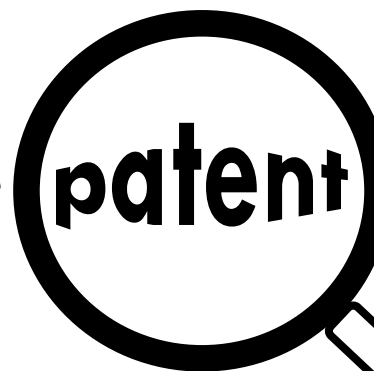




The elaboration of the
processing instrument
based on the machine learning
technology



17th GCBSS-2025 Conference – Bali, Indonesia

Sheresheva M.Y.

Lomonosov Moscow State University

Gorlacheva E.N.

Moscow State Technical University N.E. Bauman



INTRODUCTION

Research Relevance

1. Increasing demand for intellectual property as a key enterprise asset
2. The patent analytics reflects the level of the current research and development, is a forecasting source of the operative and long-term directions in the innovation development of an industrial enterprise, possesses the reliable parameters
3. The development of artificial intelligence, machine learning, deep learning and artificial neural networks allows for the implementation of high-quality patent research

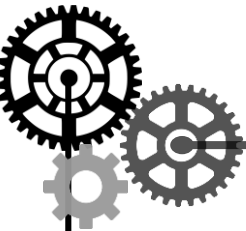
Purpose

The elaboration of the patent processing instrument based on the machine learning technology

The Main Contribution

Develop the idea of the machine learning technology implementation in the patent analytics, unveil its opportunities and restrictions

Demonstrate on the practical example how the elaborated instrument works



THE ROLE AND THE PLACE OF THE PATENT ANALYTICS IN INNOVATION MANAGEMENT

Factors that make it possible to successfully use the patent base for analysis are

Priority date of documents

Links to previously known technical solutions and similar patents

Similar requirements for the volume and form of presentation of the claimed technical solution in patent documents of different countries

Patent documents structure in accordance with the International Patent Classification

Mandatory indication of the author(s) and the patent owner(s)

Patent Analytics Tasks

Finding and selecting the most promising and effective scientific and technical solutions

Determining trends in the development of technologies

Assessing the competitiveness and technical level of manufactured or developed industrial products

Analyzing the market situation in order to identify the main competitors and possible partners

THEORETICAL BACKGROUND AND RELATED WORKS

Concerning the theoretical domain the patent analytics knowledge corpus is mainly developing in two interconnected directions

Instrumental
Approach

Conceptual
Approach

Despite the fact that the techniques for the patent analysis have become mature there are areas that still need improvements

For instance, the analysis of the patent data using machine learning algorithms has not been considered within the framework of the patent analytics

Stage 1.
Pre-processing

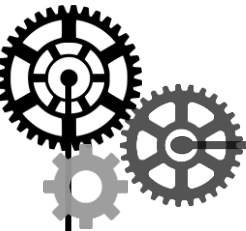
The data is collected, cleaned, prepared comprehensively and the information extracted

Stage 2.
Processing

The extracted data is analyzed to classify it using different methods

Stage 3.
Post-processing

Result is visualized and evaluating done thus helping toward making strategic decisions



MACHINE LEARNING TECHNOLOGIES IN PROCESSING THE PATENT DATA

Machine learning (ML) is a set of mathematical, statistical and computational methods for developing algorithms that can solve a problem not in a direct way, but on the basis of finding patterns in a variety of input data

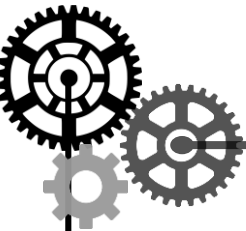
The sources of data are various:

1. Espacenet
2. Patentscope
3. EAPO.ORG
4. EAPITS.COM
5. USPTO
6. Patent Yandex
7. Google Patent
8. Etc.

The relevance of using ML:

The ML technologies can reduce the burden on the departments that make management decisions, because based on the analysis of incoming data, the system will determine in which cases the participation of a specialist is required; in addition, it will independently enter all the data in statistical tables





MACHINE LEARNING TECHNOLOGIES IN PROCESSING THE PATENT DATA

The starting query for the database was the following

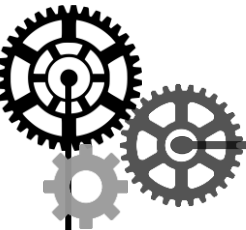
pd > "2015" AND ctxt all "gravity electric generator" AND ctxt all "gravity power generator"

