TUGAS KECIL 1 STRATEGI ALGORITMA

Penyelesaian Permainan Queen's Linkedin dengan Algoritma Brute Force

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BAB 1

DESKRIPSI PERMAINAN DAN ALGORITMA

1. Permainan Queen's LinkedIn

Permainan Queen's LinkedIn merupakan permainan logika berbasis grid yang terinspirasi dari variasi *N-Queens*, tetapi memiliki aturan tambahan yang membuat permainan ini menjadi lebih kompleks. Pada permainan ini, pemain diminta untuk menempatkan sejumlah *queen* pada papan berukuran n *x* n dengan beberapa batasan tertentu.

Tujuan utama permainan ini adalah mengisi kotak - kotak yang terdapat dalam papan permainan sehingga terdapat 1 *queen* di setiap baris, kolom, dan wilayah berwarna tanpa ada *queen* yang saling bersentuhan, bahkan secara diagonal jarak dekat.

2. Algoritma Brute Force

Algoritma *brute force* adalah metode pemecahan suatu masalah yang menyelesaikan persoalan secara langsung (*straightforward*). Algoritma ini memecahkan persoalan secara sederhana, langsung, serta dengan cara yang jelas dan mudah dipahami. Tidak hanya itu, tetapi algoritma *brute force* menjamin akan menemukan solusi yang optimal jika solusi tersebut ada.

Meskipun begitu, algoritma *brute force* umumnya tidak "cerdas" dan tidak sangkil, karena ia membutuhkan *cost* komputasi yang besar dan waktu yang lama dalam penyelesaiannya. Oleh karenanya, algoritma *brute force* lebih cocok untuk persoalan yang ukuran masukannya kecil.

3. Algoritma Penyelesaian Permainan Queen's LinkedIn dengan Metode Brute Force

Algoritma *brute force* yang diimplementasikan pada permainan Queen's LinkedIn memiliki tahapan sebagai berikut :

1. Tentukan ukuran papan permainan (*dengan membaca jumlah baris input konfigurasi permainan*).
2. Representasikan posisi *queen* menggunakan array 1 dimensi, di mana indeks array menunjukkan baris dan nilai array menunjukkan kolom.
3. Cari semua kemungkinan kombinasi posisi *queen.*
4. Setiap kombinasi akan diperiksa apakah terdapat *queen* dalam baris atau kolom yang sama, apakah terdapat *queen* dalam wilayah daerah yang sama, dan apakah terdapat *queen* yang saling bersebelahan.
5. Jika semua batasan dipenuhi, maka solusi telah ditemukan dan proses pencarian berhenti.
6. Jika tidak dipenuhi, proses akan lanjut ke kombinasi berikutnya.
7. Jika semua kemungkinan telah dicoba dan tidak ada solusi, maka permainan dinyatakan tidak memiliki solusi.

Berikut adalah *pseudocode* untuk penyelesaian permainan Queen's LinkedIn menggunakan algoritma *brute force (murni)* :

```
function isValid(pos: list of integer, letters: matrix, n:
integer)  -> boolean
       i traversal [0..n]
              j traversal [0..n]
                     if pos[i] = pos[j] then
                            -> false
                     if letters[i][pos[i]] =
                        letters[j][pos[j]] then
                            -> false
                     if abs(i - j) <= 1 and abs(pos[i] -
                        pos[j]) <= 1 then
                            -> false
       -> true


** Board = Kelas buatan

function solve(board: Board) -> boolean, integer, integer
       n <- board.row
       letters <- board.board
       caseCount <- 0
       startTime <- time.time()
```

```
total <- n ^ n
num traversal [0..total]
        caseCount <- caseCount + 1
        i traversal [0..n]
                pos[i] <- 0
        x <- num
        i traversal [n-1..-1]
                pos[i] <- x % n
                x <- x // n

        if isValid(pos, letters, n) then
                i traversal [0..n]
                        board.update(i, pos[i])

                totalTime = (time.time() - startTime)
                             * 1000
                -> true, caseCount, totalTime

totalTime = (time.time() - startTime) * 1000
-> false, caseCount, totalTime
```

Adapun dalam praktiknya, algoritma *brute force* murni membutuhkan waktu yang sangat lama *(kompleksitas waktu n!)* sehingga tidak mungkin digunakan untuk menyelesaikan masalah dengan masukkan yang besar. Oleh karena itu, dibuatlah solusi yang lebih optimal menggunakan *backtracking*.

Backtracking merupakan pengembangan dari *brute force* yang tetap mencoba semua kemungkinan solusi, tetapi dengan cara yang lebih efisien. Pada permainan ini, *backtracking* bekerja dengan menempatkan queen secara bertahap pada setiap baris. Jika posisi tersebut melanggar aturan, maka proses akan kembali ke baris sebelumnya dan mencoba posisi lain.

Berikut *pseudocode* untuk algoritma *brute force* menggunakan *backtrack* :

```
function isValidBacktrack(pos: list of integer, letters:
matrix, row, col: integer)  -> boolean
        i traversal [row]
                if pos[i] = pos[j] then
                        -> false
```

```
                if letters[i][pos[i]] = letters[j][pos[j]]
                then
                        -> false
                if abs(i - j) <= 1 and abs(pos[i] - pos[j])
                = 1 then
                        -> false
        -> true

function solve(board: Board) -> boolean, integer, integer
        n <- board.row
        letters <- board.board
        caseCount <- 0
        startTime <- time.time()

        i traversal [0..n]
                pos[i] <- -1

        function backtrack(row: integer) -> boolean
                if row = n then
                        -> true
                col traversal [0..n]
                        caseCount <- caseCount + 1
                              if isValidBacktrack(pos,
                                 letters, row, col) then
                                     pos[row] <- col
                                     if backtrack(row+1)then
                                             -> true
                                     pos[row] <- -1
                -> false

        found <- backtrack(0)
        if found then
                i traversal [0..n]
                        board.update(i, pos[i])

                totalTime = (time.time() - startTime) * 1000
                -> true, caseCount, totalTime

        totalTime = (time.time() - startTime) * 1000
        -> false, caseCount, totalTime
```

