

## LAMPIRAN

### Lampiran 1 Source Code Login

```
class DataAdminController extends Controller
{
    // Show list of users (Read)
    public function index()
    {
        $users = User::all(); // Fetch all users from the database
        return view('pages.data-admin.index', compact('users'));
    }

    // Show the form for creating a new user (Create)
    public function create()
    {
        return view('pages.data-admin.create');
    }

    // Store the newly created user in the database (Store)
    public function store(Request $request)
    {
        // Validate the data
        $validatedData = $request->validate([
            'name' => 'required|string|max:255',
            'email' => 'required|email|unique:users,email',
            'password' => 'required|string|min:6|confirmed',
        ]);

        // Create the new user
        User::create([
            'name' => $validatedData['name'],
            'email' => $validatedData['email'],
            'password' => bcrypt($validatedData['password']),
        ]);

        // Redirect with success message
        return redirect()->route('data-admin.index')->with('success', 'User created successfully!');
    }

    // Show the form for editing the specified user (Edit)
    public function edit($id)
    {
        $user = User::findOrFail($id); // Find the user by ID
    }
}
```

```

return view('pages.data-admin.edit', compact('user'));
}

// Update the specified user in the database (Update)
public function update(Request $request, $id)
{
    // Validate the data
    $validatedData = $request->validate([
        'name' => 'required|string|max:255',
        'email' => 'required|email|unique:users,email,' . $id, // Allow the current email
        'password' => 'nullable|string|min:6|confirmed', // Optional password field
    ]);

    $user = User::findOrFail($id); // Find the user by ID

    // Update the user
    $user->update([
        'name' => $validatedData['name'],
        'email' => $validatedData['email'],
        'password' => $request->filled('password') ? bcrypt($validatedData['password']) :
    $user->password, // Update password if provided
    ]);

    // Redirect with success message
    return redirect()->route('data-admin.index')->with('success', 'User updated
successfully!');
}

// Delete the specified user (Delete)
public function destroy($id)
{
    $user = User::findOrFail($id);
    $user->delete();

    return redirect()->route('data-admin.index')->with('success', 'User deleted successfully!');
}
}
}

```

#### Lampiran 2 Source Code Dashboard

```

<div class="container-fluid">
    <!-- Page Heading -->
    <div class="d-sm-flex align-items-center justify-content-between mb-4">

```

```

    <h1 class="h3 mb-0 text-gray-800">Dashboard</h1>
</div>

<!-- Row statistik singkat -->
<div class="row">
  {{-- Card Total Dataset --}}
  <div class="col-xl-3 col-md-6 mb-4">
    <div class="card border-left-primary shadow h-100 py-2">
      <div class="card-body">
        <div class="row no-gutters align-items-center">
          <div class="col mr-2">
            <div class="text-xs font-weight-bold text-primary text-uppercase mb-1">
              Total Dataset
            </div>
            <div class="h5 mb-0 font-weight-bold text-gray-800">
              {{ $totalDataset ?? 0 }}
            </div>
            <div class="col-auto">
              <i class="fas fa-database fa-2x text-gray-300"></i>
            </div>
          </div>
        </div>
      </div>
    </div>
  </div>
  {{-- Kalau nanti mau tambah card lain, bisa di sini --}}
  {{--
  <div class="col-xl-3 col-md-6 mb-4">
    ...
  </div>
  --}}
</div>

<!-- Penjelasan metode K-Means -->
<div class="row">
  <div class="col-lg-12">
    <div class="card shadow mb-4">
      <div class="card-header py-3">
        <h6 class="m-0 font-weight-bold text-primary">
          Penjelasan Singkat Metode K-Means Clustering
        </h6>
      </div>
      <div class="card-body">

```

untuk

<p>  
Aplikasi ini menggunakan <strong>metode K-Means Clustering</strong>  
mengelompokkan platform e-wallet berdasarkan beberapa variabel penilaian,  
seperti <strong>VTP, NTP, PPE, FPE, PSD, IPE, dan PKP</strong>.  
</p>

cluster

rata-rata

<p>  
Secara sederhana, K-Means akan membagi data ke dalam  
<strong>K buah cluster</strong> (misalnya 2, 3, 4, atau 5 cluster). Setiap  
memiliki sebuah <em>centroid</em> (titik pusat) yang mewakili karakteristik  
rata-rata data dalam cluster tersebut.  
</p>

terdekat).</li>

tiap cluster.</li>

<strong>konvergen</strong>

</ol>

<p>

</p>

<ul>

data ke masing-masing

cluster mana.</li>

yang menggambarkan

seberapa rapat data terhadap centroid cluster-nya.</li>

<p class="mb-2"><strong>Alur utama metode K-Means:</strong></p>

<ol>

<li>Pilih jumlah cluster (<strong>K</strong>), misalnya 2–5 cluster.</li>

<li>Pilih centroid awal dari beberapa data yang dipilih sebagai titik awal.</li>

<li>Hitung <strong>jarak Euclidean</strong> tiap data ke setiap centroid.</li>

<li>Setiap data dimasukkan ke cluster dengan jarak paling dekat (cluster

<li>Update centroid dengan menghitung rata-rata nilai semua data di dalam

<li>Ulangi proses perhitungan jarak dan update centroid sampai

(centroid sudah tidak banyak berubah).</li>

</ol>

<p>

Pada halaman <strong>Proses K-Means</strong>, kamu dapat melihat:

</p>

<ul>

<li><strong>Centroid awal</strong> berdasarkan dataset yang dipilih.</li>

<li><strong>Perhitungan jarak Euclidean</strong> tiap iterasi untuk setiap

centroid.</li>

<li><strong>Cluster terdekat</strong> yang menunjukkan data masuk ke

<li><strong>SSE (Sum of Squared Errors)</strong> per iterasi dan totalnya,

seberapa rapat data terhadap centroid cluster-nya.</li>

```

        <li><strong>DBI (Davies-Bouldin Index)</strong> dan nilai-nilai lain yang
membantu
        mengevaluasi kualitas hasil clustering.</li>
    </ul>

    <p class="mb-0">
        Semakin kecil nilai <strong>SSE</strong> dan semakin baik nilai
<strong>DBI</strong>,
        biasanya menunjukkan bahwa pembentukan cluster semakin baik, yaitu data
dalam satu cluster
        cenderung mirip dan antar cluster semakin berbeda.
    </p>
</div>
</div>
</div>
</div>
</div>
</div>

```

Lampiran 3 Source Code Halaman Dataset

```

<div class="container-fluid">
    <!-- DataTales Example -->
    <div class="card shadow mb-4">
        <div class="card-header py-3">
            <h4 class="m-0 font-weight-bold text-primary">Dataset</h4>
        </div>
        <div class="card-body">
            <a href="{{ route('dataset.create') }}" class="btn btn-primary mb-3">Tambah
Dataset</a>

            <!-- Import Dataset Button (Triggers Modal) -->
            <button class="btn btn-info mb-3" data-toggle="modal" data-
target="#importModal">Import Dataset</button>

            <div class="table-responsive">
                <table class="table table-bordered text-center" id="dataTable" width="100%"
cellspacing="0">
                    <thead>
                        <tr>
                            <th>No</th>
                            <th>Nama Platform E-Wallet</th>

```

```

<th>VTP</th>
<th>NTP</th>
<th>PPE</th>
<th>FPE</th>
<th>PSD</th>
<th>IPE</th>
<th>PKP</th>
<th>Action</th>
</tr>
</thead>
<tbody>
@forelse ($datasets as $dataset)
<tr>
<td>{{ $loop->iteration }}</td>
<td>{{ $dataset->nama_platform_e_wallet }}</td>
<td>{{ $dataset->VTP }}</td>
<td>{{ $dataset->NTP }}</td>
<td>{{ $dataset->PPE }}</td>
<td>{{ $dataset->FPE }}</td>
<td>{{ $dataset->PSD }}</td>
<td>{{ $dataset->IPE }}</td>
<td>{{ $dataset->PKP }}</td>
<td>
<a href="{{ route('dataset.edit', $dataset->id) }}"
class="btn btn-warning btn-sm">Edit</a>
<form action="{{ route('dataset.destroy', $dataset->id) }}"
method="POST"
style="display:inline;">
@csrf
@method('DELETE')
<button type="submit" class="btn btn-danger btn-
sm">Delete</button>
</form>
</td>
</tr>
@empty
<tr>
<td colspan="10" class="text-center">Belum ada data</td>
</tr>
@endforelse
</tbody>
</table>
</div>
</div>

```

```

</div>

</div>

<!-- Modal for Importing Dataset -->
<div class="modal fade" id="importModal" tabindex="-1" role="dialog" aria-
labelledby="importModalLabel"
  aria-hidden="true">
  <div class="modal-dialog" role="document">
    <div class="modal-content">
      <div class="modal-header">
        <h5 class="modal-title" id="importModalLabel">Import Dataset</h5>
        <button type="button" class="close" data-dismiss="modal" aria-label="Close">
          <span aria-hidden="true">&times;</span>
        </button>
      </div>
      <div class="modal-body">
        <!-- Import Form -->
        <form action="{{ route('dataset.import') }}" method="POST"
  enctype="multipart/form-data">
          @csrf
          <div class="form-group">
            <label for="file">Upload Excel File</label>
            <input type="file" class="form-control" name="file" required>
          </div>
          <div class="modal-footer">
            <button type="button" class="btn btn-secondary" data-
  dismiss="modal">Cancel</button>
            <button type="submit" class="btn btn-primary">Import</button>
          </div>
        </form>
      </div>
    </div>
  </div>
</div>
</div>
@endsection

@push('css')
  <!-- Custom styles for this page -->
  <link href="{{ asset('vendor/datatables/dataTables.bootstrap4.min.css') }}"
  rel="stylesheet">
@endpush

@push('script')

