

AiMA- An AI-Based Mobile System to Assist College Students with Math-Related Issues



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Outline

- Introduction

- Background

- System Design

- Results

0

1

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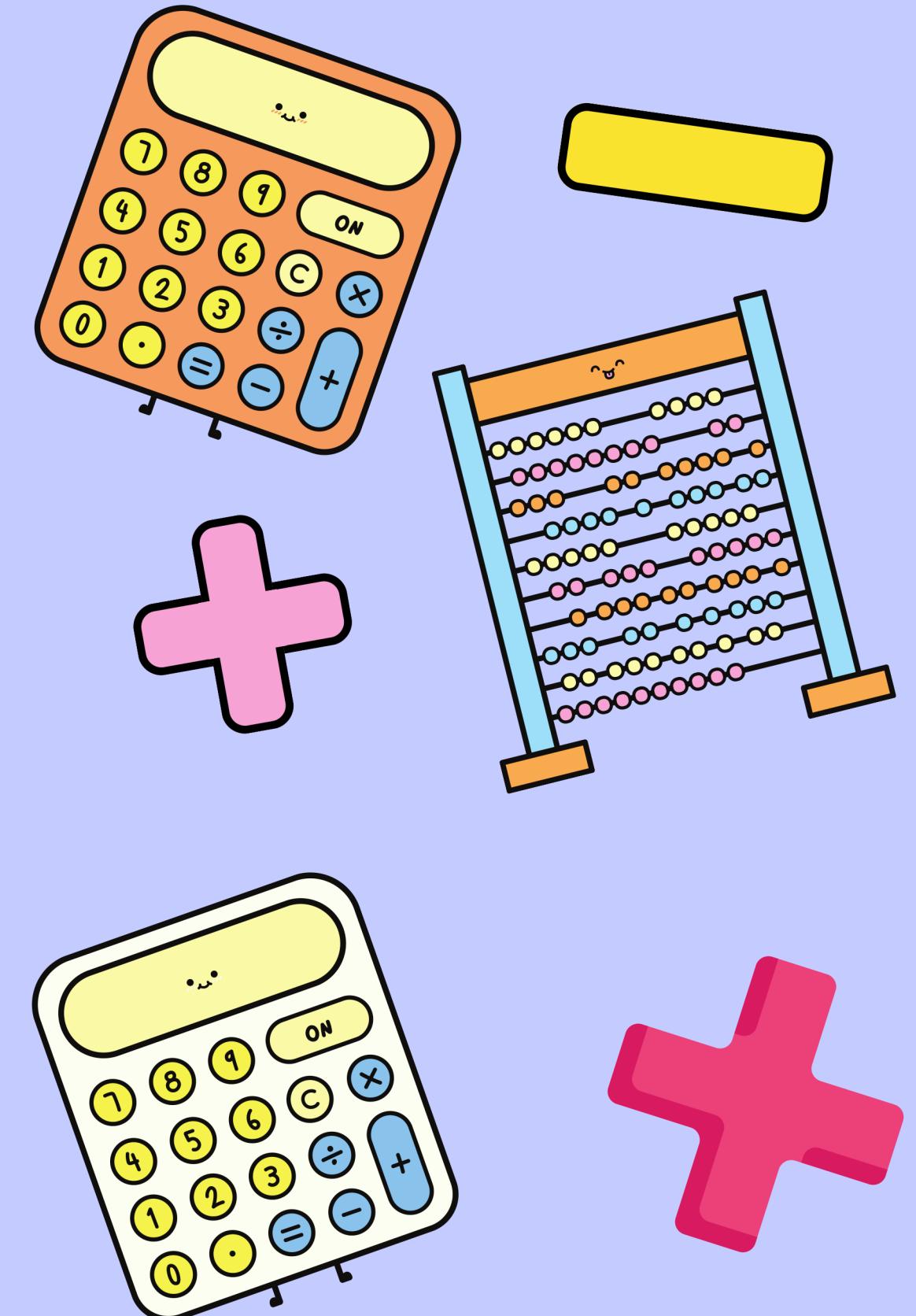
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8

Introduction

- Problem statement?
- About mathematical areas?
- What is OCR technology?



What do you think about this?

$$\int_0^{\pi/2} \sin(x)(4 \cos(x))e^{2 \cos(x)+1} dx$$

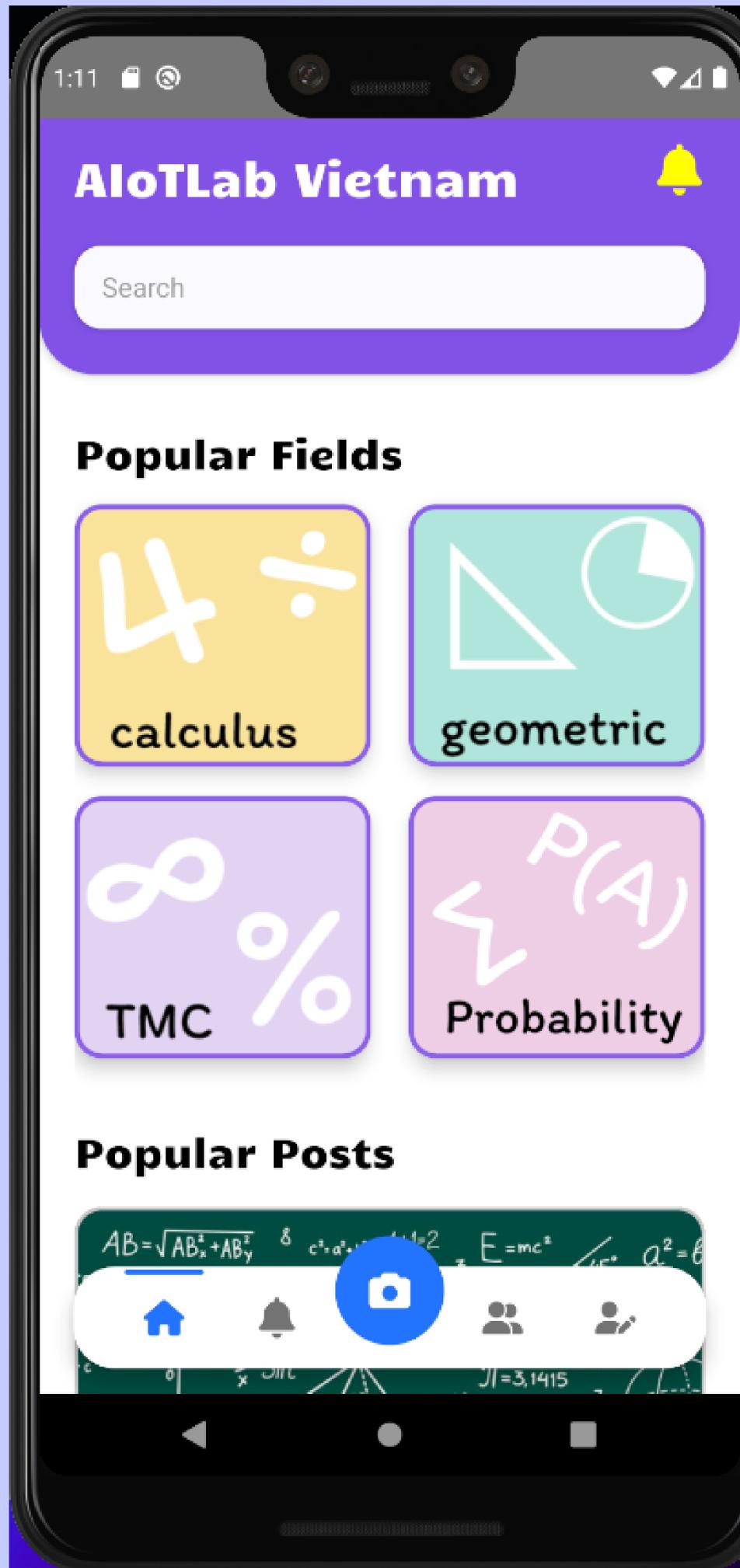


What do you think about this?