BAB 2

SOURCE CODE PROGRAM

1. Link Repository Program

https://github.com/ValentinoDan/Tucil1_13524104.git

2. Source Code Program

Struktur program :

```
├───bin
├───doc
├───result
├───src
│   ├───core
│   └───ui
└───test
```

board.py

```python
class Board:
    def __init__(self, row, col):
        self.row = row
        self.col = col
        self.board = [["" for _ in range(col)] for _ in
                      range(row)]

    # Update 1 posisi di board menjadi Queen
    def update(self, row, col):
        self.board[row][col] = "#"
```

helper.py

```python
from .board import Board

# Kode warna
colors = {
    'A': 196, 'B': 202, 'C': 226, 'D': 46,
    'E': 51, 'F': 21, 'G': 93, 'H': 201,
    'I': 208, 'J': 118, 'K': 39, 'L': 129,
    'M': 220, 'N': 82, 'O': 27, 'P': 200,
    'Q': 214, 'R': 154, 'S': 75, 'T': 141,
    'U': 190, 'V': 49, 'W': 33, 'X': 165,
    'Y': 229, 'Z': 99
}

def validate(board):
    n = board.row

    # Jumlah daerah maksimal sama dengan sisi
    place = []
    for i in range(n):
        for j in range(n):
            if board.board[i][j].upper() not in place:
                place.append(board.board[i][j].upper())

    if len(place) > n:
        return False

    return True

def validateLine(line):
    if not line:
        return False, "Baris kosong tidak diperbolehkan"

    for char in line:
        if not char.isalpha():
            return False, f"Karakter wajib berupa alphabet"

    return True, ""

# Baca file dengan validasi
```

```
def readFile(file):
    try:
        with open(file, "r") as f:
            lines = [line.strip() for line in f if line.strip()]

            if not lines:
                return None, "File kosong!"

            n = len(lines)

            # Mengecek tiap baris
            for i, line in enumerate(lines):
                isValid, errorMsg = validateLine(line)
                if not isValid:
                    return None, f"Baris {i+1}: {errorMsg}"

            # Mengecek board
            for line in lines:
                if len(line) != n:
                    return None, f"Board harus berbentuk persegi."

            # Buat board
            board = Board(n, n)
            for i in range(n):
                for j in range(n):
                    board.board[i][j] = lines[i][j]

            # Mengecek jumlah daerah
            if not validate(board):
                return None, f"Jumlah daerah tidak boleh lebih
                        dari {n}."

            return board, None

    except FileNotFoundError:
        return None, f"File {file} tidak ditemukan"
    except Exception as e:
        return None, f"Error membaca file: {str(e)}"
```

```
# Warna teks
def textColor(letter):
    number = colors.get(letter)
    return f"\033[38;5;{number}m{letter}\033[0m"

# Output solusi
def showResult(board):
    for i in range(board.row):
        for j in range(board.col):
            if board.board[i][j] == "#":
                print("#", end="")
            else:
                print(textColor(board.board[i][j]), end="")
        print()
```

solver.py

```
from .board import Board
import time

def isValid(pos, letters, n):
    for i in range(n):
        for j in range(i+1, n):
            if pos[i] == pos[j]: # 1 kolom
                return False
            if letters[i][pos[i]] == letters[j][pos[j]]: # tdk
            bisa di daerah sama
                return False
            if abs(i - j) <= 1 and abs(pos[i] - pos[j]) <= 1: #
            tdk boleh bersebelahan (diagonal dekat jg)
                return False

    return True

def isValidBacktrack(pos, letters, row, col):
    for i in range(row):
        prev = pos[i]

        if prev == col: # cek apakah sudah ada queen ditempat ini
```

```
            return False

        if letters[i][prev] == letters[row][col]: # cek daerah
        queen before
            return False

        if abs(i - row) <= 1 and abs(prev - col) <= 1: # cek
        apakah dekat
            return False

    return True

def solve(board, update=None, interval=None, backtracks=False):
    n = board.row
    letters = board.board # copy board
    caseCount = 0
    startTime = time.time()

    if backtracks:
        pos = [-1] * n

        def backtrack(row):
            nonlocal caseCount # caseCount global

            if row == n:
                return True

            for col in range(n):
                caseCount += 1

                if isValidBacktrack(pos, letters, row, col):
                    pos[row] = col

                    # Live update
                    if update and interval and caseCount %
                       interval == 0:
                        tempBoard = Board(n, n)
                        for i in range(n):
                            for j in range(n):
```

```
                                tempBoard.board[i][j] =
                                letters[i][j]

                        for i in range(n):
                            if pos[i] != -1:
                                tempBoard.update(i, pos[i])
                        update(tempBoard)
                        time.sleep(1e-6)

                    if backtrack(row+1):
                        return True

                    pos[row] = -1 # gagal

            return False

        found = backtrack(0)
        if found:
            for i in range(n):
                board.update(i, pos[i])

            totalTime = (time.time() - startTime) * 1000
            return True, caseCount, totalTime

        totalTime = (time.time() - startTime) * 1000
        return False, caseCount, totalTime

    else:
        total = n ** n

        for num in range(total):
            caseCount += 1

            pos = [0] * n # posisi queen
            x = num
            for i in range(n - 1, -1, -1):
                pos[i] = x % n
                x //= n
```

```
            # Live update
            if update and interval and caseCount % interval == 0:
                tempBoard = Board(n, n)
                for i in range(n):
                    for j in range(n):
                        tempBoard.board[i][j] = letters[i][j]

                for i in range(n):
                    tempBoard.update(i, pos[i])
                update(tempBoard)

            if isValid(pos, letters, n):
                for i in range(n):
                    board.update(i, pos[i])

                totalTime = (time.time() - startTime) * 1000
                return True, caseCount, totalTime

        totalTime = (time.time() - startTime) * 1000
        return False, caseCount, totalTime
```

