

DREAM:

**Digital Reconstruction and
Enhanced of Ancient Manuscripts**

Setiawan Hadi

**Anggota INAPR
Universitas Padjadjaran**

Agenda

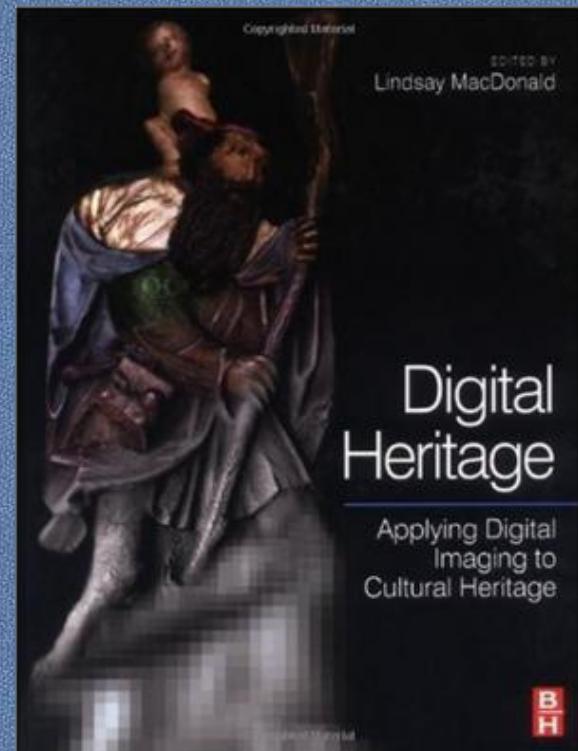
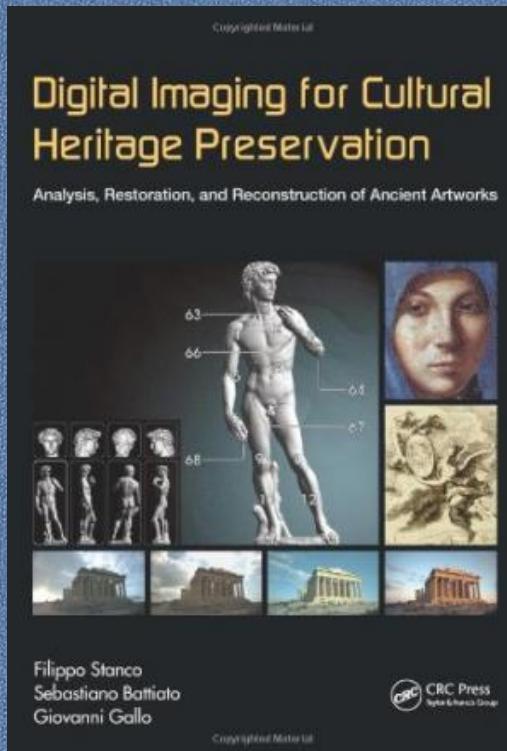
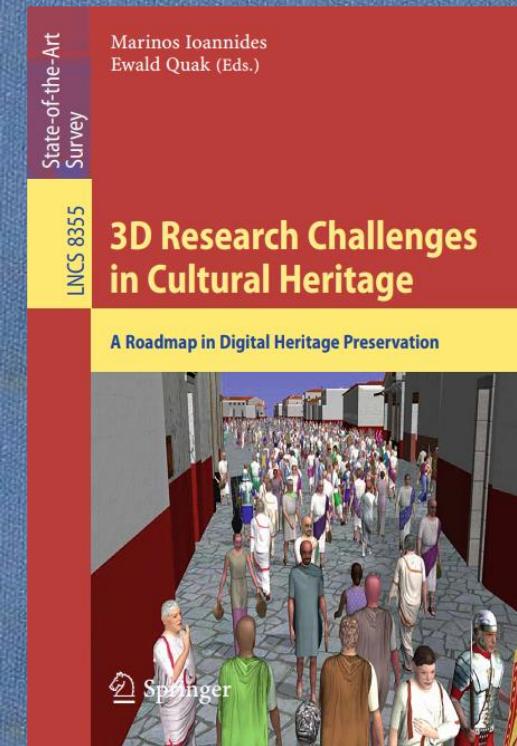
- Research in Ancient Manuscripts???
- Previous Project Overview
 - AMADI
 - AMIRA
- Next Work : DREAM



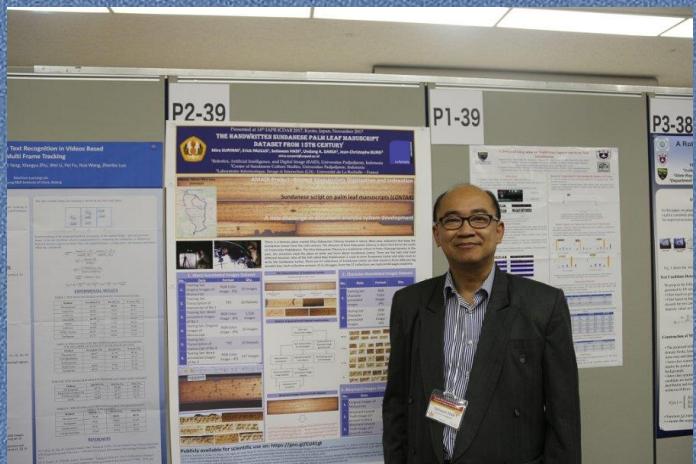
Research in Ancient Manuscripts ???



Books



Conferences



https://u-pat.org/ICDAR2017/album/Nov.14%20Main%20Conference%20Day2/slides/IMG_8459.html

Journals



Journal of
Imaging
applied sciences

Competition/Challenges

DIBCO, ICFHR 2016, ICFHR 2018

2019 International Conference on Document Analysis and Recognition (ICDAR)

ICDAR 2019 Competition on Document Image Binarization (DIBCO 2019)

DIBCO '19

Home Resources/Evaluation Registration

DIBCO 2019

ICDAR 2019 Document Image Binarization Competition

16th International Conference on Frontiers in Handwriting Recognition

ICFHR 2018

Niagara Falls, USA, August 5 - 8, 2018



Competition on Document Image Analysis Tasks for
Southeast Asian Palm Leaf Manuscripts

2016 15th International Conference on Frontiers in Handwriting Recognition

**ICFHR 2016 Competition on the Analysis of Handwritten Text in Images of
Balinese Palm Leaf Manuscripts**

Jean-Christophe Burie¹, Mickael Coustiaty¹, Setiawan Hadi³, Made Windu Antara Kesiman^{1,2}, Jean-Marc Ogier¹, Erick Paulus³, Kimheng Sok⁴, I Made Gede Sunarya² and Dona Valy⁴,

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{jean-christophe.burie, mickael.coustiaty, made_windu_antara.kesiman, jean-marc.ogier}@univ-lr.fr

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Jalan Udayana No 11, 81116, Singaraja, Bali, Indonesia

³Robotics, Artificial Intelligence, and Digital image (RAID) Laboratory,
University of Padjajaran, Bandung, Indonesia

⁴Department of Information and Communication Engineering,
Institute of Technology of Cambodia, Cambodia

Etnoinformatika



Previous Project Overview

AMADI



Dossier de candidature STIC ASIE 2015

1 - Projet

Titre et acronyme: Ancient manuscripts digitization and indexation

Domaine : 9 - Sciences et technologies de l'information et de la communication

Section CNU : INFORMATIQUE

<http://amadi.univ-lr.fr/partners.php>



Discover AMADI

Bahasa Indonesia ▾ Login Contact

Amadi Home Form of Kaganga Lontar Search Skriptorium Sunda About Project Log Activity Members Visualisasi Naskah

