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2020

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**International Conference in Engineering, Technology and Innovative Researches (ICETIR 2020)  
2nd-3rd September 2020, Purbalingga, Indonesia**

Accepted papers received: 06 November 2020

Published online: 18 December 2020

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### Preface

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011001

Preface

+ Open abstract



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Peer review declaration

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PDF

### Artificial Intelligent

OPEN ACCESS

012001

Computer Aided System for Gambung Tea Identification using Convolutional Neural Network

Nur Ibrahim, YN Fu'adah, NK Caecar Pratiwi, Syamsul Rizal and Koredianto Usman

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012002

Automatic Diabetic Detection System based on Retina Using an artificial intelligent system

Zayd Assyarif Alaydrus, Winda Astuti and Sofyan Tan

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+ Open abstract



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PDF



012003

[+ Open abstract](#) [View article](#) [PDF](#)

012004

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012005

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012009

Inda Purnama and G. K. Aeguhmeke Luhur Prasasti and Bangun Satria Utama

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**OPEN ACCESS**

012010

**Cholesterol Level Detection Through Eye Image Using Fractal and Decision Tree**

Dian Sari, Jangkung Raharjo and Ledya Novamizanti

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012011

**Identification of Foot Posture using *Foot Posture Index-6* (FPI-6) based on Image Processing**

Hasya Azqia Hanifan, Ledya Novamizanti and Husnaeni Mukhtar

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**OPEN ACCESS**

012012

**Preprocessing Using Correlation Based Features Selection on Naive Bayes Classification**

Yogiek Indra Kurniawan, Teguh Cahyono, Nofiyati, Eddy Maryanto, Ari Fadli and Naisha Rahma Indraswari

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**Information System****OPEN ACCESS**

012013

**Thermal Hotspots Distribution of MODIS Aqua/Terra Satellite in Humbang Hasudutan Regency, Northern Sumatra**

Yahya Darmawan, Lamtupa Nainggolan, Thahir Daniel Hutapea, Erwin Eka Syahputra Makmur and Ivan Mambaul Munir

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**OPEN ACCESS**

012014

**Mapping of Tornado Wind Vulnerability using Satellite Data (Study case of Humbang Hasudutan Regency, North Sumatera)**

Yahya Darmawan, Lamtupa Nainggolan, Thahir Daniel Hutapea, Erwin Eka Syahputra Makmur and Ivan Mambaul Munir

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**Software Engineering****OPEN ACCESS**

012015

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**Simple Correlation Between Weather and COVID-19 Pandemic Using Data Mining**

## Algorithms

Ari Fadli, Azis Wisnu Widhi Nugraha, Muhammad Syaiful Aliim, Acep Taryana, Yogie Indra Kurniawan and Widhiatmoko Herry Purnomo

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## Control System

**OPEN ACCESS** 012016

### Design of Open Loop Single Axis Solar Tracker System

Rizal Rinaldi, Bandiyah Sri Aprillia, Cahyantari Ekaputri and Muhamad Reza

[+ Open abstract](#) [View article](#) [PDF](#)

**OPEN ACCESS** 012017

### Control System for Smart Home Energy Management

Alfian Teguh Suryanto, Bandiyah Sri Aprillia and Cahyantari Eka Putri

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## Electrical Power

**OPEN ACCESS** 012018

### Electricity Power Needs Evaluation in Kulonprogo Post Developing the Yogyakarta International Airport

Iyus Rusmana and Dulhadi

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**OPEN ACCESS** 012019

### Hotspot Detection Method in Large Capacity Photovoltaic (PV) Farm

P A A Pramana and R Dalimi

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**OPEN ACCESS** 012020

### CUK Converter for Power Factor Correction Using *Moth Flame Optimization-PI Controller*

Adinda Aisyah Pratiwi, Moh. Zaenal Efendi and Farid Dwi Murdianto

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**OPEN ACCESS** 012021

### Investigation of Wind Power Potential in Al-Aqiq, Saudi Arabia

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Saeed Ahmed Al-Ghamdi

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012022

## Design of 1 kW Buck-Boost Chopper with PI Control for Photovoltaic Power Conversion

Suroso, Winasis, Priswanto and Ignatius Daniel Purnama

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012023

## Standalone Photovoltaic System Cost Optimization for Matantimali Village Central Sulawesi

Bandiyah Sri Aprillia, I Made Hendry Keswara, Jangkung Raharjo, Mohamad Ramdhani, Kharisma Bani Adam and Efri Suhartono

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## Electronics

OPEN ACCESS

012024

The Electrical Property of SiO<sub>2</sub>/Graphene/PBA-NHS/anti O and K *E. coli* Antibodies as Sensing Layer for *Escherichia coli* Bacteria Sensor

K. M. Wibowo, N. M. Rosni, A. Muslihati, G. Romadhona, Royan, Fatiatun and M. Z. Sahdan

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012025

## Sensitivity of Optical Fiber Sensors to Deflection of Reinforced Concrete Beam

Farida Asriani, Winasis and Gandjar Pamudji

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## Telecommunication

OPEN ACCESS

012026

## Performance Comparison of File Transfer Protocol Service Between Link State and Distance Vector Routing Protocol in Software Defined Network

Rohmat Tulloh, Jafaruddin Gusti Amri Ginting, Asep Mulyana and Muhammad Lutfi

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OPEN ACCESS

012027

## Performance analysis of erbium-doped fiber amplifier (EDFA) and hybrid optical

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## amplifier in NG-PON2 based on TWDM-PON system

Rafiendra Bagas Aryandhika, Anggun Fitriani Isnawati and Dodi Zulherman

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### OPEN ACCESS

012028

## Performance Analysis of DDM Method to Reduce The Doppler Effect on Vehicular

Muhammad Ardi Rahmadiansyah and Titiek Suryani

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### OPEN ACCESS

012029

## Calibrating the Standard Propagation Model (SPM) for Suburban Environments Using 4G LTE Field Measurement Study Case in Indonesia

Muntaqo Alfin Amanaf, Alfin Hikmaturokhman and Achmad Fadhlan Septian

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### OPEN ACCESS

012030

## Energy Consumption Performance on IEEE 802.11ah Networks with Station Grouping Scheme

A S Aminah, D Perdana and I Wahidah

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## Civil Engineering

### OPEN ACCESS

012031

## FEMA 310 Tier 1 seismic evaluation of existing building: A case study of a 7-story academic RC building of Jenderal Soedirman University, Indonesia

Yanuar Haryanto, Hsuan-Teh Hu, Arnie Widyaningrum, Esya Alfidiah and Banu Ardi Hidayat

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### OPEN ACCESS

012032

## Load-carrying capacity and failure mode of composite steel-concrete truss element under monotonic loading

Nanang Gunawan Wariyatno, Yanuar Haryanto, Ay Lie Han, Buntara Sthenly Gan and Gathot Heri Sudibyo

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### OPEN ACCESS

012033

## Capacity-based seismic design of a middle-rise residential building in an area of

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## IOP Conference Series: Materials Science and Engineering

### COUNTRY

[United Kingdom](#)Universities and research  
institutions in United KingdomMedia Ranking in United  
Kingdom

### SUBJECT AREA AND CATEGORY

[Engineering](#)  
[Engineering](#)  
(miscellaneous)[Materials Science](#)  
[Materials Science](#)  
(miscellaneous)

### PUBLISHER

[IOP Publishing Ltd.](#)

### H-INDEX

48

### PUBLICATION TYPE

Conferences and Proceedings

### ISSN

17578981, 1757899X

### COVERAGE

2009-2021

### INFORMATION

[Homepage](#)[How to publish in this journal](#)[mse@iop.org](mailto:mse@iop.org)

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## IOP Conference Series: Materials Science and Engineering

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[United Kingdom](#)Universities and research  
institutions in United KingdomMedia Ranking in United  
Kingdom

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[Engineering](#)  
[Engineering](#)  
(miscellaneous)[Materials Science](#)  
[Materials Science](#)  
(miscellaneous)