gui.py

```
import flet as ft
import os
from PIL import Image, ImageDraw, ImageFont
from core.board import Board
from core.solver import solve
from core.helper import readFile, validate, validateLine

def main(page: ft.Page):
    page.title = "Queen's Linkedin Game Solver"
    page.window.width = 1050
    page.window.height = 750
    page.padding = 30
    page.scroll = "auto"
    page.theme_mode = ft.ThemeMode.DARK

    # Text field untuk input board
```

```
    boardInput = ft.TextField(
        cursor_color=ft.Colors.BLUE_200,
        multiline=True,
        max_lines=15,
        min_lines=9,
        width=350,
        label="Input Board",
        hint_text="Masukkan board atau load dari file",
        border_color=ft.Colors.BLUE_400,
        focused_border_color=ft.Colors.BLUE_700,
        border_radius=5
    )

    # Warna untuk tiap daerah
    colors = {
        'A': '#EF4444', 'B': '#F97316', 'C': '#F59E0B', 'D':
        '#EAB308', 'E': '#84CC16', 'F': '#22C55E', 'G': '#10B981',
        'H': '#14B8A6', 'I': '#06B6D4', 'J': '#0EA5E9', 'K':
        '#3B82F6', 'L': '#6366F1', 'M': '#8B5CF6', 'N': '#A855F7',
        'O': '#D946EF', 'P': '#EC4899', 'Q': '#F43F5E', 'R':
        '#FB7185', 'S': '#FDA4AF', 'T': '#FCA5A5', 'U': '#FCD34D',
        'V': '#BEF264', 'W': '#86EFAC', 'X': '#5EEAD4',
        'Y': '#7DD3FC', 'Z': '#A5B4FC'
    }

    # Buat board grid
    def createBoardGrid(board):
        n = board.row
        cellSize = min(40, 380 // n)

        grid = ft.Column(spacing=2,
        horizontal_alignment=ft.CrossAxisAlignment.CENTER)

        for i in range(n):
            row = ft.Row(spacing=2,
            alignment=ft.MainAxisAlignment.CENTER)
            for j in range(n):
                letter = board.board[i][j]
                isQueen = (letter == '#')
```

```
            if isQueen:
                bgcolor = "#FFD700"
                content = ft.Text("👑", size=cellSize*0.6,
                weight=ft.FontWeight.BOLD)
            else:
                bgcolor = colors.get(letter.upper(),
                "#94A3B8")
                content = ft.Text(size=cellSize*0.5,
                weight=ft.FontWeight.BOLD)

            cell = ft.Container(
                content=content,
                width=cellSize,
                height=cellSize,
                bgcolor=bgcolor,
                border_radius=3,
                alignment=ft.alignment.center,
            )
            row.controls.append(cell)
        grid.controls.append(row)

    return grid

# Grid Board
boardDisplay = ft.Column(spacing=10,
horizontal_alignment=ft.CrossAxisAlignment.CENTER,
scroll=ft.ScrollMode.AUTO)

# Text Result
result = ft.Text(size=12, selectable=True,
weight=ft.FontWeight.W_500, text_align=ft.TextAlign.CENTER)

# Text untuk nama file
fileName = ft.Text("", size=12, color=ft.Colors.GREY_400)

# Result container
resultContainer = ft.Container(
    content=ft.Column([
```

```
            boardDisplay,
            ft.Divider(height=10, color=ft.Colors.TRANSPARENT),
            result
        ], spacing=5,
     horizontal_alignment=ft.CrossAxisAlignment.CENTER,
scroll=ft.ScrollMode.AUTO),
        padding=15,
        border_radius=8,
        bgcolor=ft.Colors.BLUE_100,
        border=ft.border.all(1, ft.Colors.GREY_300),
        width=480,
        height=550,
        animate=ft.Animation(300, "ease")
    )

    # checkbox backtrack
    checkbox = ft.Checkbox(label = "Enable Backtracking (Faster &
    Recommended)", value = False)

    def validateBoard():
        if not boardInput.value or not boardInput.value.strip():
            return None, "Silakan masukkan konfigurasi board
            terlebih dahulu!"

        lines = boardInput.value.strip().split("\n")
        n = len(lines)

        # Validasi tiap baris
        for i, line in enumerate(lines):
            isValid, errorMsg = validateLine(line)
            if not isValid:
                return None, f"Format board tidak valid!\nBaris
                {i+1}: {errorMsg}"

        # Cek persegi
        for line in lines:
            if len(line) != n:
                return None, "Format board tidak valid!\nBoard
                harus berbentuk persegi."
```

```
        # Buat board
        board = Board(n, n)
        try:
            for i in range(n):
                for j in range(n):
                    board.board[i][j] = lines[i][j]
        except IndexError:
            return None, "Format board tidak valid!"

        # Validasi jumlah daerah
        if not validate(board):
            return None, "Format board tidak valid!"

        return board, None

    def exportTxt(e):
        board, error = validateBoard()
        boardDisplay.controls.clear()
        if error:
            result.value = error
            resultContainer.bgcolor = "#78350F"
            resultContainer.border = ft.border.all(1, "#F59E0B")
            result.color = "#FCD34D"
            page.update()
            return
        folder = "result" # folder save output
        if not os.path.exists(folder):
            os.makedirs(folder)

        files = os.listdir(folder)
        found, count, time = solve(board)
        filepath = os.path.join(folder, f"result{len(files) +
        1}.txt")

        with open(filepath, "w") as f:
            if found:
                for i in range(board.row):
                    for j in range(board.col):
```

```
                            f.write(board.board[i][j])
                    f.write("\n")
                f.write("\n")
            else:
                f.write("Solusi tidak ditemukan\n")
            f.write(f"Waktu pencarian: {time:.2f} ms\n")
            f.write(f"Banyak kasus yang ditinjau: {count}
            kasus\n")

        result.value = f"Berhasil diexport ke result{len(files) +
        1}.txt"
        resultContainer.bgcolor = "#064E3B"
        resultContainer.border = ft.border.all(1, "#10B981")
        result.color = "#6EE7B7"
        page.update()

    def exportImage(e):
        board, error = validateBoard()
        boardDisplay.controls.clear()
        if error:
            result.value = error
            resultContainer.bgcolor = "#78350F"
            resultContainer.border = ft.border.all(1, "#F59E0B")
            result.color = "#FCD34D"
            page.update()
            return

        n = board.row

        found, count, time = solve(board)
        if not found:
            result.value = "Solusi tidak ditemukan, tidak bisa
            di-export"
            resultContainer.bgcolor = "#7F1D1D"
            resultContainer.border = ft.border.all(1, "#EF4444")
            result.color = "#FCA5A5"
            page.update()
            return
```

```
        grid = [[0 for _ in range(n)] for _ in range(n)]
        queens = []
        for i in range(n):
            for j in range(n):
                if board.board[i][j] != "#":
                    grid[i][j] =
                colors.get(board.board[i][j].upper(), "#94A3B8")
                else:
                    grid[i][j] = "#FFD700"
                    queens.append((i, j))

        cell = 80
        font = ImageFont.truetype("seguiemj.ttf", cell // 2)
        img = Image.new("RGB", (n * cell, n * cell))
        draw = ImageDraw.Draw(img)

        for i in range(n):
            for j in range(n):
                x1 = j * cell
                y1 = i * cell
                x2 = x1 + cell