20% secondary students are struggling with math

54% secondary think math is medium difficult



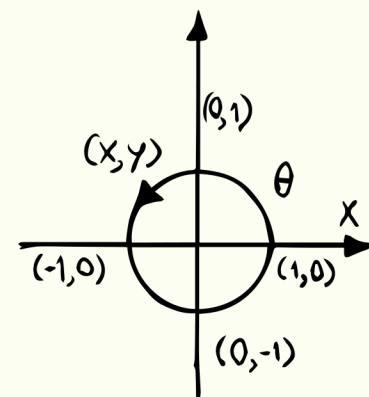


Recommended mobile application

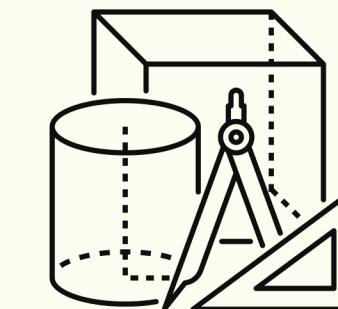
- Calculation ability
- Easy to use
- High performance
- Diversifying features
- Low development costs

About mathematical areas?

Mathematics is the abstract study of numbers, quantities, shapes, and patterns.



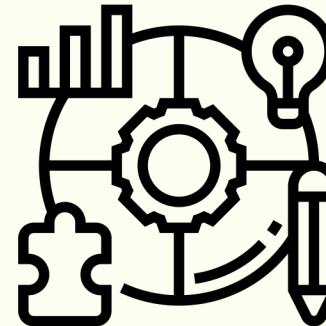
Calculus



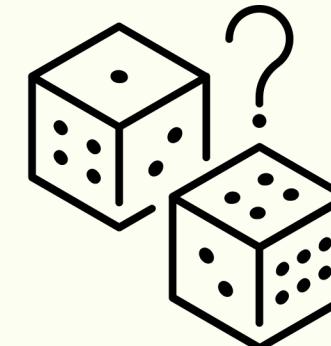
Geometry

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

Linear Algebra



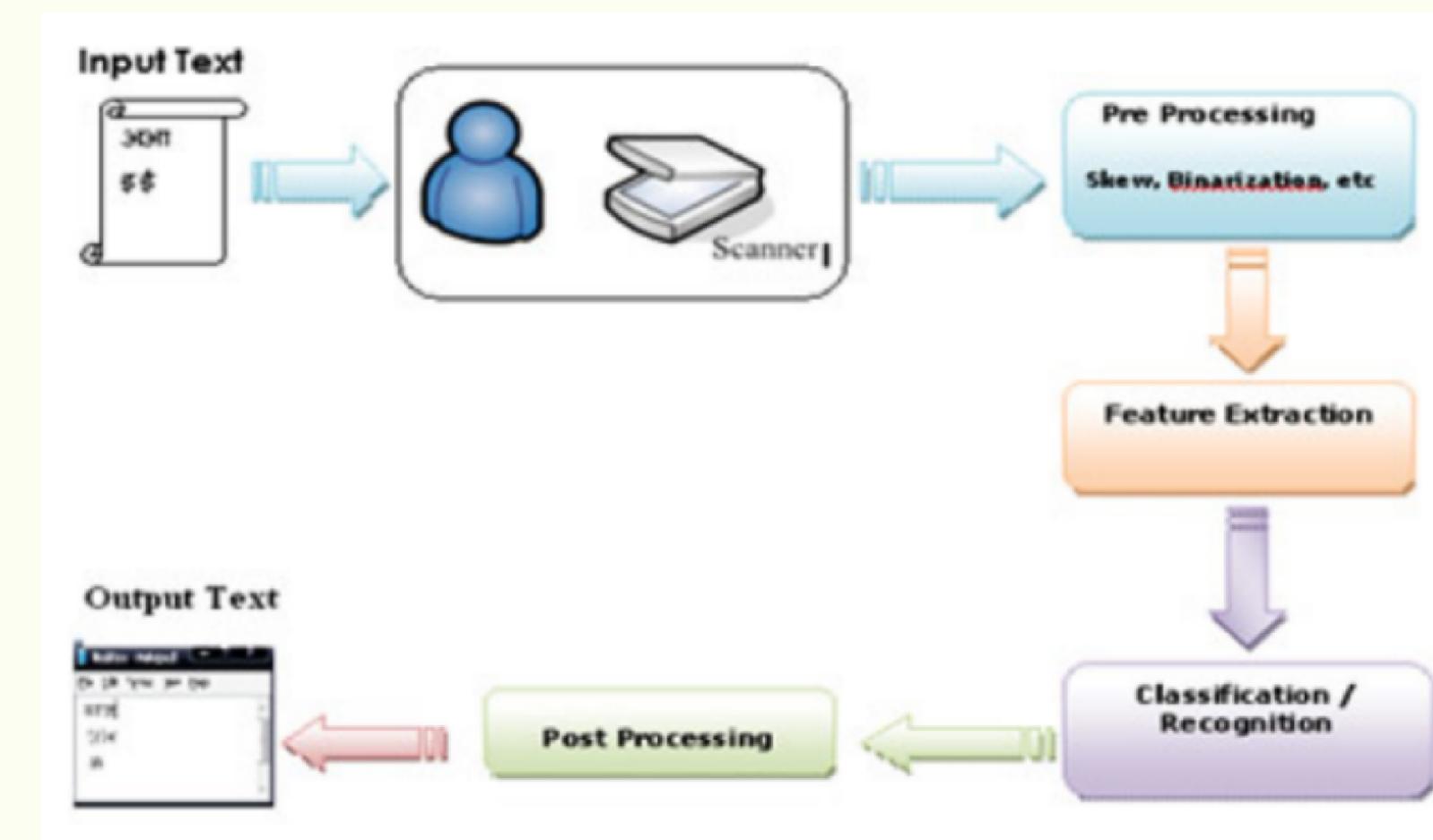
Numerical Methods



Probability

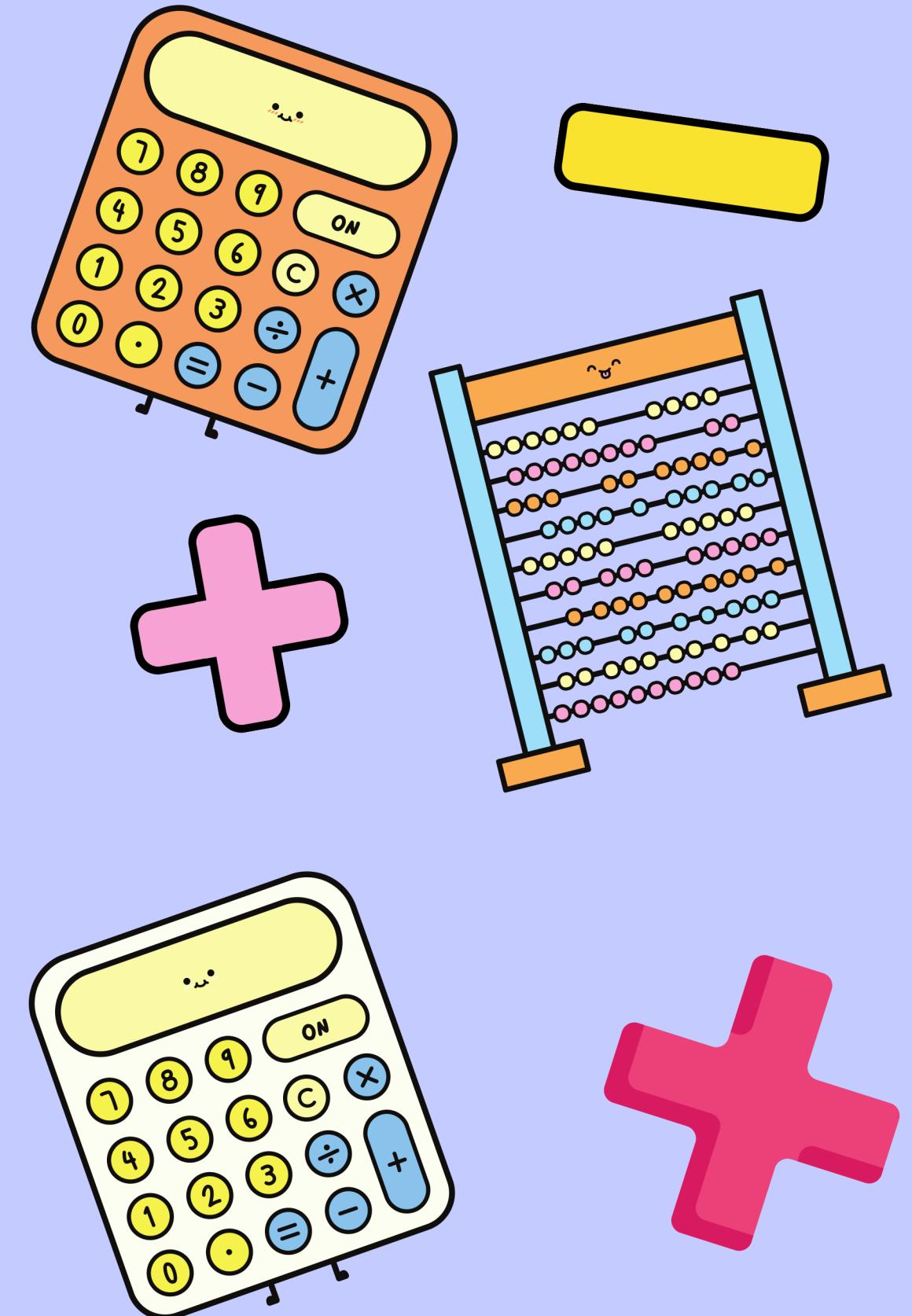
What is OCR tech?

OCR - Optical Character Recognition, is a technology that converts printed or handwritten text into machine-readable data.