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### H-INDEX

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### INFORMATION

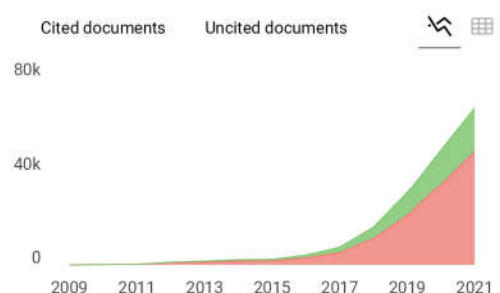
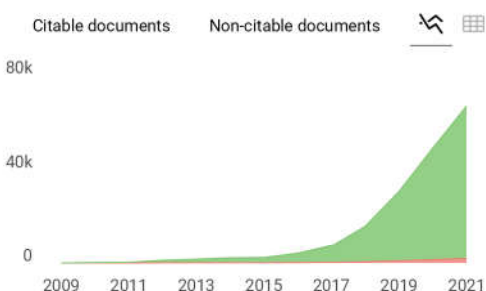
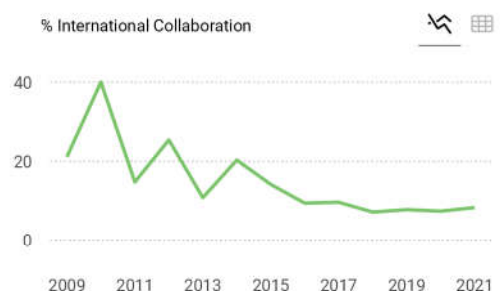
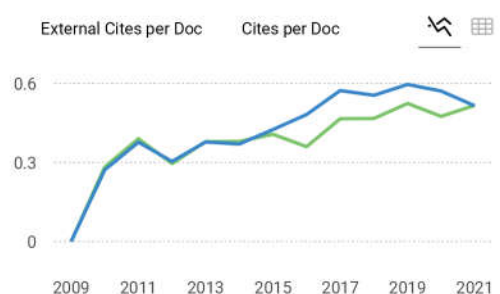
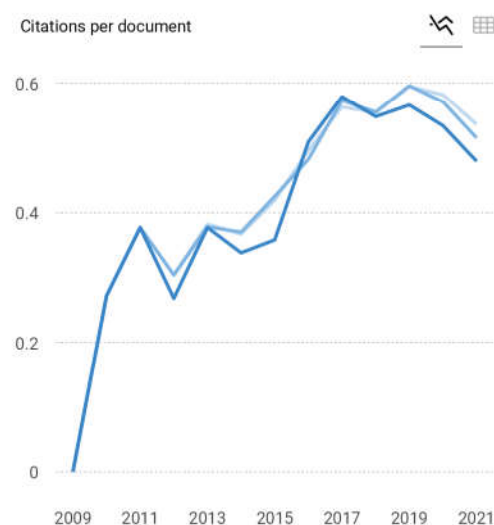
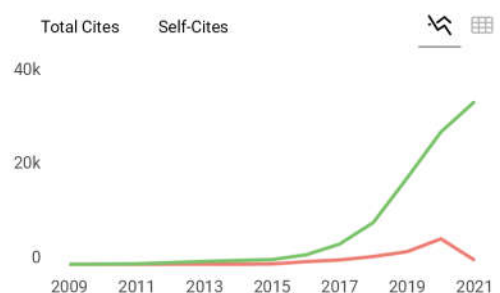
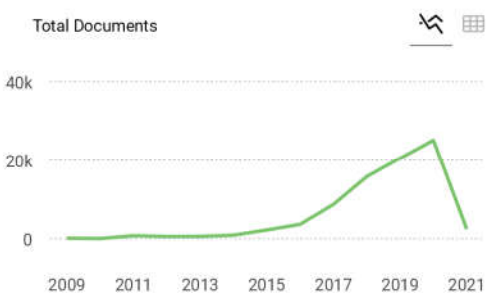
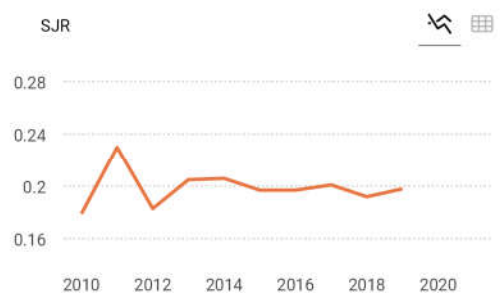
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Metrics based on Scopus® data as of April 2022

Q **Quoc Hoan Pham** 5 months ago

Hello,  
What is the quartile of this Journal?

reply



**Melanie Ortiz** 5 months ago

SCImago Team

Dear Quoc Hoan,  
Thank you for contacting us. Please see comments below.  
Best Regards, SCImago Team

C **Cecilia Soerawidjaja** 1 year ago

How can I find the cover of IOP Conference Series: Materials Science and Engineering Volume 550 of 2019? Thank you.

reply



**Melanie Ortiz** 1 year ago

SCImago Team

Dear Cecilia,  
Thank you for contacting us. Could you please expand a little bit on your comment?  
Best Regards, SCImago Team

N **Юрий** 1 year ago

Какой Импакт-фактор у журнала

reply



**Melanie Ortiz** 1 year ago

SCImago Team

Dear Юрий, thank you very much for your comment. SCImago Journal and Country Rank uses Scopus data, our impact indicator is the SJR (Check it on our website). We suggest you consult the Journal Citation Report for other indicators (like Impact Factor) with a Web of Science data source. Best Regards, SCImago Team

V **Vikas Magdum** 2 years ago

Respected sir,

From which volume IOP conference Series material science and Engineering is discontinued from Scopus.

But after using following link it shown as indexed from 2007-present

<https://www.scopus.com/sourceid/19700200831?origin=resultslist>

Please clarify wheather it Scopus Indexed or not?

reply



**Melanie Ortiz** 2 years ago

SCImago Team

Dear Vikas,

Thank you very much for your comment.

All the metadata have been provided by Scopus /Elsevier in their last update sent to SCImago, including the Coverage's period data. The SJR for 2020 has been released on 17 May 2021. We suggest you consult the Scopus database directly to see the current index status as SJR is a static image of Scopus, which is changing every day.

For further information, please contact Scopus support: [https://service.elsevier.com/app/answers/detail/a\\_id/14883/kw/scimago/supporthub/scopus/](https://service.elsevier.com/app/answers/detail/a_id/14883/kw/scimago/supporthub/scopus/)

Best Regards, SCImago Team

V **Vikas Magdum** 2 years ago

Is IOP conference science: Material Science and Engineering is Web of Science Indexed?

Upto which volume or date IOP Material Science and Engineering journal is Scopus Indexed?

reply



**Melanie Ortiz** 2 years ago

SCImago Team

Dear Vikas,

Thank you for contacting us.

SJR is a portal with scientometric indicators of journals indexed in Elsevier/Scopus.

Unfortunately, we cannot help you with your request referring to the index status. We suggest you consult Scopus database (see the current status of the journal) or the mentioned database for further information.

Best Regards, SCImago Team

N **NITISH KUMAR SAINI** 2 years ago

It is again continued in Scopus, kindly recheck and verify by following link

<https://www.scopus.com/sourceid/19700200831?origin=resultslist>

Now kindly help me, wheather it is continued from same volume or some volumes are not covered in Scopus.

But it's good that, it's web of science indexing is continue.

reply

Q **Quoc Hoan PHAM** 3 months ago

Hello,

I have just check:

Scopus coverage years:from 2009 to 2021(coverage discontinued in Scopus)



**Melanie Ortiz** 2 years ago

SCImago Team

Dear Nitish,

thank you very much for your comment, unfortunately we cannot help you with your request. We suggest you contact Scopus support: [https://service.elsevier.com/app/answers/detail/a\\_id/14883/kw/scimago/supporthub/scopus/](https://service.elsevier.com/app/answers/detail/a_id/14883/kw/scimago/supporthub/scopus/)

Best Regards, SCImago Team

G **Gaurang Patel** 2 years ago

The scopus coverage of this Journal shows continue on it's website but here there is no SJR value, Why?

reply



**Melanie Ortiz** 2 years ago

SCImago Team

Dear Gaurang,

Thank you for contacting us.

According to the latest update sent by Scopus this year, this journal was discontinued in its database as of 2021. Therefore, it seems that they did not send us any data to calculate the scientometric indicators related to 2020 for this journal.

Best Regards, SCImago Team

H **Hassan Obaid Abbas** 2 years ago

I would like to ask if the IOP conference series:Material science and Engineering is still or discontinued for Scopus.

With regards

reply

A **Ahmed A. Thabit** 2 years ago

Discontinued in Scopus as of 2021

G **GUNUPUDI RAJESH KUMAR** 2 years ago

It is discontinued from SCOPUS. But it still indexed in CPCI-S (WoS Core Group)

L **Lateef Assi** 2 years ago

discontinued for Scopus



**Melanie Ortiz** 2 years ago

SCImago Team

Dear Hassan,

Thank you very much for your comment.

All the metadata have been provided by Scopus /Elsevier in their last update sent to SCImago, including the Coverage's period data. The SJR for 2019 was released on 11 June 2020. We suggest you consult the Scopus database directly to see the current index status as SJR is a static image of Scopus, which is changing every day.

Best Regards, SCImago Team

F **Ferit Artkin** 2 years ago

Dear Scimango Team,

Which IOP conferences in Sci expanded indexing in Engineering in 2021? May IOP material science and Engineering congress be in Sci expanded? I am interested in Mechanical Engineering especially Optical and Mechanical Measurements like Laser Technologies and Laser manufacturing ör measurements. Thanks,

Sincerely,

Ferit A., PhD

reply



**Melanie Ortiz** 2 years ago

SCImago Team

Dear Ferit,

Thank you for contacting us.

SJR is a portal with scientometric indicators of journals indexed in Elsevier/Scopus.

Unfortunately, we cannot help you with your request. We suggest you contact the WoS team for that information.