                y2 = y1 + cell

                draw.rectangle([x1, y1, x2, y2], fill=grid[i][j],
                outline="black")

                if (i, j) in queens:
                    draw.text((x1 + cell // 6, y1 + cell // 4),
                    "👑", font=font)

        folder = "result"
        if not os.path.exists(folder):
            os.makedirs(folder)

        img.save("result/game.png")

        result.value = "Berhasil diexport ke game.png"
        resultContainer.bgcolor = "#064E3B"
        resultContainer.border = ft.border.all(1, "#10B981")
```

```
        result.color = "#6EE7B7"
        page.update()

    # Load file
    def loadFile(e: ft.FilePickerResultEvent):
        if e.files:
            filePath = e.files[0].path
            fileName.value = f"File: {e.files[0].name}"

            board, error = readFile(filePath)
            if board:
                lines = []
                for i in range(board.row):
                    lines.append("".join(board.board[i]))
                boardInput.value = "\n".join(lines)
                boardDisplay.controls.clear()
                result.value = "File berhasil dimuat"
                resultContainer.bgcolor = "#064E3B"
                resultContainer.border = ft.border.all(1,
                "#10B981")
                result.color = "#6EE7B7"
            else:
                boardDisplay.controls.clear()
                result.value = f"Error: {error}"
                resultContainer.bgcolor = "#7F1D1D"
                resultContainer.border = ft.border.all(1,
                "#EF4444")
                result.color = "#FCA5A5"
            page.update()

    filePicker = ft.FilePicker(on_result=loadFile)
    page.overlay.append(filePicker)

    def pickFile(e):
        filePicker.pick_files(
            allowed_extensions=["txt"],
            dialog_title="Pilih file konfigurasi"
        )
```

```
    # Solve
    def solves(e):
        board, error = validateBoard()
        if error:
            boardDisplay.controls.clear()
            result.value = error
            resultContainer.bgcolor = "#78350F"
            resultContainer.border = ft.border.all(1, "#F59E0B")
            result.color = "#FCD34D"
            page.update()
            return

        backtracks = checkbox.value # ambil value dari checkbox

        n = board.row
        boardDisplay.controls.clear()
        result.value = "Sedang mencari solusi..."
        resultContainer.bgcolor = "#1E3A8A"
        result.color = ft.Colors.WHITE
        page.update()

        # Live update
        def updateProgress(tempBoard):
            boardDisplay.controls.clear()
            boardDisplay.controls.append(ft.Text("Mencari
            solusi...", size=14, weight=ft.FontWeight.BOLD,
            color="#60A5FA"))

        boardDisplay.controls.append(createBoardGrid(tempBoard))
            page.update()

        found, caseCount, time = solve(board,
        update=updateProgress, interval=1.5,
        backtracks=backtracks)

        if found:
            boardDisplay.controls.clear()
            boardDisplay.controls.append(
                ft.Text("Solusi Ditemukan!", size=16,
```

```
                weight=ft.FontWeight.BOLD, color="#10B981")
            )
            boardDisplay.controls.append(createBoardGrid(board))

            result.value = f"Waktu pencarian: {time:.2f} ms\nKasus
            ditinjau: {caseCount} kasus"
            resultContainer.bgcolor = "#064E3B"
            resultContainer.border = ft.border.all(1, "#10B981")
            result.color = "#6EE7B7"
        else:
            boardDisplay.controls.clear()
            boardDisplay.controls.append(
                ft.Text("Solusi Tidak Ditemukan", size=16,
                weight=ft.FontWeight.BOLD, color="#EF4444")
            )
            result.value = f"Coba dengan konfigurasi board yang
            berbeda.\nWaktu pencarian: {time:.2f} ms\nKasus
            ditinjau: {caseCount} kasus"
            resultContainer.bgcolor = "#7F1D1D"
            resultContainer.border = ft.border.all(1, "#EF4444")
            result.color = "#FCA5A5"

        page.update()

    # UI
    page.add(
        ft.Container(
            content=ft.Column([
                ft.Text(
                    "Queen's Linkedin Game Solver",
                    size=28,
                    weight=ft.FontWeight.BOLD,
                    color=ft.Colors.BLUE_700
                ),
                ft.Divider(height=20, color=ft.Colors.BLUE_200),

                ft.Row([
                    ft.Container(
                        content=ft.Column([
```

```
                ft.Text("Input Board:", size=16,
                color="#E2E8F0",
                weight=ft.FontWeight.BOLD),
                boardInput,
                ft.Row([
                    ft.ElevatedButton(
                        "Load dari File",
                        icon=ft.Icons.UPLOAD_FILE,
                        on_click=pickFile,
                        style=ft.ButtonStyle(
                            color=ft.Colors.WHITE,
                            bgcolor=ft.Colors.BLUE_600
                        )
                    ),
                    ft.ElevatedButton(
                        "Solve",
                        icon=ft.Icons.PLAY_ARROW,
                        on_click=solves,
                        style=ft.ButtonStyle(
                            color=ft.Colors.WHITE,

                        bgcolor=ft.Colors.GREEN_600
                        )
                    ),
                ], spacing=10),
                ft.Row([
                    ft.ElevatedButton(
                        "Export TXT",
                        icon=ft.Icons.SHARE,
                        on_click=exportTxt,
                        style=ft.ButtonStyle(
                            color=ft.Colors.WHITE,

                        bgcolor=ft.Colors.PURPLE_600
                        )
                    ),
                    ft.ElevatedButton(
                        "Export Image",
                        icon=ft.Icons.IMAGE,
```

```
                                    on_click=exportImage,
                                    style=ft.ButtonStyle(
                                        color=ft.Colors.WHITE,
                                        bgcolor=ft.Colors.PINK_600
                                    )
                                ),
                            ], spacing=10),
                            checkbox,
                            fileName,
                        ], spacing=15),
                        padding=20,
                        border_radius=10,
                        bgcolor="#1E293B"
                    ),

                    ft.Container(
                        content=ft.Column([
                            ft.Text("Hasil:", size=16,
                            color=ft.Colors.WHITE54,
                            weight=ft.FontWeight.BOLD),
                            resultContainer,
                        ], spacing=10),
                        padding=20,
                    )
                ], spacing=20, scroll=ft.ScrollMode.AUTO),
            ], spacing=10,
            horizontal_alignment=ft.CrossAxisAlignment.CENTER),
            bgcolor=ft.Colors.BLACK38,
            border_radius=15,
            padding=20,
        )
    )
```