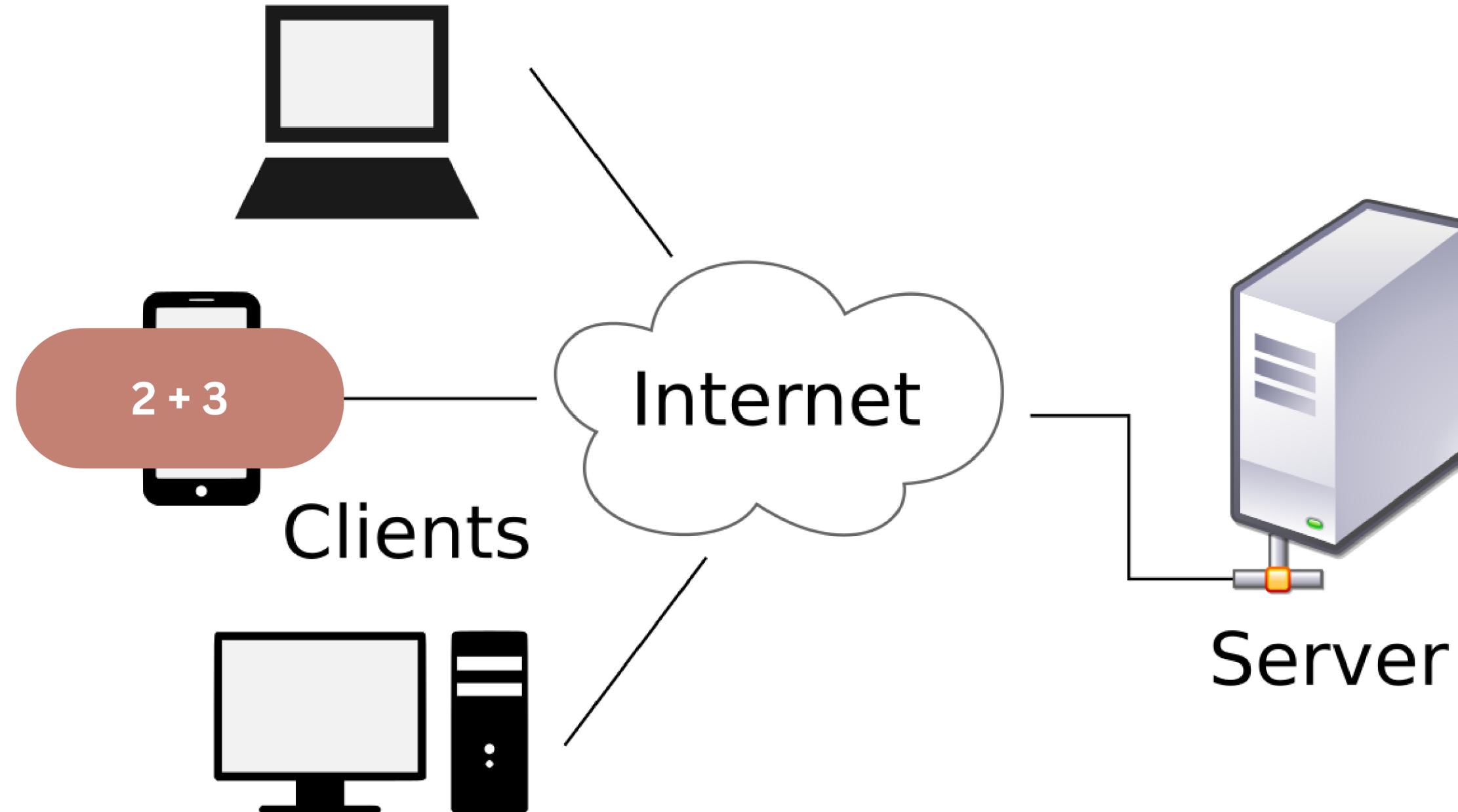


Background

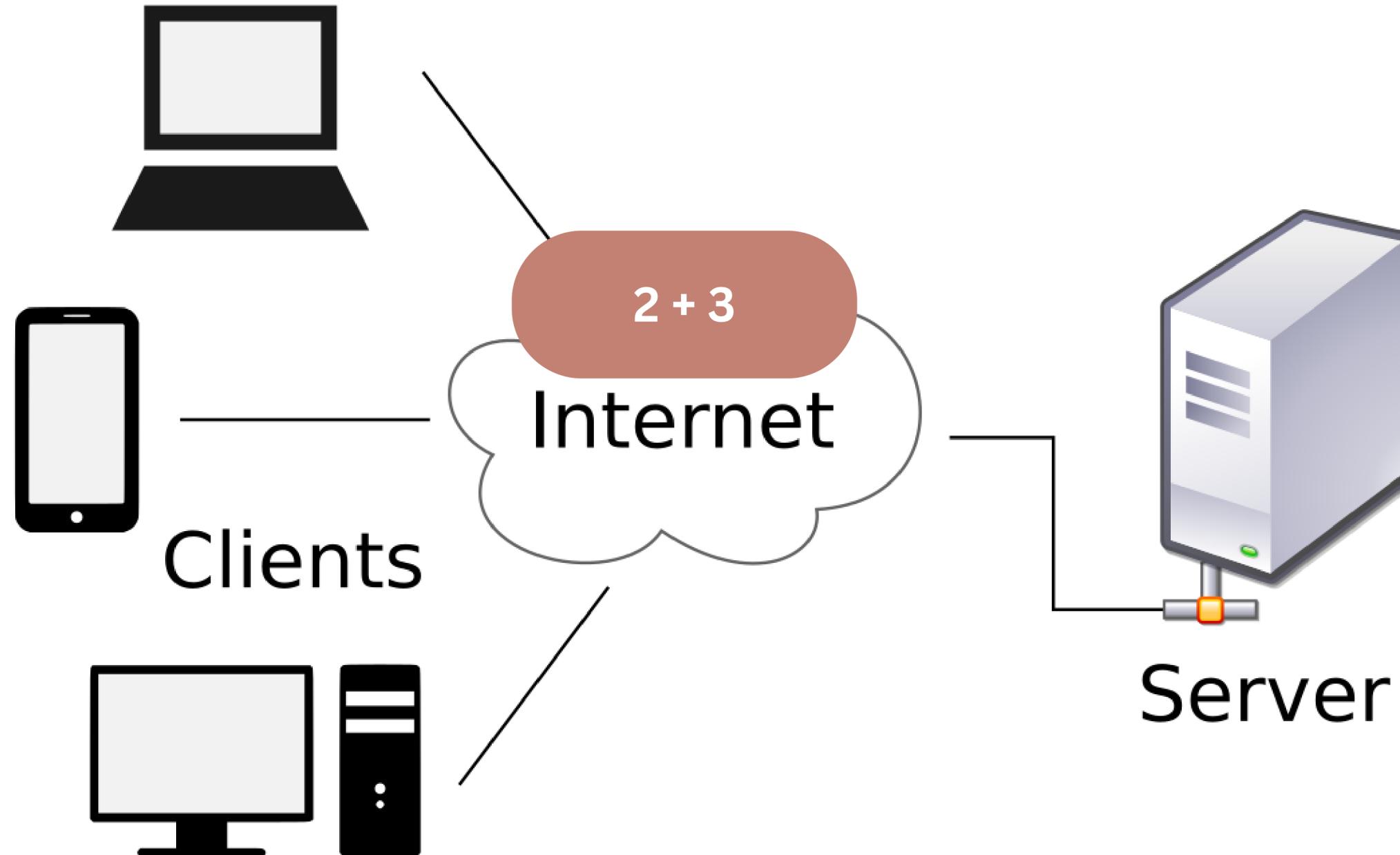
- Calculation function
- Forum function
- AI-scanning work-flow