Best Regards, SCImago Team

N **Nelly** 2 years ago

Dear friends!

Please explain why in Scopus conference collections IOP Conference Series: Earth and Environmental Science, etc. have a quartile in the Citescore index, and in SJR conference materials are not assigned a quartile. Thank you for the clarification

reply



**Melanie Ortiz** 2 years ago

SCImago Team

Dear Nelly,

Thank you for contacting us. We calculate the SJR data for all the publication's types, but

the Quartile's data are only calculated for Journals and Book Series.  
Best regards, SCImago Team

K **KOVENDAN** 2 years ago

Dose the IOP conference series covers in scopus database or not.

reply



**Melanie Ortiz** 2 years ago

SCImago Team

Dear Kovendan,

Thank you very much for your comment.

All the metadata have been provided by Scopus /Elsevier in their last update sent to SCImago, including the Coverage's period data. The SJR for 2019 was released on 11 June 2020. We suggest you consult the Scopus database directly to see the current index status as SJR is a static image of Scopus, which is changing every day.

For further information, please contact Scopus support: [https://service.elsevier.com/app/answers/detail/a\\_id/14883/kw/scimago/supporthub/scopus/](https://service.elsevier.com/app/answers/detail/a_id/14883/kw/scimago/supporthub/scopus/)

Best Regards, SCImago Team

R **Rafael** 2 years ago

No se visualiza el cuartil, cual es el motivo?

reply



**Melanie Ortiz** 2 years ago

SCImago Team

Dear Rafael,

Thank you for contacting us. Please see comments below.

Best Regards, SCImago Team

V **Vo Anh Tuan** 2 years ago

Dear Melanie , Elena and SCImago team

Can you please let me know Q1/ Q2:/ Q3 or Q4 Classification as the journal IOP Conference Series : Materials Science and Engineering , with the Volume published as the link below:

<https://iopscience.iop.org/volume/1757-899X/869>

Thank you so much for your Promp reply

Warmest regards

Võ Anh Tuấn



University of Architecture of HO CHI MINH CITY, VIETNAM  
Tel: 84908226165  
196 Pasteur , District 3, HCMC, Vietnam

reply



**Melanie Ortiz** 2 years ago

SCImago Team

Dear Vo Anh Tuan,  
Thank you for contacting us. We calculate the SJR data for all the publication's types, but the Quartile's data are only calculated for Journals and Book Series.  
Best regards, SCImago Team

P **ptnabeel** 2 years ago

I was looking for a template to publish my paper in IOP conference series: Material Science and Engineering.

reply



**Melanie Ortiz** 2 years ago

SCImago Team

Dear Sir/Madam,  
thank you for contacting us.  
We suggest you visit the journal's homepage (See submission/author guidelines) or contact the journal's editorial staff , so they could inform you more deeply.  
Best Regards, SCImago Team

H **Haydar Al-Ethari** 3 years ago

I hope this message finds you very well  
I have two papers published in the IOP Conference Series: Materials Science and Engineering, Volume 881, 3rd International Conference on Sustainable Engineering Techniques (ICSET 2020) 15 April 2020, Baghdad, Iraq, but I did not find them in my id author profile in scopus and could not add them manually. Is there any problem with this publication/conference/journal? (may be out of scopus). The online publication was at 1/7/2020.  
Best Regards

reply

S **Saran** 2 years ago

Hi.is there any problem in adding to scopus author profile?



**Melanie Ortiz** 2 years ago

SCImago Team

Dear Saran,



thank you very much for your comment, unfortunately we cannot help you with your request. We suggest you contact Scopus support: [https://service.elsevier.com/app/answers/detail/a\\_id/14883/kw/scimago/supporthub/scopus/](https://service.elsevier.com/app/answers/detail/a_id/14883/kw/scimago/supporthub/scopus/)  
Best Regards, SCImago Team



**Melanie Ortiz** 3 years ago

SCImago Team

Dear Haydar,  
thank you very much for your comment, unfortunately we cannot help you with your request. We suggest you contact Scopus support: [https://service.elsevier.com/app/answers/detail/a\\_id/14883/kw/scimago/supporthub/scopus/](https://service.elsevier.com/app/answers/detail/a_id/14883/kw/scimago/supporthub/scopus/)  
Best Regards, SCImago Team

A **AL-Kurdhani J. M. H.** 3 years ago

Hello  
Dear Elena,  
I want to know what is the value of impact factor of 2019 for useful all MSC. or/and pH.D. students by publishing in these journals and my students need the Q1 or Q2 in SJR with Scopus Q-ranking to graduation.  
Thank you so much.

Best Regards,

reply



**Melanie Ortiz** 3 years ago

SCImago Team

Dear AL-Kurdhani,

Thank you for contacting us. Could you please tell us which particular journal you are referring to?

Best Regards, SCImago Team

V **Virat Khanna** 3 years ago

Can you please tell, how much time does IOP conference series take to publish the proceeding of the conference after the conference date.

reply



**Melanie Ortiz** 3 years ago

SCImago Team

Dear Virat,  
thank you for contacting us.  
Unfortunately, we cannot help you with your request, we suggest you contact the editorial staff, so they could inform you more deeply.  
Best Regards, SCImago Team

S **syafriyudin** 3 years ago

is The journal IOP Conference Series: Materials Science and Engineering in the scopus index

reply



**Melanie Ortiz** 3 years ago

SCImago Team

Dear Syafriyudin,

Thank you very much for your comment.

All the metadata have been provided by Scopus /Elsevier in their last update sent to SCImago, including the Coverage's period data. The SJR for 2019 was updated on June 2020, 11. We suggest you consult the Scopus database directly to see the current index status as SJR is a static image of Scopus, which is changing every day.

Best Regards, SCImago Team

F **Fouad Fadhil Al-Qaim** 3 years ago

Dear Sir/Madam

May I know this Journal whether Q1, Q2,Q3 or Q4? Actually, there is no any quarter reported here.

Thank you

reply



**Melanie Ortiz** 3 years ago

SCImago Team

Dear Fouad,

Thank you for contacting us. We calculate the SJR data for all the publication's types, but the Quartile's data are only calculated for Journals.

Best regards, SCImago Team

R **Raj kamal** 3 years ago

IOP is whether scopus indexed

reply



**Melanie Ortiz** 3 years ago

SCImago Team

Dear Raj,

Thank you very much for your comment.

All the metadata have been provided by Scopus /Elsevier in their last update sent to SCImago, including the Coverage's period data. The SJR for 2019 was updated on June 2020, 11. We suggest you consult the Scopus database directly to see the current index status as SJR is a static image of Scopus, which is changing every day.

Best Regards, SCImago Team

R **ramanathan venkatachalam** 3 years ago

What is impact factor of IOP Conf. Series: Materials Science and Engineering

reply



**Melanie Ortiz** 3 years ago

SCImago Team

Dear Ramanathan, thank you very much for your comment.

SCImago Journal and Country Rank uses Scopus data, our impact indicator is the SJR.

Check out our web to localize the journal. We suggest you consult the Journal Citation Report for other indicators (like Impact Factor) with a Web of Science data source. Best

Regards, SCImago Team

A **Abbas Al-Hdabi** 3 years ago

Dear Elena

I hope that you are very well and will be safe within Corona virus crises.

Please let me know when you issue the new journal classification i.e. Q1, q2 ... and what is your strategy for your update.

My query is a general one not regarding IOP publications.

Kind regards and stay safe

Abbas

reply



**Melanie Ortiz** 3 years ago

SCImago Team

Dear Abbas,

Thank you for contacting us. Our data come from Scopus, they annually send us an update of the data. This update is sent to us around April / May every year. Thus, the indicators for 2019 will be available in June 2020. Best Regards, SCImago Team

B **Boumediene sadoun** 3 years ago

Hello

I want to know what is the value of impact factor of 2019.

Also, is the nature of publishing in this journal considered as an article or a processing?

In addition to this, can we take PhDs in this journal?

reply



**Melanie Ortiz** 3 years ago

SCImago Team

Dear Boumediene, thank you very much for your comment.

SCImago Journal and Country Rank uses Scopus data, our impact indicator is the SJR.

Check out our web to localize the journal. We suggest you to consult the Journal Citation Report for other indicators (like Impact Factor) with a Web of Science data source. For

further information about this journal, please visit the journal's website. Best Regards,  
SCImago Team

P **PARU** 3 years ago

IOP CONFERENCE SERIES A BOOK OR JOURNAL.

reply



**Melanie Ortiz** 3 years ago

SCImago Team

Dear Paru,

Thank you for contacting us.