Amadi Project
Ancient MAnuscripts Digitation and Indexation

Form of Kaganga Skriptorium Sunda Lontar Search

Project Purpose



Digitization



Digital
Images



Indexation

AMADI : Ancient Manuscripts Acquisition and Indexation

Research Collaboration



Acquisition of Sundanese Ancient Manuscripts



Digitization Process



Set up the environment

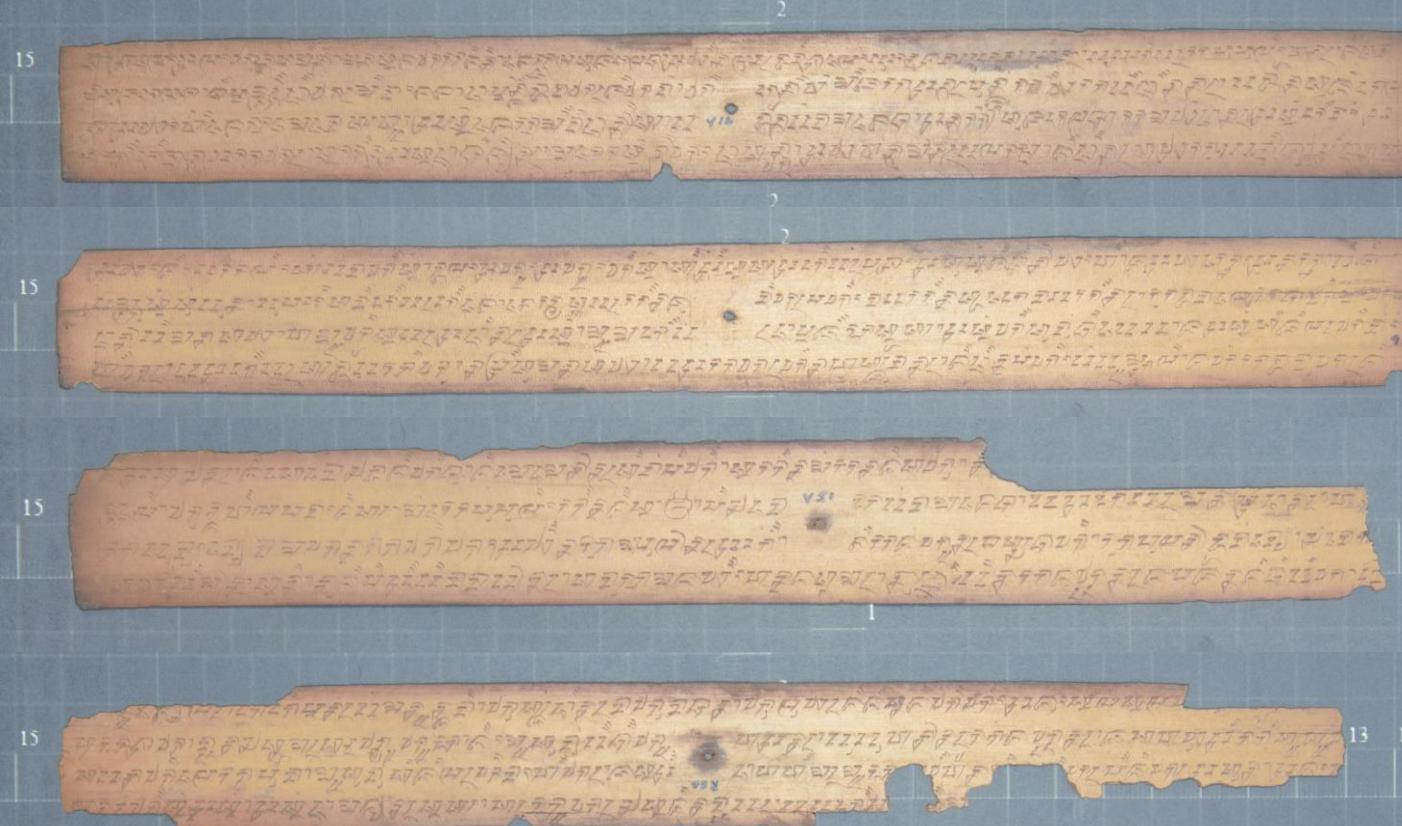


Check the elevation of the camera



Prepare the Lontar

Results



The screenshot shows the Amadi Project website. At the top, there is a navigation bar with links: Home, Form of Kaganga, Lontar Search, Skriptorum Sunda, About Project, Log Activity, Members, and Visualisasi Naskah. Below the navigation bar, there is a banner with the text "Amadi Project" and "Ancient MAnuscripts Digitization and Indexation". The banner features several small images related to the project. Below the banner, there is a section titled "Dashboard" with the following data:

| Category | Value | Icon |
|-----------------|-------|------------------|
| Data | 1456 | Bag icon |
| Transliteration | 558 | Bar chart icon |
| Translate | 2 | Donut chart icon |
| BOX 1 | 522 | Bag icon |
| BOX 2 | 598 | Bag icon |
| BOX 3 | 332 | Bag icon |

Judul Ciptaan

Tanggal dan tempat diumumkan untuk pertama kali
di wilayah Indonesia atau di luar wilayah Indonesia

: **FOTO KOLEKSI LONTAR DI SITUS KABUYUTAN CIBURUY**
: 8 Agustus 2019, di Universitas Padjadjaran Jatinangor

Indexation

- Labelling
- Annotation and Segmentation
- Transliteration
- Translation





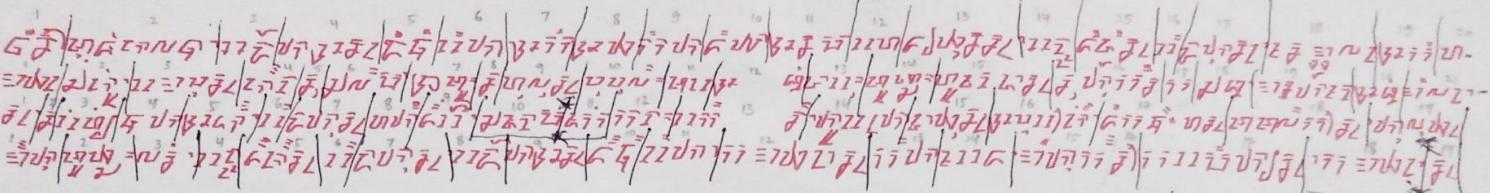
Digitized version of the manuscript strip above, showing the same text in a clear, modern red font. The text is a continuous block of Indonesian script, likely a transcription of the original handwritten text.



Indexation

- Labelling
- Annotation and Segmentation
- Transliteration
- Translation

1. 3306.tif



- (1) ngeun**nna**bujanggalawa/ saurtaan¹deuwisita/ akiaya²kita dinya/ anak³sahadyayunan/ sa-rwa⁴deungeunsiutun/
némbal⁵aki ha-
- (2) maycanggong/ samapungeura⁶nu/cali⁷k/ ébohnahulunpupulih/ basaaingngasuhbonycah⁸/
horénganputurkeun⁹kacai/ mantaré¹⁰aing milanga-
- (3) n/ na sanghyang watang ageung/ si utun hateudingsir/ carékkéng¹¹karah sakini/ tosta ngayun apus sageung¹²/
dikawihhan¹³babali**kkkan**¹¹/ tuluy/
- (4) metubonycah¹⁴lanang/ sa-rwa¹⁵deungeunsiutun/ saurtaandeuwisia/ kamayangan kitaseda/
metukeuna**nnna**¹⁴kasaktyin/ kamayangananaing

1. 3306.tif

(1) ngeun**nna**bujanggalawa/ saur taan deuwi sita/ aki aya kita dinya/ anak¹saha dyayunan/ sa-rwa²deungeun si utun/
borsoma bujanggalan¹ kato tuan Dovi sita¹ Kakde ada kamu disitu/ ana siapa di~~ng~~² borian¹ sama dengan si buyung/
némbal³ aki ha- menjawat kakel ha-