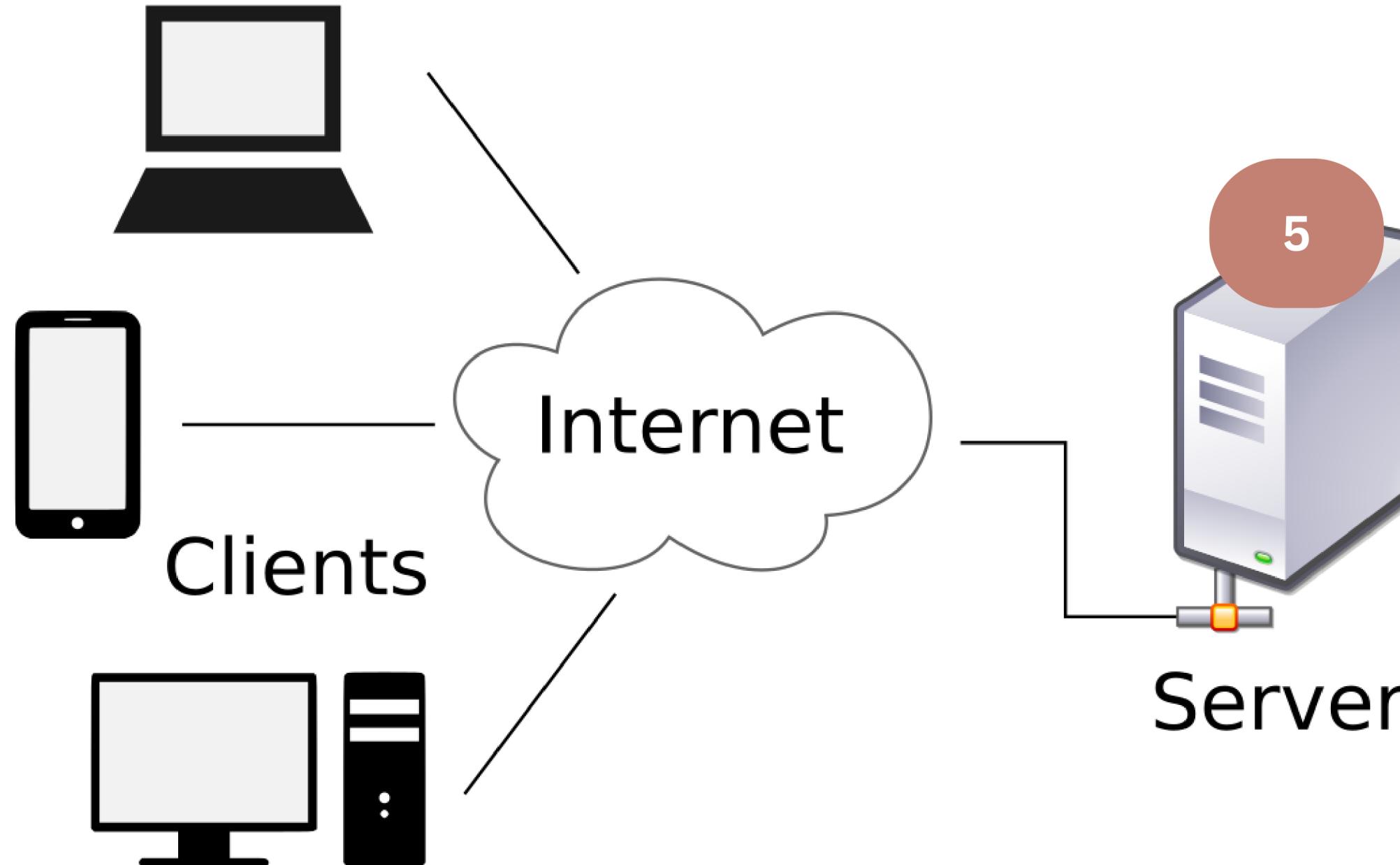
Calculus function



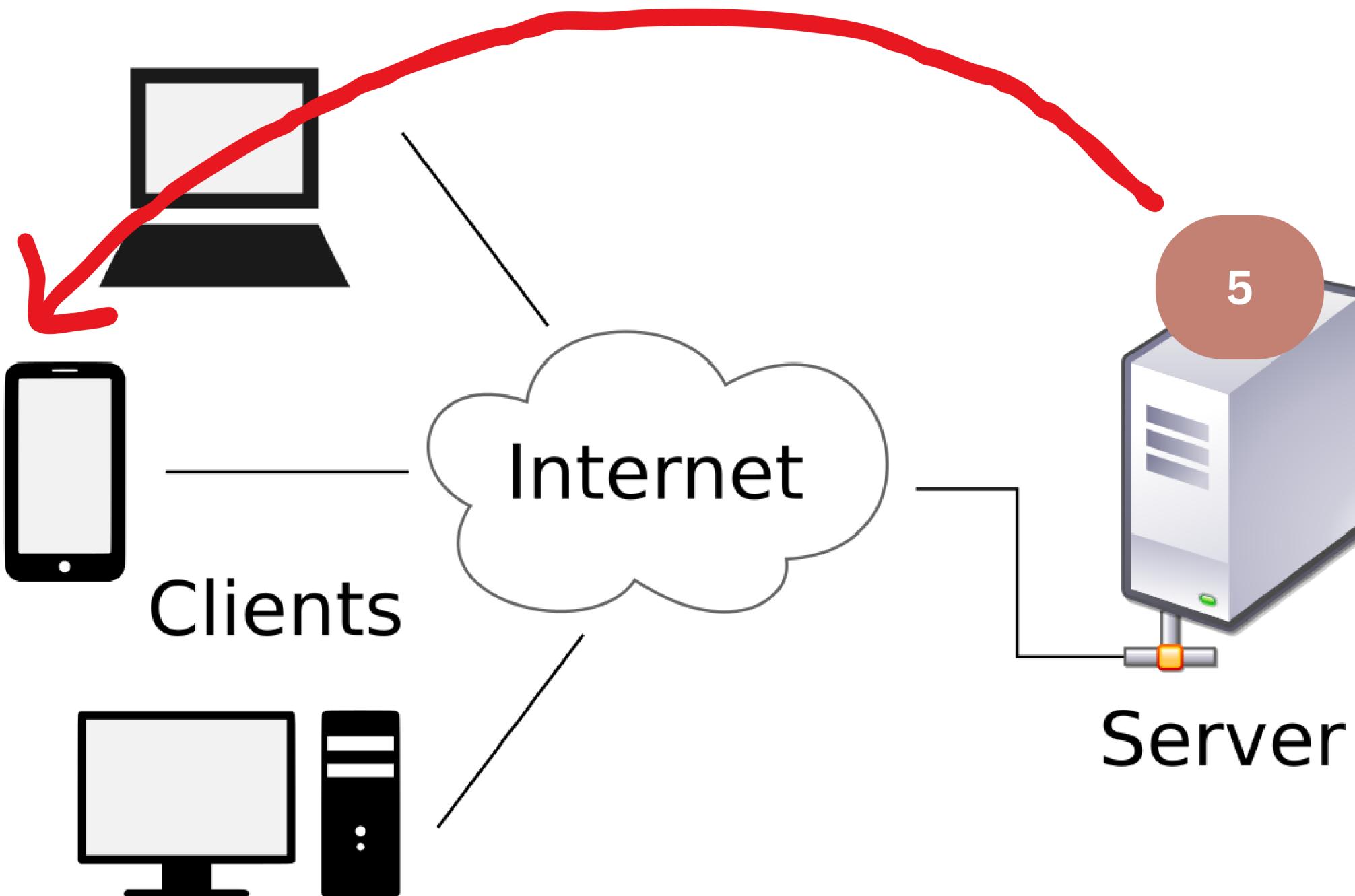
Calculus function



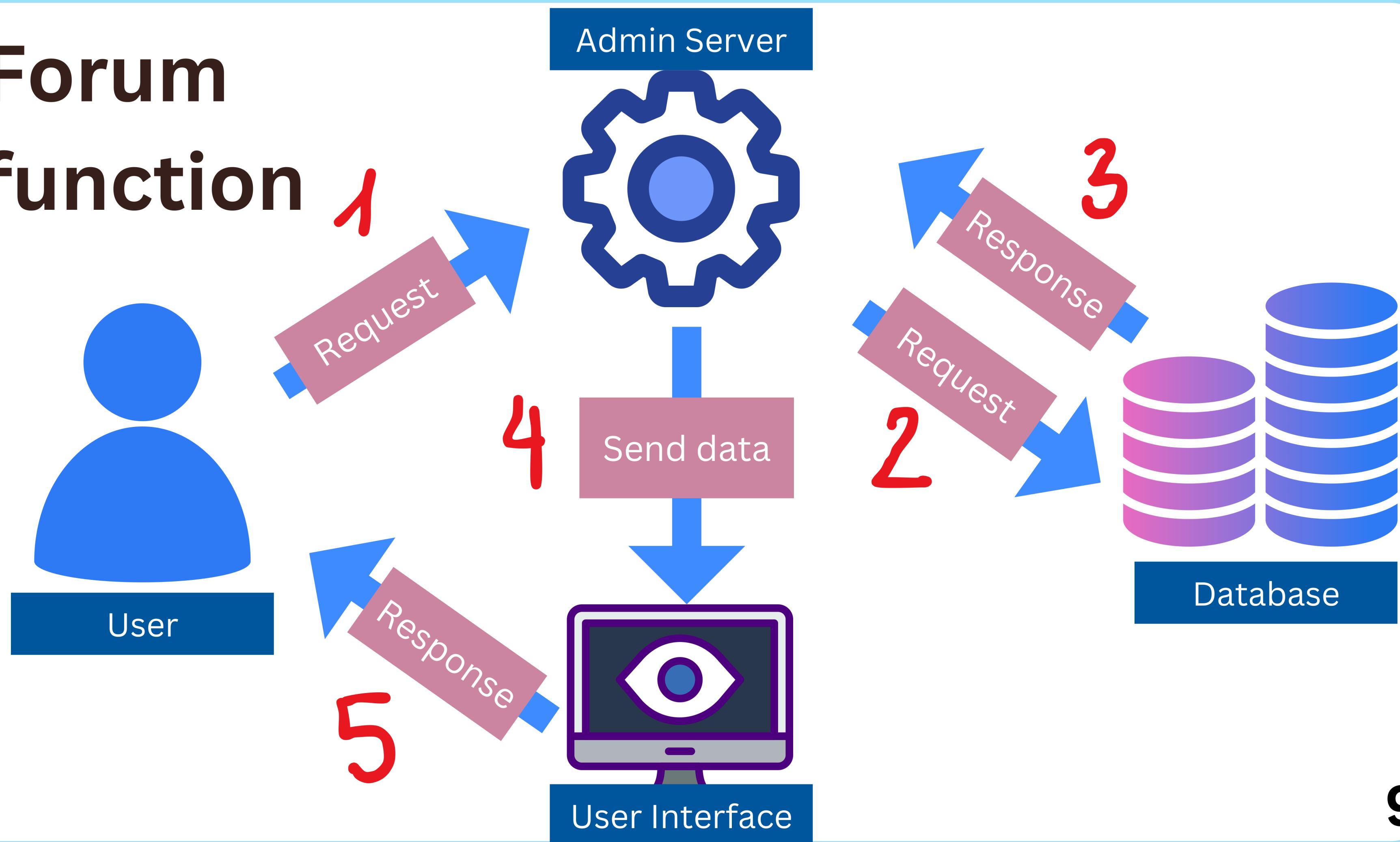
Calculus function