SJR is a portal with scientometric indicators of journals indexed in Scopus. All the data have been provided By Scopus /Elsevier and SCImago doesn't have the authority over this data which are property of Scopus/Elsevier. SCImago has a signed agreement that limits our performance to the generation of scientometric indicators derived from the metadata sent in the last update. Apparently, Scopus has categorized this publication in "Conference and Proceedings" section. We suggest you to contact with Scopus support regarding this request:

[https://service.elsevier.com/app/answers/detail/a\\_id/14883/kw/scimago/supporthub/scopus/](https://service.elsevier.com/app/answers/detail/a_id/14883/kw/scimago/supporthub/scopus/). Best Regards, SCImago Team



**Hebatallahman Hebatallahman** 3 years ago

please what is value can express impact factor for IOP conference series material science and engineering

reply



**Melanie Ortiz** 3 years ago

SCImago Team

Dear Hebatallahman, thank you very much for your comment.

SCImago Journal and Country Rank uses Scopus data, our impact indicator is the SJR.

Check out our web to localize the journal. We suggest you to consult the Journal Citation Report for other indicators (like Impact Factor) with a Web of Science data source. Best Regards, SCImago Team

A **Andrei** 3 years ago

No me carga el cuartil, saben porqué se debe eso?

reply



**Melanie Ortiz** 3 years ago

SCImago Team

Dear Andrei,

Thank you for contacting us. We calculate the SJR data for all the publication types, but

the Quartile data are only calculated for Journal type's publications. Best regards,  
SCImago Team

K **Kassim** 3 years ago

Hello

I want know that is Elsevier a publisher of this journal?

reply

M **MADHU LATA BHARTI** 3 years ago

please tell me if this journal is ugc listed, if it is, what is its ugc approval number?

reply

O **Ondrej** 3 years ago

Madhu means if the journal is approved and listed in University Grants Commission of India.

It is possible to find it out here (after registration):

<https://ugccare.unipune.ac.in/site/website/index.aspx>

However, IOP Conference Series: Materials Science and Engineering, is not, in fact, journal, but it collects proceedings from conferences, not journal articles. Still, the good thing is that IOP CS is WOS, Scopus (SJR) indexed. Generally, IOP publishing house is fair and reliable institution.



**Melanie Ortiz** 3 years ago

SCImago Team

Dear user, thanks for your participation! Best Regards, SCImago Team



**Melanie Ortiz** 3 years ago

SCImago Team

Dear Madhu, could you please expand your comment? Best Regards, SCImago Team

O **osamah raad** 3 years ago

please how can I know the dates future conferences of IOP? are there any website for that purpose?

Regards

reply

K **Kabiru** 3 years ago

Dear Elena,

If IOP is a conference, then papers published in it are Scopus journal articles or just conference papers?

I was told that the papers published in IOP: material science and engineering are Scopus indexed journal papers with Scopus Q-ranking.

We need this for our Ph.D. graduation requirement.

THANK YOU

reply



**Elena Corera** 3 years ago

SCImago Team

Dear Kabiru, thank you very much for your comment, unfortunately we cannot help you with your request. We suggest you consult the Scopus database directly. Remember that the SJR is a static image of a database (Scopus) which is changing every day. Best regards, SCImago Team

A **Asha Rajiv** 4 years ago

Wanted to know whether the journal is scopus indexed?

reply



**Elena Corera** 4 years ago

SCImago Team

Dear Asha,

please, check comments below.

Best regards,  
SCImago Team



**a ridwan** 4 years ago

if this conference and proceeding indexed by scopus how could i find my id author in scopus ?

reply

S **Salam Jabr** 4 years ago

<https://www.eetc-pec19.org>

[/?fbclid=IwAR2lOrbhvf6gtCwmddESpBVea7\\_p9MCW\\_bw3WurzzZV1IB5BMgl6d5FA1mA](https://fbclid=IwAR2lOrbhvf6gtCwmddESpBVea7_p9MCW_bw3WurzzZV1IB5BMgl6d5FA1mA)



**Elena Corera** 4 years ago

SCImago Team

Dear A Ridwan,

thank you very much for your comment, unfortunately we cannot help you with your request. We suggest you contact Scopus [https://service.elsevier.com/app/answers/detail/a\\_id/14883/kw/scimago/supporthub/scopus/](https://service.elsevier.com/app/answers/detail/a_id/14883/kw/scimago/supporthub/scopus/)



Best Regards,  
SCImago Team

T **Thanikasalam** 4 years ago

Hi, is this Scopus indexed?

reply



**Elena Corera** 4 years ago

SCImago Team

Dear Thanikasalam,  
thank you for your request, all the journals included in SJR are indexed in Scopus. Elsevier / Scopus is our data provider.  
Best Regards,  
SCImago Team



**Dr. Ellahi** 4 years ago

Dear Mam,  
Just i want to ask you it is SCI, SCIE, OR EI or other journal? I know it is conference proceeding journal.  
Thanks.

reply



**Elena Corera** 4 years ago

SCImago Team

Dear Dr Ellahi, SCImago Journal and Country Rank uses Scopus data, our impact indicator is the SJR. Check our page to locate the journal. We suggest you consult the Journal Citation Report for other indicators (like Impact Factor) with a Web of Science data source. Best Regards, SCImago Team

N **Nikhil jain** 5 years ago

Madam i came 2018 conference papers not published yet can you tell me status

reply



**Elena Corera** 5 years ago

SCImago Team

Dear Nikhil,  
  
articles published in 2018 are not over yet (we are in September). 2018 indicators will not be available until June 2019. We can not see what will happen in the future with this journal. SCImago receives the data from Scopus / Elsevier annually and does not have the authority to include, exclude or modify the data provided by Scopus.

Best Regards,  
SCImago Team

M **Moisés Toapanta** 5 years ago

The IOP Conference is considered a research journal or only remains in conference proceedings.  
What is the difference of the SJR impact between a conference journal and a scientific journal

reply



**Elena Corera** 4 years ago

SCImago Team

Dear Moisés,  
thank you very much for your comment. This journal is a conference proceedings. We only  
do an SJR calculation, it is the same for any type of publication  
Best Regards,  
SCImago Team

V **Vadym** 5 years ago

Dears, colleagues!

The journal IOP Conference Series: Materials Science and Engineering is it Q3 or Q4?

Best Regards

reply



**ahmad fauzi** 3 years ago

why journal of physics (IOP conferences has Q3? but the journal don't have. Both of them are  
conferences



**Elena Corera** 5 years ago

SCImago Team

Dear friend,  
It's a conference, it does not have a quartile.  
<https://www.scimagojr.com/journalsearch.php?q=19700200831&tip=sid&clean=0>  
Best Regards, SRG

**Leave a comment**

Name



Email

(will not be published)

Submit

The users of Scimago Journal & Country Rank have the possibility to dialogue through comments linked to a specific journal. The purpose is to have a forum in which general doubts about the processes of publication in the journal, experiences and other issues derived from the publication of papers are resolved. For topics on particular articles, maintain the dialogue through the usual channels with your editor.

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EST MODUS IN REBUS  
Horatio (Satire 1.1.106)

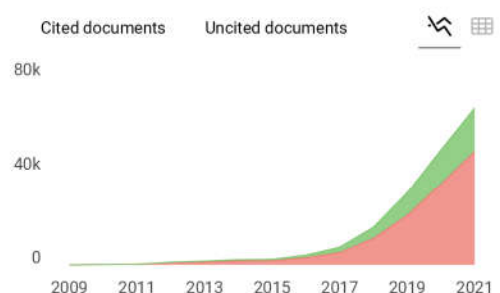
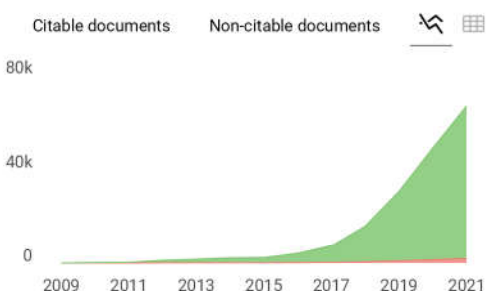
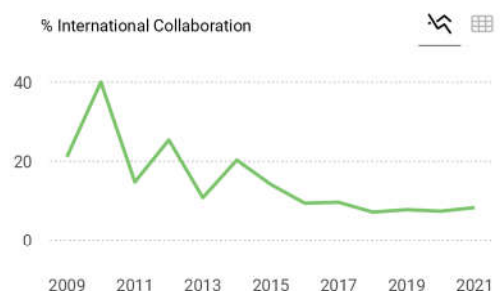
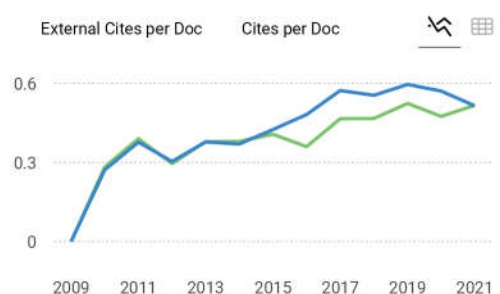
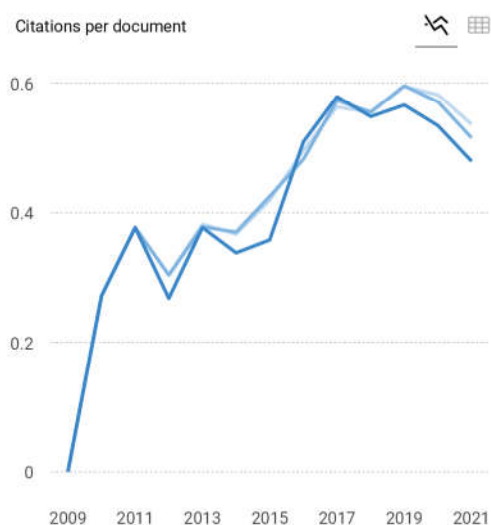
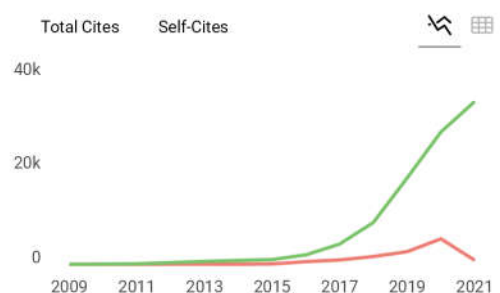
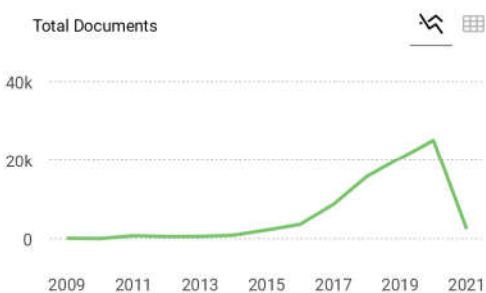
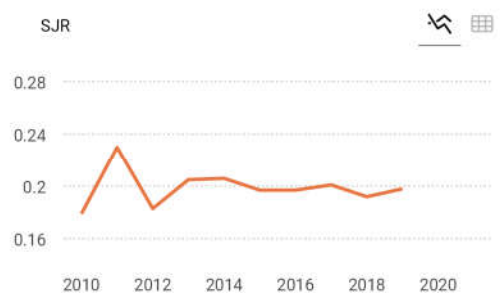
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#### SCOPE

