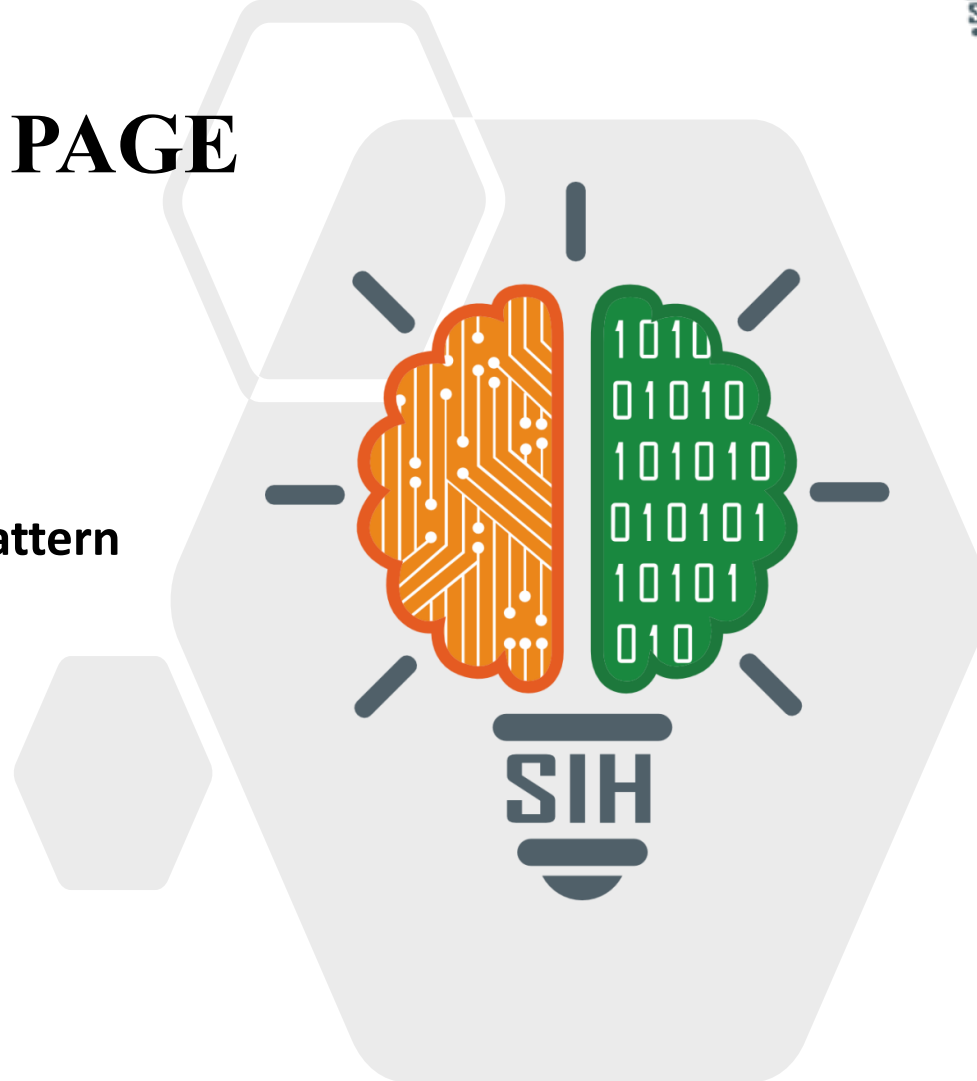


SMART INDIA HACKATHON 2025



TITLE PAGE

- **Problem Statement ID – SIH12507**
- **Problem Statement Title- Kolam AI — Pattern Recreation**
- **Theme- Heritage and Culture**
- **PS Category- Software**
- **Team ID- 92287**
- **Team Name- DOT 2 CODE**