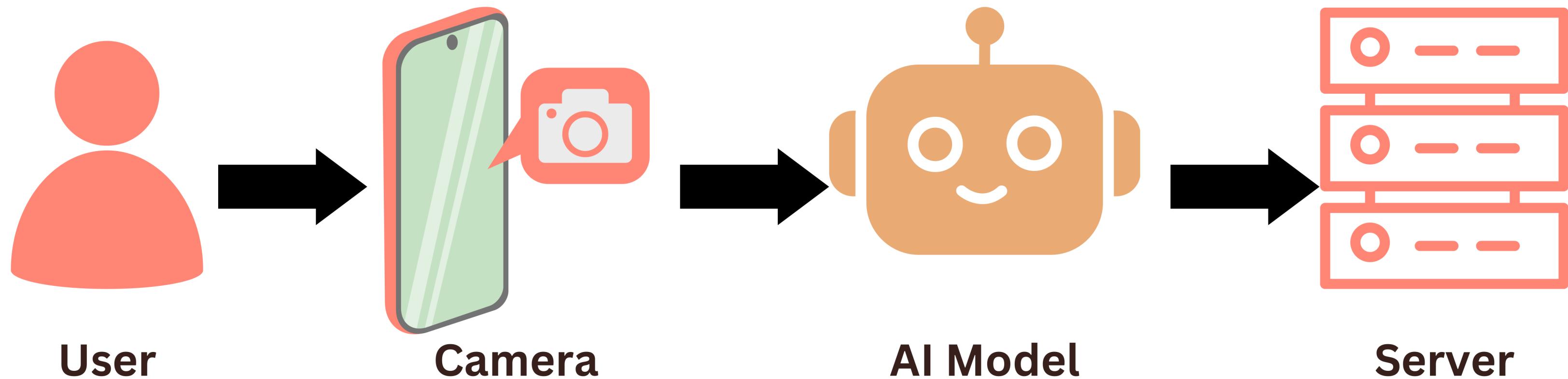
Calculus function



Forum function



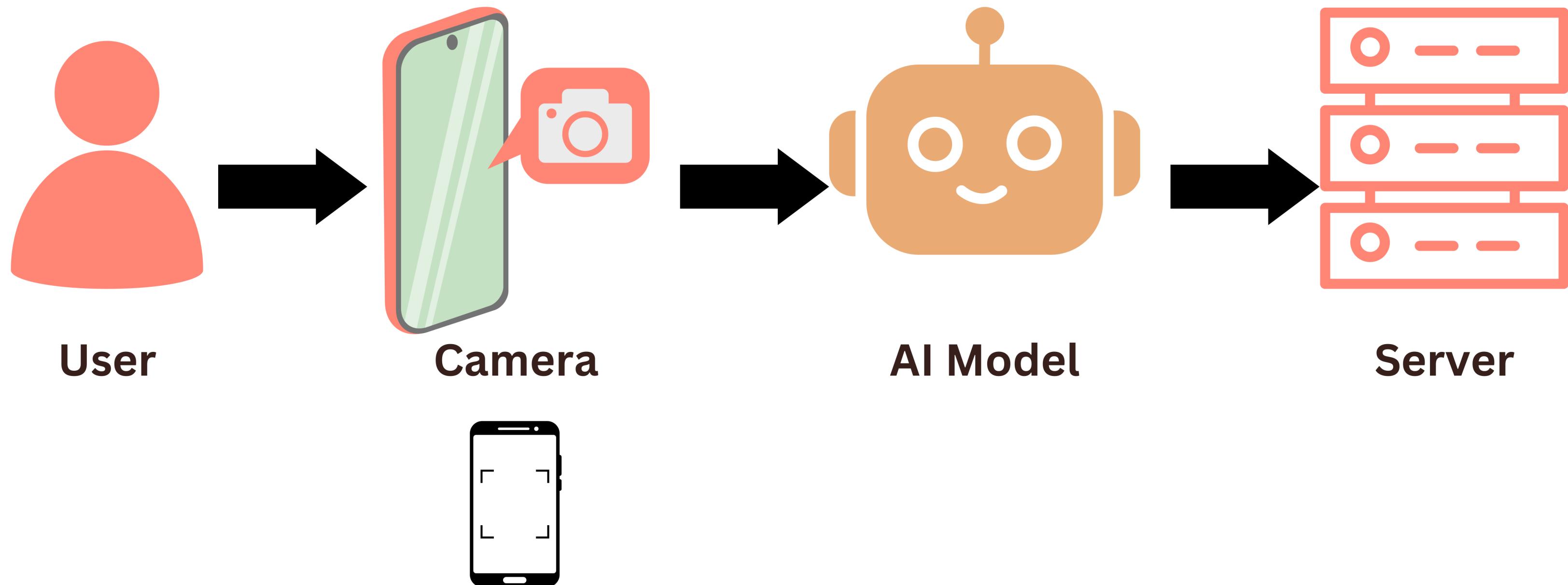
AI-scanning work-flow



$$\int_0^1 2x + 2dx$$

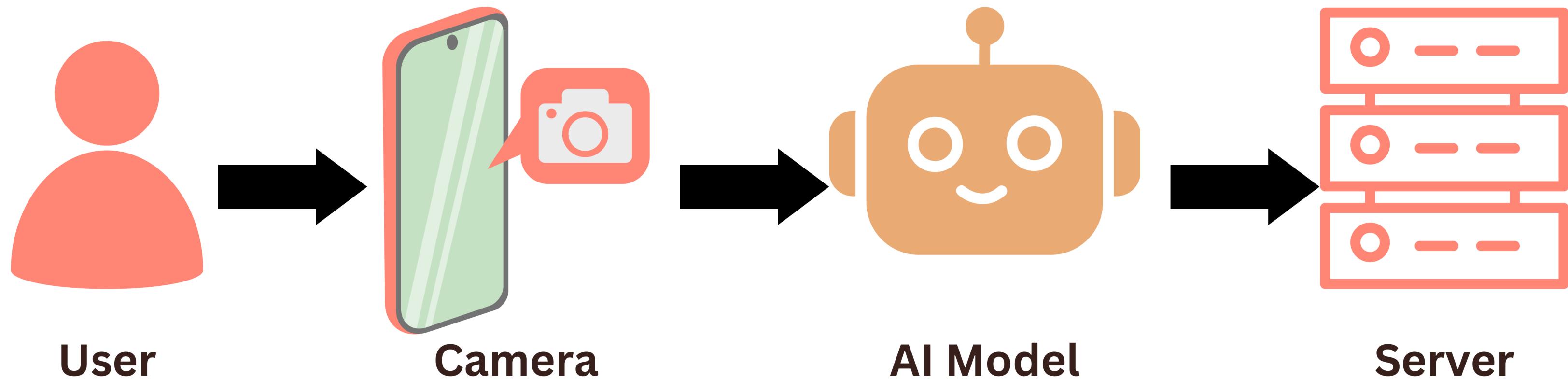