The open access IOP Conference Series provides a fast, versatile and cost-effective proceedings publication service for your conference. Key publishing subject areas include: physics, materials science, environmental science, bioscience, engineering, computational science and mathematics.

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`<a href="https://www.scimagojr.com/journalsearch.php?q=19700200831&tip=si..."`

**SCImago Graphica**

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Metrics based on Scopus® data as of April 2022

Q **Quoc Hoan Pham** 5 months ago

Hello,  
What is the quartile of this Journal?

reply



**Melanie Ortiz** 5 months ago

SCImago Team

Dear Quoc Hoan,  
Thank you for contacting us. Please see comments below.  
Best Regards, SCImago Team

C **Cecilia Soerawidjaja** 1 year ago

How can I find the cover of IOP Conference Series: Materials Science and Engineering Volume 550 of 2019? Thank you.

reply



**Melanie Ortiz** 1 year ago

SCImago Team

Dear Cecilia,  
Thank you for contacting us. Could you please expand a little bit on your comment?  
Best Regards, SCImago Team

N **Юрий** 1 year ago

Какой Импакт-фактор у журнала

reply



**Melanie Ortiz** 1 year ago

SCImago Team

Dear Юрий, thank you very much for your comment. SCImago Journal and Country Rank uses Scopus data, our impact indicator is the SJR (Check it on our website). We suggest you consult the Journal Citation Report for other indicators (like Impact Factor) with a Web of Science data source. Best Regards, SCImago Team

V **Vikas Magdum** 2 years ago

Respected sir,

From which volume IOP conference Series material science and Engineering is discontinued from Scopus.

But after using following link it shown as indexed from 2007-present

<https://www.scopus.com/sourceid/19700200831?origin=resultslist>

Please clarify wheather it Scopus Indexed or not?

reply



**Melanie Ortiz** 2 years ago

SCImago Team

Dear Vikas,

Thank you very much for your comment.

All the metadata have been provided by Scopus /Elsevier in their last update sent to SCImago, including the Coverage's period data. The SJR for 2020 has been released on 17 May 2021. We suggest you consult the Scopus database directly to see the current index status as SJR is a static image of Scopus, which is changing every day.

For further information, please contact Scopus support: [https://service.elsevier.com/app/answers/detail/a\\_id/14883/kw/scimago/supporthub/scopus/](https://service.elsevier.com/app/answers/detail/a_id/14883/kw/scimago/supporthub/scopus/)

Best Regards, SCImago Team

V **Vikas Magdum** 2 years ago

Is IOP conference science: Material Science and Engineering is Web of Science Indexed?

Upto which volume or date IOP Material Science and Engineering journal is Scopus Indexed?

reply



**Melanie Ortiz** 2 years ago

SCImago Team

Dear Vikas,

Thank you for contacting us.

SJR is a portal with scientometric indicators of journals indexed in Elsevier/Scopus.

Unfortunately, we cannot help you with your request referring to the index status. We suggest you consult Scopus database (see the current status of the journal) or the mentioned database for further information.

Best Regards, SCImago Team

N **NITISH KUMAR SAINI** 2 years ago

It is again continued in Scopus, kindly recheck and verify by following link

<https://www.scopus.com/sourceid/19700200831?origin=resultslist>

Now kindly help me, wheather it is continued from same volume or some volumes are not covered in Scopus.

But it's good that, it's web of science indexing is continue.

reply

Q **Quoc Hoan PHAM** 3 months ago

Hello,

I have just check:

Scopus coverage years:from 2009 to 2021(coverage discontinued in Scopus)



**Melanie Ortiz** 2 years ago

SCImago Team

Dear Nitish,

thank you very much for your comment, unfortunately we cannot help you with your request. We suggest you contact Scopus support: [https://service.elsevier.com/app/answers/detail/a\\_id/14883/kw/scimago/supporthub/scopus/](https://service.elsevier.com/app/answers/detail/a_id/14883/kw/scimago/supporthub/scopus/)

Best Regards, SCImago Team

G **Gaurang Patel** 2 years ago

The scopus coverage of this Journal shows continue on it's website but here there is no SJR value, Why?

reply



**Melanie Ortiz** 2 years ago

SCImago Team

Dear Gaurang,

Thank you for contacting us.

According to the latest update sent by Scopus this year, this journal was discontinued in its database as of 2021. Therefore, it seems that they did not send us any data to calculate the scientometric indicators related to 2020 for this journal.

Best Regards, SCImago Team

H **Hassan Obaid Abbas** 2 years ago

I would like to ask if the IOP conference series:Material science and Engineering is still or discontinued for Scopus.

With regards

reply

A **Ahmed A. Thabit** 2 years ago

Discontinued in Scopus as of 2021

G **GUNUPUDI RAJESH KUMAR** 2 years ago

It is discontinued from SCOPUS. But it still indexed in CPCI-S (WoS Core Group)

L **Lateef Assi** 2 years ago

discontinued for Scopus



**Melanie Ortiz** 2 years ago

SCImago Team

Dear Hassan,

Thank you very much for your comment.

All the metadata have been provided by Scopus /Elsevier in their last update sent to SCImago, including the Coverage's period data. The SJR for 2019 was released on 11 June 2020. We suggest you consult the Scopus database directly to see the current index status as SJR is a static image of Scopus, which is changing every day.

Best Regards, SCImago Team

F **Ferit Artkin** 2 years ago

Dear Scimango Team,

Which IOP conferences in Sci expanded indexing in Engineering in 2021? May IOP material science and Engineering congress be in Sci expanded? I am interested in Mechanical Engineering especially Optical and Mechanical Measurements like Laser Technologies and Laser manufacturing ör measurements. Thanks,

Sincerely,

Ferit A., PhD

reply



**Melanie Ortiz** 2 years ago

SCImago Team

Dear Ferit,

Thank you for contacting us.

SJR is a portal with scientometric indicators of journals indexed in Elsevier/Scopus.

Unfortunately, we cannot help you with your request. We suggest you contact the WoS team for that information.

Best Regards, SCImago Team

N **Nelly** 2 years ago

Dear friends!

Please explain why in Scopus conference collections IOP Conference Series: Earth and Environmental Science, etc. have a quartile in the Citescore index, and in SJR conference materials are not assigned a quartile. Thank you for the clarification

reply



**Melanie Ortiz** 2 years ago

SCImago Team

Dear Nelly,

Thank you for contacting us. We calculate the SJR data for all the publication's types, but

the Quartile's data are only calculated for Journals and Book Series.  
Best regards, SCImago Team

K **KOVENDAN** 2 years ago

Dose the IOP conference series covers in scopus database or not.

reply



**Melanie Ortiz** 2 years ago

SCImago Team

Dear Kovendan,

Thank you very much for your comment.

All the metadata have been provided by Scopus /Elsevier in their last update sent to SCImago, including the Coverage's period data. The SJR for 2019 was released on 11 June 2020. We suggest you consult the Scopus database directly to see the current index status as SJR is a static image of Scopus, which is changing every day.

