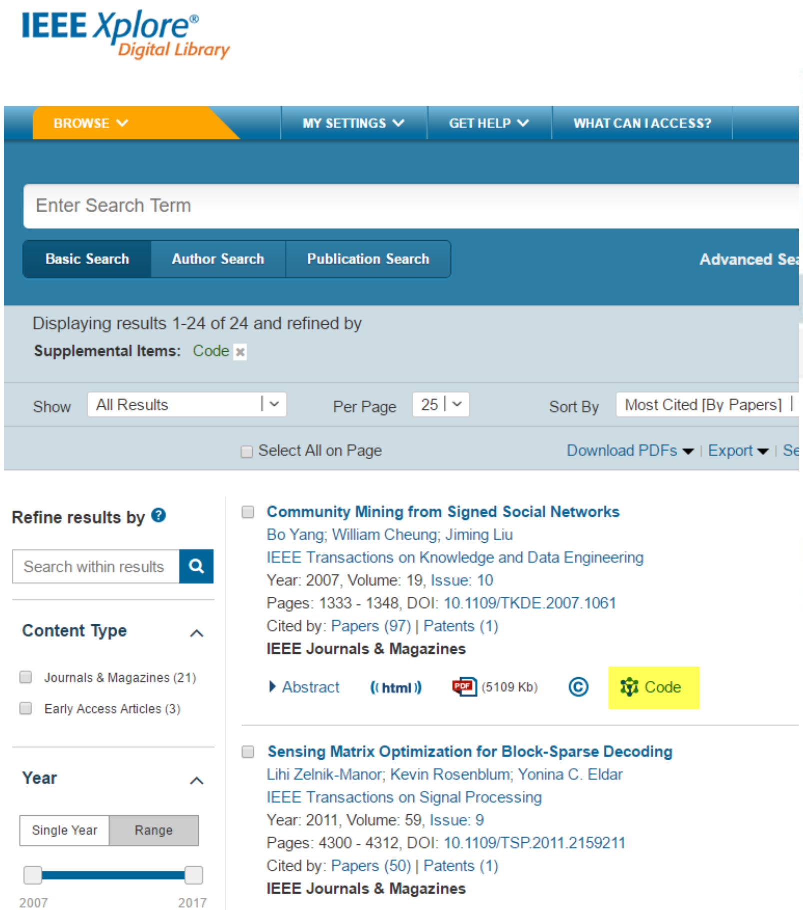
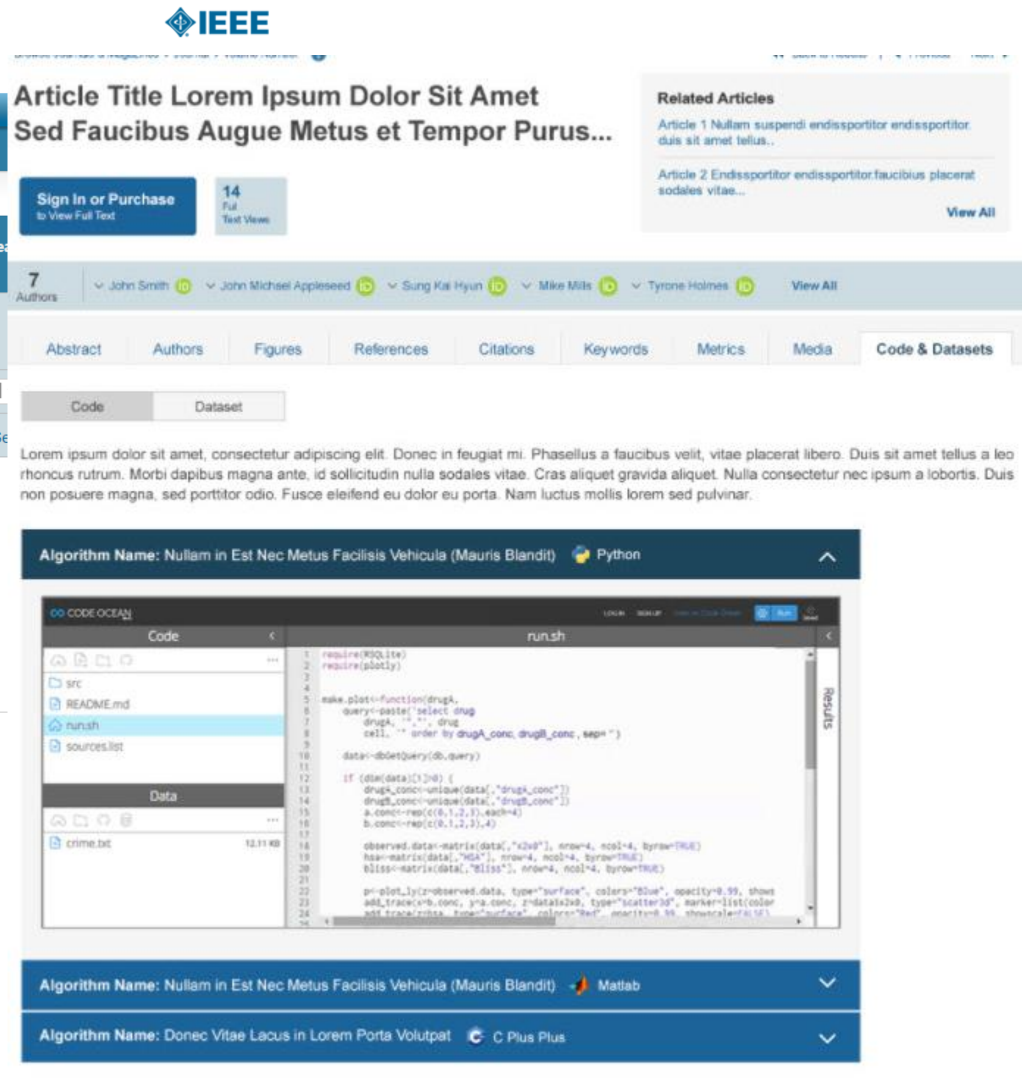
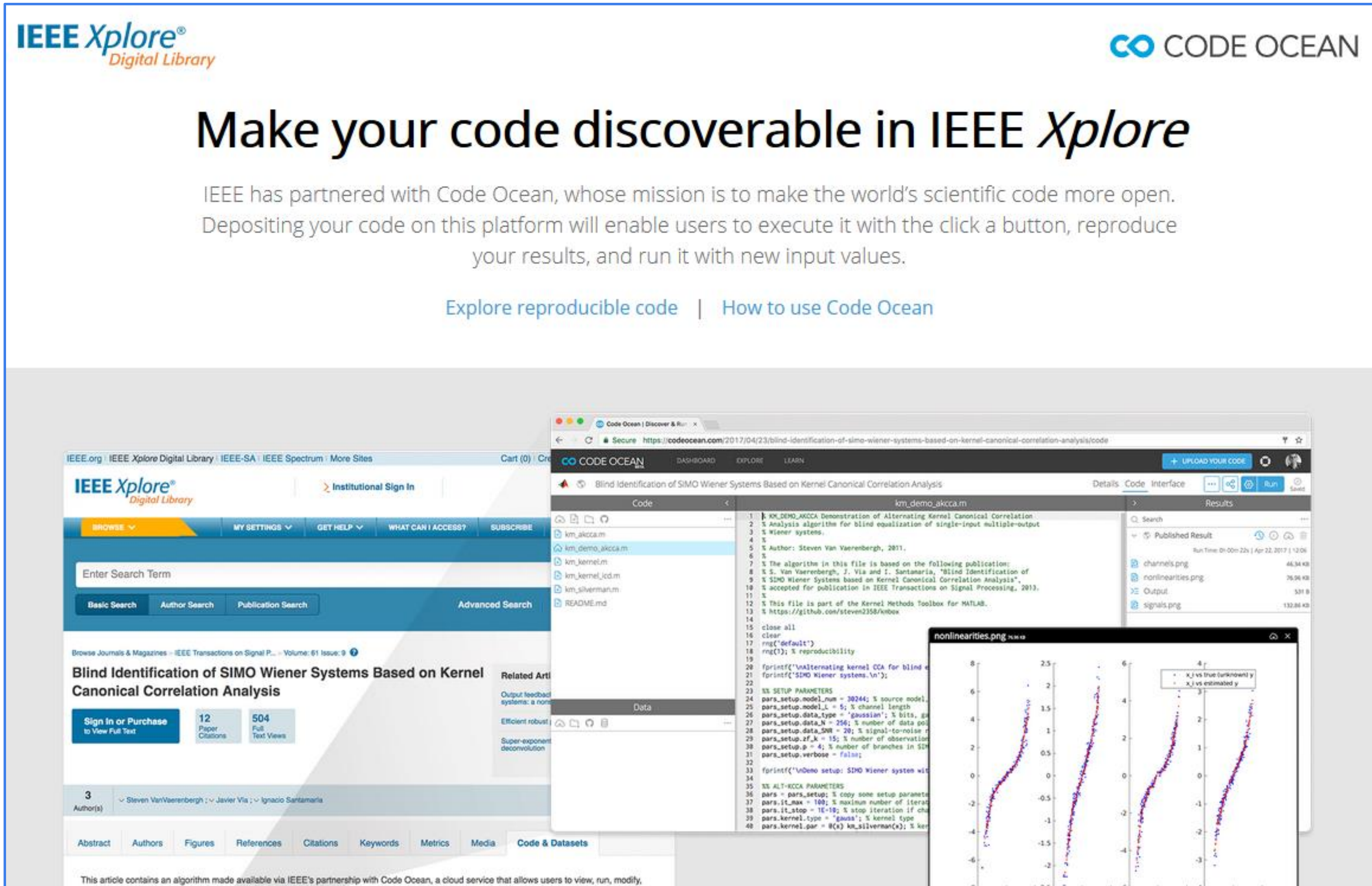