maincli.py

```
from core.board import Board
from core.solver import solve
from core.helper import readFile, showResult
import os
```

```
file = input("Silahkan masukkan nama file (tanpa .txt) : ")
path = os.path.join("test", file)
board, error = readFile(f"{path}.txt")

if board is None:
    print(f"Error: {error}")
    exit(1)

ans = input("Apakah ingin mengoptimalkan solusi (backtrack) Y/N:
")
if ans.upper() == "Y":
    found, caseCount, time = solve(board, None, None,
    backtracks=True)
else:
    found, caseCount, time = solve(board)

if found:
    showResult(board)
    print()
    print(f"Waktu pencarian: {time:.2f} ms")
    print(f"Banyak kasus yang ditinjau: {caseCount} kasus")
else:
    print("Solusi tidak ditemukan")
```

maingui.py

```
from ui.gui import main
import flet as ft

ft.app(target=main)
```

BAB 3

UJI PROGRAM

1. Kasus Uji 1 - *valid*

Input :

```
AAABBCCCD
ABBBBCECD
ABBBDCECD
AAABDCCCD
BBBBDDDDD
FGGGDDHDD
FGIGDDHDD
FGIGDDHDD
FGGGDDHHH
```

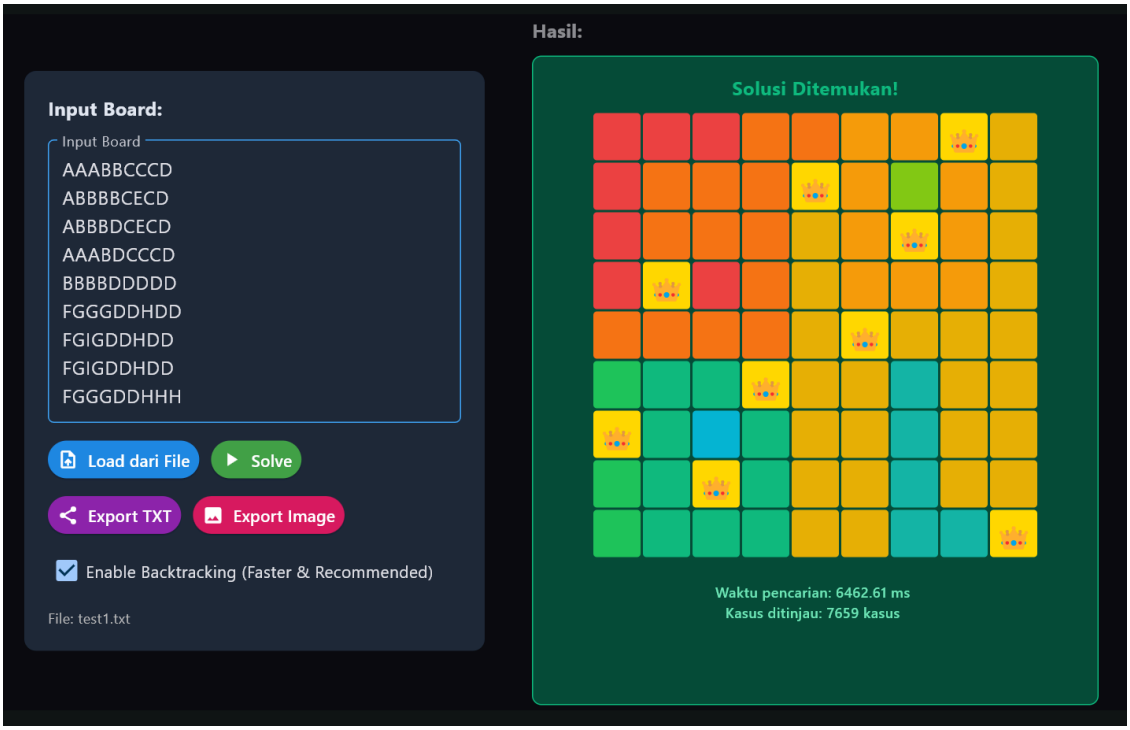
Output :

CLI

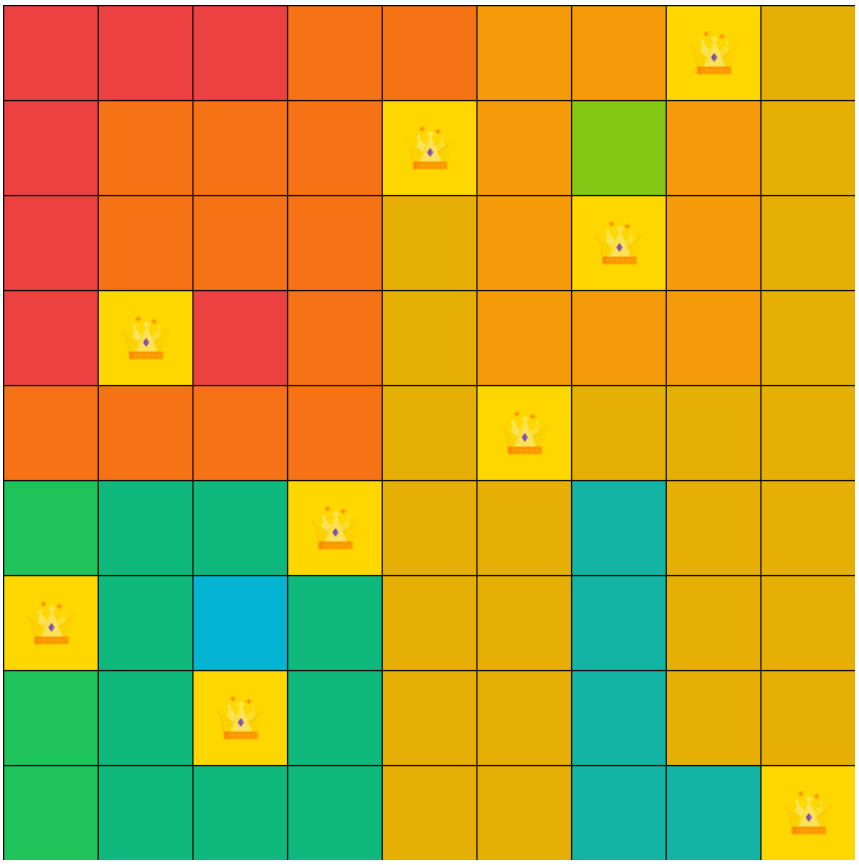
```
Silahkan masukkan nama file (tanpa .txt) : test1
Apakah ingin mengoptimalkan solusi (backtrack) Y/N: Y
AAABBCC#D
ABBB#CECD
ABBBDC#CD
A#ABDCCCD
BBBBD#DDD
FGG#DDHDD
#GIGDDHDD
FG#GDDHDD
FGGGDDHH#

Waktu pencarian: 8.67 ms
Banyak kasus yang ditinjau: 7659 kasus
```

***Menggunakan backtrack untuk mempercepat*

GUI



Export Image



2. Kasus Uji 2 - *valid*

Input :