Kolam AI — Pattern Recreation

Our Solution

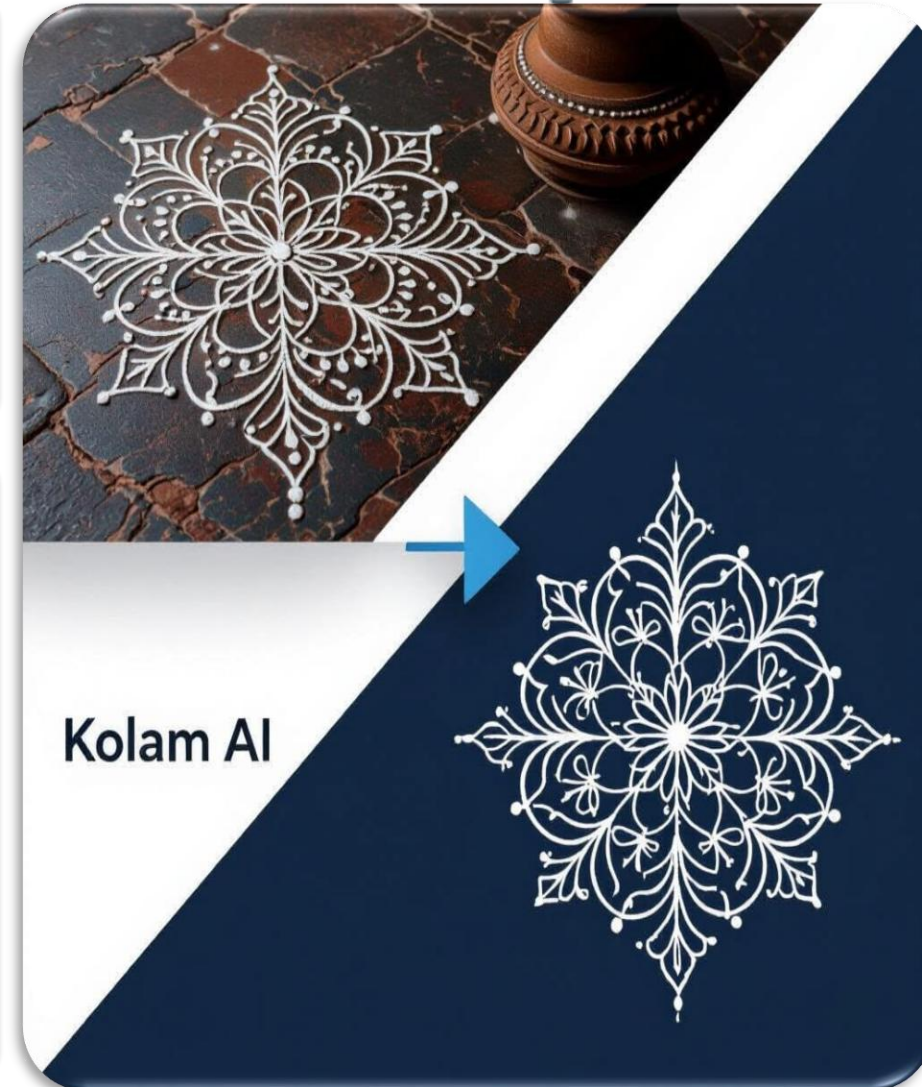
- ❖ An AI that analyzes Kolam images using computer vision to detect dot-grids and strokes.
- ❖ Extracts core design rules like symmetry and repetition to create clean, scalable digital versions (SVG/PNG).
- ❖ Preserves both the final pattern and the principles behind it for learning, art, and cultural applications.

The Challenge

- ❖ Traditional Kolams are temporary and their intricate design logic is disappearing with time.
- ❖ No system currently exists to digitally capture the underlying principles of their creation.

Innovation & Uniqueness

- ❖ The first system to automatically decode the "grammar" of Kolam art.
- ❖ Uniquely combines Computer Vision + Pattern Grammar + AI-based Generation.
- ❖ Generates new, authentic Kolams based on learned rules—it doesn't just copy existing ones.