```

```

<!-- Page level plugins -->
<script src="{{ asset('vendor/datatables/jquery.dataTables.min.js') }}"></script>
<script src="{{ asset('vendor/datatables/dataTables.bootstrap4.min.js') }}"></script>

<!-- Page level custom scripts -->
<script>
    $(document).ready(function() {
        // Destroy the previous instance if any
        if ($.fn.dataTable.isDataTable('#dataTable')) {
            $('#dataTable').DataTable().destroy();
        }

        // Initialize the DataTable with the additional option for 5 entries
        $('#dataTable').DataTable({
            "pageLength": 5, // Default number of rows per page
            "lengthMenu": [5, 10, 25, 50, 100] // Options for rows per page
        });
    });
</script>

```

#### Lampiran 4 Source Code Halaman Proses K-Means

```

<div class="container-fluid">
    <div class="card shadow mb-4">
        <div class="card-header py-3 d-flex align-items-center justify-content-between">
            <h4 class="m-0 font-weight-bold text-primary">Proses Kmeans</h4>
            @if (isset($iterationsUsed))
                <span class="badge badge-info">Konvergen dalam {{ $iterationsUsed }}
iterasi</span>
            @endif
        </div>

        <div class="card-body">

            {{-- Kartu total dataset --}}
            <div class="col-xl-3 col-md-6 mb-4 p-0">
                <div class="card border-left-primary shadow h-100 py-2">
                    <div class="card-body">
                        <div class="row no-gutters align-items-center">
                            <div class="col mr-2">
                                <div class="text-xs font-weight-bold text-primary text-uppercase
mb-1">Total Dataset

```

```

        </div>
        <div class="h5 mb-0 font-weight-bold text-gray-800">{{
$totalDataset ?? 0 }}</div>
    </div>
    <div class="col-auto">
        <i class="fas fa-database fa-2x text-gray-300"></i>
    </div>
</div>
</div>
</div>
</div>
</div>
</div>
</div>
    <!-- Form pilih kluster & dataset -->
    <form action="{{ route('proses.cluster') }}" method="POST"
id="kmeansForm">
        @csrf

        <div class="form-group">
            <label for="cluster">Select Cluster</label>
            <select name="cluster" id="cluster" class="form-control" required>
                <option value="" disabled {{ empty($selectedCluster) ? 'selected' : "
}}>Select Cluster
            </option>
            @foreach ([2, 3, 4, 5] as $k)
                <option value="{{ $k }}"
                    {{ isset($selectedCluster) && $selectedCluster == $k ? 'selected' : "
" }}>Cluster
                    {{ $k }}</option>
            @endforeach
            </select>
        </div>

        <!-- ===== BLOCK KLUSTER 2 ===== -->
        <div id="block-2" class="cluster-block" style="display:none">
            @for ($i = 1; $i <= 2; $i++)
                <label class="mt-2">Select Dataset {{ $i }}</label>
                <select name="dataset_id[]" class="form-control cluster-2" disabled
required>
                    <option value="">Select Dataset {{ $i }}</option>
                    @foreach ($allDatasets as $d)
                        <option value="{{ $d->id }}">
                            {{ 'Dataset ' . $d->id . ' - ' . $d->nama_platform_e_wallet
}}</option>
                    @endforeach
        </div>
    </div>

```

```

        </select>
    @endfor
</div>

{{-- ===== BLOCK KLUSTER 3 ===== --}}
<div id="block-3" class="cluster-block" style="display:none">
    @for ($i = 1; $i <= 3; $i++)
        <label class="mt-2">Select Dataset {{ $i }}</label>
        <select name="dataset_id[]" class="form-control cluster-3" disabled
required>
            <option value="">Select Dataset {{ $i }}</option>
            @foreach ($allDatasets as $d)
                <option value="{{ $d->id }}">
                    {{ 'Dataset ' . $d->id . ' - ' . $d->nama_platform_e_wallet
}}</option>
            @endforeach
        </select>
    @endfor
</div>

{{-- ===== BLOCK KLUSTER 4 ===== --}}
<div id="block-4" class="cluster-block" style="display:none">
    @for ($i = 1; $i <= 4; $i++)
        <label class="mt-2">Select Dataset {{ $i }}</label>
        <select name="dataset_id[]" class="form-control cluster-4" disabled
required>
            <option value="">Select Dataset {{ $i }}</option>
            @foreach ($allDatasets as $d)
                <option value="{{ $d->id }}">
                    {{ 'Dataset ' . $d->id . ' - ' . $d->nama_platform_e_wallet
}}</option>
            @endforeach
        </select>
    @endfor
</div>

{{-- ===== BLOCK KLUSTER 5 ===== --}}
<div id="block-5" class="cluster-block" style="display:none">
    @for ($i = 1; $i <= 5; $i++)
        <label class="mt-2">Select Dataset {{ $i }}</label>
        <select name="dataset_id[]" class="form-control cluster-5" disabled
required>
            <option value="">Select Dataset {{ $i }}</option>
            @foreach ($allDatasets as $d)