HOW DOES THIS AI MODEL WORK?

AI-scanning work-flow



HOW DOES THIS AI MODEL WORK?

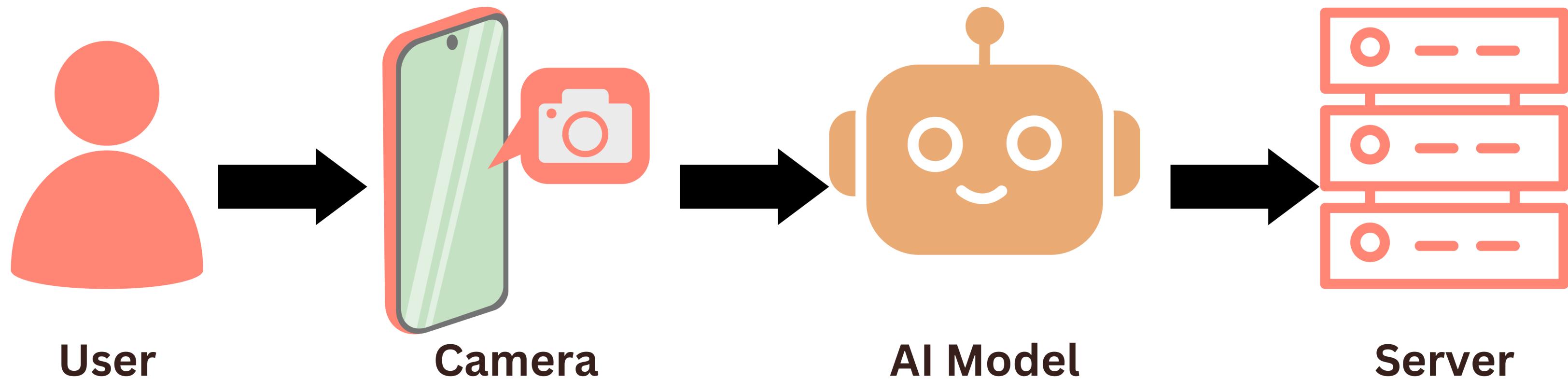
AI-scanning work-flow



$$\int_0^1 (2x+2) dx$$

HOW DOES THIS AI MODEL WORK?