# View code & datasets



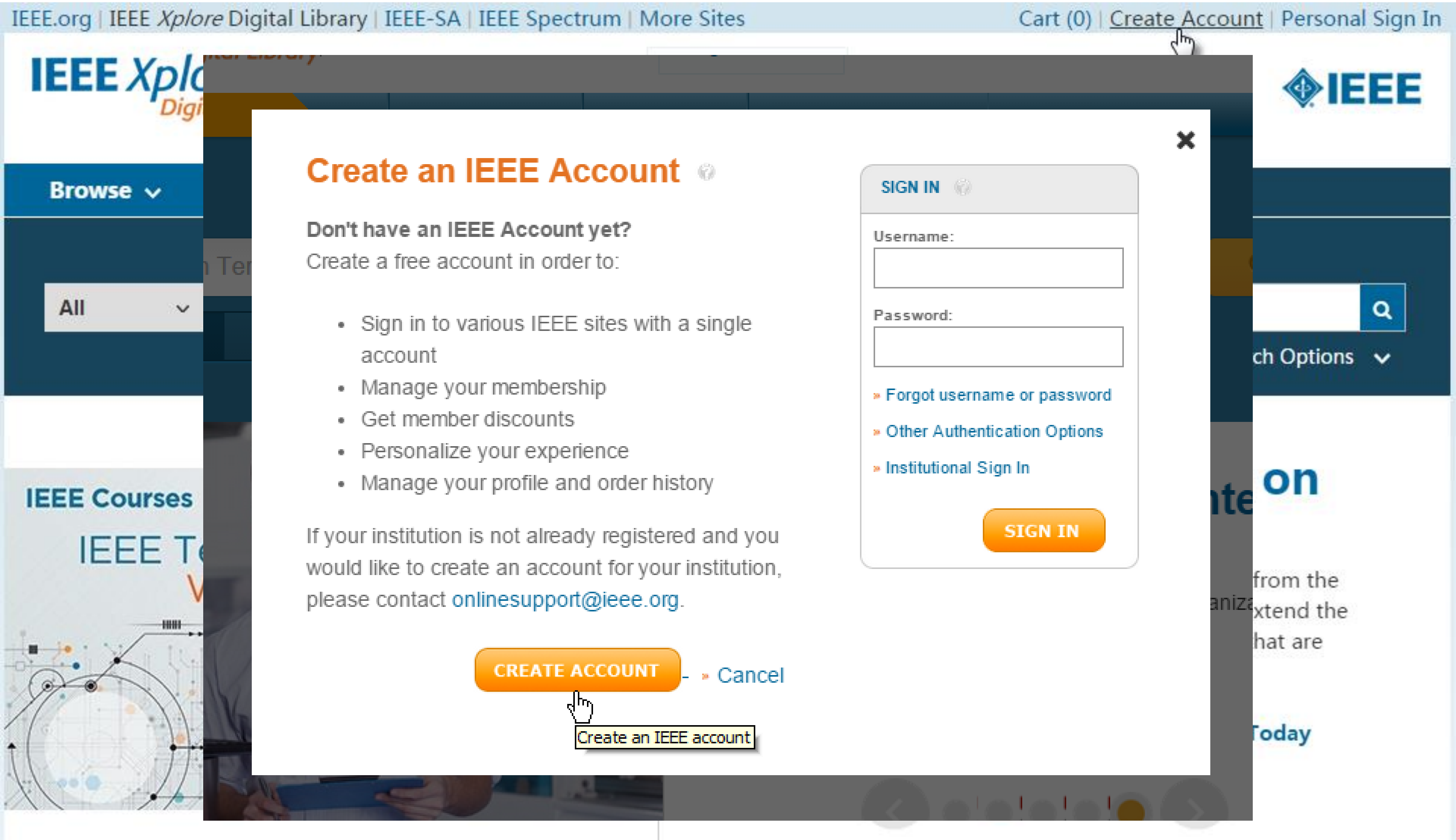



# IEEE code sharing platform




https://codeocean.com/signup/ieee

# Alerts: Keep track & Stay current



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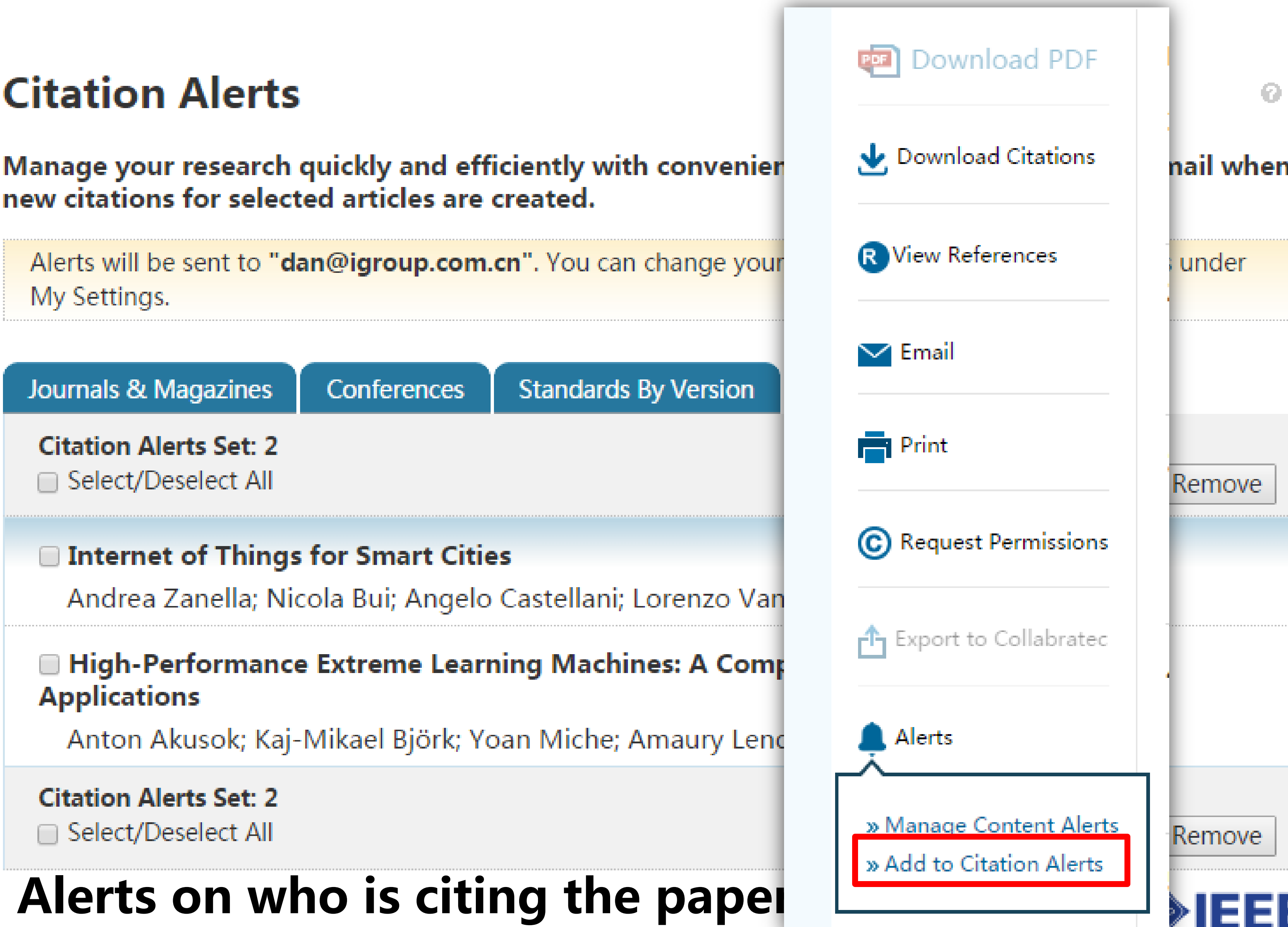
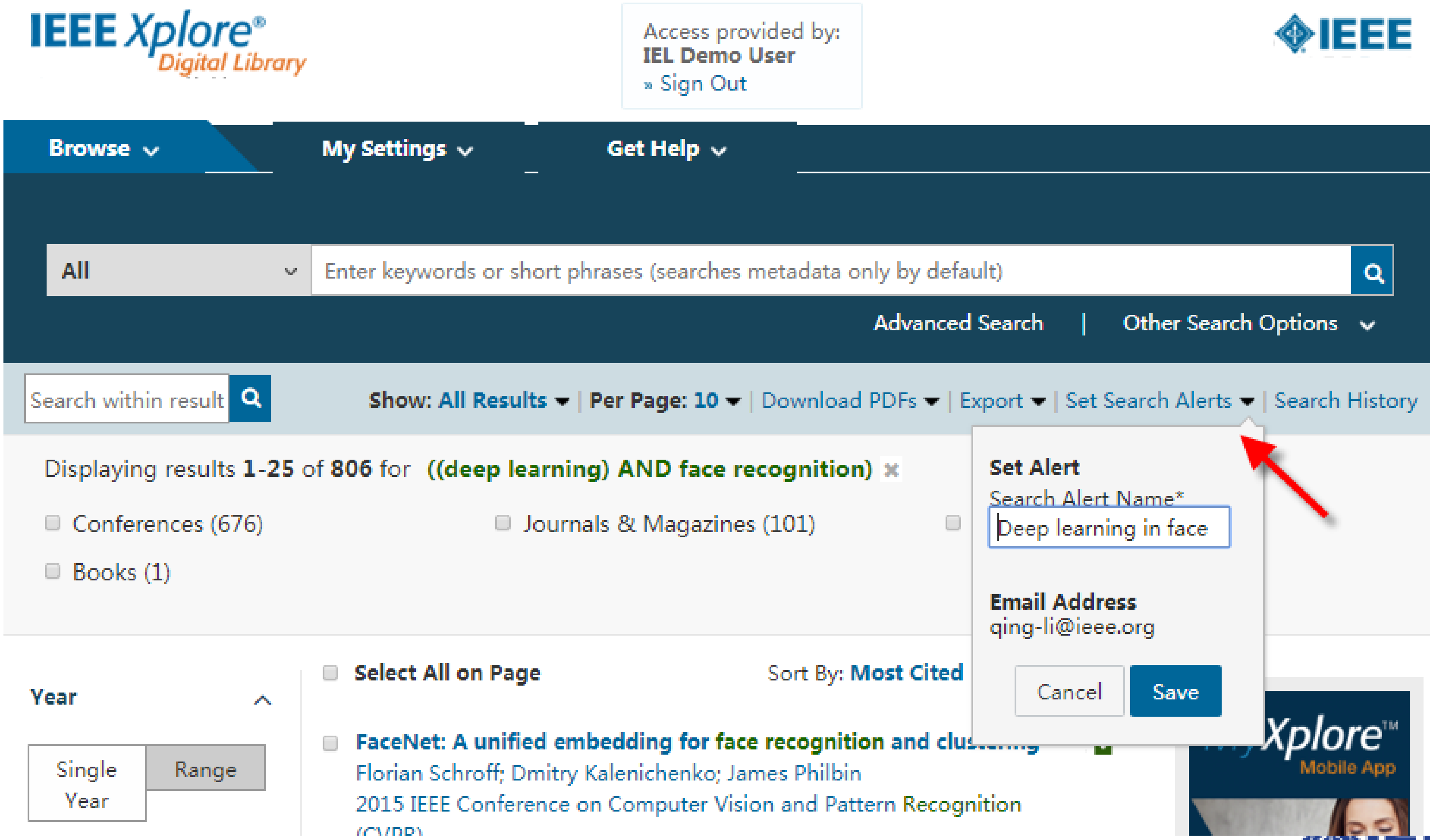



**Alerts on who is citing the paper**

# Search alerts: track a technology trend/expert/affiliation



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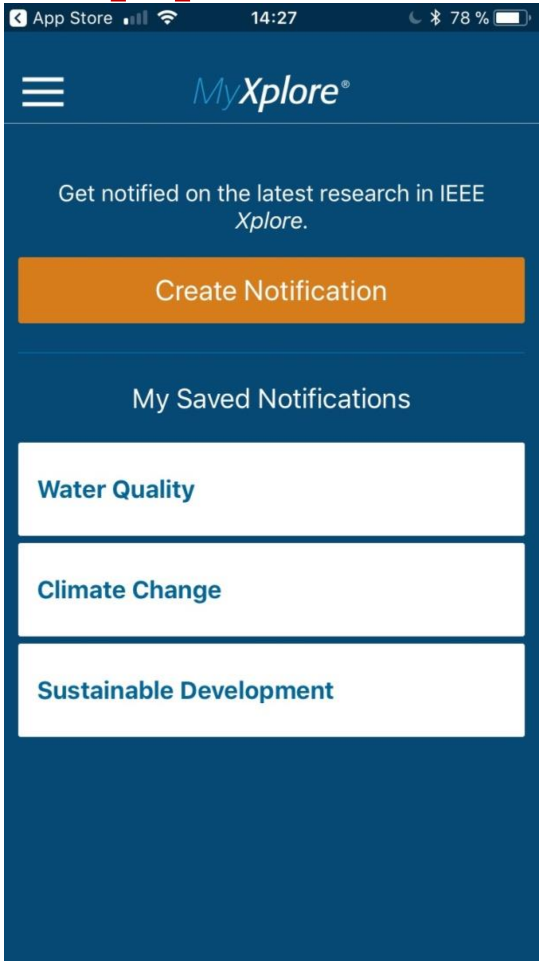


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# If you have a idea to search or test

Next >

## Face recognition using modified deep learning neural network

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2 Author(s) Umme Aiman ; Virendra P. Vishwakarma View All Authors

Abstract | Authors | Figures | References | Citations | Keywords | Metrics | Media

**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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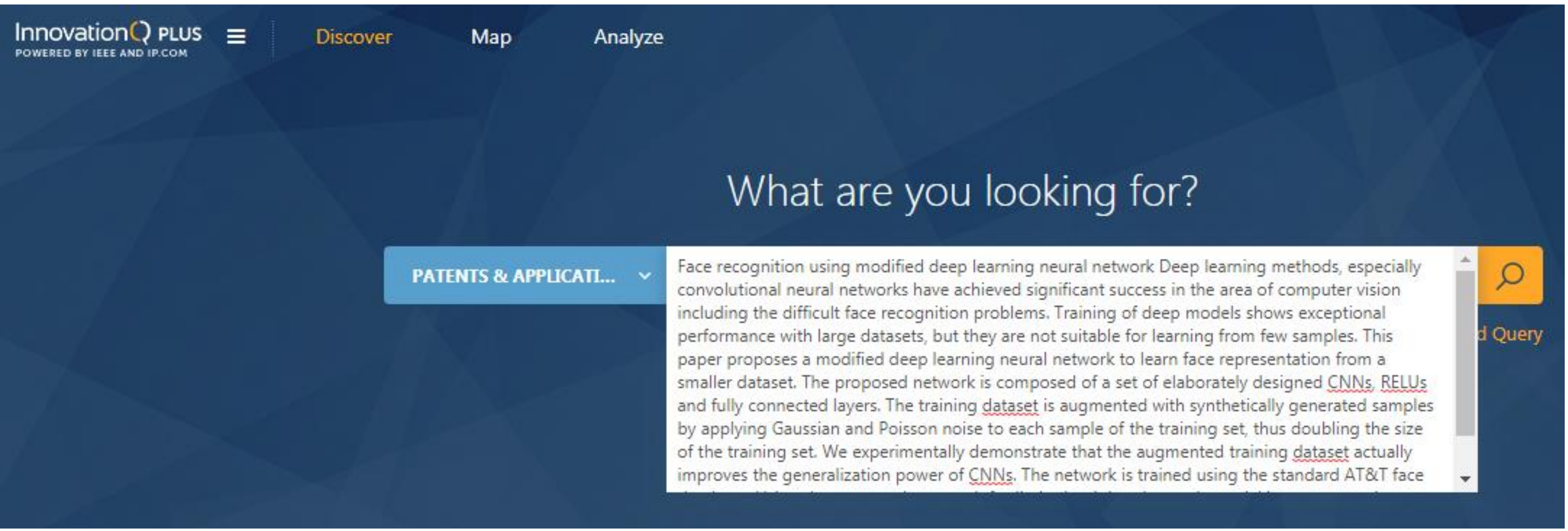
# Just express in natural language