```

```

        <option value="{{ $d->id }}">
            {{ 'Dataset ' . $d->id . ' - ' . $d->nama_platform_e_wallet
    }}</option>
        @endforeach
    </select>
    @endfor
</div>

<button type="submit" class="btn btn-primary mt-3">Proses</button>
</form>

{{-- Tabel hasil pilihan --}}
@if (!empty($selectedDatasets) && count($selectedDatasets))
    <div class="mt-4">
        <h5 class="mb-3">Hasil Pilihan Dataset (Centroid Awal)</h5>
        <table class="table table-bordered">
            <thead>
                <tr>
                    <th class="text-center">No</th>
                    <th class="text-center">ID</th>
                    {{-- Header Nama Platform E-Wallet tetap rata kiri --}}
                    <th class="text-start">Nama Platform E-Wallet</th>
                    <th class="text-center">VTP</th>
                    <th class="text-center">NTP</th>
                    <th class="text-center">PPE</th>
                    <th class="text-center">FPE</th>
                    <th class="text-center">PSD</th>
                    <th class="text-center">IPE</th>
                    <th class="text-center">PKP</th>
                </tr>
            </thead>
            <tbody>
                @foreach ($selectedDatasets as $row)
                    <tr>
                        <td class="text-center">{{ $loop->iteration }}</td>
                        <td class="text-center">{{ $row->id }}</td>
                        {{-- Isi tetap rata kiri --}}
                        <td class="text-start">{{ $row->nama_platform_e_wallet
    }}</td>

```

```

<td class="text-center">{{ $row->VTP }}</td>
<td class="text-center">{{ $row->NTP }}</td>
<td class="text-center">{{ $row->PPE }}</td>
<td class="text-center">{{ $row->FPE }}</td>
<td class="text-center">{{ $row->PSD }}</td>
<td class="text-center">{{ $row->IPE }}</td>
<td class="text-center">{{ $row->PKP }}</td>
</tr>
@endforeach
</tbody>
</table>

</div>
@endif

{{-- Grouped Tables per Iteration --}}
@if (!empty($allIterations) || !empty($allDistancesPerIteration) ||
!empty($allClusterResultsPerIteration))
@foreach ($allIterations as $iterationIndex => $iteration)
<div class="mt-4">
<div class="mt-5">
{{-- Iterasi --}}
<div class="text-center" style="background-color: #ecf7ff; border-
radius: 8px;">
<h5 class=" text-primary font-weight-bold" style="font-size:
1.5rem;">Iterasi
{{ $iterationIndex + 1 }}</h5>
</div>
</div>

<h6 class="font-weight-bold mt-3">Perhitungan Jarak
Euclidean</h6>

@if (isset($allDistancesPerIteration[$iterationIndex]))
<table class="table table-bordered table-striped">
<thead>
<tr>
<th class="text-center">No</th>
{{-- <th>ID</th> --}}

{{-- Header Nama Platform tetap kiri --}}
<th class="text-start">Nama Platform E-Wallet</th>

@for ($i = 1; $i <= $selectedCluster; $i++)

```

```

        <th class="text-center">Jarak ke C{{ $i }}</th>
    @endfor

    <th class="text-center">Jarak Terdekat</th>
    <th class="text-center">Cluster Terdekat</th>
    <th class="text-center">Perubahan</th>
    <th class="text-center">Jarak Terdekat ^2</th>
</tr>
</thead>

<tbody>
    @foreach ($allDistancesPerIteration[$iterationIndex] as $i =>
$row)
        <tr>
            <td class="text-center">{{ $i + 1 }}</td>

            {{-- Isi Nama Platform E-Wallet tetap kiri --}}
            <td class="text-start">{{ $row['dataset']-
>nama_platform_e_wallet }}</td>

            @foreach ($row['distances'] as $d)
                <td class="text-center">{{ number_format($d, 4)
}}</td>

            @endforeach

            <td class="text-center">{{ number_format($row['dmin'],
4) }}</td>

            <td class="text-center">
                @php
                    $color = match ($row['nearest']) {
                        1 => 'primary',
                        2 => 'warning',
                        3 => 'success',
                        4 => 'danger',
                        5 => 'info',
                        default => 'secondary',
                    };
                @endphp
                <span
                    class="badge badge-{{ $color }}">C{{ $row['nearest']
}}</span>

            </td>
        </tr>
    @endforeach
</tbody>
</table>