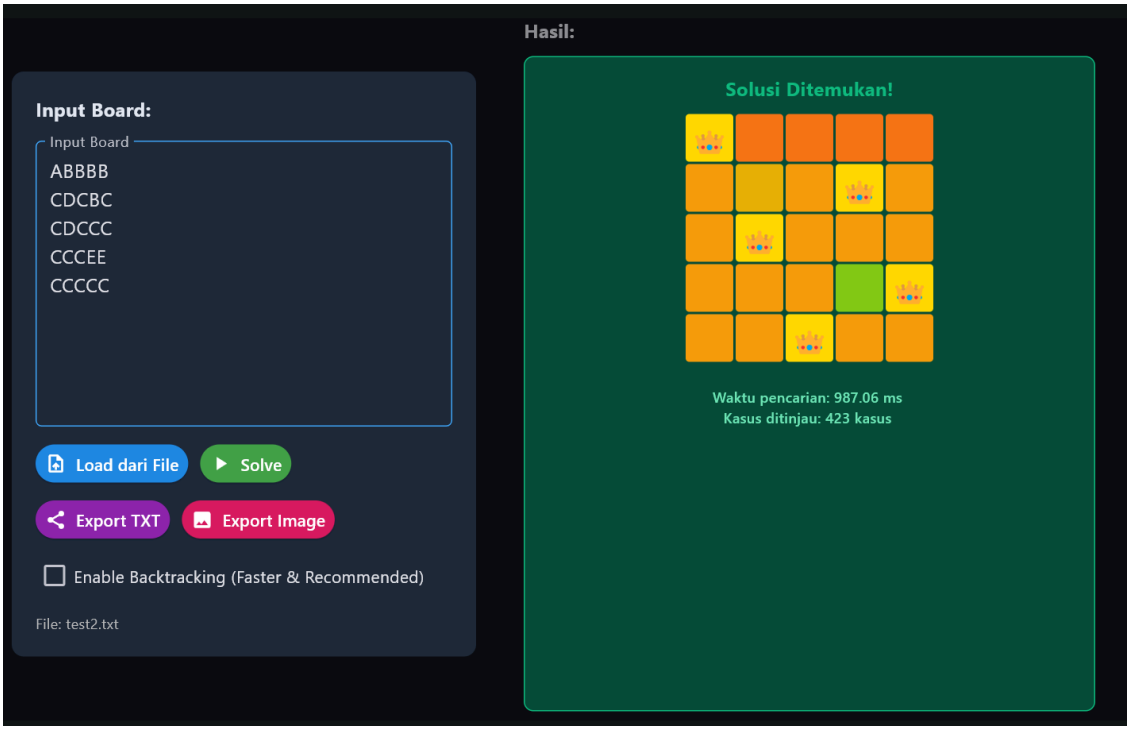
```
ABBBB
CDCBC
CDCCC
CCCEE
CCCCC
```

Output :

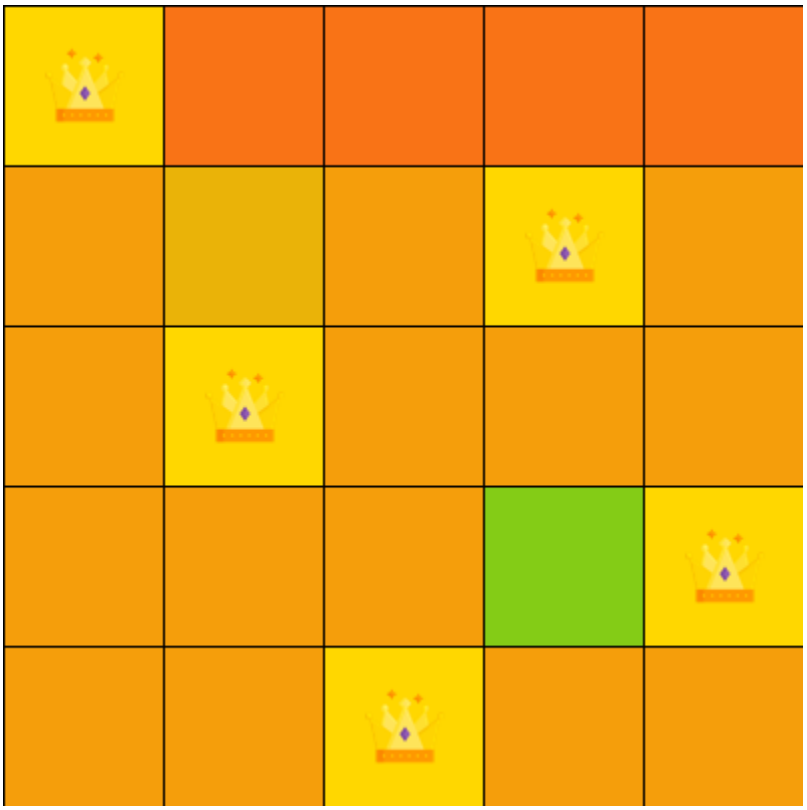
CLI

```
Silahkan masukkan nama file (tanpa .txt) : test2
Apakah ingin mengoptimalkan solusi (backtrack) Y/N: N
#BBBB
CDC#C
C#CCC
CCCE#
CC#CC

Waktu pencarian: 1.64 ms
Banyak kasus yang ditinjau: 423 kasus
```

GUI



Export Image



3. Kasus Uji 3 - *invalid (daerah terlalu banyak)*

Input :

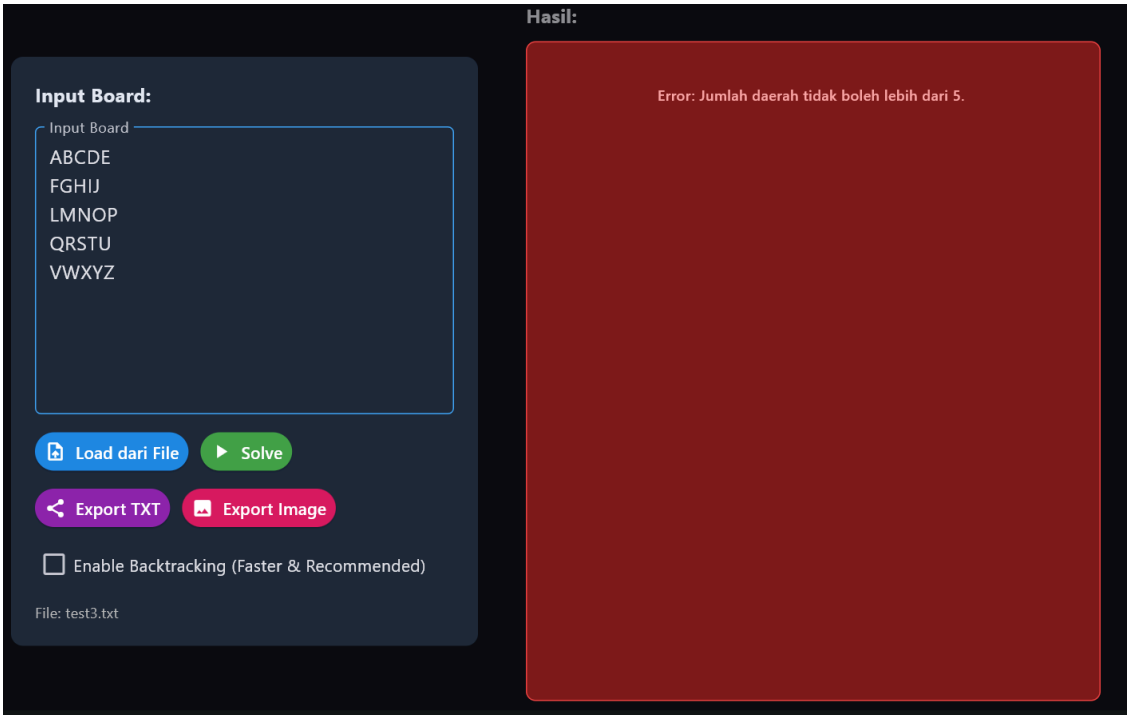
```
ABCDE
FGHIJ
LMNOP
QRSTU
VWXYZ
```

Output :