For further information, please contact Scopus support: [https://service.elsevier.com/app/answers/detail/a\\_id/14883/kw/scimago/supporthub/scopus/](https://service.elsevier.com/app/answers/detail/a_id/14883/kw/scimago/supporthub/scopus/)

Best Regards, SCImago Team

R **Rafael** 2 years ago

No se visualiza el cuartil, cual es el motivo?

reply



**Melanie Ortiz** 2 years ago

SCImago Team

Dear Rafael,

Thank you for contacting us. Please see comments below.

Best Regards, SCImago Team

V **Vo Anh Tuan** 2 years ago

Dear Melanie , Elena and SCImago team

Can you please let me know Q1/ Q2:/ Q3 or Q4 Classification as the journal IOP Conference Series : Materials Science and Engineering , with the Volume published as the link below:

<https://iopscience.iop.org/volume/1757-899X/869>

Thank you so much for your Promp reply

Warmest regards

Võ Anh Tuấn



University of Architecture of HO CHI MINH CITY, VIETNAM  
Tel: 84908226165  
196 Pasteur , District 3, HCMC, Vietnam

reply



**Melanie Ortiz** 2 years ago

SCImago Team

Dear Vo Anh Tuan,  
Thank you for contacting us. We calculate the SJR data for all the publication's types, but the Quartile's data are only calculated for Journals and Book Series.  
Best regards, SCImago Team

P **ptnabeel** 2 years ago

I was looking for a template to publish my paper in IOP conference series: Material Science and Engineering.

reply



**Melanie Ortiz** 2 years ago

SCImago Team

Dear Sir/Madam,  
thank you for contacting us.  
We suggest you visit the journal's homepage (See submission/author guidelines) or contact the journal's editorial staff , so they could inform you more deeply.  
Best Regards, SCImago Team

H **Haydar Al-Ethari** 3 years ago

I hope this message finds you very well  
I have two papers published in the IOP Conference Series: Materials Science and Engineering, Volume 881, 3rd International Conference on Sustainable Engineering Techniques (ICSET 2020) 15 April 2020, Baghdad, Iraq, but I did not find them in my id author profile in scopus and could not add them manually. Is there any problem with this publication/conference/journal? (may be out of scopus). The online publication was at 1/7/2020.  
Best Regards

reply

S **Saran** 2 years ago

Hi.is there any problem in adding to scopus author profile?



**Melanie Ortiz** 2 years ago

SCImago Team

Dear Saran,

thank you very much for your comment, unfortunately we cannot help you with your request. We suggest you contact Scopus support: [https://service.elsevier.com/app/answers/detail/a\\_id/14883/kw/scimago/supporthub/scopus/](https://service.elsevier.com/app/answers/detail/a_id/14883/kw/scimago/supporthub/scopus/)  
Best Regards, SCImago Team



**Melanie Ortiz** 3 years ago

SCImago Team

Dear Haydar,  
thank you very much for your comment, unfortunately we cannot help you with your request. We suggest you contact Scopus support: [https://service.elsevier.com/app/answers/detail/a\\_id/14883/kw/scimago/supporthub/scopus/](https://service.elsevier.com/app/answers/detail/a_id/14883/kw/scimago/supporthub/scopus/)  
Best Regards, SCImago Team

A **AL-Kurdhani J. M. H.** 3 years ago

Hello  
Dear Elena,  
I want to know what is the value of impact factor of 2019 for useful all MSC. or/and pH.D. students by publishing in these journals and my students need the Q1 or Q2 in SJR with Scopus Q-ranking to graduation.  
Thank you so much.

Best Regards,

reply



**Melanie Ortiz** 3 years ago

SCImago Team

Dear AL-Kurdhani,

Thank you for contacting us. Could you please tell us which particular journal you are referring to?

Best Regards, SCImago Team

V **Virat Khanna** 3 years ago

Can you please tell, how much time does IOP conference series take to publish the proceeding of the conference after the conference date.

reply



**Melanie Ortiz** 3 years ago

SCImago Team

Dear Virat,  
thank you for contacting us.  
Unfortunately, we cannot help you with your request, we suggest you contact the editorial staff, so they could inform you more deeply.  
Best Regards, SCImago Team

S **syafriyudin** 3 years ago

is The journal IOP Conference Series: Materials Science and Engineering in the scopus index

reply



**Melanie Ortiz** 3 years ago

SCImago Team

Dear Syafriyudin,

Thank you very much for your comment.

All the metadata have been provided by Scopus /Elsevier in their last update sent to SCImago, including the Coverage's period data. The SJR for 2019 was updated on June 2020, 11. We suggest you consult the Scopus database directly to see the current index status as SJR is a static image of Scopus, which is changing every day.

Best Regards, SCImago Team

F **Fouad Fadhil Al-Qaim** 3 years ago

Dear Sir/Madam

May I know this Journal whether Q1, Q2,Q3 or Q4? Actually, there is no any quarter reported here.

Thank you

reply



**Melanie Ortiz** 3 years ago

SCImago Team

Dear Fouad,

Thank you for contacting us. We calculate the SJR data for all the publication's types, but the Quartile's data are only calculated for Journals.

Best regards, SCImago Team

R **Raj kamal** 3 years ago

IOP is whether scopus indexed

reply



**Melanie Ortiz** 3 years ago

SCImago Team

Dear Raj,

Thank you very much for your comment.

All the metadata have been provided by Scopus /Elsevier in their last update sent to SCImago, including the Coverage's period data. The SJR for 2019 was updated on June 2020, 11. We suggest you consult the Scopus database directly to see the current index status as SJR is a static image of Scopus, which is changing every day.

Best Regards, SCImago Team

R **ramanathan venkatachalam** 3 years ago

What is impact factor of IOP Conf. Series: Materials Science and Engineering

reply



**Melanie Ortiz** 3 years ago

SCImago Team

Dear Ramanathan, thank you very much for your comment.

SCImago Journal and Country Rank uses Scopus data, our impact indicator is the SJR.

Check out our web to localize the journal. We suggest you consult the Journal Citation Report for other indicators (like Impact Factor) with a Web of Science data source. Best

Regards, SCImago Team

A **Abbas Al-Hdabi** 3 years ago

Dear Elena

I hope that you are very well and will be safe within Corona virus crises.

Please let me know when you issue the new journal classification i.e. Q1, q2 ... and what is your strategy for your update.

My query is a general one not regarding IOP publications.

Kind regards and stay safe

Abbas

reply



**Melanie Ortiz** 3 years ago

SCImago Team

Dear Abbas,

Thank you for contacting us. Our data come from Scopus, they annually send us an update of the data. This update is sent to us around April / May every year. Thus, the indicators for 2019 will be available in June 2020. Best Regards, SCImago Team

B **Boumediene sadoun** 3 years ago

Hello

I want to know what is the value of impact factor of 2019.

Also, is the nature of publishing in this journal considered as an article or a processing?

In addition to this, can we take PhDs in this journal?

reply



**Melanie Ortiz** 3 years ago

SCImago Team

Dear Boumediene, thank you very much for your comment.

SCImago Journal and Country Rank uses Scopus data, our impact indicator is the SJR.

Check out our web to localize the journal. We suggest you to consult the Journal Citation Report for other indicators (like Impact Factor) with a Web of Science data source. For

further information about this journal, please visit the journal's website. Best Regards,  
SCImago Team

P **PARU** 3 years ago

IOP CONFERENCE SERIES A BOOK OR JOURNAL.

reply



**Melanie Ortiz** 3 years ago

SCImago Team

Dear Paru,

Thank you for contacting us.

SJR is a portal with scientometric indicators of journals indexed in Scopus. All the data have been provided By Scopus /Elsevier and SCImago doesn't have the authority over this data which are property of Scopus/Elsevier. SCImago has a signed agreement that limits our performance to the generation of scientometric indicators derived from the metadata sent in the last update. Apparently, Scopus has categorized this publication in "Conference and Proceedings" section. We suggest you to contact with Scopus support regarding this request:

[https://service.elsevier.com/app/answers/detail/a\\_id/14883/kw/scimago/supporthub/scopus/](https://service.elsevier.com/app/answers/detail/a_id/14883/kw/scimago/supporthub/scopus/). Best Regards, SCImago Team



**Hebatallahman Hebatallahman** 3 years ago

please what is value can express impact factor for IOP conference series material science and engineering

reply



**Melanie Ortiz** 3 years ago

SCImago Team

Dear Hebatallahman, thank you very much for your comment.

SCImago Journal and Country Rank uses Scopus data, our impact indicator is the SJR.