```

```

<td class="text-center">
  @if ($row['changed'] === 'Iya')
    <span class="badge badge-danger">Iya</span>
  @else
    <span class="badge badge-success">Tidak</span>
  @endif
</td>

<td class="text-center">{{
number_format($row['dminSquared'], 4) }}</td>
</tr>
@endforeach
</tbody>
</table>
@endif

{{-- Tabel Hasil Cluster dan Nama Platform E-Wallet per Iterasi --}}
<h6 class="font-weight-bold mt-3">Menetapkan data ke kelas
terdekat
</h6>
@if (isset($allClusterResultsPerIteration[$iterationIndex]))
<table class="table table-bordered">
<thead>
<tr>
<th class="text-center">Cluster</th>
<th>Nama Platform E-Wallet</th>
</tr>
</thead>
<tbody>
@foreach ($allClusterResultsPerIteration[$iterationIndex] as
$result)
<tr>
<td class="text-center">
  @php
    $color = 'primary'; // default

    switch ($result['cluster']) {
      case 1:
        $color = 'primary'; // biru
        break;
      case 2:
        $color = 'warning'; // kuning
        break;
      case 3:

```



```

switch ($clusterNum) {
  case 1:
    $color = 'primary'; // biru
    break;
  case 2:
    $color = 'warning'; // kuning
    break;
  case 3:
    $color = 'success'; // hijau
    break;
  case 4:
    $color = 'danger'; // merah
    break;
  case 5:
    $color = 'info'; // biru muda
    break;
  default:
    $color = 'secondary'; // abu-abu
    break;
}
@endphp

<span class="badge badge-{{ $color }}">C{{ $clusterNum
}}</span>

</td>
@foreach ($features as $f)
  <td>{{ number_format($centroid[$f] ?? 0, 2) }}</td>
@endforeach
</tr>
@endforeach
</tbody>
</table>

{{-- SSE Per Iterasi --}}
@if (isset($allSSEPerIteration[$iterationIndex]))
  <div class="mt-3">
    <div
      class="d-flex justify-content-start align-items-center p-2
border rounded bg-light">
      <div>
        {{-- <div class="small text-muted mb-1">SSE per
Iterasi</div> --}}

        <div class="font-weight-semibold mr-2">
          SSE Iterasi {{ $iterationIndex + 1 }} :

```

```

        </div>
    </div>

    <span class="badge badge-primary">
        {{ number_format($allSSEPerIteration[$iterationIndex], 4) }}
    </span>
</div>
</div>
@endif

</div>
@endforeach
@endif

{{--
<div class="mt-3">
    <div class="d-flex justify-content-start align-items-center p-2 border
rounded bg-light">
        <div>

            <div class="font-weight-semibold mr-2">
                <strong> Total SSE (Sum of Squared Errors) :</strong>
            </div>
        </div>

        <span class="badge badge-primary">
            <strong>{{ number_format($sseTotal, 4) }}</strong>
        </span>
    </div>
</div> --}}
@if (!empty($newCentroids))
    <div class="card shadow-sm mt-4">
        <div class="card-header bg-primary text-white">
            <h4 class="mb-0 text-center">Hasil Konvergen</h4>
        </div>
        <div class="m-4">
            {{-- Centroid akhir (konvergen) --}}
            @if (!empty($newCentroids))
                <div class="row">
                    <div class="col-12">
                        <div class="card shadow-sm">
                            <div class="card-header">
                                <h5 class="mb-0">Centroid Akhir (Konvergen)</h5>
                            </div>

```

```
<div class="card-body">
  <div class="table-responsive">
    <table
      class="table table-sm table-bordered text-center
align-middle mb-0">
      <thead class="table-light">
        <tr>
          <th style="width: 10%">Cluster</th>
          @foreach ($features as $feature)
            <th>{{ $feature }}</th>
          @endforeach
        </tr>
      </thead>
      <tbody>
        @foreach ($newCentroids as $index => $centroid)
          <tr>
            <td>
              @php
                $clusterNum = $index + 1;
                $color = 'primary'; // default

                switch ($clusterNum) {
                  case 1:
                    $color = 'primary'; // biru
                    break;
                  case 2:
                    $color = 'warning'; // kuning
                    break;
                  case 3:
                    $color = 'success'; // hijau
                    break;
                  case 4:
                    $color = 'danger'; // merah
                    break;
                  case 5:
                    $color = 'info'; // biru muda
                    break;
                  default:
                    $color = 'secondary'; // abu-abu
                    break;
                }
              @endphp
            </td>
          </tr>
        @endforeach
      </tbody>
    </table>
  </div>
</div>
```

```

        <span
            class="badge badge-{{ $color }}">C{{
$clusterNum }}</span>

        </td>

        @foreach ($features as $f)
            <td>{{ number_format($centroid[$f] ?? 0, 2)
}}</td>

        @endforeach
    </tr>
    @endforeach
</tbody>
</table>
</div> {{-- /.table-responsive --}}
</div> {{-- /.card-body --}}
</div> {{-- /.card --}}
</div> {{-- /.col --}}
</div> {{-- /.row --}}
@endif

{{-- Menetapkan data ke kelas terdekat --}}
@if (!empty($newCentroids))
    <div class="row mt-4">
        @php
            $finalIterIndex = count($allClusterResultsPerIteration) - 1;
        @endphp

        @foreach ($allClusterResultsPerIteration[$finalIterIndex] as
$clusterNumber => $result)
            <div class="col-md-4 mb-2"> {{-- 2 kolom per baris pada layar
medium ke atas --}}

                <div class="card shadow-sm">
                    <div class="card-header">
                        @php
                            $clusterName = 'C' . ($clusterNumber + 1);
                        @endphp

                        <h5 class="mb-0">
                            Cluster {{ $clusterNumber + 1 }}:
                            {{ $clusterLabel[$clusterName] ?? 'Tidak Ada Data' }}
                        </h5>

                    </div>

                </div>
            </div>
        @endforeach
    </div>