(2) may canggong/ samapun geura nu calik⁴/ éboh na hulun pupulih/ basa aing ngasuh bonycah⁵/ horéngan
May canggong / Silakan duduk dulu/ ~~akan~~⁶ say⁷ beritahu ketika saya mengajui anak / Terengata
nuturkeun⁸ ka cai/ mantaré⁹ aing milanga- pergi ke suguai/ semerdana atau ~~ng~~¹⁰ neumbara

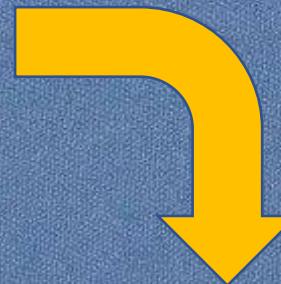
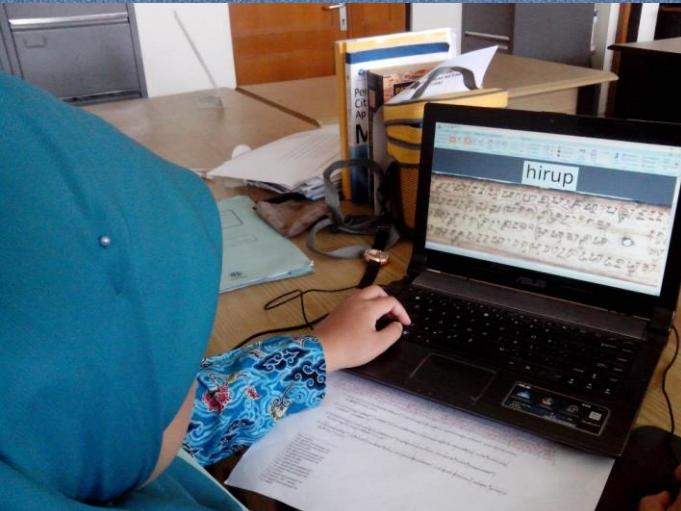
(3) n/ na sanghyang watang ageung/ si utun hateu dingsir/ carékkéng¹¹karah sakini/ tosta ngayun apus sageung¹²/
saughyang watang ageung/ Si buyung tidak kucau/ jadi akutakatakan/ setelah mengayun kitab suci/
dikawihhan¹³babali**kkkan**¹¹/ tuluy dimanyangkan pautun / lalu

(4) metu bonycah¹⁴lanang/ sa-rwa¹⁵deungeun si utun/ saur taan deuwi sita/ kamayangan kita seda/ metukeuna**nnna**¹⁴
keluar anak lahi¹⁵ / Sama dengan si buyung/ kato tuan dari sita/ benarlah eyhan sethi/ mezeluaran
lehetian/ lenar¹⁶ aken



Indexation

- Labelling
- Annotation and Segmentation
- Transliteration
- Translation



```
Notepad - New Text Document - Notepad
File Edit Format View Help
<?xml version="1.0" encoding="UTF-8"?>
<PgGts xmlns="http://schema.primaresearch.org/PAGE/gts/pagecontent/2013-07-15"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" \
  xsi:schemaLocation="http://schema.primaresearch.org/PAGE/gts/pagecontent/2013-07-15
    http://schema.primaresearch.org/PAGE/gts/pagecontent/2013-07-15/pagecontent.xsd">
  <Metadata>
    <Creator></Creator>
    <Created>2015-10-04T21:40:38</Created>
    <LastChange>2015-10-08T07:50:07</LastChange></Metadata>
    <Page imageFilename="3306_new.tif" imageWidth="3025" imageHeight="326">
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        <TextLine id="templine357564684568544579089">
          <Coords points="0,0 1,0 1,1 0,1"/>
          <Word id="r1">
            <Coords points="101,9 100,19 94,28 88,42 77,44 67,48 57,48 53,58 55,68 60,77 69,83 80,83 90,81 102,82 111,87 121,89
              130,82 140,77 149,72 159,71 169,69 175,60 180,50 181,40 184,30 184,19 177,11 167,7 157,6 102,6"/>
            <TextEquiv>
              <Unicode>ngeunna</Unicode></TextEquiv></Word>
```