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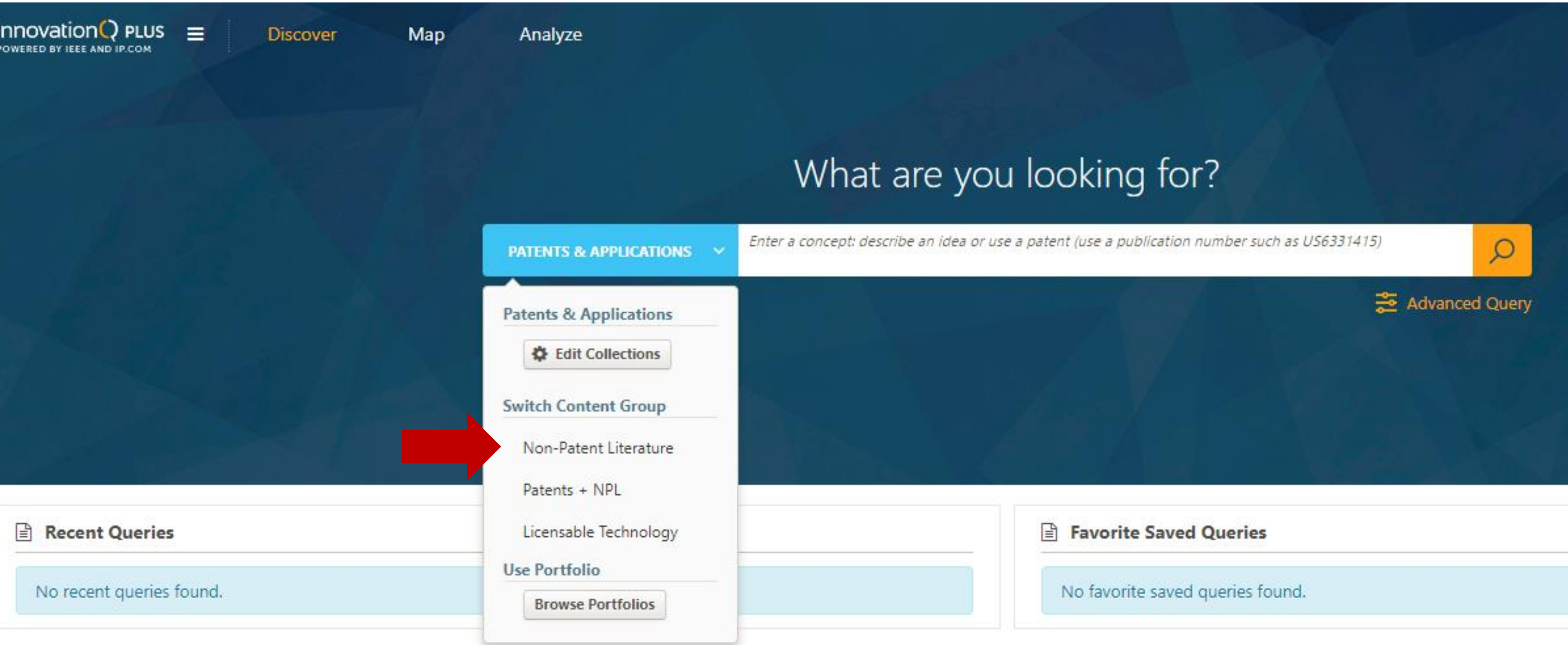


# Semantically search IEEE literature

1 - 50 — 3,478,467 results

1. Face recognition using modified deep learning neural network
   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...
   IEEE Xplore | IEEE CONFERENCES | 01-JUL-2017 | 2017 8th International Conference on Computing, Communication and Networking Technologies (ICCCNT) (Page(s): 1-5)

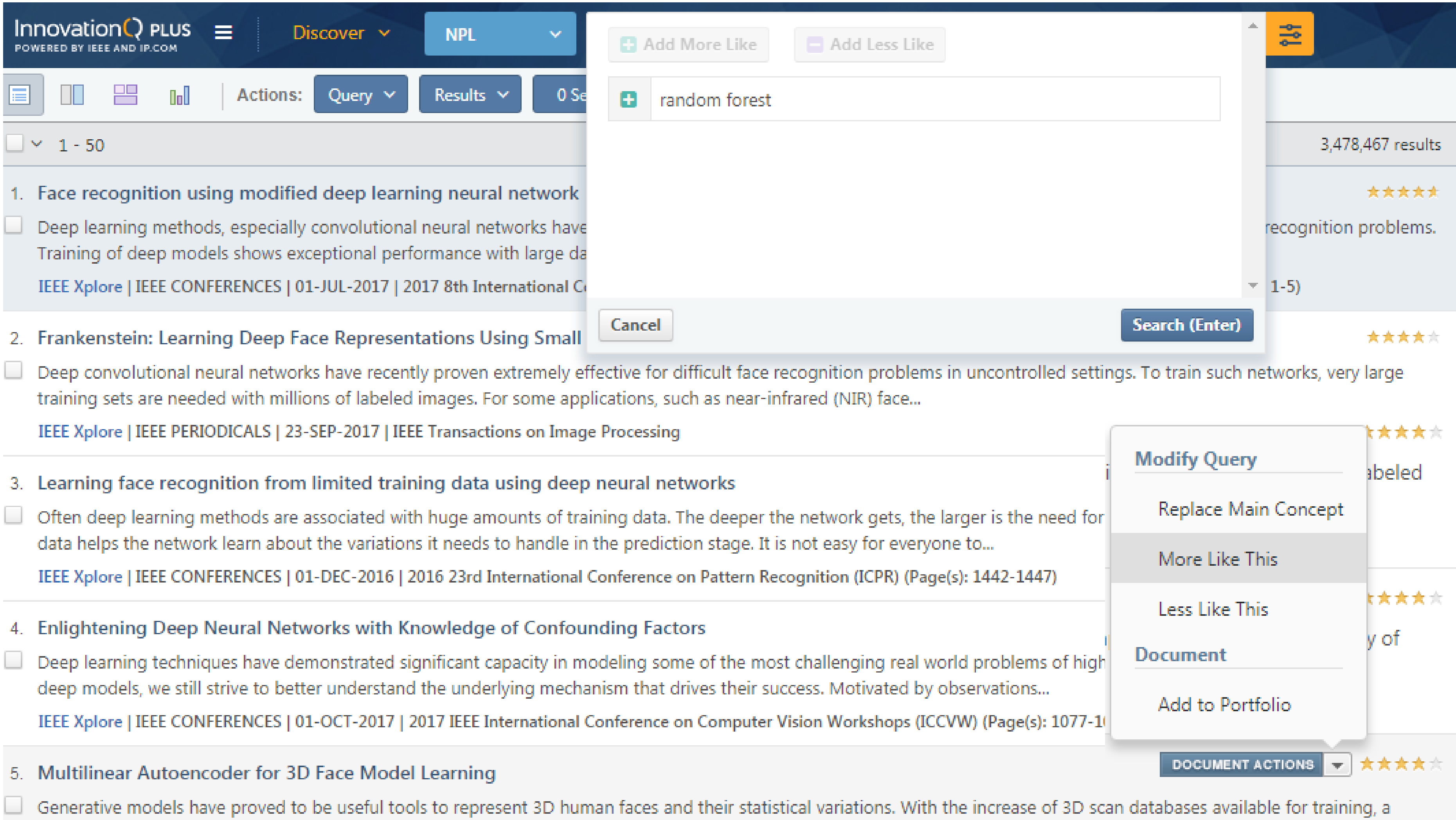
2. Frankenstein: Learning Deep Face Representations Using Small Data
   Deep convolutional neural networks have recently proven extremely effective for difficult face recognition problems in uncontrolled settings. To train such networks, very large training sets are needed with millions of labeled images. For some applications, such as near-infrared (NIR) face...
   IEEE Xplore | IEEE PERIODICALS | 23-SEP-2017 | IEEE Transactions on Image Processing

3. Learning face recognition from limited training data using deep neural networks
   Often deep learning methods are associated with huge amounts of training data. The deeper the network gets, the larger is the need for training data. A large amount of labeled data helps the network learn about the variations it needs to handle in the prediction stage. It is not easy for everyone to...
   IEEE Xplore | IEEE CONFERENCES | 01-DEC-2016 | 2016 23rd International Conference on Pattern Recognition (ICPR) (Page(s): 1442-1447)

4. Enlightening Deep Neural Networks with Knowledge of Confounding Factors
   Deep learning techniques have demonstrated significant capacity in modeling some of the most challenging real world problems of high complexity. Despite the popularity of deep models, we still strive to better understand the underlying mechanism that drives their success. Motivated by observations...
   IEEE Xplore | IEEE CONFERENCES | 01-OCT-2017 | 2017 IEEE International Conference on Computer Vision Workshops (ICCVW) (Page(s): 1077-1086)

5. Multilinear Autoencoder for 3D Face Model Learning
   Generative models have proved to be useful tools to represent 3D human faces and their statistical variations. With the increase of 3D scan databases available for training, a

# Modify search-think like human being




Add text to an existing concept; refine with "More Like This" and "Less Like This"

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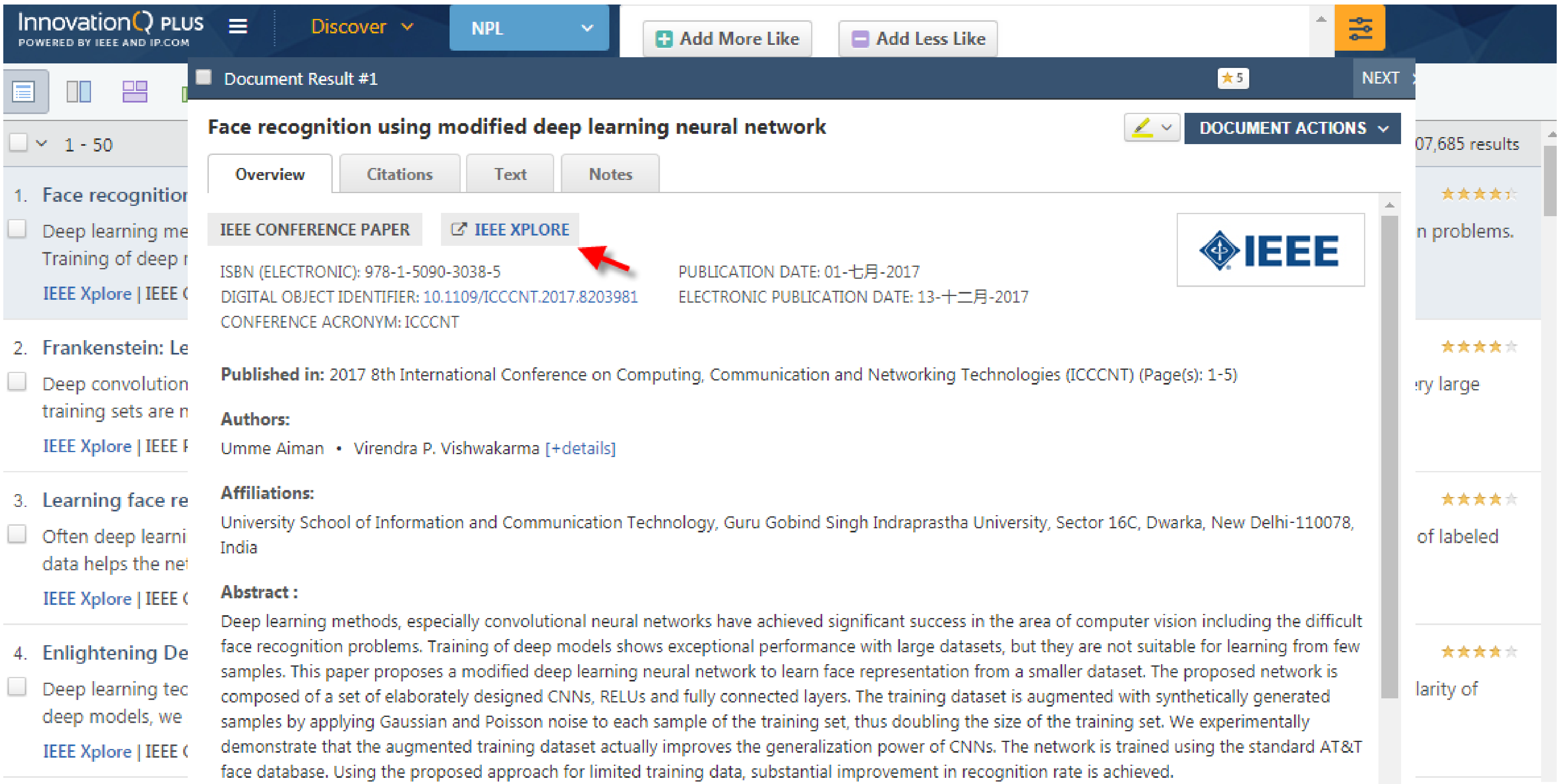