Check out our web to localize the journal. We suggest you to consult the Journal Citation Report for other indicators (like Impact Factor) with a Web of Science data source. Best Regards, SCImago Team

A **Andrei** 3 years ago

No me carga el cuartil, saben porqué se debe eso?

reply



**Melanie Ortiz** 3 years ago

SCImago Team

Dear Andrei,

Thank you for contacting us. We calculate the SJR data for all the publication types, but

the Quartile data are only calculated for Journal type's publications. Best regards,  
SCImago Team

K **Kassim** 3 years ago

Hello

I want know that is Elsevier a publisher of this journal?

reply

M **MADHU LATA BHARTI** 3 years ago

please tell me if this journal is ugc listed, if it is, what is its ugc approval number?

reply

O **Ondrej** 3 years ago

Madhu means if the journal is approved and listed in University Grants Commission of India.

It is possible to find it out here (after registration):

<https://ugccare.unipune.ac.in/site/website/index.aspx>

However, IOP Conference Series: Materials Science and Engineering, is not, in fact, journal, but it collects proceedings from conferences, not journal articles. Still, the good thing is that IOP CS is WOS, Scopus (SJR) indexed. Generally, IOP publishing house is fair and reliable institution.



**Melanie Ortiz** 3 years ago

SCImago Team

Dear user, thanks for your participation! Best Regards, SCImago Team



**Melanie Ortiz** 3 years ago

SCImago Team

Dear Madhu, could you please expand your comment? Best Regards, SCImago Team

O **osamah raad** 3 years ago

please how can I know the dates future conferences of IOP? are there any website for that purpose?

Regards

reply

K **Kabiru** 3 years ago

Dear Elena,

If IOP is a conference, then papers published in it are Scopus journal articles or just conference papers?



I was told that the papers published in IOP: material science and engineering are Scopus indexed journal papers with Scopus Q-ranking.

We need this for our Ph.D. graduation requirement.

THANK YOU

reply



**Elena Corera** 3 years ago

SCImago Team

Dear Kabiru, thank you very much for your comment, unfortunately we cannot help you with your request. We suggest you consult the Scopus database directly. Remember that the SJR is a static image of a database (Scopus) which is changing every day. Best regards, SCImago Team

A **Asha Rajiv** 4 years ago

Wanted to know whether the journal is scopus indexed?

reply



**Elena Corera** 4 years ago

SCImago Team

Dear Asha,

please, check comments below.

Best regards,  
SCImago Team



**a ridwan** 4 years ago

if this conference and proceeding indexed by scopus how could i find my id author in scopus ?

reply

S **Salam Jabr** 4 years ago

<https://www.eetc-pec19.org>

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# Unsupervised Method for Calculating Diameter and Number of Leukocyte Cells

Retno Supriyanti<sup>1,3</sup>, Ahmad Haeromi<sup>1</sup>, Yogi Ramadhani<sup>1</sup>, Wahyu Siswandari<sup>2</sup>

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**Abstract.** Leukocyte has an essential role in the body. Leukocyte has functioned as the body's immune system function to protect the body from viruses, bacteria, and pathogens. Under normal circumstances, leukocyte has a relatively constant amount. If the number of leukocytes exceeds or is less than usual, health problems can occur. So that the leukocyte cell counts as an indicator of abnormalities and diseases. Digital image processing is an alternative method to identify leukocyte in addition to a hematology analyzer or manually by medical personnel by processing blood images so that the desired information is obtained. Blood images have a variety of lighting conditions, staining time, and cell thickness that cause the various attributes of the blood image. This experiment segmented leukocyte using unsupervised method especially the K-Means clustering method on the hue component of the image after being transformed into HSV color coordinates by grouping leukocyte cell images (great hue value) into one cluster. The results show that the performance of our system as follows, sensitivity 84%, specificity 94%, and accuracy 97%.

## 1. Introduction

Blood is a liquid in the body that functions to carry the oxygen needed by cells throughout the body. Blood also supplies body tissues with nutrients, transports metabolic waste, and contains various ingredients that make up the immune system that aims to defend the body from various diseases. Blood cells consist of red blood cells erythrocytes, leukocytes, and platelets. Leukocytes are blood cells that function as the body's immune system. Increasing or decreasing the number of leukocytes in the blood, indicating various disorders and diseases. The number and diameter of leukocytes in the body could apply for the classification of types of leukocyte cells as well as indicators of abnormalities that can help medical staff diagnose diseases. On the other hand, the development of information technology, especially in terms of digital image processing, is also proliferating. This field is also widely used in the health sector, namely the field of medical image processing. One of the applications that have been widely developed is microscopic image processing, which includes processing and analyzing leukocytes based on image processing. According to this condition, currently a lot of research about leukocyte in the world. Nizam [1] researched intending to evaluate the efflux of leukocytes and platelets fibrin (L-PRF) and combining with bovine bone mineral in the treatment of maxillary sinus. Moshavash [2] researched texture-based leukocyte segmentation for leukemia identification. Li [3] developed a holographic imaging system to determine the differences in three

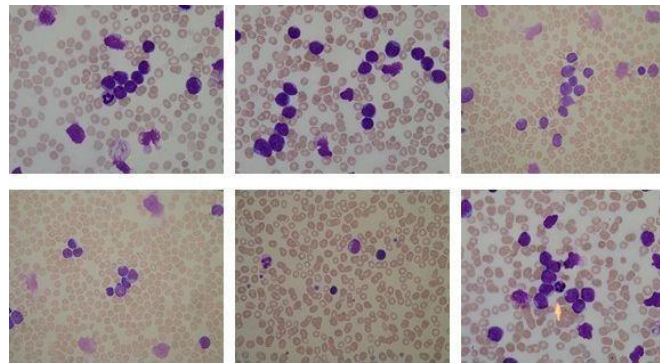


parts of leukocytes. Wang [4] used the use of machine learning in classifying leukocytes, in particular, the use of the Single Shot Multibox Detector method. The results obtained have a pretty good precision of around 90%. Choi [5] researched the automatic counting system of leukocytes cells from the bone marrow using a two-stage artificial neural network. After that, classify myeloid and erythroid. Reta [6] researched identifying leukocyte morphology by using the contextual analysis method in acute leukemia. Blood cell data came from the bone marrow. From this analysis, he can produce an automatic leukemia detection system with an accuracy of around 90%. Hegde [7] researched leukocyte image processing to detect cell nuclei and leukocyte classification based on cell core features using the TissueQuant method. The primary variable used in the identification and classification of this research is color. Abdulhay [8] researched leukocyte segmentation by focusing on identifying the region of interest (ROI) accurately. The input image used is a static microscopic image. Kelley [9] In his research, he uses a protocol used to explain multichannel in confocal images in living cells. The method he uses includes all stages of research, such as preparation, image synchronization, image acquisition, and quantitative analysis of leukocyte images. Loddo [10] reviewed a variety of research into the operation of blood cell morphology in the classification of various diseases that have relevance to blood cells. Our research also discusses the application of digital image processing in the health sector. The long-term goal of our research is the development of computer-aided diagnosis (CAD) in early detection of leukemia. Based on the fact that in developing countries like Indonesia, the number of specialist doctors is minimal. So that the presence of CAD can help improve the quality of health, especially optimal health services in the community. We have conducted several experiments in the context of developing CAD [11] [12][13][14][15][16][17]. In this paper, we focus on calculating the diameter and number of leukocytes using the K-means clustering method. The main objective is to obtain one of the leukocyte morphology variables precisely and accurately as apart of our CAD leukemia identification.

## **2. Methods**

### *2.1. Input images*

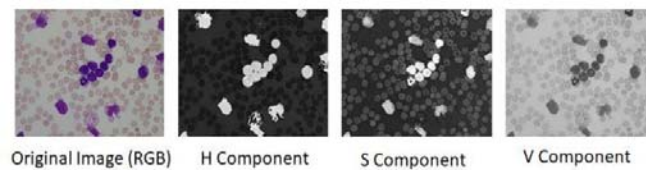
This experiment uses a digital image of blood cells taken from the Acute lymphoblastic Leukemia Image Database for Image Processing (ALL-IDB) of the University of Degli Studi in Milano, Italy, and is available at <http://crema.di.unimi.it/~fscotti/all/>. Image data available on ALL-IDB was taken with a laboratory optical microscope plus a Canon PowerShot G5 camera with different microscope magnifications ranging from 300 to 500. All images are in JPG format with 24-bit color depth and a resolution of 2592 x 1944. Figure 1 shows examples of input images which is used in this experiment. In this paper, we will analyze the results of the segmentation of white blood cell objects from the image of blood cells of Acute Lymphoblastic Leukemia (ALL) patients, which then count the number and diameter. There are two types of leukocytes cells in the image data, namely ordinary leukocyte cell objects that are dark blue in solid and round shape. Furthermore, abnormal leukocyte cell objects are purplish in blue and have a non-solid and round shape. Normal leukocyte cell objects to be segmented and counted in number and diameter.



**Figure 1.** Examples of input images

### 2.2. Pre-Processing Image

At the stage of image pre-processing, we performed contrast stretching operations and the conversion of RGB color space to HSV color space. Contrast stretching techniques have a function to improve image contrast so that the values of the image pixels are distributed evenly. It refers to the input image, as shown in Figure 1, each component of the image of a blood cell has low contrast; that is, the image pixels grouped in a particular area. The initial image is in the form of an RGB image that has been stretched out before contrast and then transformed into the HSV color space. Figure 2 shows an example of an input image that has been converted into the HSV color space and is ready for use in this research, especially for the image in the H component.