```

```

<div class="card-body">
  <div class="table-responsive">
    <table class="table table-sm table-bordered align-
middle">
      <thead class="table-light">
        <tr>
          <th class=" text-center">No</th>
          <th>E-Wallet</th>
        </tr>
      </thead>
      <tbody>
        @foreach ($result as $index => $platforms)
          @if ($loop->first)
            @continue {{-- Skip iterasi pertama --}}
          @endif
          {{-- Memisahkan string platform dengan
explode dan menghilangkan spasi yang tidak perlu --}}
          @foreach (explode(',', $platforms) as
$platform)
            <tr>
              <td class=" text-center">
                {{ $loop->iteration }}
              </td>
              {{-- Menampilkan nomor urut yang benar
--}}
              <td>{{ trim($platform) }}</td>
              {{-- Menampilkan nama platform setelah
di-trim --}}
            </tr>
          @endforeach
        @endforeach
      </tbody>
    </table>
  </div> {{-- /.table-responsive --}}
</div> {{-- /.card-body --}}
</div> {{-- /.card --}}
</div> {{-- /.col-md-6 --}}
@endforeach
</div> {{-- /.row --}}
@endif
{{-- ===== VISUALISASI HASIL CLUSTERING AKHIR
===== --}}
@if (!empty($clusterScatterDatasets) && !empty($centroidScatter))
  <div class="row mt-4">

```

```

<div class="col-12">
  <div class="card shadow-sm">
    <div class="card-header">
      <h5 class="mb-0">
        Visualisasi Clustering Akhir (Scatter)
        {{-- <small class="text-muted">{{ $plotX }} vs
          {{ $plotY }}</small> --}}
      </h5>
    </div>
    <div class="card-body">
      <div class="table-responsive">
        <canvas id="clusterScatterChart"
height="120"></canvas>
      </div>
      <small class="text-muted d-block mt-2">
        Titik berwarna = data (e-wallet), titik hitam = centroid.
        Kedekatan titik menunjukkan kemiripan, jarak centroid
        menunjukkan
        separasi antar cluster.
      </small>
    </div>
  </div>
</div>
@endif
{{--
-----
--}}

</div>
</div>
@endif

@if (!empty($newCentroids))
  <div class="card shadow-sm mt-4">
    <div class="card-header bg-primary text-white">
      <h4 class="mb-0 text-center">Hasil Rata-Rata</h4>
    </div>
    {{-- SECTION METRIK CLUSTERING --}}
    <div class="row m-2">

      {{-- Rata-rata Centroid --}}
      @if (!empty($centroidAverages))
        <div class="col-lg-6 mb-2 mt-3">

```



```

        $color = 'info'; // biru muda
        break;
    default:
        $color = 'secondary'; // abu-abu
        break;
    }
    @endphp

    <span
        class="badge badge-{{ $color }}">{{
$clusterName }}</span>

    </td>
    <td>{{ number_format($average, 4) }}</td>
    </tr>
    @endforeach
    </tbody>
    </table>
    </div>
    </div>
    </div>
    @endif

    {{-- SSE per Iterasi + Total SSE --}}
    @if (!empty($allSSEPerIteration))
    <div class="col-lg-6 mb-4 mt-3">
    <div class="card shadow-sm h-100">
    <div class="card-header d-flex justify-content-between align-
items-center">
        <h5 class="mb-0">SSE per Iterasi</h5>
    </div>
    <div class="card-body">
    <div class="table-responsive">
    <table class="table table-sm table-bordered align-middle
mb-0">
        <thead class="table-light">
        <tr>
            <th class="text-center" style="width:
40%">Iterasi</th>
            <th class="text-center">SSE</th>
        </tr>
        </thead>
        <tbody>