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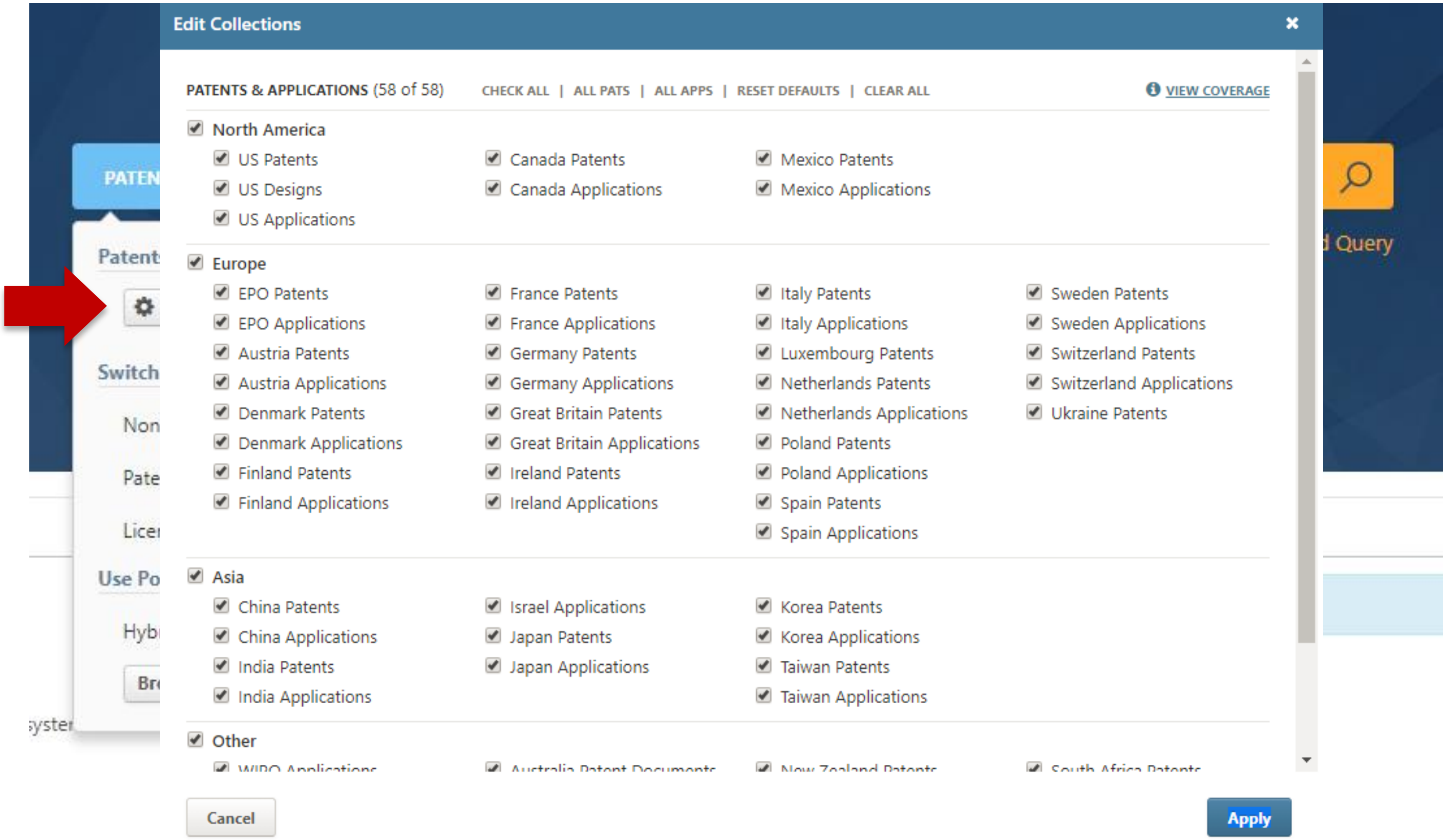
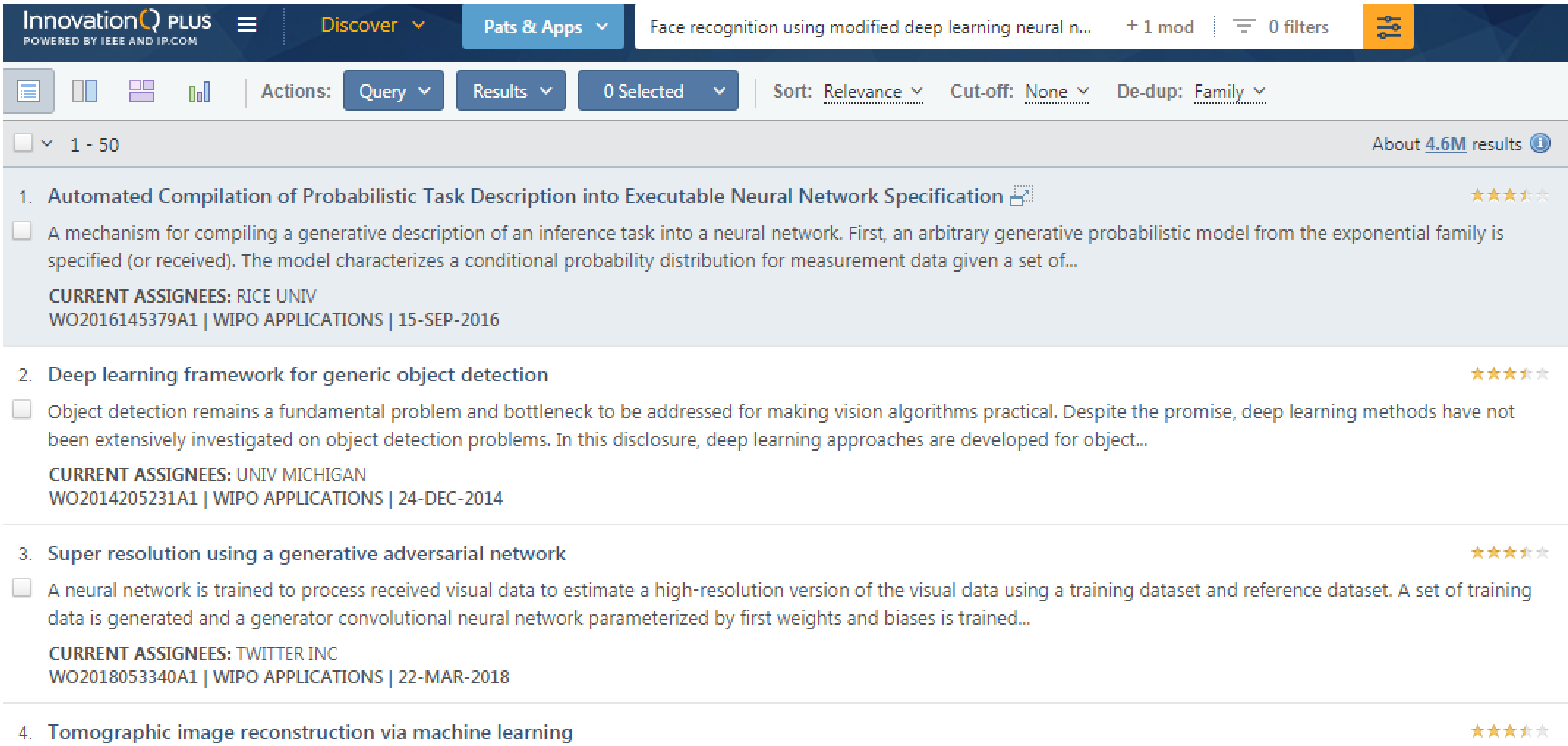


# Identify similar patents



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1 - 50
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1. Automated Compilation of Probabilistic Task Description into Executable Neural Network Specification

A mechanism for compiling a generative description of an inference task into a neural network. First, an arbitrary generative probabilistic model from the exponential family is specified (or received). The model characterizes a conditional probability distribution for measurement data given a set of...

**CURRENT ASSIGNEES:** RICE UNIV
WO2016145379A1 | WIPO APPLICATIONS | 15-SEP-2016

2. Deep learning framework for generic object detection

Object detection remains a fundamental problem and bottleneck to be addressed for making vision algorithms practical. Despite the promise, deep learning methods have not been extensively investigated on object detection problems. In this disclosure, deep learning approaches are developed for object...

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WO2014205231A1 | WIPO APPLICATIONS | 24-DEC-2014

3. Super resolution using a generative adversarial network

A neural network is trained to process received visual data to estimate a high-resolution version of the visual data using a training dataset and reference dataset. A set of training data is generated and a generator convolutional neural network parameterized by first weights and biases is trained...

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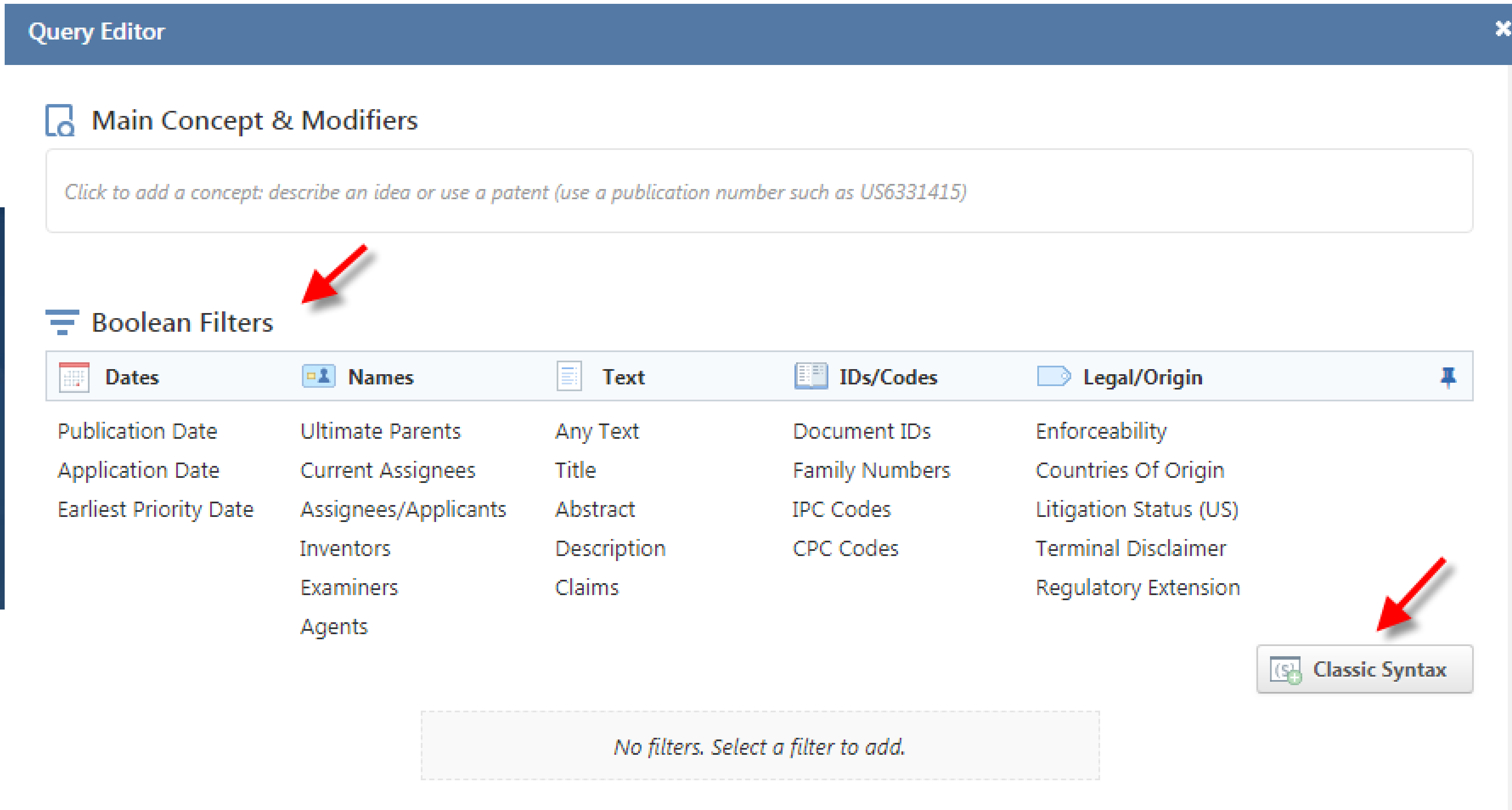
4. Tomographic image reconstruction via machine learning

