



# Details



Problem Statement : AI-powered automatic circuit design

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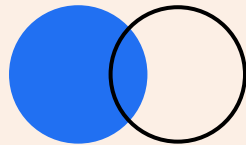


# Ideas & Methodologies



## Problem Focus

- Traditional circuit design is complex, time-consuming, and requires expert knowledge
- Lack of AI-driven automation



## Goal

- Automate circuit design using AI to reduce complexity and effort
- Enable easy circuit creation without requiring deep expertise



## Methodology

- Implementing RAG
  - Using LLMs (fine tuning) and circuit simulators combined with multi-agent systems

# Study of Problem Statement



- > An example given shows the challenge:
  - Users need to input specifications like "Design an amplifier circuit with a gain of 10 having input of 2V AC and 25V DC using resistors and capacitors."
- >Currently requires manual calculations and deep expertise

# Solution

Circuit  
Design AI

Circuit Design AI - A system that provides automated circuit design and adaptive optimization through AI-driven processes

## Component-1 - DESIGN

AI transforms user requirements into optimized circuit designs by automatically selecting components and generating schematics using LLMs and multi-agent systems

## Component-2 - VALIDATION

AI performs real-time circuit validation and adaptive optimization through simulation, ensuring the generated designs meet the specified requirements and performance criteria

# Methodology -Brief - 1

Uses multiple **AI agents:**

- 1) User Query Processing Agent
- 2) Component Selection Agent
- 3) Formula Retrieval Agent
- 4) Circuit Generation Agent
- 5) Simulation & Optimization Agent



User Query



AI Model Processes

The Requirements

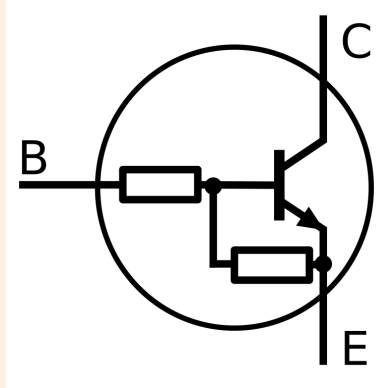


> Component Selection

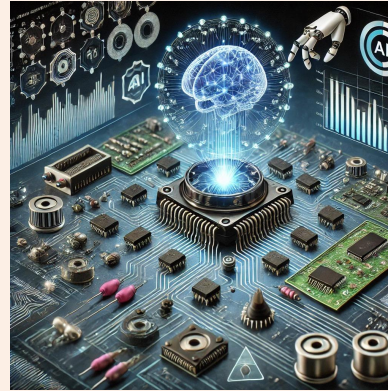
```
{  
  ["Rf = 9kΩ  
   Ri = 1kΩ  
   Cin = 0.1μF"]  
}
```

# Methodology -Brief - 2

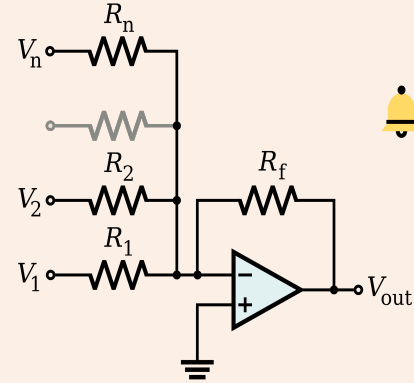
multiple AI agents:



Generate Schematic Circuit



Simulation & Testing & Optimization



Final Optimized circuit



# Additional Info & Future Work

## AI circuit design

### Tech Stack

AI Models : DeepSeek,  
Gemini, OpenAI

Circuit : NgSpice,  
Simulators LTSpice

RAG implementation

Multi-agent system

### Innovation

1. Automated formula retrieval using AI Agent
2. Dynamic circuit optimization
3. Iterative learning & self-improving designs
4. Requirement-specific component selection

### Future Work

1. AI-driven PCB layout automation
  2. Integration with real-world component databases
  3. Advanced AI fault detection for circuits
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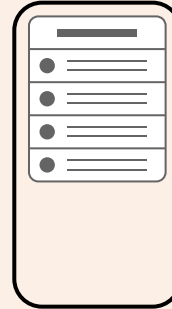
# Conclusion

## Use Cases:

- Quick prototyping for research and industrial applications
- AI-assisted learning for beginners
- Adapts designs based on specific requirements



Team task  
breakdown and  
responsibilities



Durga Rama Krishna – AI/ml  
Leela Prasad – AI/ml  
Lahari – Frontend  
Venu – Backend