**Figure 2.** An example of an RGB image conversion to HSV color space

### 2.3. K-Means Clustering

K-means clustering is one type of clustering algorithm that is commonly used by grouping data according to similar characteristics. This data group is called a cluster. Data in a cluster has similar characteristics and is not similar to data in another cluster. The input received is the data or object and the desired group (cluster). This algorithm will group data or objects into these groups. In each cluster, there is a center point (centroid) that represents the cluster. The process of grouping data into a cluster could be done by calculating the closest distance from a data to a centroid point. The distance of each data to the centroid added, and the smallest total distance obtained. Minkowski distance calculation could use to calculate the distance between 2 pieces of data, as shown in Equation 1.

$$d(X_i, X_j) = (|X_{i1} - X_{j1}|^g + |X_{i2} - X_{j2}|^g + \dots + |X_{ip} - X_{jp}|^g)^{1/g} \quad (1)$$

which is:

$g = 1$ , to calculate Manhattan distance

$g = 2$ , to calculate Euclidian distance

$g = \infty$ , to calculate Chebychev distance

$x_i, x_j$  are the two data to be calculated the distance

$p$  = dimension of a data

If the total distance of each data is already obtained, then the centroid will be updated to the midpoint of the data in the cluster. The renewal of a centroid can be done by Equation 2.

$$-\sum \quad (2)$$

Which is  $\mu_k$  is centroid point of the K-cluster,  $N_k$  is the amount of data in the K cluster, and  $x_q$  is  $q$  data in the K-cluster.

#### 2.4. Number of Objects Calculation

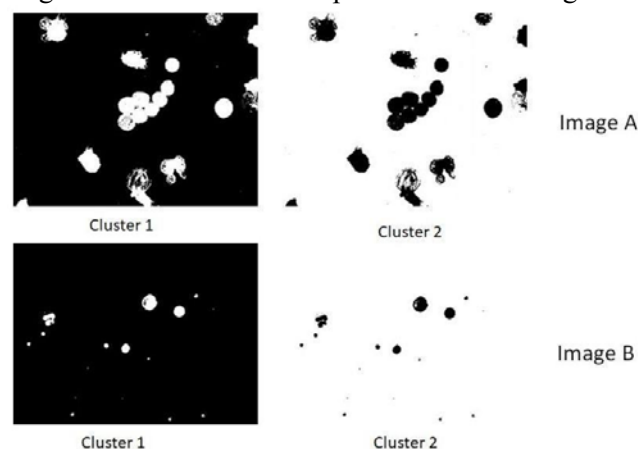
Calculation of leukocyte objects number by tracing the edge of pixels of each object or hole in the object. The results of the calculation would be stored in the matrix  $M \times 2$ , where the length  $M$  is the number of detected leukocyte cell objects.

#### 2.5. Object Diameter Calculation

Diameter is the longest distance between two points of a shape. In digital image processing can use the maximum distance between each pair of points that form an object. The calculation is quickly done by testing the points on the edges of the object, ie, the distance between each pair of edge points. This experiment will calculate the diameter of each object one by one —the result obtained by calculating the distance of the one-pixel pair and counting the other pixel pairs. Then the most significant distance between pixels is obtained and taken as the diameter of the object.

### 3. Results and Discussions

As already explained in Subsection 2, the image to be analyzed in this experiment is the image in the HSV color space, precisely the image of the H component only. In the hue component, leukocyte cell objects have a high intensity value used to segment leukocyte cell objects using the K-Means method. The hue component which is the matrix  $M \times N$  will be changed to  $2 \times (M * N)$ . This experiment has two clusters, cluster 1 for high-value data, and cluster 2 for low-value data. The system makes two centroids that represent each cluster. Data of each pixel that has been grouped is then labeled based on the cluster and stored for later in comparison with the original image so that the K-Means clustering segmentation image can be displayed. Figure 3 shows some examples of the clustering result.

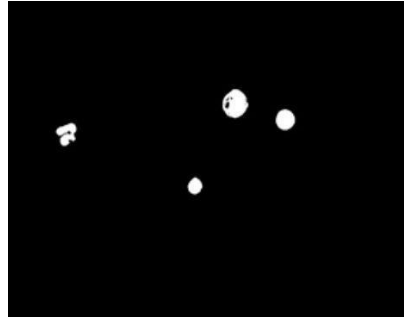


**Figure 3.** Examples of clustering

However, image segmentation results not only produce leukocyte cell images, but there is also much noise. If not removed, noise can interfere with subsequent processes. Our algorithm will delete

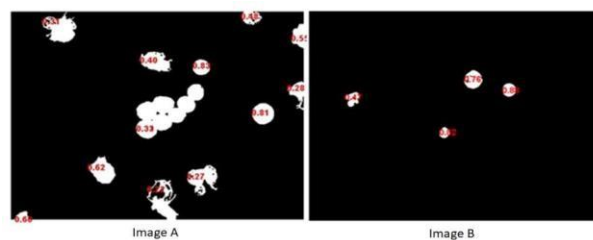


objects with a value of fewer than 500 pixels. After the noise is removed, the image of leukocytes will be obtained. Figure 4 shows an example of noise removal in image B.



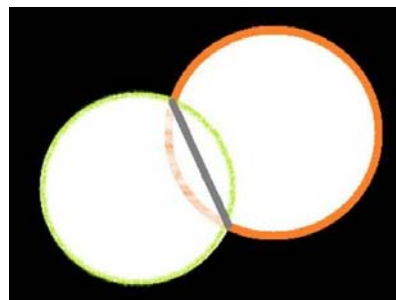
**Figure 4.** Image B after noise removal

According to Figure 3, there are several round objects. The first is a single leukocyte cell objects. The second is an irregularly shaped. The others are non-round objects are abnormal leukocyte cell objects, and almost round-shaped objects, which are several leukocyte cell objects which are attached to produce one only object. In order to get the number and diameter of leukocytes cells accurately, these leukocyte cell objects must be separated or cut. Before the object is almost rounded and not rounded, it must be grouped first in order to facilitate the process of cutting the leukocyte cell objects together. Figure 5 shows some examples of the results of measuring the degree of roundness of each object.



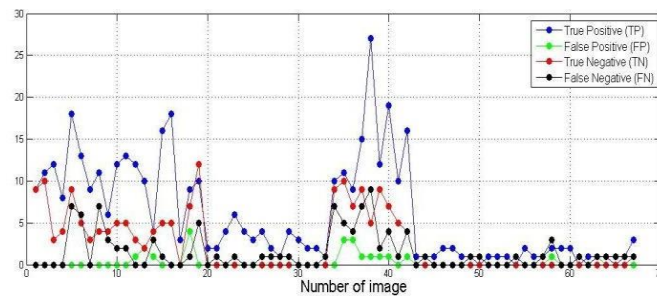
**Figure 5.** Examples of roundness degree measurement of each Object

Objects that have a degree of roundness approaching value 1 are increasingly rounded the object according to some of the experiments we did. Then the value of the degree of roundness to separate a single object that approaches 1 with a coincident object and unusual object is 0.77. If an object has a degree of roundness less than the boundary value, then the object will be grouped into coinciding and unusual objects, which will then be separated as shown in Figure 6.



**Figure 6.** Cutting two Circles Into Each Other

In the object that coincide will be detected several forms of intersecting circles. The area between the two intersecting circle points will then be cut as in Figure 6 so that the adjacent leukocyte cell object can be separated. System accuracy calculation uses sensitivity and specificity methods as we discussed in [17]. In the test using the sensitivity and specificity methods, then there are four variables used, namely True Positive (TP), True Negative (TN), False Positive (FP) and False Negative (FN). Calculation results are shown in Figure 7.



**Figure 7.** Graph of Calculation Results of Leukocyte Cell Count

Based on the results in Figure 7, the performance results that we obtain in this experiment are as shown in Table 1.

**Table 1.** Performance of Our System

No.	Performance	%
1.	Sensitivity	84%
2.	Specificity	94%
3.	Accuracy	97%

#### 4. Conclusions

Based on the results we have presented in the previous sub-section, our system can segment 67 cell leukocyte images using the K-Means clustering method. The first step is to improve the input images using contrast stretching operation and the conversion to the HSV color space. There are 2 clusters used, where cluster 1 succeeds in segmenting leukocytes cells, and cluster 2 succeeds in segmenting red blood cells. Although some noise should remove in the input image due to the degree of roundness that is not appropriate, our system can get a sensitivity performance of 84%, a specificity of 94%, and an accuracy of 97%. These results are quite promising for the further development of computer-aided rediagnosis.

#### Acknowledgements

We want to thank the Ministry of Research and Technology - BRIN for funding support through the Fiscal Year 2020 "Penelitian Terapan" Grant.

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