Indexation

- Labelling
- Annotation and Segmentation
- Transliteration
- Translation Word



Syllable

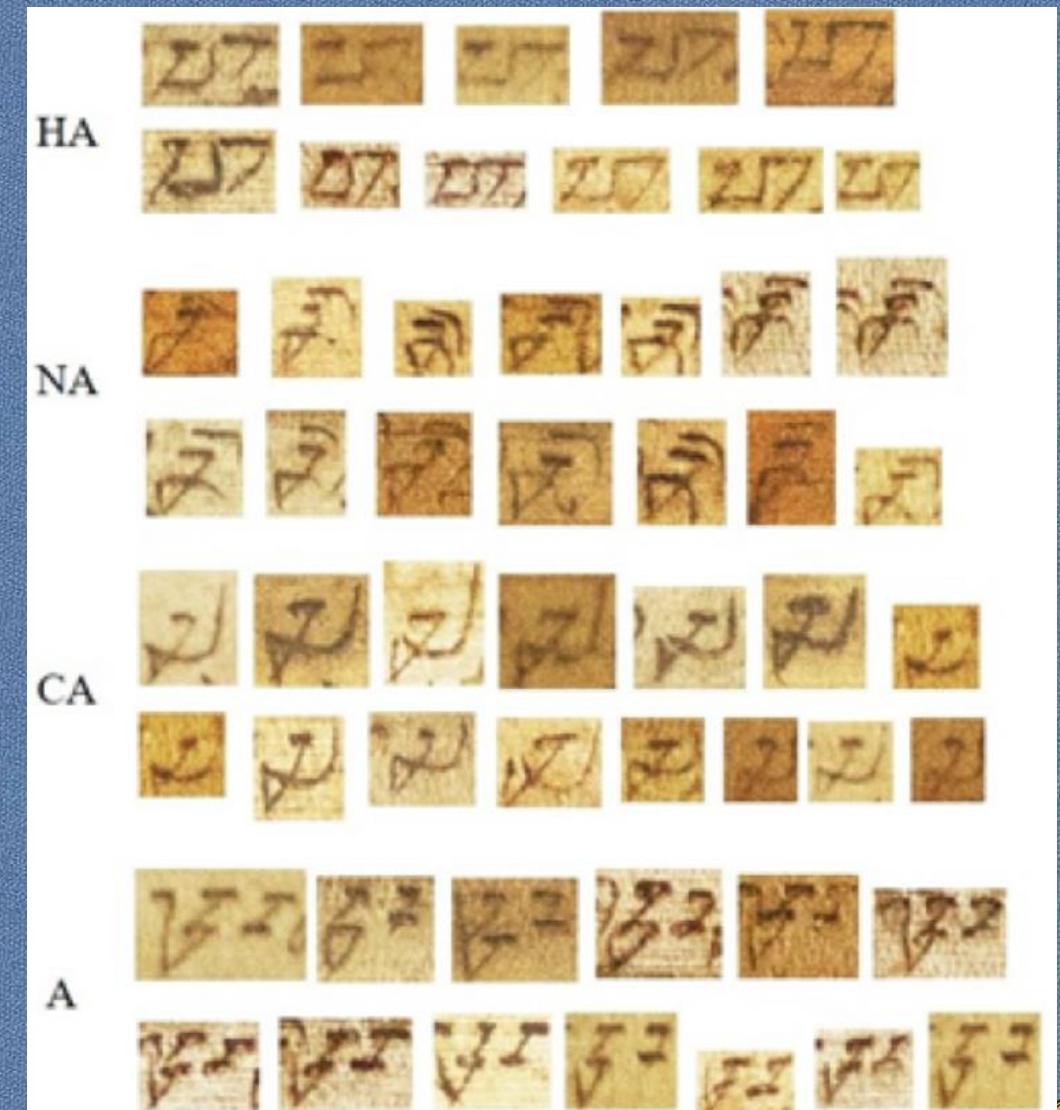
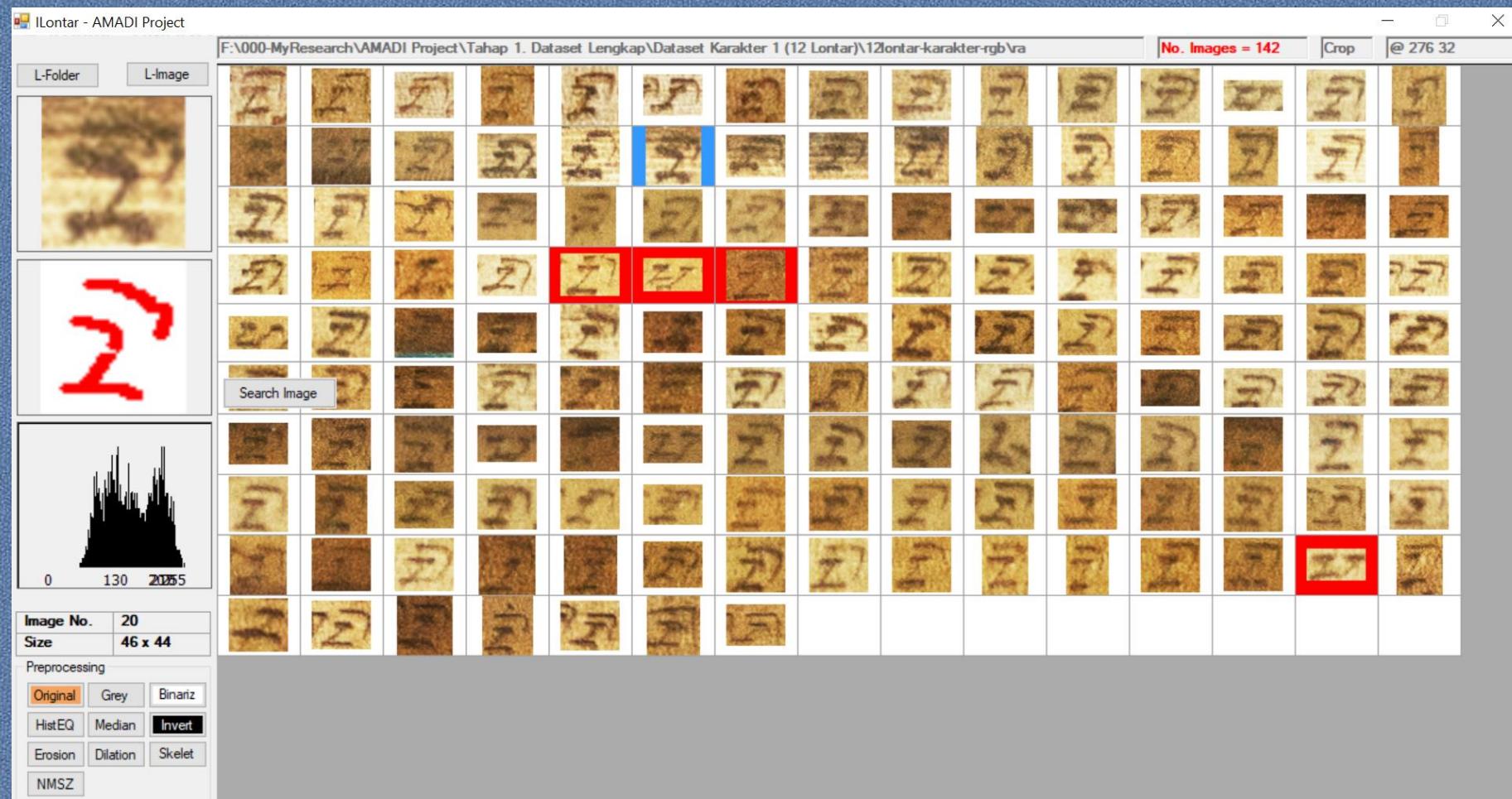
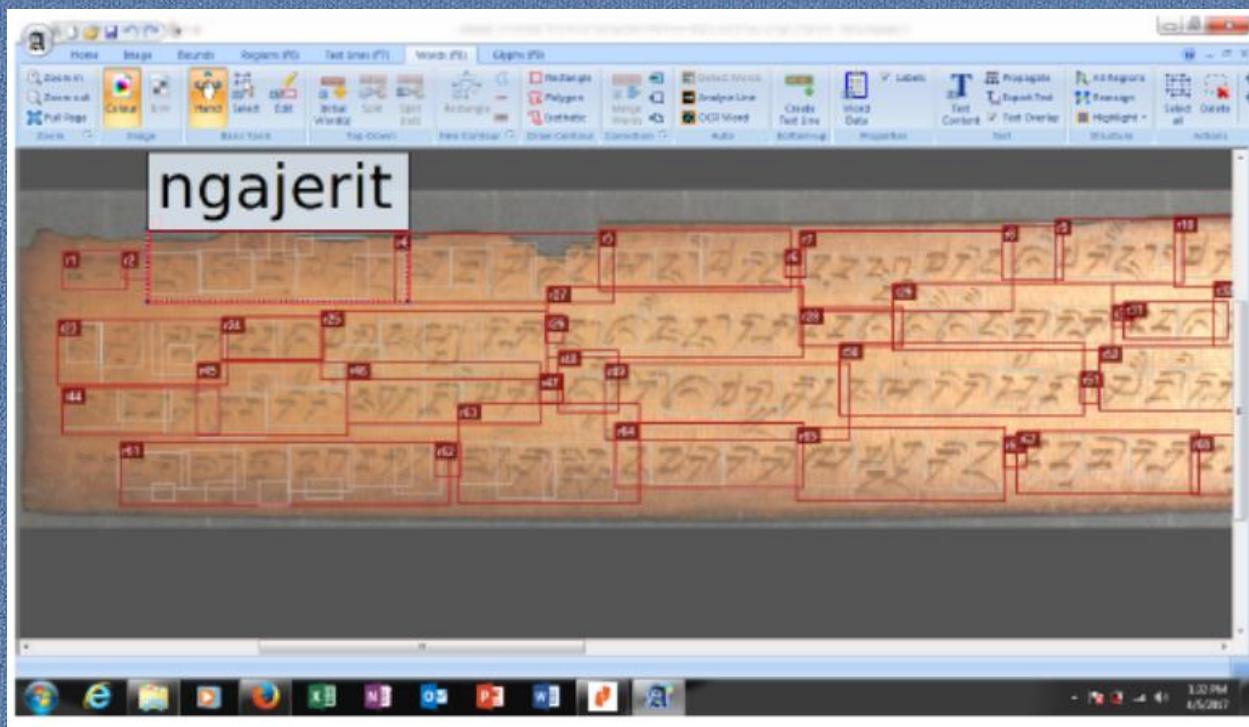