# If you prefer to use Boolean search

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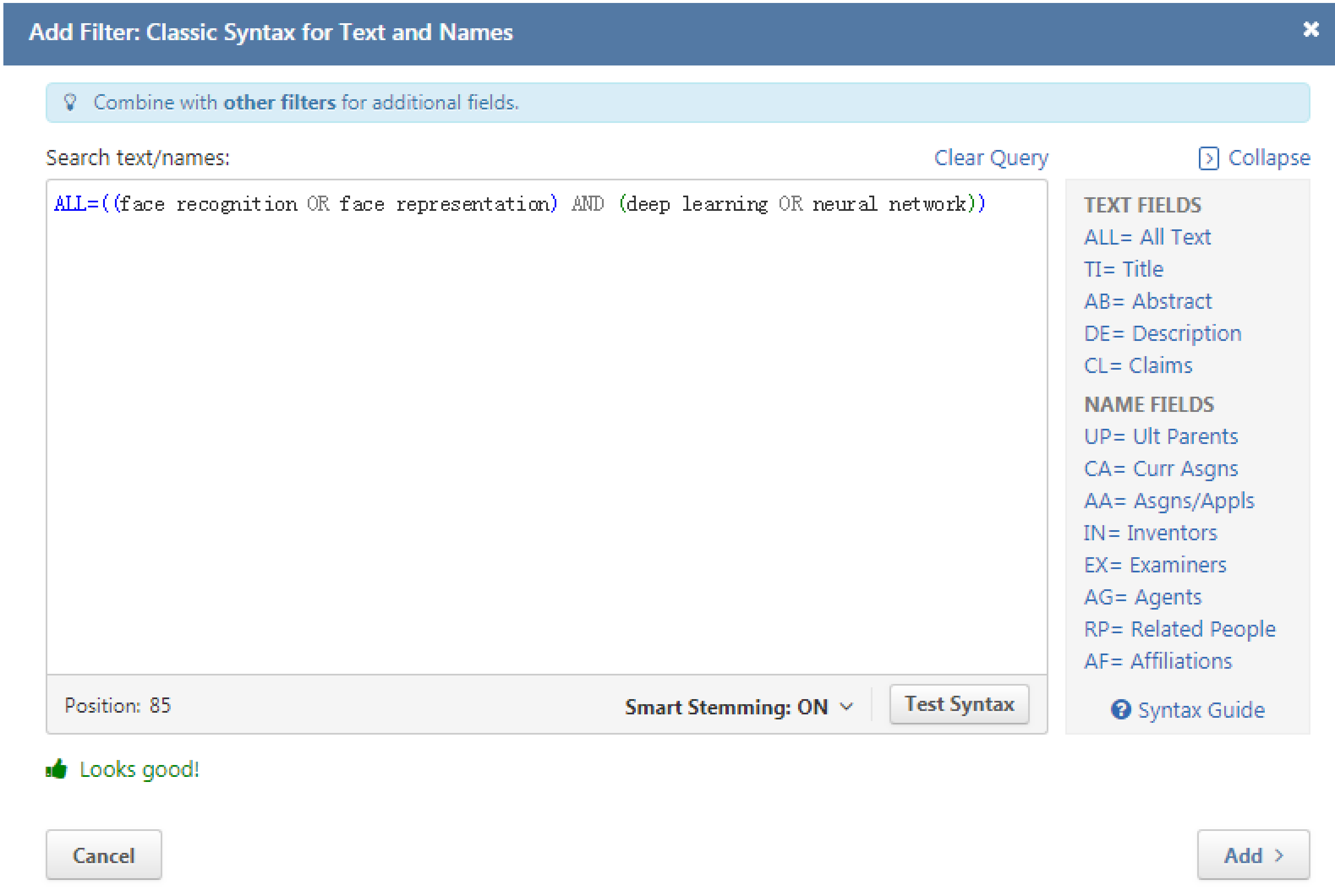
# Classic Syntax: Boolean Terms/Logic



# Classic syntax logic

## Word

A Word may contain a-z, A-Z, 0-9, a hyphen, or single quote and must have at least one alphanumeric character, for all other characters use a qu
quotation marks. Words and Compound T

## Truncation

**Word*** – use * to match an unlimited num
**Word?[?...][*]** – use ? to match one chara
match the number of characters represent
Quick Tip: We recommend our Smart Ste
link Stemming and Searching for Compou

## Phrase

Two types of phrases are supported: **"dou**
alphanumeric character. Phrases in "doubl
quotes` are never stemmed.

## Boolean / Positional Operators

**ADJn** – sequentially adjacent within "n" w
**NEARn** – unordered adjacent within "n" w
**SAMENAME** – occurs within the same nar
**AND** – must include all operands (default
**NOT** – must include left operand but not
**OR** – must include at least one operand (b

## Order of Operation

**1 – ( )** – use parenthesis to set the preced
**2 – ADJ | NEAR | SAMENAME** – position
**3 – AND | NOT** – these operators are pro
**4 – OR** – this operator is processed last

**Fields Qualifier** – Field[+Field...]; include 1
combine Text Fields and Name Fields; include only 1 Name Field. For example, TI+CL searches the Title or

## Order of Operation

**1 – ( )** – use parenthesis to set the precedence
**2 – ADJ | NEAR | SAMENAME** – positional operators are processed from left to right
**3 – AND | NOT** – these operators are processed next
**4 – OR** – this operator is processed last

## Fields Qualifier

**Fields Qualifier** – Field[+Field...]; include 1 or more Text Fields; no spaces between "+" and Text Field; cannot combine Text Fields and Name Fields; include only 1 Name Field. For example, TI+CL searches the Title or Claims Fields.

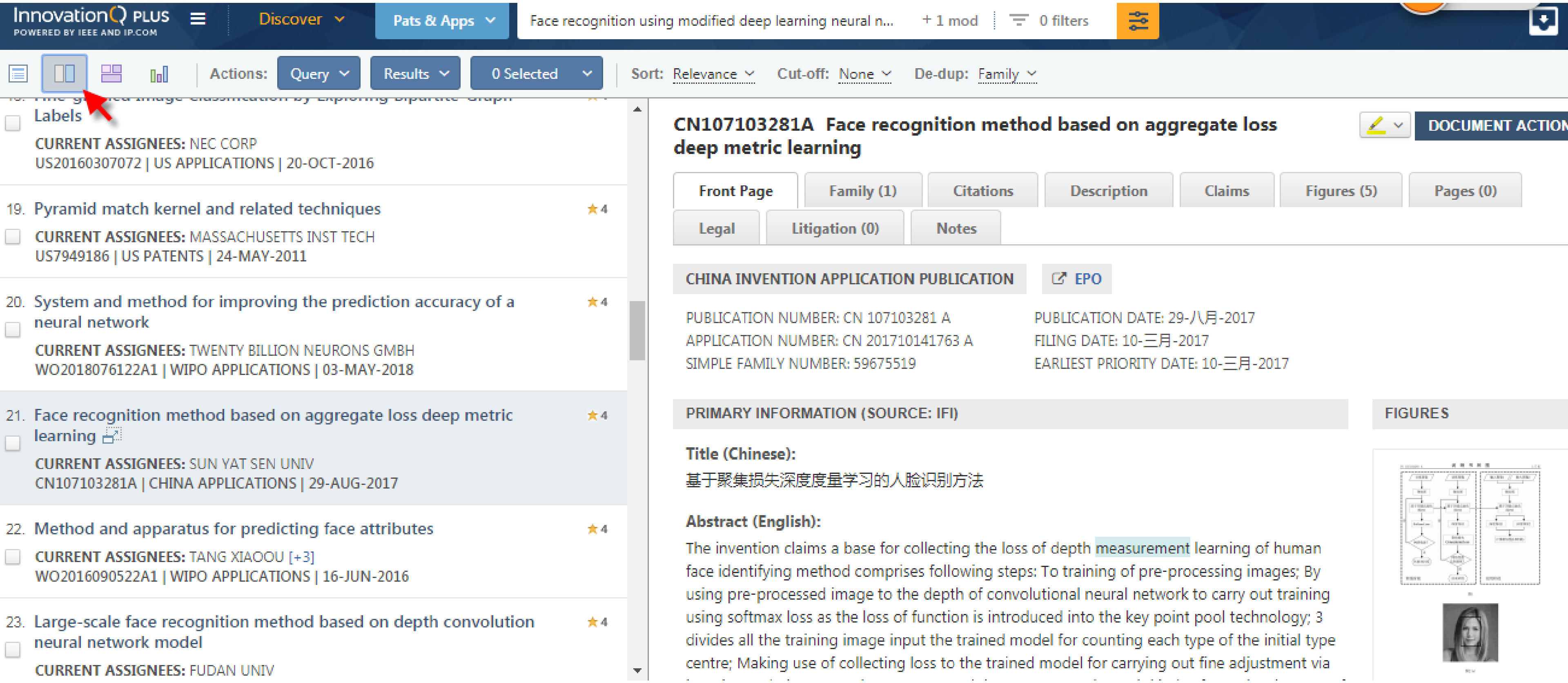
| Text Fields | Description |
|---|---|
| ALL (default) | Title+Abstract+Description+Claims |
| TI | Title |
| AB | Abstract |
| DE \| DSC \| BT | Description |
| CL | Claims |
| TAC | Title+Abstract+Claims |

| Name Fields | Description |
|---|---|
| UP | Ultimate Parents |
| CA | Current Assignees |
| AA \| PA | Assignees/Applicants |
| IN \| AU | Inventor |
| EX | Examiners |
| AG | Agents |
| RP | *Related People* |
| AF | Affiliations |