CLI

```
Silahkan masukkan nama file (tanpa .txt) : test3
Error: Jumlah daerah tidak boleh lebih dari 5.
```

GUI



4. Kasus Uji 4 - *invalid (board tidak lengkap)*

Input :

```
AAAD
```

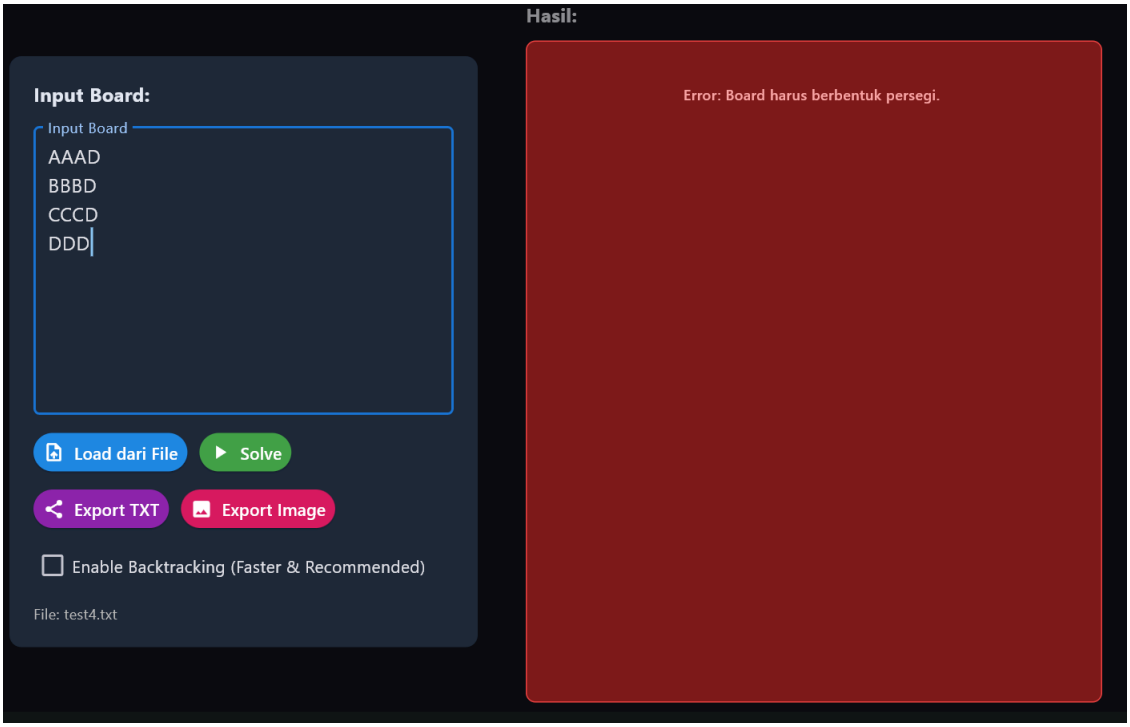
```
BBBD
CCCD
DDD
```

Output :

CLI

```
Silahkan masukkan nama file (tanpa .txt) : test4
Error: Board harus berbentuk persegi.
```

GUI



5. Kasus Uji 5 - *invalid (bukan alphabet)*

Input :

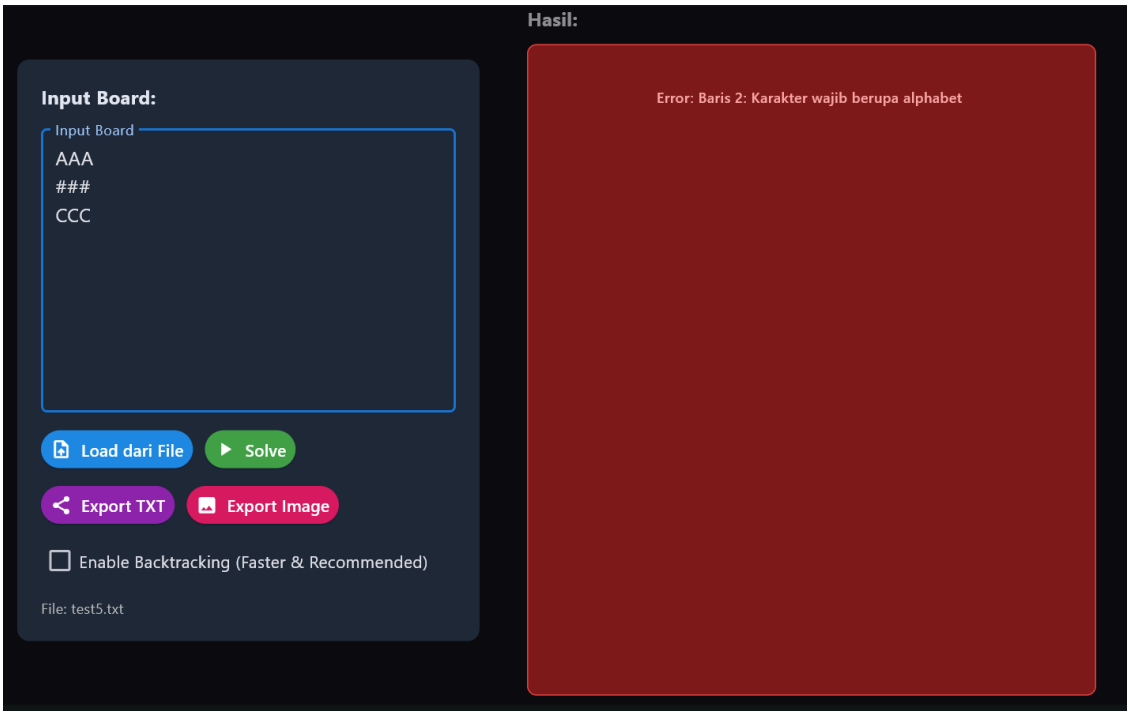
```
AAA
###
CCC
```

Output :

CLI

```
Silahkan masukkan nama file (tanpa .txt) : test5
Error: Baris 2: Karakter wajib berupa alphabet
```

GUI



6. Kasus Uji 6 - *valid*

Input :