ID	Patent Number	Publication Date	Patent Title	Applicants	Inventors	IPC	CPC	Abstract
0	CN105576790A	2016-05-11	Gravity power generator	XI'AN RANKE INFORMATION TECH CO LTD	GAO LEI, WEI YONGBO, XIE FANFAN	H02J7/32	Y02B40/00 (EP)	The invention discloses a gravity power genera...
1	CN106505826A	2017-03-15	Gravity generator	ZHAN CHENGZHEN	ZHAN CHENGZHEN	H02K53/00	None	The invention provides a gravity generator, be...
2	WO2017206550A1	2017-12-07	EXPERIMENTAL GRAVITY ELECTRIC GENERATOR	DU GUISHENG [cn]	DU GUISHENG [cn]	F03G3/00	F03G3/00 (EP,CN)	An experimental gravity electric generator, ch...
3	CN108204347A	2018-06-26	Gravity lever power generator	SUN YAN	SUN YAN	F03G3/06, H02K7/18	F03G3/08 (CN), H02K7/18 (CN)	The invention discloses a gravity lever power ...
4	CN111207048A	2020-05-29	Gravity power generation device	SHI JIE	SHI JIE	F03G3/00	F03G3/00 (CN)	The invention relates to a gravity power gener...
...
1770	JP2019147516A	2019-09-05	VEHICLE	CALSONIC KANSEI CORP, MAZDA MOTOR	KAWAI SHISUKE, KAWAMATA TATSU, KOIKE YUSUKE, M...	B60H1/20, F28D15/02	None	[SUMMARY OF THE INVENTION "The subject of the ...
1771	JP2019147515A	2019-09-05	VEHICLE	CALSONIC KANSEI CORP, MAZDA MOTOR	KAWAI SHISUKE, KAWAMATA TATSU, KOIKE YUSUKE, M...	B60H1/20, F28D15/02	None	[SUMMARY OF THE INVENTION "Provided is a vehic...
1772	JP2019071440A, JP6677790B2	2019-05-09, 2020-04-08	SUBSTRATE PROCESSING APPARATUS, SUBSTRATE PROC...	EBARA CORP	MARUYAMA TORU, OBATA ITSUKI, SHIOKAWA YOICHI, ...	H01L21/304, H01L21/306	H01L22/12 (EP,US)	To provide a substrate processing apparatus wi...
1773	WO2020106169A2	2020-05-28	INTEGRATED SET OF PRODUCTS FOR THE MOVEMENT OF...	SANCHEZ PAULO [pt]	SANCHEZ PAULO [pt]	B60F5/00, G06Q50/30	G06Q50/30 (EP)	None
1774	US2020320159A1	2020-10-08	Magnetic-enthalpy symbol H gasiform species di...	MATTHEWS ROBERT R [us]	MATTHEWS ROBERT R [us]	C09K5/10, G05B15/02, G06F17/16	G06F17/16 (EP)	Heat a heater fluid a superconductor of magnet...

1775 rows x 8 columns

$$\text{sim}(d, q) = \cos(\vec{v}(d), \vec{v}(q)) = \frac{\vec{v}(d) * \vec{v}(q)}{||\vec{v}(d)|| * ||\vec{v}(q)||} = \frac{\sum_{i=1}^{|V|} d_i * q_i}{\sqrt{\sum_{i=1}^{|V|} d_i^2} * \sqrt{\sum_{i=1}^{|V|} q_i^2}} \quad (1)$$

For this query, 1775 results received



MACHINE LEARNING TECHNOLOGIES IN PROCESSING THE PATENT DATA

	Abstract	gravity	electric	power	generator
ID					
0	The invention discloses a gravity power genera...	4	2	11	10
1	The invention provides a gravity generator, be...	4	0	1	7
2	An experimental gravity electric generator, ch...	17	5	0	4
3	The invention discloses a gravity lever power ...	4	0	4	4
4	The invention relates to a gravity power gener...	11	2	10	4
...
1769	[SUMMARY OF THE INVENTION The present inventio...	0	1	0	0
1770	[SUMMARY OF THE INVENTION "The subject of the ...	0	0	0	0
1771	[SUMMARY OF THE INVENTION "Provided is a vehic...	0	0	0	0
1772	To provide a substrate processing apparatus wi...	0	0	0	0
1774	Heat a heater fluid a superconductor of magnet...	0	0	0	0