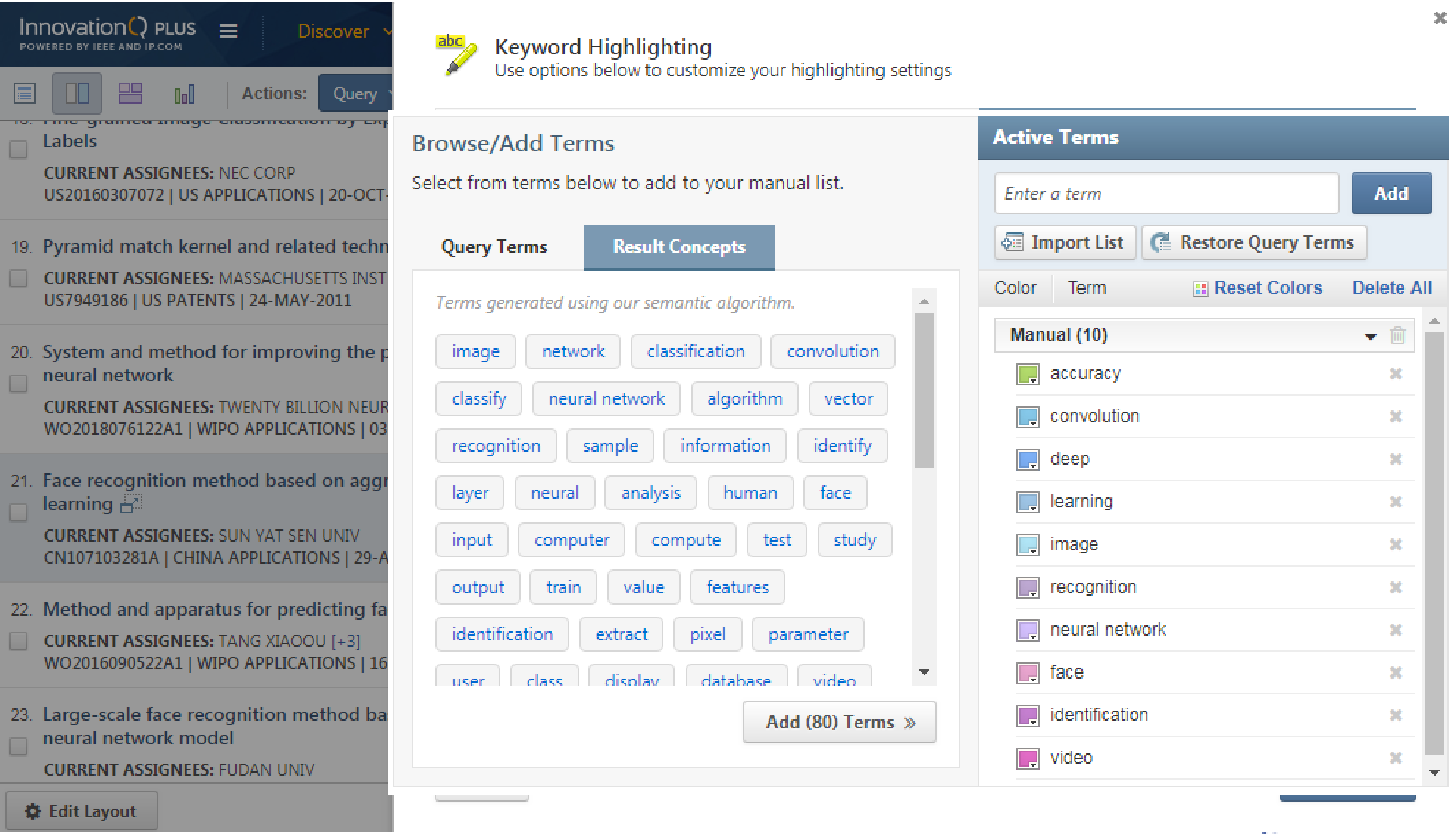
## Syntactical Query Grammar

**Term :=** Word | Phrase | Truncation
**Clause :=** Term | ( Clause ) | (Clause Operator Clause)
**Query :=** Clause | Fields Qualifier = Clause | Query Operator Query

# Browse relevant documents faster



# Term Highlighting



# Term Highlighting

See location and frequency of concept terms in document full view

# Patent Research: Q&A

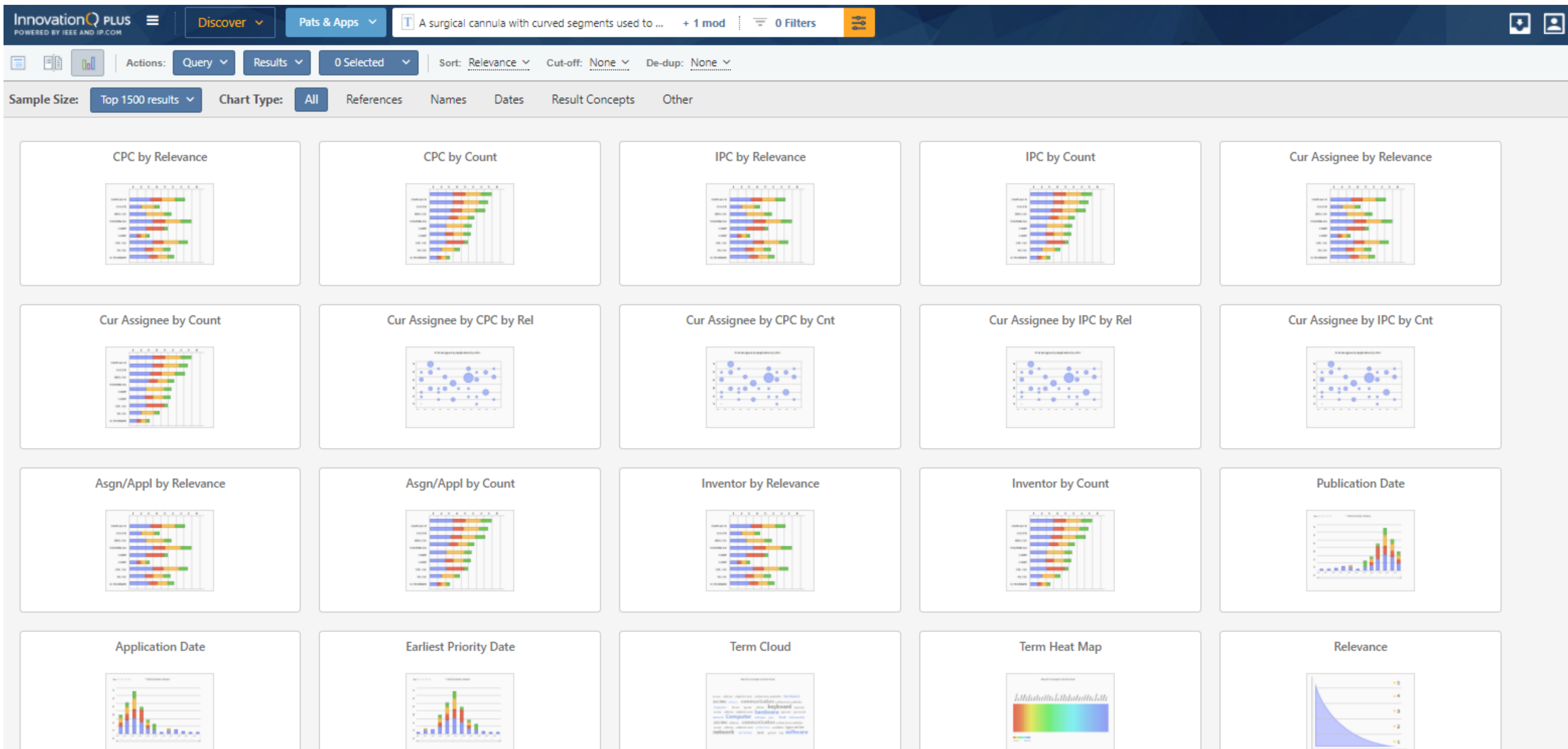
**Technical Intelligence:**

1. Knowledge of the "art" (subject matter)
2. Prior Art searching
3. Technology trends
4. Technology applications (old, current and future)

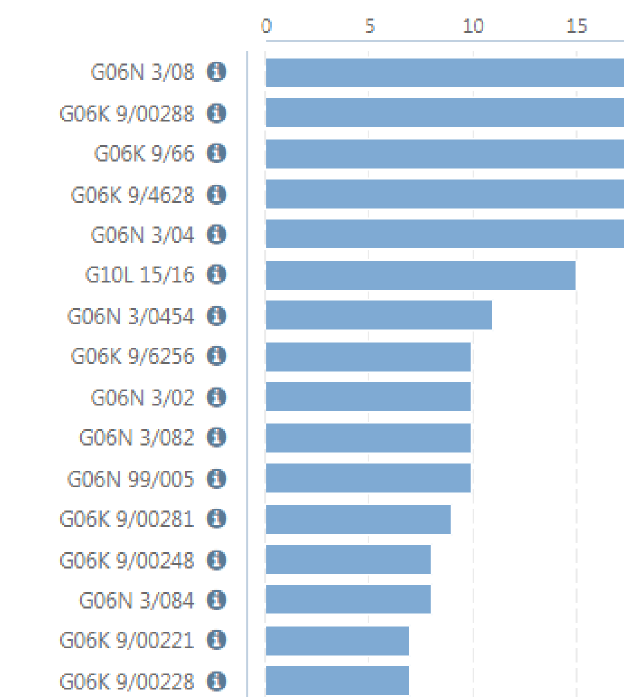
**Competitive Intelligence:**

1. Who (organizations) are in this tech space? (assignee/applicant)
2. Who (people) are the professionals? (author/inventor)
3. Who are they collaborating with?
4. What are they doing?
5. How are they doing it? (patent claims)
6. How can I track these alliances or competitors? (search alerts)
7. Where are they interested in doing business?