```

```

@foreach ($allSSEPerIteration as $iterationIndex =>
    $sse)
    <tr>
        <td class="text-center">Iterasi {{ $iterationIndex
+ 1 }}
        </td>
        <td class="text-center">{{ number_format($sse,
4) }}</td>
    </tr>
@endforeach
</tbody>
</table>
</div>
<div class="mt-3">
    <div
        class="d-flex justify-content-start align-items-center p-2
border rounded bg-light">
        <div>
            {{-- <div class="small text-muted mb-1">SSE per
Iterasi</div> --}}
            <div class="font-weight-semibold mr-2">
                Total SSE :
            </div>
            </div>
            <span class="badge badge-primary">
                {{ number_format($totalSSE, 4) }}
            </span>
        </div>
    </div>
</div>
</div>
</div>
@endif
</div>

<div class="row m-2">
    {{-- SSW --}}
    @if (!empty($centroidSum))
        <div class="col-lg-6 mb-2 mt-3">

```

```

<div class="card shadow-sm h-100">
  <div class="card-header">
    <h5 class="mb-0">SSW per Cluster</h5>
  </div>
  <div class="card-body">
    <div class="table-responsive">
      <table class="table table-sm table-bordered align-middle
mb-0">
        <thead class="table-light">
          <tr>
            <th class=" text-center" style="width:
30%">Cluster</th>
            <th class=" text-center">Nilai</th>
          </tr>
        </thead>
        <tbody>
          @foreach ($centroidSum as $clusterName => $sum)
            <tr>
              <td class=" text-center">
                @php
                  // Ambil nomor cluster dari nama cluster,
misal "C2" → 2
preg_match('/C(\d+)/', $clusterName,
$matches);
                $clusterNum = isset($matches[1])
                  ? (int) $matches[1]
                  : 0;
                $color = 'primary'; // default
                switch ($clusterNum) {
                  case 1:
                    $color = 'primary'; // biru
                    break;
                  case 2:
                    $color = 'warning'; // kuning
                    break;
                  case 3:
                    $color = 'success'; // hijau
                    break;
                  case 4:
                    $color = 'danger'; // merah
                    break;
                  case 5:

```

```

        $color = 'info'; // biru muda
        break;
    default:
        $color = 'secondary'; // abu-abu
        break;
    }
    @endphp

    <span
        class="badge badge-{{ $color }}">{{
$clusterName }}</span>

        </td class=" text-center">
        <td>{{ number_format($sum, 4) }}</td>
    </tr>
    @endforeach
</tbody>
</table>
</div>
</div>
</div>
</div>
@endif

{{-- DBI --}}
{{-- Tabel DBI --}}
@if (!empty($dbiPerCentroid))
    <div class="col-lg-6 mb-2 mt-3">
        <div class="card shadow-sm h-100">
            <div class="card-header">
                <h5 class="mb-0">Davies-Bouldin Index per Centroid</h5>
            </div>
            <div class="card-body">
                <div class="table-responsive">
                    <table class="table table-sm table-bordered text-center
align-middle mb-0">
                        <thead class="table-light">
                            <tr>
                                <th class=" text-center" style="width:
30%">Pasangan Centroid

                                </th>
                                <th class=" text-center">Jarak Euclidean</th>
                            </tr>
                        </thead>
                    </tbody>

```

- C2" → 1

\$matches);

\$row['pair'] }}</span>

}}

```
@foreach ($dbiPerCentroid as $row)
<tr>
  <td class=" text-center">
    @php
      // Ambil cluster pertama dari pair, misal "C1
      preg_match('/C(\d+)/', $row['pair'],
      $matches);
      $clusterNum = isset($matches[1])
        ? (int) $matches[1]
        : 0;
      $color = 'primary';
      switch ($clusterNum) {
        case 1:
          $color = 'primary'; // biru
          break;
        case 2:
          $color = 'warning'; // kuning
          break;
        case 3:
          $color = 'success'; // hijau
          break;
        case 4:
          $color = 'danger'; // merah
          break;
        case 5:
          $color = 'info'; // biru muda
          break;
        default:
          $color = 'secondary'; // abu-abu
          break;
      }
    @endphp
    <span
      class="badge badge-{{ $color }}">{{
</td>
<td class=" text-center">
  {{ number_format($row['euclidean'], 4, ',', '.')
</td>
```

```

        </tr>
        @endforeach
    </tbody>
</table>
</div>

{{-- Optional: DBI summary (kalau punya total DBI) --}}
@isset($dbiTotal)
    <div class="mt-3 text-end">
        <h6 class="mb-0">
            <strong>Total DBI:</strong> {{
number_format($dbiTotal, 4, ',', '.') }}
        </h6>
    </div>
@endisset
</div>
</div>
</div>
@endif

{{-- Tabel R --}}
@if (!empty($centroidSum) && !empty($dbiPerCentroid))
    <div class="col-lg-6 mb-3 mt-3">
        <div class="card shadow-sm h-100">
            <div class="card-header">
                <h5 class="mb-0">Tabel Perhitungan R</h5>
            </div>
            <div class="card-body">
                <div class="table-responsive">

                    @php
                        $totalClusters = count($centroidSum);
                        $rValues = [];
                        $distanceMap = [];

                        // Normalisasi pasangan jarak
                        foreach ($dbiPerCentroid as $row) {
                            if (empty($row['pair'])) {
                                continue;
                            }
                            $key = strtoupper(
                                str_replace(['-', '—', ''], ['-', '-', ''], $row['pair']),
                            );
                            $distanceMap[$key] = (float) $row['euclidean'];