Image Processing

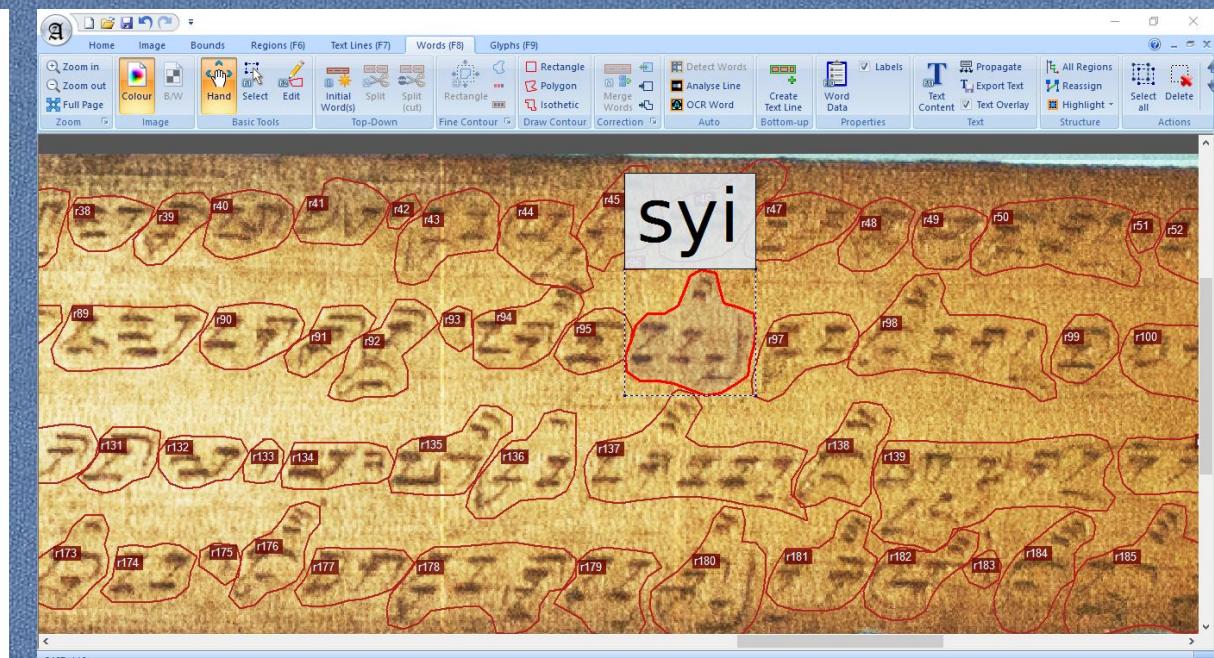


Segmentation and Annotation

Word



Syllable



Searching Lontar by Text

prabu bibisana

Doc No. 3309

Transliteration

sana/ ayeuna nu ngareungeuhheun/ nyeueung inya hirup deui/ pamrerang sa-ryénana/ pajurit ratu rawana/ saur pra bibisana/ puu- n patih sang sombali / rampés nu cacalikkannan/ ka manggung deukeut awakking/ carék patih sang sombali/ rampés a- loéng sumanger/ naréma na panyundukeun/ ugah prabu manabaya/ deungeun radén mégananda / deungeun patih sang sombali / nu ré- a di pada handap / di lemah mayaknu séba/ tuluy dibéré lemarreun/ saur prabu bibisana/ rampés geura nu ngalemar/ puun

Translation

sekarang yang terheran-heran melihat mereka hidup lagi tentara semuanya prajurit raja rawana kata prabu bibisana paman patih sang sombali silahkan duduklah ke atas dekat aku kata patih sang sombali baiklah anakku yang bahagia aku terima sambutannmu naiklah prabu manabaya dengan raden megananda serta patih sang sombali orang banyak duduk di bawah di tanah penuh menghadap lalu diberi sirih pinang kata prabu bibisana silahkan anda meminang paman

Doc No. 3312

Sample Publications

A Novel Scheme for Handwritten Binarization Method on Sundanese Palm Leaf Document Images

Erick Paulus, Mira Suryani, Setiawan Hadi and Intan Nurma Yulita
Computer Science Department
University of Padjadjaran

Correcting circular non-uniform illumination of Sundanese lontar images

S Hadi, M Suryani, E Paulus, and A K Supriatna
Department of Computer Science, University of Padjadjaran
Jalan Raya Bandung Sumedang KM21 Jatinangor 45363, INDONESIA

Improved Line Segmentation Framework for Sundanese Old Manuscripts

E Paulus, M Suryani, S Hadi
Department of Computer Science, University of Padjadjaran, Jalan Raya Bandung Sumedang
KM21 Jatinangor 45363, INDONESIA

Southeast Asian palm leaf manuscript images: a review of handwritten text line segmentation methods and new challenges

Made Windu Antara Kesiman^{a,b,*}, Dona Valy^{c,d}, Jean-Christophe Burie^a, Erick Paulus^e, I. Made Gede Sunarya^b, Setiawan Hadi^e, Kim Heng Sok^c, and Jean-Marc Ogier^a

ICFHR 2016 Competition on the Analysis of Handwritten Text in Images of Balinese Palm Leaf Manuscripts

Jean-Christophe Burie¹, Mickael Coustaty¹, Setiawan Hadi³, Made Windu Antara Kesiman^{1,2}, Jean-Marc Ogier¹, Erick Paulus³, Kimheng Sok⁴, I Made Gede Sunarya² and Dona Valy⁴,

Benchmarking of Document Image Analysis Tasks for Palm Leaf Manuscripts from Southeast Asia

Made Windu Antara Kesiman^{1,2,*}, Dona Valy^{3,4}, Jean-Christophe Burie¹, Erick Paulus⁵, Mira Suryani⁵, Setiawan Hadi⁵, Michel Verleysen², Sophea Chhun⁴ and Jean-Marc Ogier¹



Final Seminar of AMADI



Previous Project Overview

AMIRA



AMIRA : Ancient Manuscript Image Retrieval and Analysis

- Dimulai 2019
- Perkembangan AI
- Optimalisasi pemanfaatan data
 - Penggunaan CNN untuk pencarian karakter
 - Image-based Search
 - Pemanfaatan untuk pembelajaran
- Publikasi Ilmiah





AMIRA: AI Image Retrieval for Ancient Manuscript
Deep exploration in cultural heritage understanding
 S. Hadi, M. Suryani, A. Pradana, E. Paulus, S. Nadhiroh
 Artificial Intelligence Summit 2020, 10 - 13 November 2020, Indonesia



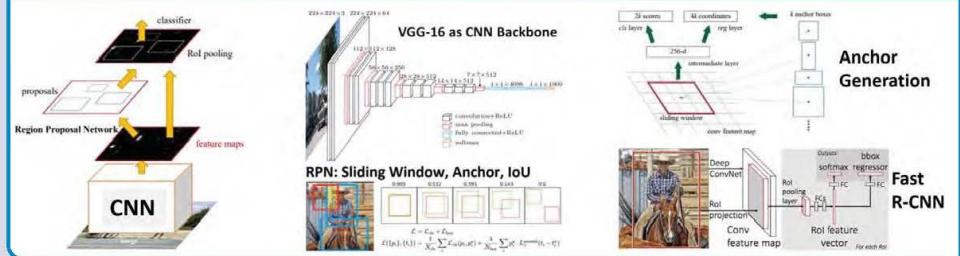
BACKGROUND

ANCIENT manuscript exploration initiative AMADI was initiated in 2015 through the AMADI international collaborative research project. The Sundanese ancient manuscripts stored in the Kabuyutan Ciburuy Site were chosen as the object of our research. There are 1452 ancient manuscripts called lontar, which have been digitized, indexed and stored in our repository <http://amadi.unpad.ac.id>. AMIRA is the next step of AMADI where we implement machine learning and deep learning algorithms based on artificial intelligence to explore and analyze digitized ancient manuscripts. AMIRA will help people to search data in the repositories according to their needs based on image or text. It will also support students learning invaluable ancient manuscripts for the sake of preserving the national cultural heritage.