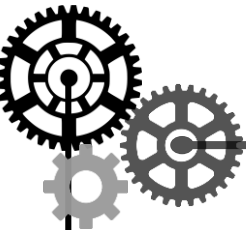
1738 rows x 5 columns

The use frequency of search queries
in the patent description

The general sum of the use
frequency of patent terms

Abstract	The invention discloses a gravity power genera...
gravity	1189
electric	3256
power	5206
generator	2282
dtype: object	





MACHINE LEARNING TECHNOLOGIES IN PROCESSING THE PATENT DATA

A cleaned sample of 393 patents

ID	Abstract	gravity	electric	power	generator
0	The invention discloses a gravity power genera...	4	2	11	10
1	The invention provides a gravity generator, be...	4	0	1	7
2	An experimental gravity electric generator, ch...	17	5	0	4
3	The invention discloses a gravity lever power ...	4	0	4	4
4	The invention relates to a gravity power gener...	11	2	10	4
...
1593	This invention relates to propulsion systems. ...	1	5	1	1
1600	FIELD: bows; crossbows.SUBSTANCE: sports throw...	1	2	1	1
1612	FIELD: electrical equipment.SUBSTANCE: inventi...	1	4	2	1
1630	The utility model relates to the hydropower in...	4	5	6	3
1674	The invention belongs to the technical field o...	1	0	3	1

393 rows x 5 columns

The received patent ranking

	Patent Number	Publication Date	Patent Title	Applicants	Inventors	Abstract	gravity	electric	power	generator	Query 1	Query 2
0	CN105576790A	2016-05-11	Gravity power generator	XI'AN RANKE INFORMATION TECH CO LTD	GAO LEI, WEI YONGBO, XIE FANFAN	The invention discloses a gravity power genera...	4	2	11	10	0.389188	0.595229
7	CN106917727A	2017-07-04	Gravity power generator	HUANG GUOJUN	HUANG GUOJUN	The invention discloses a gravity power genera...	11	0	7	5	0.334105	0.471678
1	CN106505826A	2017-03-15	Gravity generator	ZHAN CHENGZHEN	ZHAN CHENGZHEN	The invention provides a gravity generator, be...	4	0	1	7	0.412568	0.446949
3	CN108204347A	2018-06-26	Gravity lever power generator	SUN YAN	SUN YAN	The invention discloses a gravity lever power ...	4	0	4	4	0.286039	0.413167
346	JP2016501337A	2016-01-18	Water pneumatic energy generator and its opera...	None	None	The present invention relates to a water pneum...	2	0	0	1	0.390360	0.390360
...
197	KR20180008362A	2018-01-24	?	HAN SANG KWAN [kr]	HAN SANG KWAN [kr]	The present invention relates to an economical...	1	1	1	1	0.047408	0.047408
196	KR20180003492A	2018-01-09	?	HAN SANG KWAN [kr]	HAN SANG KWAN [kr]	The present invention relates to an economical...	1	1	1	1	0.046207	0.046207
268	CN211399732U	2020-09-01	Descaling steam generator	ZHONGSHAN SHANGSHAN ELECTRICAL APPLIANCE CO LTD	LAI SHANCHANG, WU FENG	The utility model discloses a descaling steam ...	1	0	0	1	0.036786	0.036786
345	CN108975243A	2018-12-11	Wind driven generator overturning and hoisting...	TIANJIN ZHIMAI LVNENG TECH CO LTD	MIN GENG, QIN XUEZHI, YIN WEIGANG	The invention relates to a method for assembl...	1	0	0	0	0.035533	0.035533
301	CN110848653A	2020-02-28	Steam generator with water scale removal function	ZHONGSHAN SUNSHANE ELECTRIC APPLIANCES CO LTD	LAI SHANCHANG, WU FENG	The present invention discloses a steam genera...	1	0	0	1	0.033011	0.033011

393 rows x 12 columns



CONCLUSION

In the framework of the study, the theoretical foundations of the formation of patent analytics were analyzed and the possibilities of **machine learning technologies usage** were described

For the development of the conceptual and categorical apparatus two key approaches to understanding the tasks of patent analytics in the process of organizing innovation activities are proposed – **instrumental** and **conceptual** approaches

The patent analytics can not only improve the quality of decisions made, but also ensure their **transparency**, which will **avoid choosing an incorrect strategy** for innovative development

The elaborated patent analysis instrument would be worthwhile for the managers who are engaged in the **strategic technology planning**



Thank you for your attention!

Marina Y. Sheresheva

*Lomonosov Moscow State University
m.sheresheva@gmail.com*