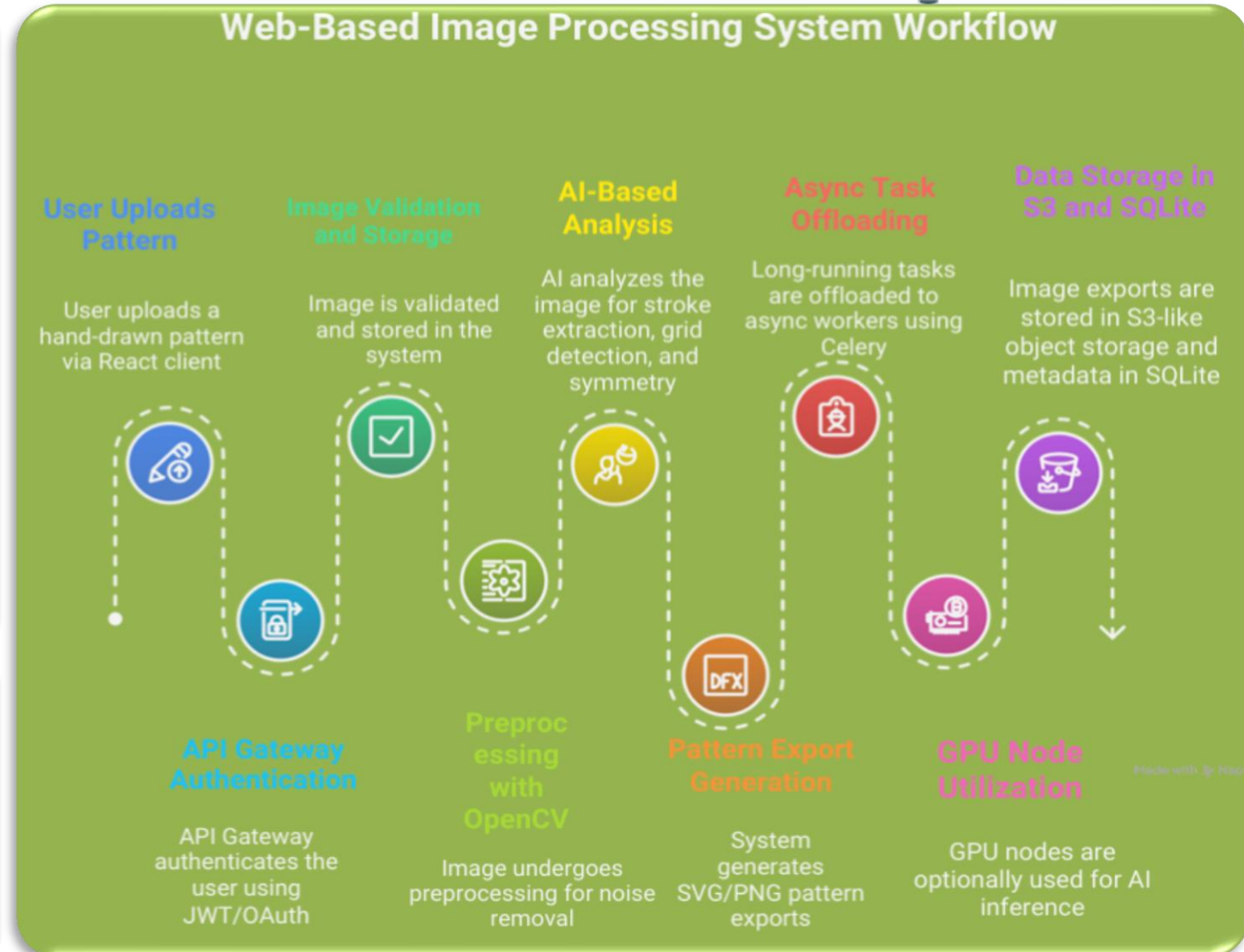


Technical Approach – Kolam AI

- ❖ Kolam AI leverages Python, JavaScript (React.js), FastAPI, OpenCV, NumPy, Scikit-image, and Tailwind CSS. It uses SQLite, Docker, Vite, and runs on standard PCs (GPU optional) for efficient AI processing.
- ❖ Images are uploaded and processed to detect dots, strokes, and symmetry for accurate pattern recreation. An interactive SVG-based frontend supports coloring, undo/redo, and export, while RESTful APIs manage async processing and data storage.

Methodology:

- ❖ Kolam images are analyzed using AI and CV to detect structures and recreate patterns.
- ❖ A dynamic UI enables coloring and customization with real-time feedback.



FEASIBILITY AND VIABILITY

Feasibility Analysis

- ❖ Uses Python, OpenCV, React (proven tech)
- ❖ Runs on standard laptops/PCs
- ❖ Low cost with open-source tools
- ❖ Skilled development team available
- ❖ Scalable to cloud deployment

Strategies to Overcome Challenges

- ❖ Image preprocessing & noise removal
- ❖ Expert validation of designs
- ❖ Optimize algorithms & use async APIs
- ❖ Build dataset via crowdsourcing
- ❖ Awareness drives & cultural tie-ups

Potential Challenges & Risks

- ❖ Noisy image detection issues
- ❖ Ensuring cultural authenticity
- ❖ Performance on large images
- ❖ Limited training dataset
- ❖ Resistance from traditional artists

Features

- ❖ Shopping Store
- ❖ Mandala Art
- ❖ Mobile-friendly App
- ❖ Multilingual UI
- ❖ Community Sharing
- ❖ Gamification
- ❖ Export & Creative Use



IMPACT AND BENEFITS

Potential Impact on Target Audience

- ❖ Preserves traditional Kolam art
- ❖ Raises cultural awareness among youth
- ❖ Platform for artists to showcase designs
- ❖ Encourages creativity and participation
- ❖ Supports cultural education in schools

Benefits of the solution

- ❖ **Social:** Revives cultural heritage
- ❖ **Economic:** Income opportunities for artists
- ❖ **Educational:** Teaches symmetry & culture
- ❖ **Environmental:** Digital preservation
- ❖ **Technological:** Promotes AI in heritage



RESEARCH AND REFERENCES



Kolam Art & Cultural Background

- ❖ <https://en.wikipedia.org/wiki/Kolam>
- ❖ <https://www.tamilnadutourism.tn.gov.in/things-to-do/kolam>
- ❖ <https://www.ikolam.com/>
- ❖ <https://www.tamilnadutourism.tn.gov.in/index.php/experiences/kolam>

Image Processing & Pattern Detection

- ❖ <https://docs.opencv.org/>
- ❖ <https://numpy.org/doc/>

Web & Backend Technologies

- ❖ <https://fastapi.tiangolo.com/>
- ❖ <https://react.dev/>

Data Sets

- ❖ <https://share.google/iOyovl4aol5GQo85Z>
- ❖ <https://pin.it/Ed9DNqonL>