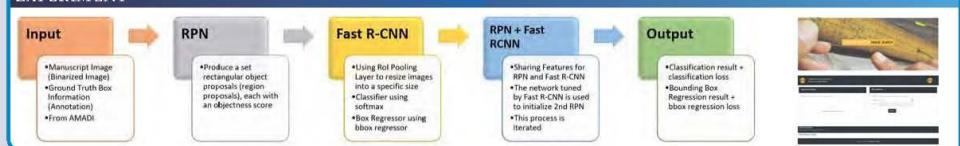
DATA GROUNDTRUTH GENERATION (AMADI)



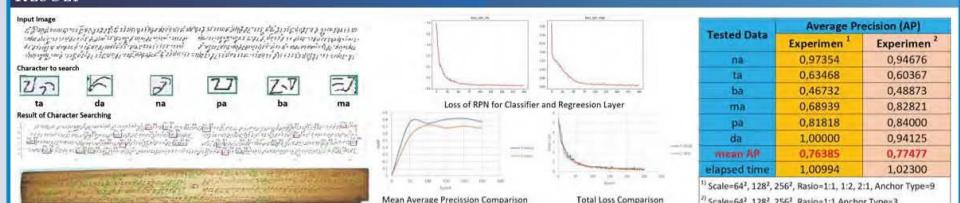
METHOD : FASTER REGION CONVOLUTIONAL NEURAL NETWORK (FASTER R-CNN)



EXPERIMENT



RESULT



AMIRA RESEARCH PARTNER



URL LINK

- Public link for data : <https://goo.gl/EU41gt>
- Public link for application : TBA.
- AMADI website <http://amadi.unpad.ac.id>.

CONTACT

Dr. Setiawan Hadi, M.Sc.CS.
 Robotics, AI and Digital image (RAID) Laboratory
 Universitas Padjadjaran, Bandung, Indonesia
 E-Mail: setiawanhadi@unpad.ac.id

<https://youtu.be/mIAGTdTNTxJE>





http://167.99.71.190/





AMIRA

Ancient Manuscript Image Retrieval and Analysis



Upload Image

Please upload image as a key



Drag and drop a file here or click

Choose Method

Choose Method that will be used

Method

HOG

Status

Choose

HOG

POCHNET

Result

result data

No Result

<https://youtu.be/JyorLuGnzX8>



Working Publications

International Journal on Document Analysis and Recognition manuscript No.
(will be inserted by the editor)

From Digitization to Indexation of Sundanese Ancient Manuscripts: An Effort to Preserve Indonesian Cultural Heritage using Modern Technology

S. Hadi • U.A. Darsa • E. Paulus • M. Suryani • J.C. Burie

IEEE Access
Multidisciplinary | Rapid Review | Open Access Journal

Date of publication xxxx 00, 0000, date of current version xxxx 00, 0000.
Digital Object Identifier 10.1109/ACCESS.2017.DOI

Image Query Searching for Historical Palm Leaf Manuscript Image

S. HADI¹, (Member, IEEE), E. Paulus^{1,2},(Member, IEEE), M. Suryani¹,(Member, IEEE),S. Saori¹, CS. Romadhon¹, JC. Burie³, (Member, IEEE), and F.J. Verbeek², (Member, IEEE).

Article

Image Retrieval System for Sundanese Ancient Characters on Lontar Manuscript using Faster R-CNN

Setiawan Hadi ^{1,‡} 0000-0002-2929-5979, Mira Suryani ^{1,†}, Shofiyah Nadhiroh^{1,‡}, Anton Satria Prabuwono ^{2,‡} and Atje Setiawan Abdullah ^{1,*}



"Binarization Techniques For Manuscript Images of The Chiselled Sundanese Characters"

Journal : IEEE Access or EURASIP Journal on Image and Video Processing

12:50 PM

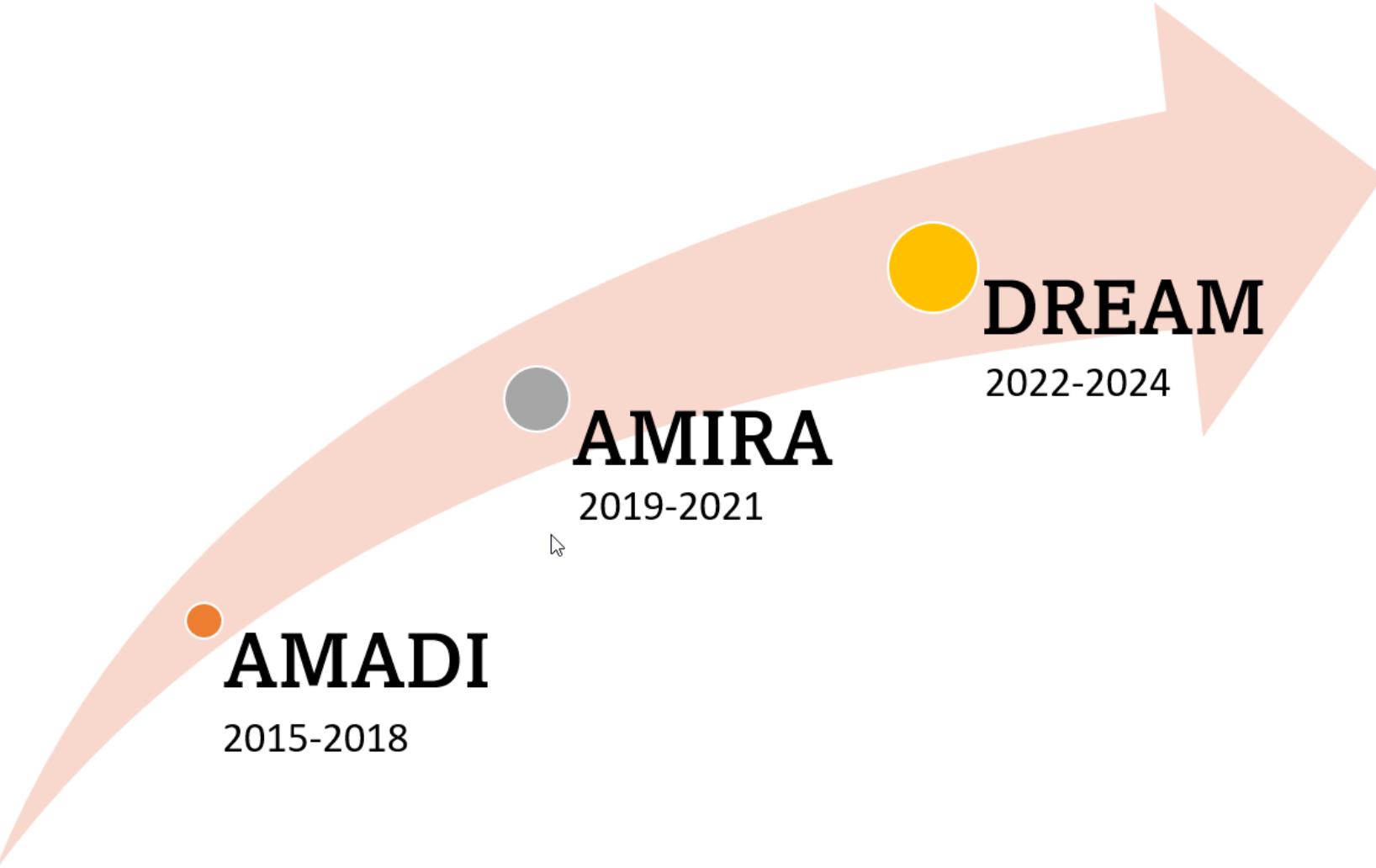


Next Work

DREAM



Roadmap Riset dalam bidang Manuskrip Kuno



DREAM

- Lontar sangat sensitif dalam hal
 - Penyimpanan
 - Penanganan
 - Suhu dan kelembaban
 - Dll
- Kerusakan fisik mengakibatkan hilangnya catatan peradaban masa lalu yang berarti **hilangnya data dan informasi**



KATEGORI LONTAR RUSAK



Why DREAM?