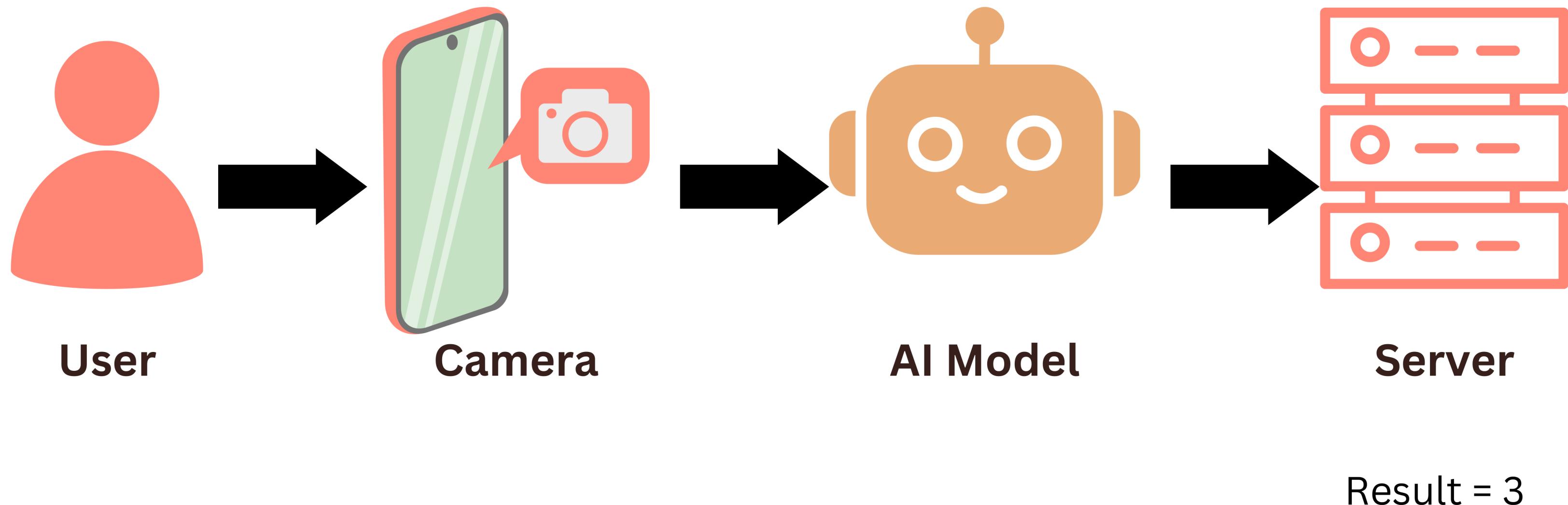
AI-scanning work-flow



$$\int_0^1 (2x+2) dx$$

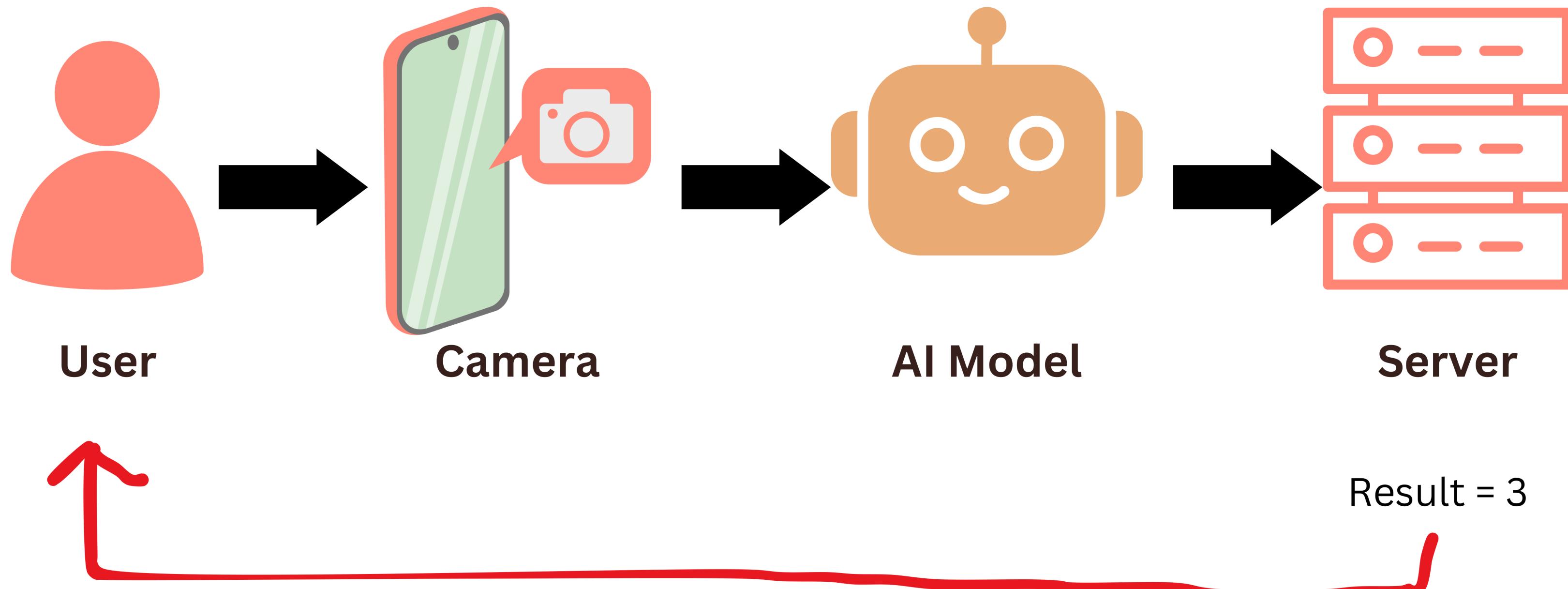
HOW DOES THIS AI MODEL WORK?

AI-scanning work-flow



HOW DOES THIS AI MODEL WORK?