# Discover: Visualizations



# Visualizations: Knowledge of the "art" (subject matter)



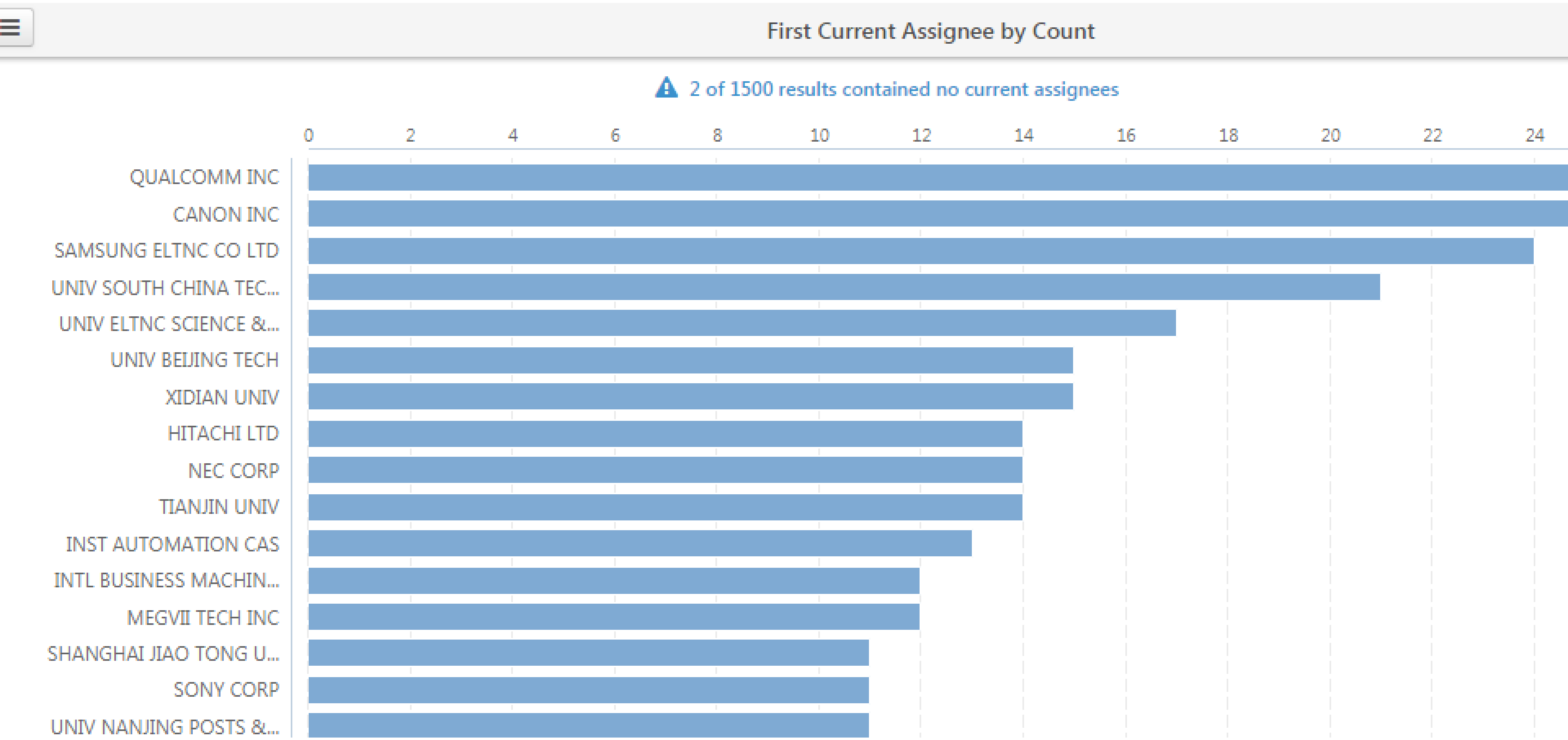

**CPC Information for G06N 3/08**

ESPACENET | version 201805

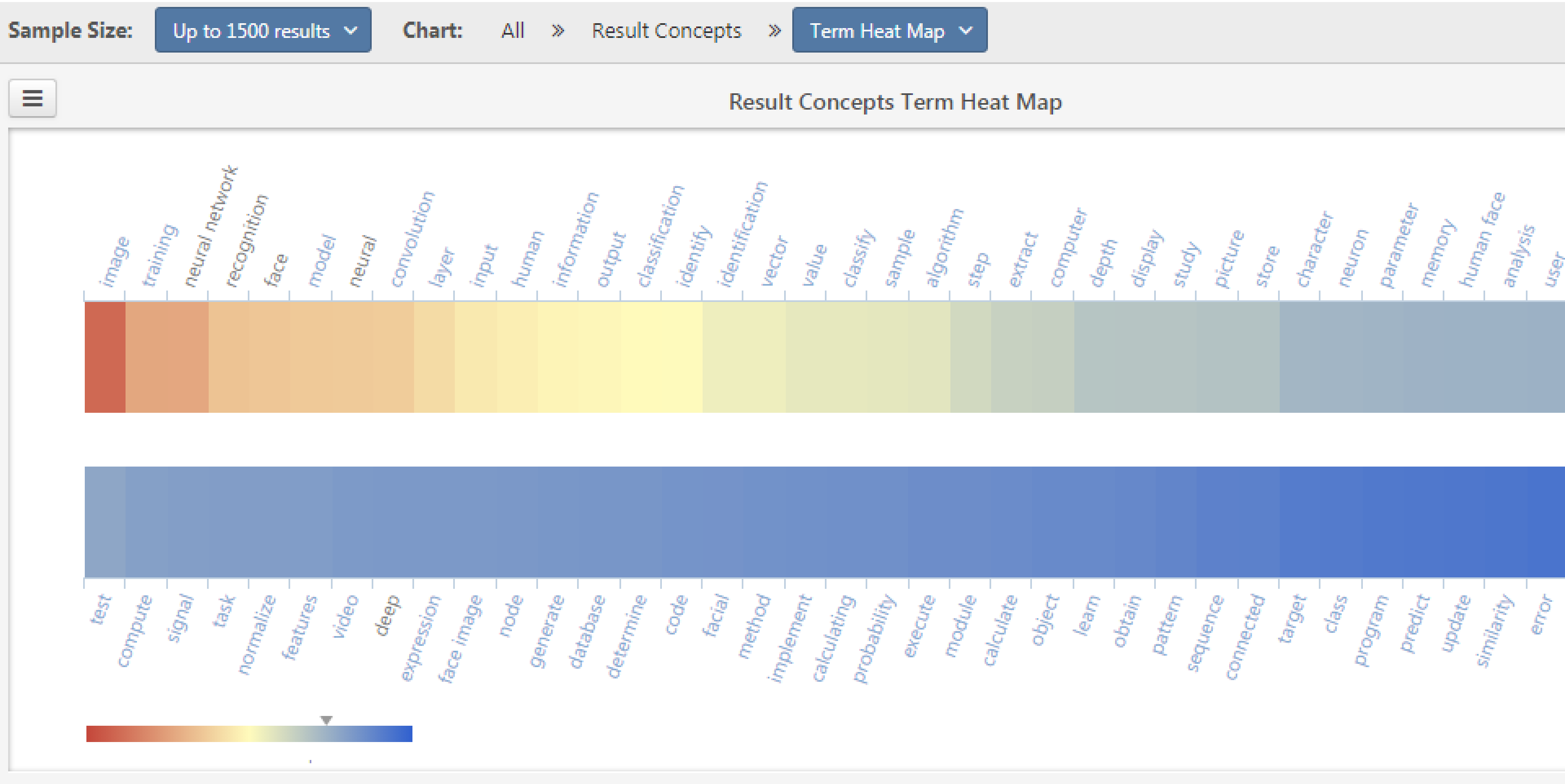
| CPC CODE | INFO |
|---|---|
| G | **PHYSICS** |
| | **INSTRUMENTS** |
| G06 | **COMPUTING CALCULATING COUNTING** (score computers for games A63B71/06, A63D15/20, A63F1/18; combinations of writing implements with computing devices B43K29/08) |
| G06N | **COMPUTER SYSTEMS BASED ON SPECIFIC COMPUTATIONAL MODELS** |
| G06N3/00 | **Computer systems based on biological models** (analogue computers simulating functional aspects of living beings G06G7/60) |
| G06N3/02 | • **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 | • • **Learning methods** |

Close

# Visualizations: Who (organizations) are in this tech space? (assignee/applicant)

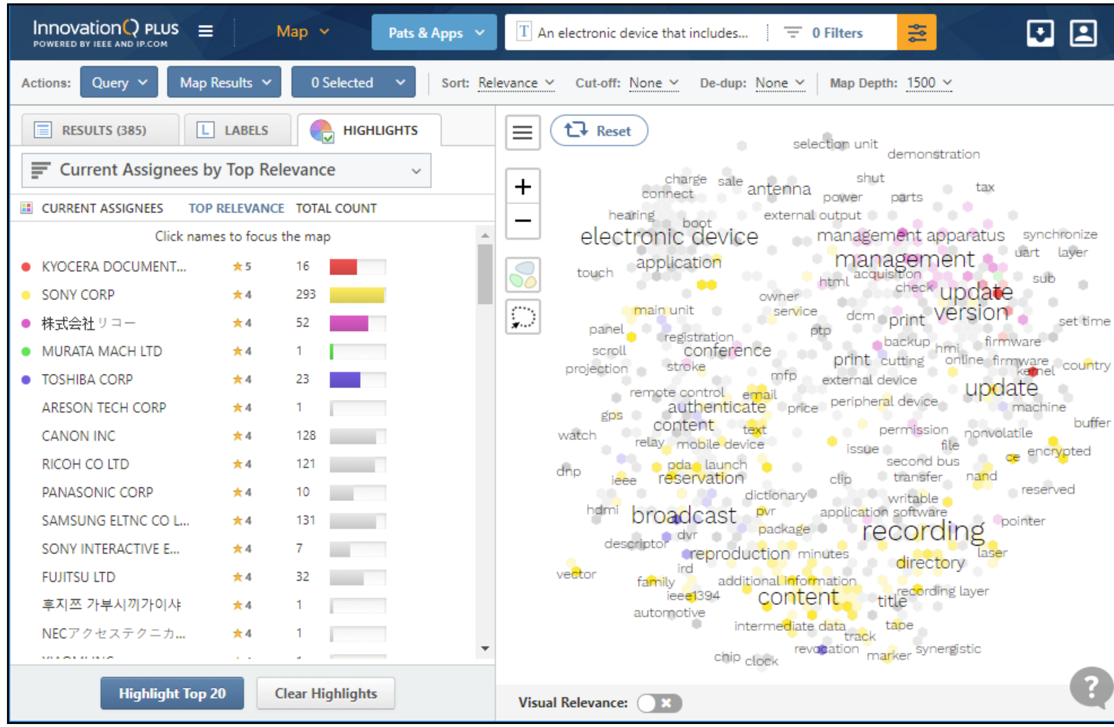


# Visualizations: Term Heat Map



# Semantic Map- Technical Intelligence

- Survey the patent landscape to identify technology trends
- Help identify potential opportunities for further investment
- Discover licensing opportunities or potential infringers
- See where competitors are focusing

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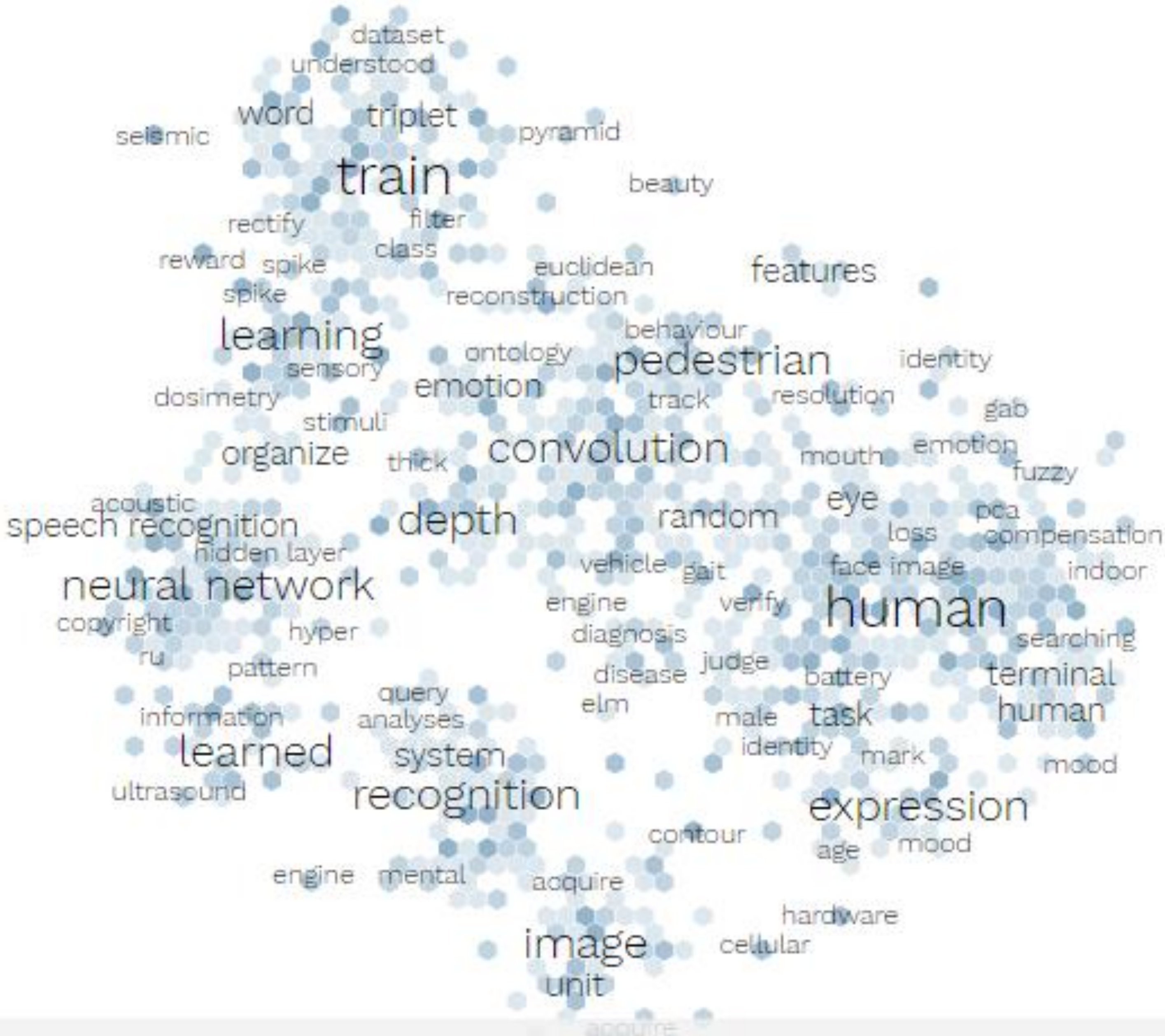
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identity
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hardware
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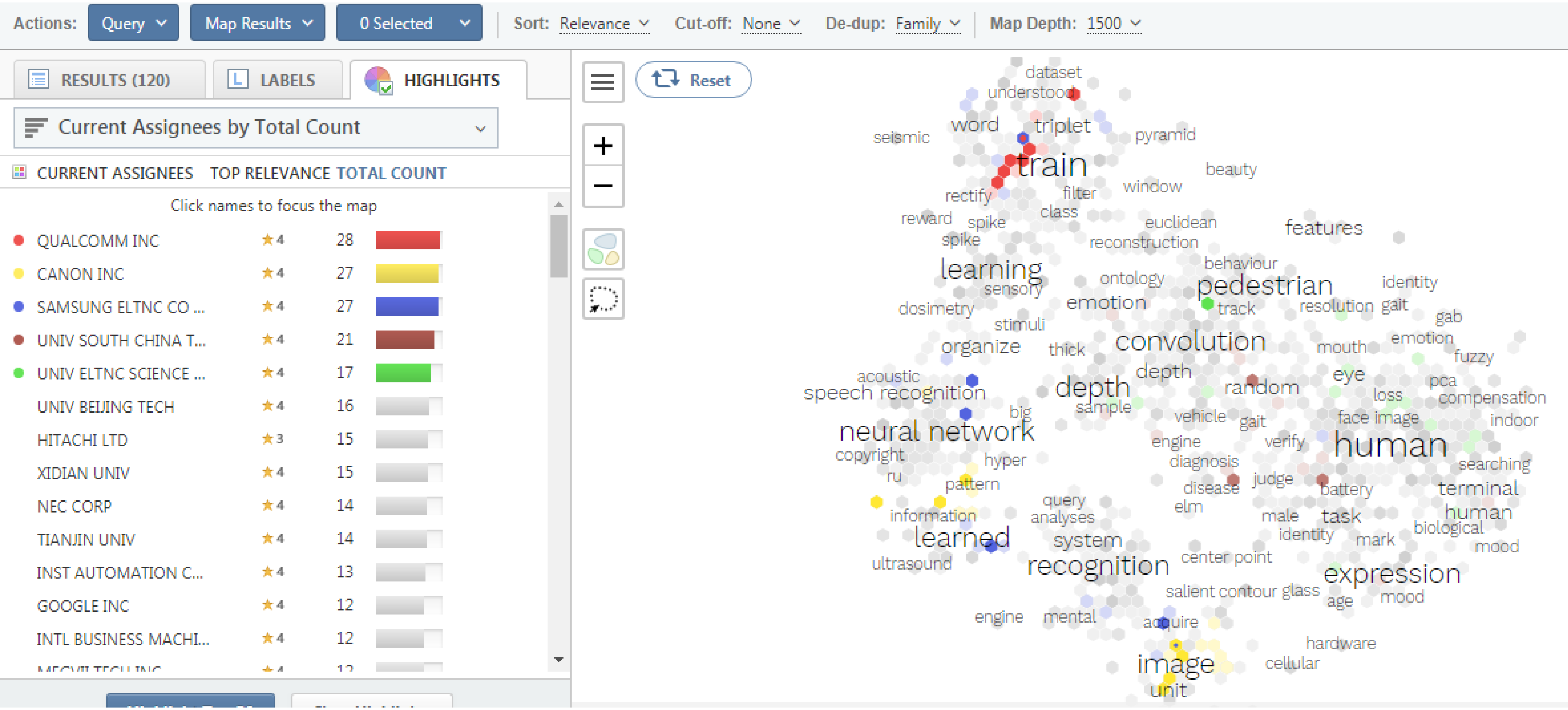
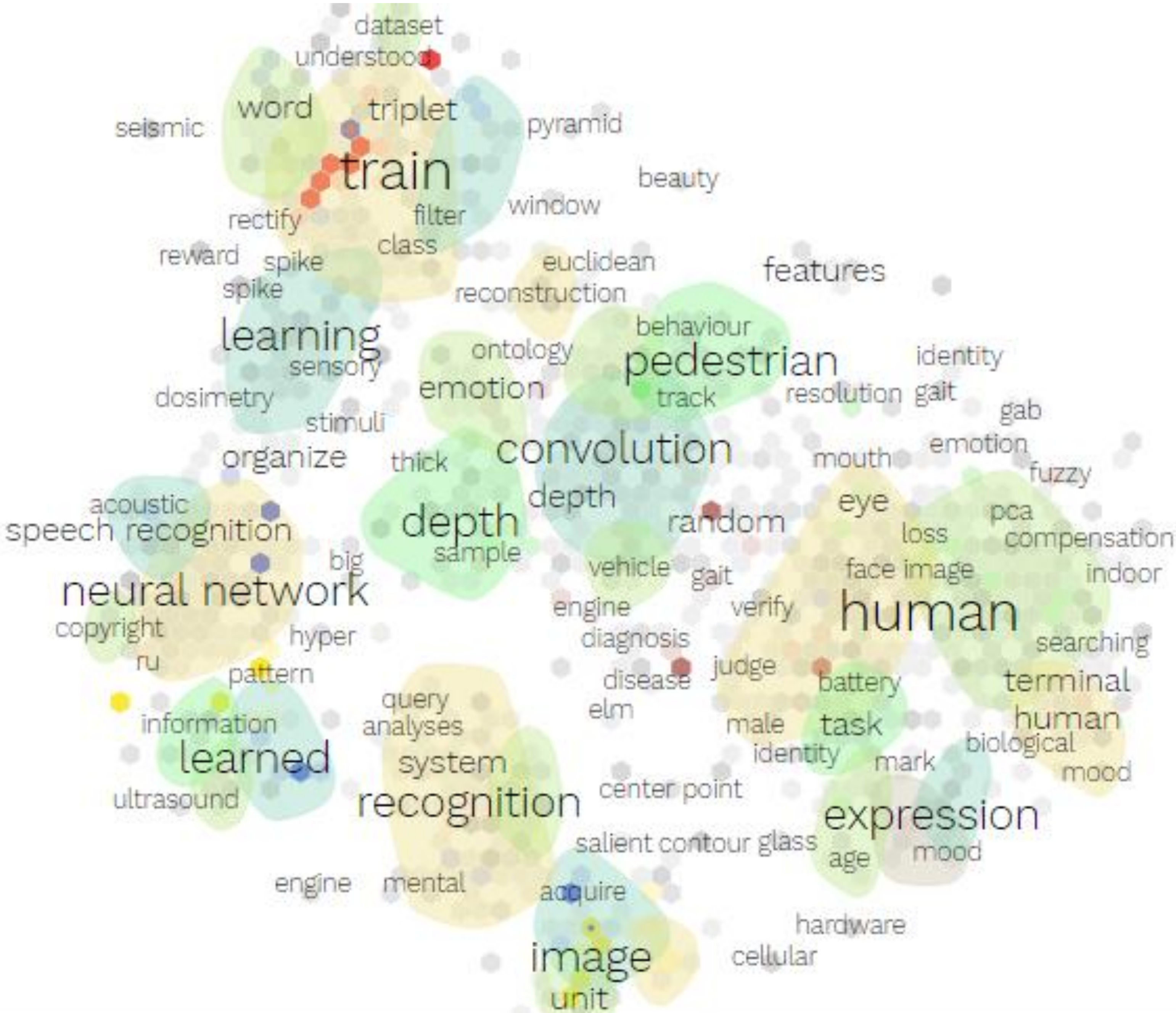
cellular
unit