- Hasil anotasi dan segmentasi untuk setiap aksara (syllable, word)
- Pelibatan Filolog
- Prosedur *preprocessing* yang jelas
- Tersedianya data lontar yang rusak
- Sebagian dataset sudah dipublikasikan dan dapat diakses di <https://goo.gl/EU41gt>

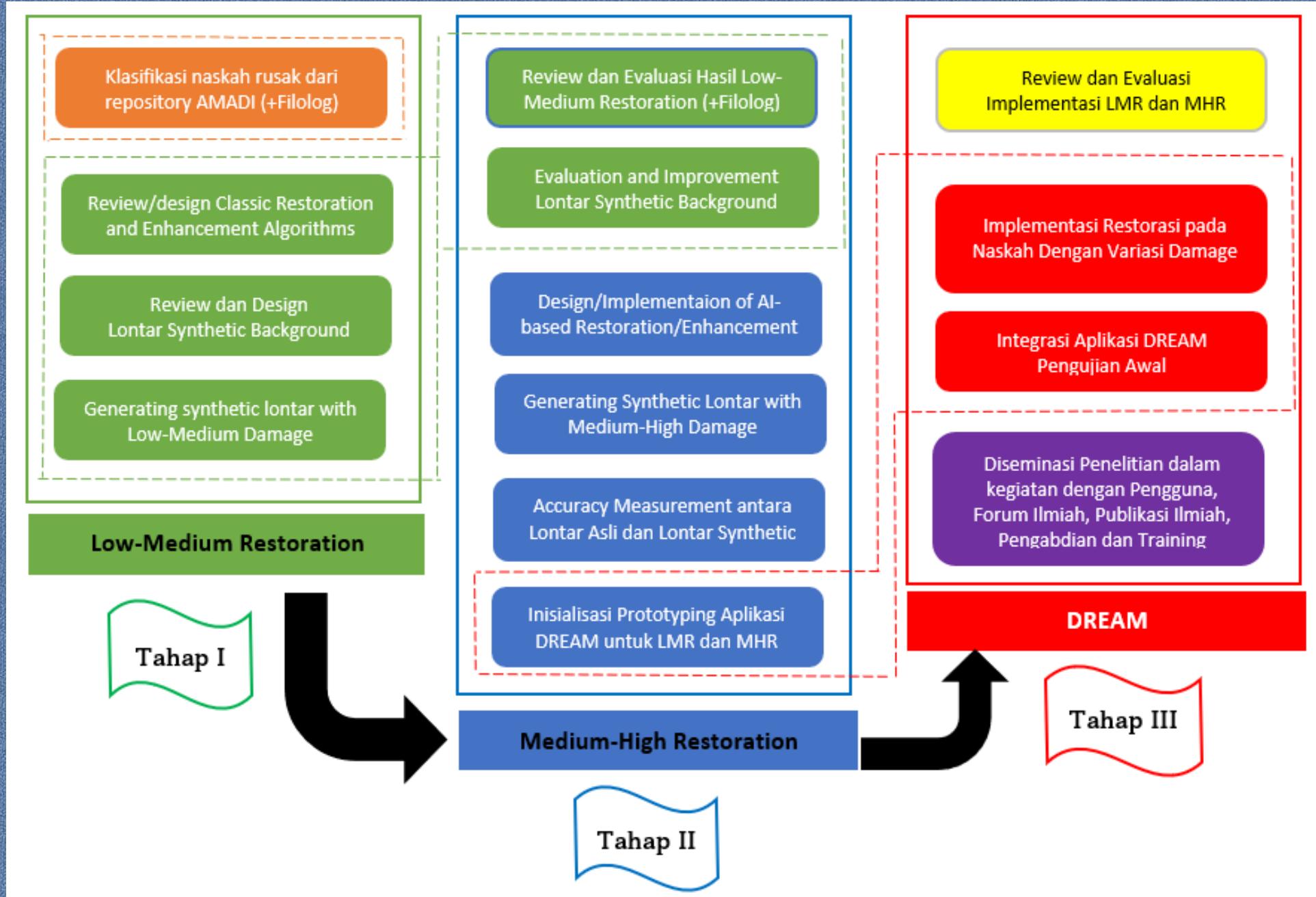


Aksara Ngalagena

| No. | Harkat Sora | Prasasti | | | Naskah | | | | | | | | Ciburuy | | | |
|-----|----------------|----------|------|-------|--------------|-----|-----|-----|-----|-----|-----|-----|---------|-----|-----|-----|
| | | Kwl. | Btl. | Kbtn. | Perpustakaan | | | | | | I | II | III | IV | | |
| | | | | | CP | FCP | CRP | PRR | SD | BM | | | | | | |
| 1. | Ka | ଠ | ଠ | ଠ | ଠ | ଠ | ଠ | ଠ | ଠ | ଠ | ଠ | ଠ | ଠ | ଠ | ଠ | ଠ |
| 2. | Ga | ଠ | ଠ | ଠ | ୟ | ୟ | ୟ | ୟ | ୟ | ୟ | ୟ | ୟ | ୟ | ୟ | ୟ | ୟ |
| 3. | Nga | ଙ୍ଗ | ଙ୍ଗ | ଙ୍ଗ | ଙ୍ଗ | ଙ୍ଗ | ଙ୍ଗ | ଙ୍ଗ | ଙ୍ଗ | ଙ୍ଗ | ଙ୍ଗ | ଙ୍ଗ | ଙ୍ଗ | ଙ୍ଗ | ଙ୍ଗ | ଙ୍ଗ |
| 4. | Ca | - | ଚ | ଚ | ଚ | ଚ | ଚ | ଚ | ଚ | ଚ | ଚ | ଚ | ଚ | ଚ | ଚ | ଚ |
| 5. | Ja | ଜ୍ଞ | ଜ୍ଞ | ଜ୍ଞ | ଜ୍ଞ | ଜ୍ଞ | ଜ୍ଞ | ଜ୍ଞ | ଜ୍ଞ | ଜ୍ଞ | ଜ୍ଞ | ଜ୍ଞ | ଜ୍ଞ | ଜ୍ଞ | ଜ୍ଞ | ଜ୍ଞ |
| 6. | Nya | - | ଣ୍ଣ | ଣ୍ଣ | ଣ୍ଣ | ଣ୍ଣ | ଣ୍ଣ | ଣ୍ଣ | ଣ୍ଣ | ଣ୍ଣ | ଣ୍ଣ | ଣ୍ଣ | ଣ୍ଣ | ଣ୍ଣ | ଣ୍ଣ | ଣ୍ଣ |
| 7. | Ta | ତ | ତ | ତ | ତ | ତ | ତ | ତ | ତ | ତ | ତ | ତ | ତ | ତ | ତ | ତ |
| 8. | Da | ଦ | ଦ | ଦ | ଦ | ଦ | ଦ | ଦ | ଦ | ଦ | ଦ | ଦ | ଦ | ଦ | ଦ | ଦ |
| 9. | Na | ନ୍ଦ | ନ୍ଦ | ନ୍ଦ | ନ୍ଦ | ନ୍ଦ | ନ୍ଦ | ନ୍ଦ | ନ୍ଦ | ନ୍ଦ | ନ୍ଦ | ନ୍ଦ | ନ୍ଦ | ନ୍ଦ | ନ୍ଦ | ନ୍ଦ |
| 10. | Pa | ପ | ପ | ପ | ପ | ପ | ପ | ପ | ପ | ପ | ପ | ପ | ପ | ପ | ପ | ପ |
| 11. | Ba | ବ୍ୟ | ବ୍ୟ | ବ୍ୟ | ବ୍ୟ | ବ୍ୟ | ବ୍ୟ | ବ୍ୟ | ବ୍ୟ | ବ୍ୟ | ବ୍ୟ | ବ୍ୟ | ବ୍ୟ | ବ୍ୟ | ବ୍ୟ | ବ୍ୟ |
| 12. | Ma | ମ୍ବ | ମ୍ବ | ମ୍ବ | ମ୍ବ | ମ୍ବ | ମ୍ବ | ମ୍ବ | ମ୍ବ | ମ୍ବ | ମ୍ବ | ମ୍ବ | ମ୍ବ | ମ୍ବ | ମ୍ବ | ମ୍ବ |
| 13. | Ya | ଯ୍ୟ | ଯ୍ୟ | ଯ୍ୟ | ଯ୍ୟ | ଯ୍ୟ | ଯ୍ୟ | ଯ୍ୟ | ଯ୍ୟ | ଯ୍ୟ | ଯ୍ୟ | ଯ୍ୟ | ଯ୍ୟ | ଯ୍ୟ | ଯ୍ୟ | ଯ୍ୟ |
| 14. | Ra | ର୍ମ | ର୍ମ | ର୍ମ | ର୍ମ | ର୍ମ | ର୍ମ | ର୍ମ | ର୍ମ | ର୍ମ | ର୍ମ | ର୍ମ | ର୍ମ | ର୍ମ | ର୍ମ | ର୍ମ |
| 15. | La | ଲ୍ଲ | ଲ୍ଲ | ଲ୍ଲ | ଲ୍ଲ | ଲ୍ଲ | ଲ୍ଲ | ଲ୍ଲ | ଲ୍ଲ | ଲ୍ଲ | ଲ୍ଲ | ଲ୍ଲ | ଲ୍ଲ | ଲ୍ଲ | ଲ୍ଲ | ଲ୍ଲ |
| 16. | Wa | ଓ | ଓ | ଓ | ଓ | ଓ | ଓ | ଓ | ଓ | ଓ | ଓ | ଓ | ଓ | ଓ | ଓ | ଓ |
| 17. | Sa | ଶ୍ର | ଶ୍ର | ଶ୍ର | ଶ୍ର | ଶ୍ର | ଶ୍ର | ଶ୍ର | ଶ୍ର | ଶ୍ର | ଶ୍ର | ଶ୍ର | ଶ୍ର | ଶ୍ର | ଶ୍ର | ଶ୍ର |
| 18. | Ha | ହ୍ର | ହ୍ର | ହ୍ର | ହ୍ର | ହ୍ର | ହ୍ର | ହ୍ର | ହ୍ର | ହ୍ର | ହ୍ର | ହ୍ର | ହ୍ର | ହ୍ର | ହ୍ର | ହ୍ର |
| 19. | Bha | ଭ୍ର | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 20. | Le/Leu | - | - | - | ଲ୍ଲ | - | ଲ୍ଲ | ଲ୍ଲ | ଲ୍ଲ | ଲ୍ଲ |
| 21. | Re/Reu | ର୍ମ | ର୍ମ | ର୍ମ | ର୍ମ | ର୍ମ | ର୍ମ | ର୍ମ | ର୍ମ | ର୍ମ | ର୍ମ | ର୍ମ | ର୍ମ | ର୍ମ | ର୍ମ | ର୍ମ |
| 22. | Tra | - | - | - | - | ତ୍ର | - | - | ତ୍ର | - | - | - | - | - | - | - |
| 23. | Ro | - | - | - | ର୍ମ | - | - | - | - | - | - | - | - | - | - | - |
| 24. | | | | | | | | | | | | | | | | |