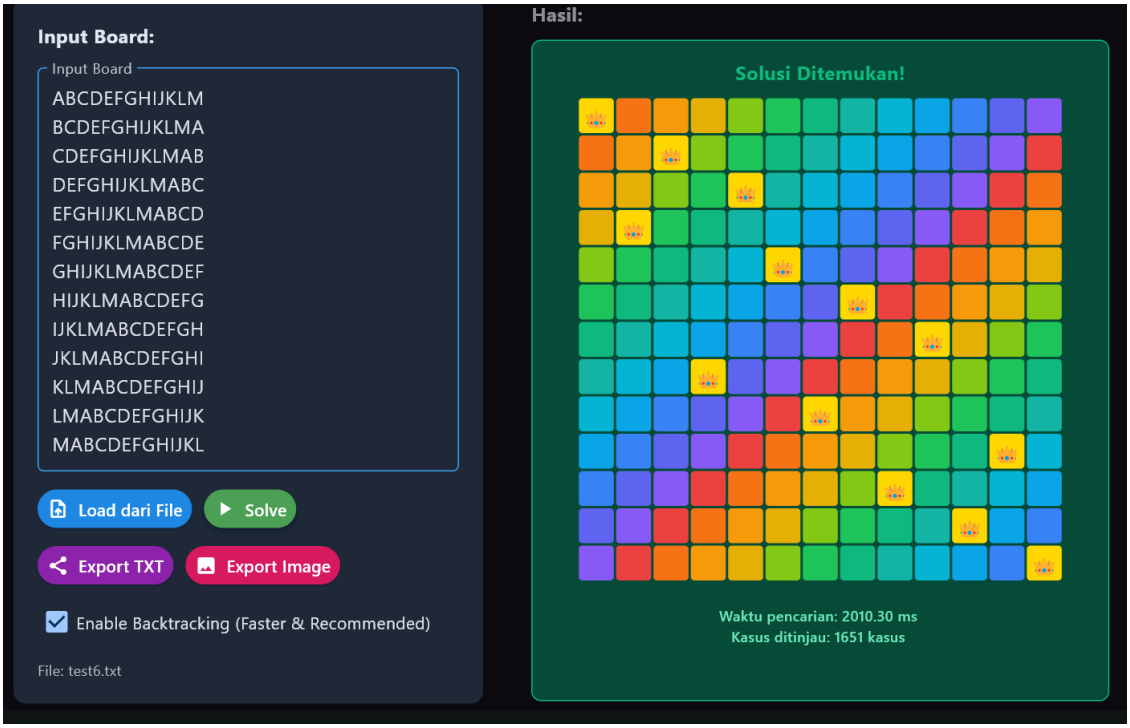
```
ABCDEFGHIJKLM
BCDEFGHIJKLMA
CDEFGHIJKLMAB
DEFGHIJKLMABC
EFGHIJKLMABCD
FGHIJKLMABCDE
GHIJKLMABCDEF
HIJKLMABCDEFG
IJKLMABCDEFGH
JKLMABCDEFGHI
KLMABCDEFGHIJ
LMABCDEFGHIJK
MABCDEFGHIJKL
```

Output :

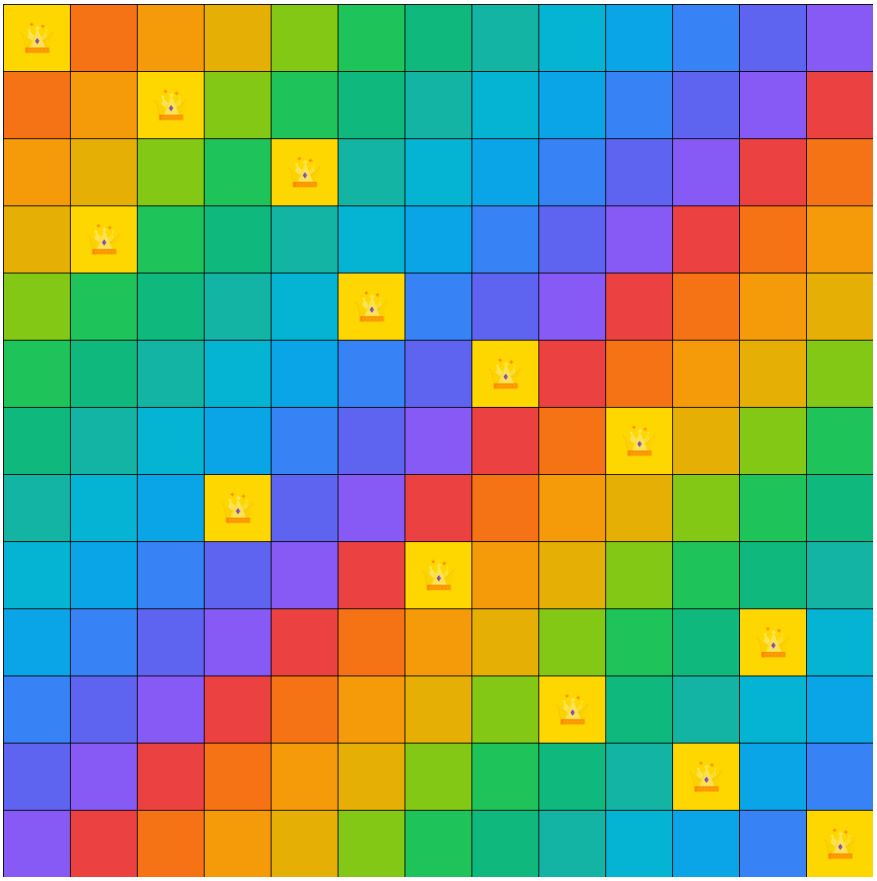
CLI

```
Silahkan masukkan nama file (tanpa .txt) : test6
Apakah ingin mengoptimalkan solusi (backtrack) Y/N: Y
#BCDEFGHIJKLM
BC#EFGHIJKLMA
CDEF#HIJKLMAB
D#FGHIJKLMABC
EFGHI#KLMABCD
FGHIJKL#ABCDE
GHIJKLMAB#DEF
HIJ#LMABCDEFG
IJKLMA#CDEFGH
JKLMABCDEFG#I
KLMABCDE#GHIJ
LMABCDEFGH#JK
MABCDEFGHIJK#

Waktu pencarian: 2.73 ms
Banyak kasus yang ditinjau: 1651 kasus
```

GUI



Export Image



BAB IV

LAMPIRAN

No	Poin	Ya	Tidak
1	Program berhasil di kompilasi tanpa kesalahan	✓	
2	Program berhasil di jalankan	✓	
3	Solusi yang diberikan program benar dan mematuhi aturan permainan	✓	
4	Program dapat membaca masukan berkas .txt serta menyimpan solusi dalam berkas .txt	✓	
5	Program memiliki Graphical User Interface (GUI)	✓	
6	Program dapat menyimpan solusi dalam bentuk file gambar	✓	

Tugas ini disusun sepenuhnya tanpa bantuan kecerdasan buatan (Generative AI), melainkan hasil pemikiran dan analisis mandiri.

Valentino Daniel Kusumo