# Semantic Map- Competitive Intelligence

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reconstruction
learning
behaviour
sensory
ontology
pedestrian
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emotion
track
resolution
gait
gab
stimuli
organize
thick
convolution
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vehicle
gait
face image
indoor
neural network
engine
verify
human
copyright
hyper
diagnosis
searching
ru
pattern
disease
judge
battery
terminal
query
elm
information
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biological
mood
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expression
salient contour glass
age
mood
engine
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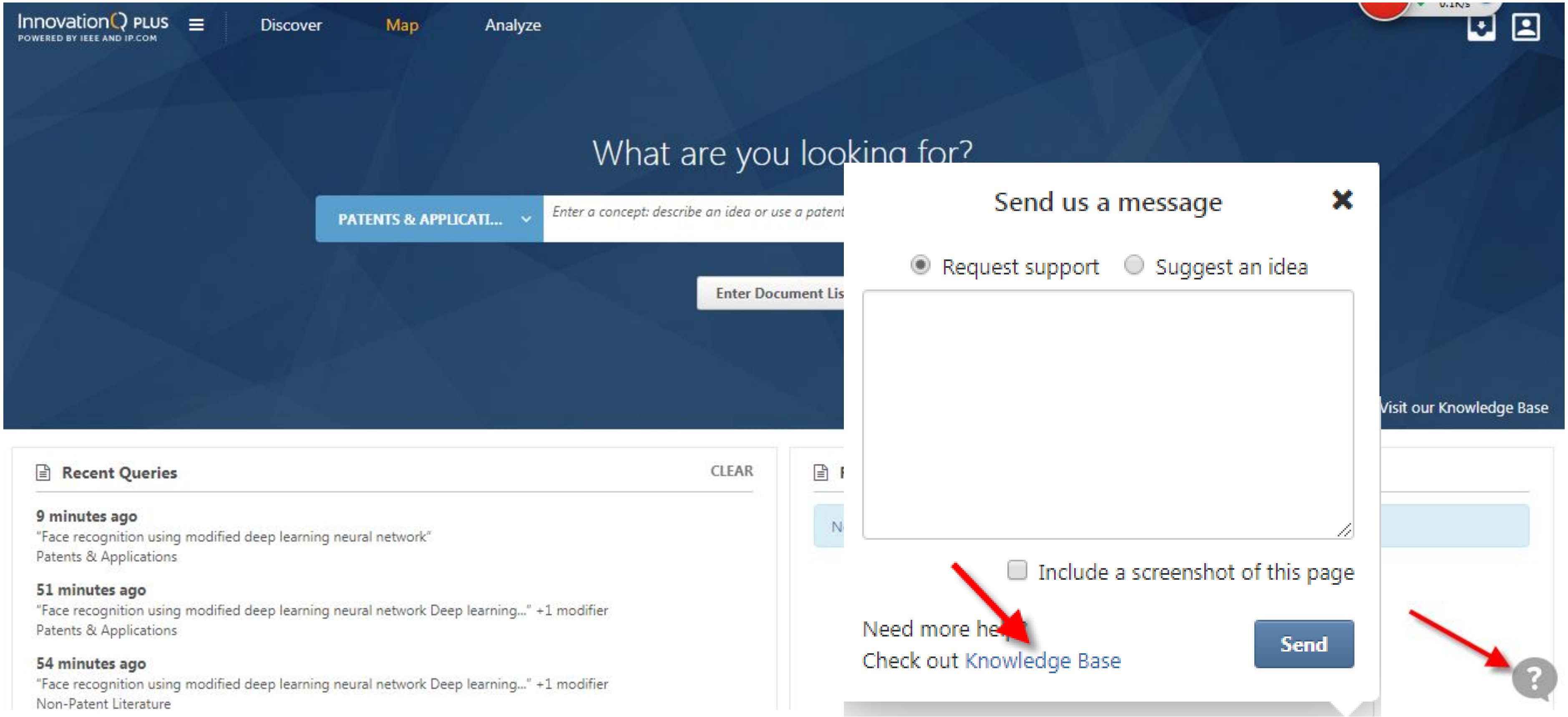
acquire
hardware
image
cellular
unit

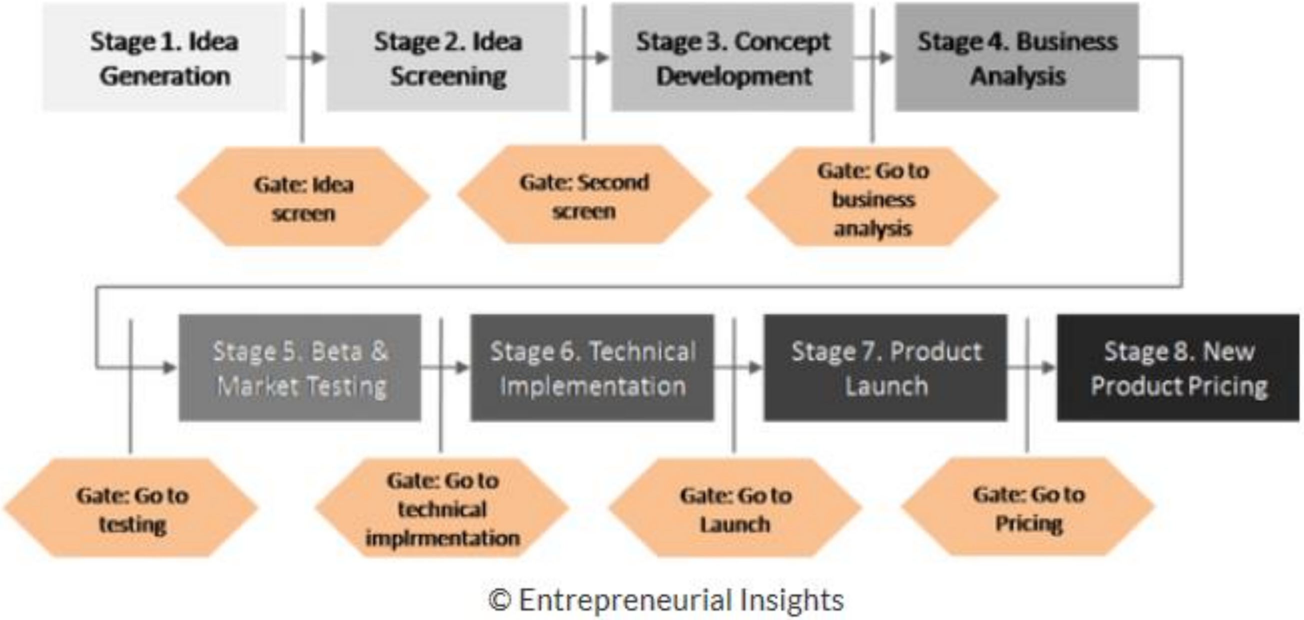
# Always check KnowledgeBase




IEEE

# Important of Semantic Search in Idea Development

- It is important to conduct prior art searching in the early stage, instead of the final stage of idea development!




Source: https://www.cleverism.com/product-development-overview-idea-product/

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【字數】至少300字（含標點符符號，標題名稱不列入字數）

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1.請分享你如何透過InnovationQ Plus找研究主題。
2.請分享你如何透過InnovationQ Plus作前案檢索。
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