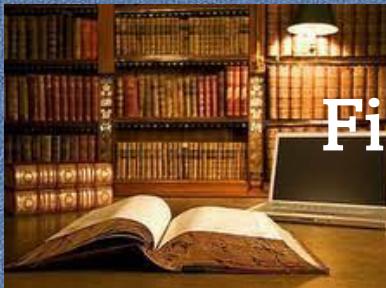
Steps



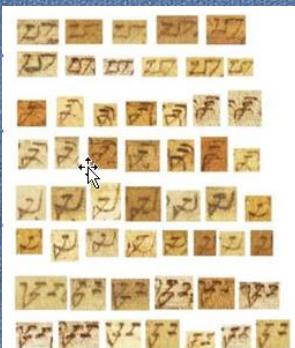
Synthetic Lontar Generation



Penentuan aksara yang hilang



Filolog



Generate synthetic background dan aksara yang hilang



| | | |
|----------------|--------------------|---|
| Tahun 1 | <i>Hak Cipta</i> | Metode Restorasi dan Enhancement Naskah kuno Menggunakan Teknik Klasik |
| | <i>Manual Book</i> | Metode Restorasi dan Enhancement Naskah kuno Menggunakan Teknik Klasik |
| | <i>Software</i> | DREAM-Classic |
| | <i>Konferensi</i> | The 3rd International Conference on Pattern Recognition and Artificial Intelligence https://icrai2022.sciencesconf.org/resource/page/id/13 1-3 June 2022 |
| | <i>Jurnal</i> | Jurnal Teknologi (Sciences and Engineering) https://www.scimagojr.com/journalsearch.php?q=21100220470&tip=sid Q3, SJR 0,19 |
| | | |
| Tahun 2 | <i>Hak Cipta</i> | Metode Restorasi dan Enhancement Naskah kuno Menggunakan Teknik Modern |
| | <i>Manual Book</i> | Metode Restorasi dan Enhancement Naskah kuno Menggunakan Teknik Modern |
| | <i>Software</i> | DREAM-Modern |
| | <i>Konferensi</i> | International Conference on Big Data, Deep Learning and Artificial Intelligence for Construction (ICBDDLAIC) August 05-06, 2023 |
| | <i>Jurnal</i> | International Journal of Pattern Recognition and Artificial Intelligence Q3, SJR 0,3 |
| | | |
| Tahun 3 | <i>Hak Cipta</i> | Metode Restorasi dan Enhancement Naskah Kuno Berbasis Kecerdasan Artifisial |
| | <i>Manual Book</i> | Metode Restorasi dan Enhancement Naskah Kuno Berbasis Kecerdasan Artifisial |
| | <i>Software</i> | DREAM-AI |
| | <i>Konferensi</i> | International Conference on Pattern Recognition - ICPR 2024 T.B.A. |
| | <i>Jurnal</i> | Journal on Computing and Cultural Heritage - ACM Q3, SJR 0,37 |
| | | |



Kegiatan Pengabdian pada Masyarakat



Kegiatan Pengabdian pada Masyarakat

2017



Kegiatan Pengabdian pada Masyarakat



Kegiatan Pengabdian pada Masyarakat

2019



Kegiatan Pengabdian pada Masyarakat

2021

Implementasi Pembelajaran
**Aksara Sunda Menggunakan
Teknologi Enriched Augmented Reality
(ARKADA) untuk SD-SMA**

Pengabdian Kepada Masyarakat Program Studi Teknik Informatika
Departemen Ilmu Komputer FMIPA Universitas Padjadjaran

LAUNCHING:
**KARTU
ARKADA**

zoom
 Sabtu, 5 Juni 2021
13.00-15.00 WIB

AMADI-AMIRA PROJECT
UNIVERSITAS PADJADJARAN
amadi@unpad.ac.id

ARKADA
Augmented Reality Cards

Kartu Aksara

Scan diatas Untuk
Mendapatkan Akses
Aplikasi ARKADA

Scanscan

Sertifikat Penghargaan

Diberikan kepada

Farsya Risca Amalia

SEBAGAI PESERTA

Kegiatan Pengabdian pada Masyarakat Berbasis Riset
Departemen Ilmu Komputer, FMIPA, Universitas Padjadjaran
"Implementasi Pembelajaran Aksara Sunda Menggunakan Teknologi Enriched Augmented Reality (ARKADA) untuk Sekolah Dasar - Sekolah Menengah Atas"
Semester Genap 2020/2021

Rekomendasi



ମହାରାଜାଙ୍କ ପଦ୍ମନାଭ

Terima Kasih