```

```

    }

    $getDistance = function ($a, $b) use ($distanceMap) {
        $p1 = strtoupper("$a-$b");
        $p2 = strtoupper("$b-$a");
        return $distanceMap[$p1] ?? ($distanceMap[$p2] ??
null);
    };
@endphp

<table class="table table-bordered text-center">
    <thead class="table-light">
        <tr>
            <th>Centroid</th>
            <th>Nilai R</th>
        </tr>
    </thead>
    <tbody>

        @foreach ($centroidSum as $c => $ssw)
            @php
                $denominator = 0;

                foreach ($centroidSum as $c2 => $ssw2) {
                    if ($c !== $c2) {
                        $dist = $getDistance($c, $c2);
                        if ($dist !== null && $dist > 0) {
                            $denominator += $dist;
                        }
                    }
                }

                if ($denominator > 0) {
                    $r = $ssw / $denominator;
                    $rValues[] = $r;
                } else {
                    $r = 'N/A';
                }
            @endphp

        <tr>
            <td>{{ $c }}</td>
            <td class="text-end">

```

```

}}</td>
                                {{ is_numeric($r) ? number_format($r, 9) : $r
</tr>
@endforeach

@php
$totalR =
count($rValues) > 0
? array_sum($rValues) / count($rValues)
: 0;
@endphp

</tbody>
</table>
<div class="mt-3">
<div class="p-2 border rounded bg-light d-inline-
block">
<span class="font-weight-semibold">Total R
(DBI):</span>
<span class="badge badge-primary">
{{ number_format($totalR, 9) }}
</span>
</div>
</div>
</div>
</div>
</div>
@endif

</div>
</div>
@endif

</div>
</div>
</div>

```

```

@endsection
<style>
  #clusterScatterChart {
    width: 100%;
    height: 400px;
    /* Atur sesuai ukuran yang diinginkan */
  }
</style>
@push('scripts')
<script src="https://cdn.jsdelivr.net/npm/chart.js"></script>
<script>
  (function() {
    const el = document.getElementById('clusterScatterChart');
    if (!el) return;

    const datasets = @json($clusterScatterDatasets ?? []);
    const centroids = @json($centroidScatter ?? []);

    // dataset centroid (marker beda)
    datasets.push({
      label: 'Centroid',
      data: centroids.map(c => ({
        x: c.x,
        y: c.y,
        cluster: c.cluster
      })),
      backgroundColor: 'rgba(0,0,0,0.75)',
      pointRadius: 7,
      pointStyle: 'rectRot',
    });

    new Chart(el.getContext('2d'), {
      type: 'scatter',
      data: {
        datasets
      },
      options: {
        responsive: true,
        maintainAspectRatio: false,
        plugins: {
          tooltip: {
            callbacks: {
              label: function(ctx) {
                const p = ctx.raw || {};

```

```

        // centroid
        if (p.cluster) {
            return `Centroid ${p.cluster}: (${Number(p.x).toFixed(2)},
${Number(p.y).toFixed(2)})`;
        }
        // point
        const name = p.name || 'Data';
        return `${name} [ID ${p.id}] → (${Number(p.x).toFixed(2)});
    }
}
},
legend: {
    position: 'bottom'
}
},
scales: {
    x: {
        title: {
            display: true,
            text: @json($plotX)
        }
    },
    y: {
        title: {
            display: true,
            text: @json($plotY)
        }
    }
}
}
});
})();
</script>

```

```

<script>
(function() {
    const clusterSelect = document.getElementById('cluster');

    function showBlock(k) {
        [2, 3, 4, 5].forEach(n => {
            const block = document.getElementById('block-' + n);
            if (!block) return;
            block.style.display = 'none';
            block.querySelectorAll('select').forEach(s => {

```

```
s.disabled = true;
s.value = "";
});
});

const active = document.getElementById('block-' + k);
if (active) {
  active.style.display = 'block';
  active.querySelectorAll('select').forEach(s => {
    s.disabled = false;
  });
}
}

@if (!empty($selectedCluster))
  showBlock({{ $selectedCluster }});
@endif

if (clusterSelect) {
  clusterSelect.addEventListener('change', function() {
    if (this.value) showBlock(this.value);
  });
}
})();
</script>
```