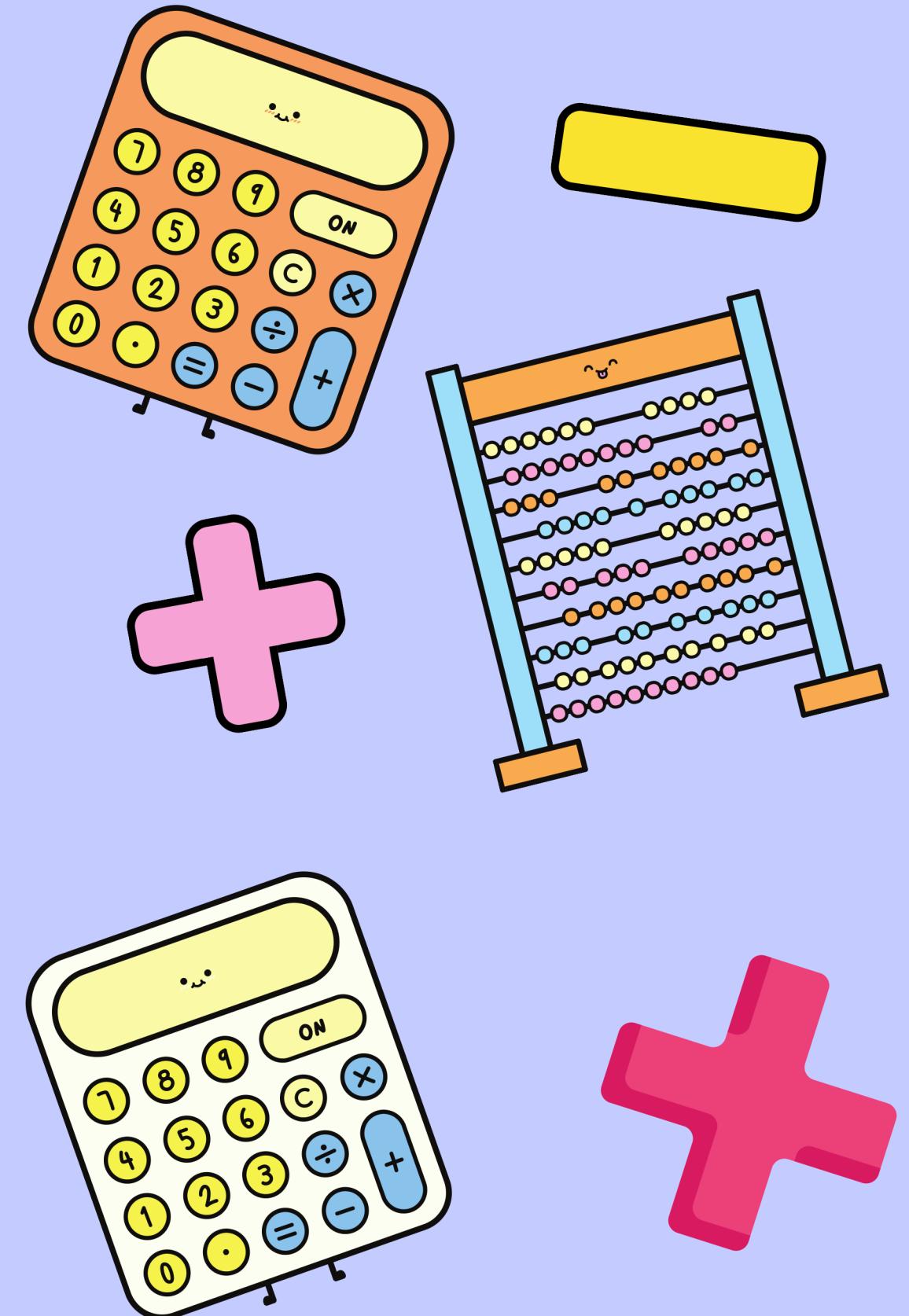
AI-scanning work-flow

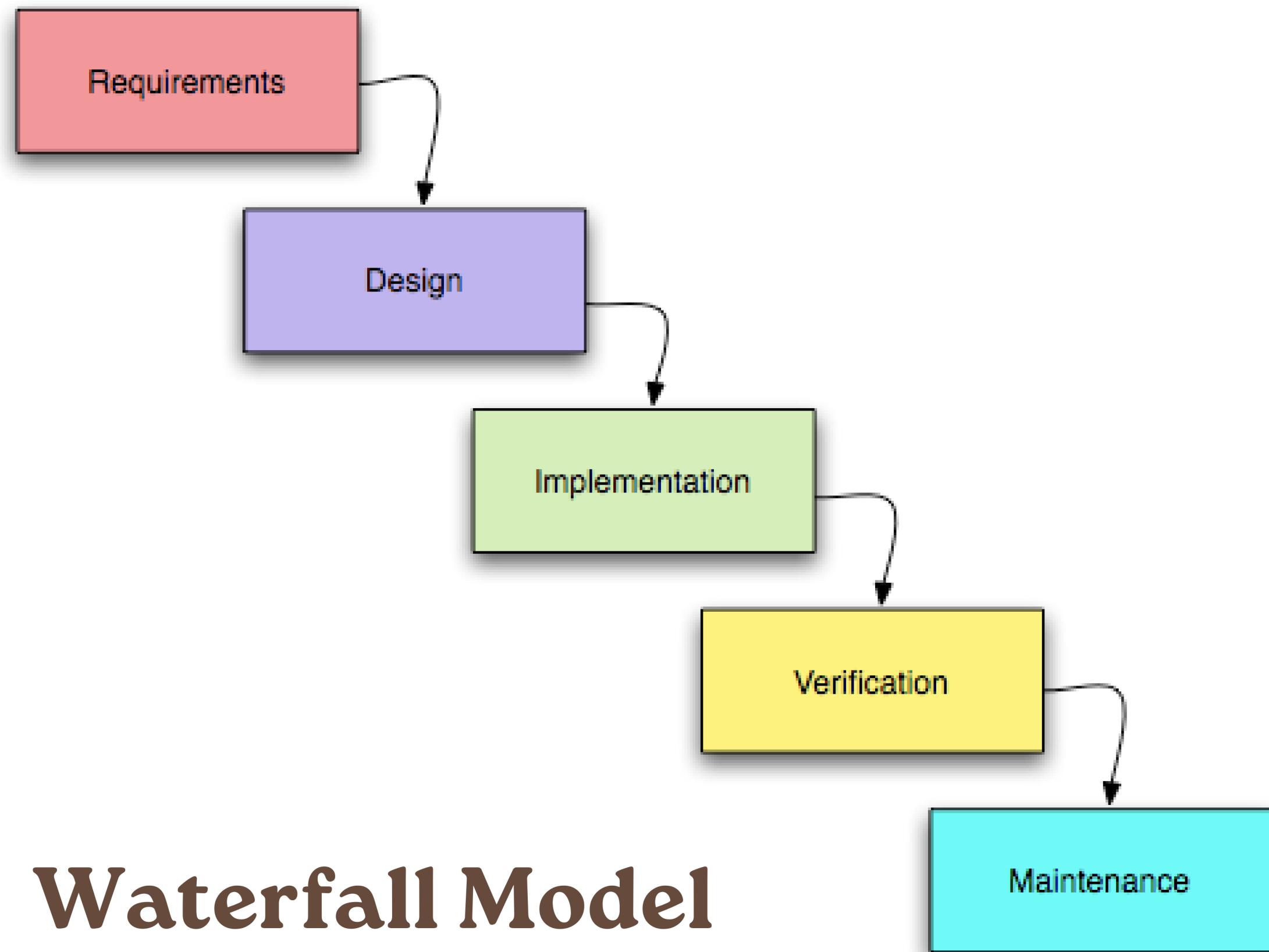
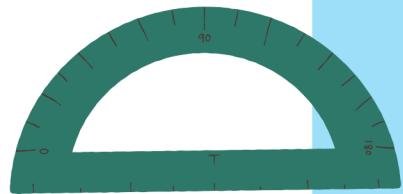
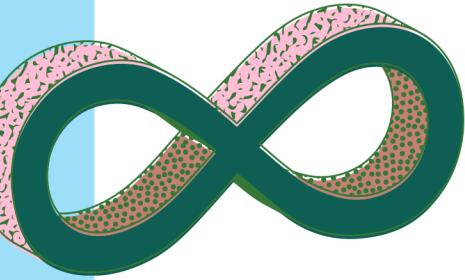


HOW DOES THIS AI MODEL WORK?

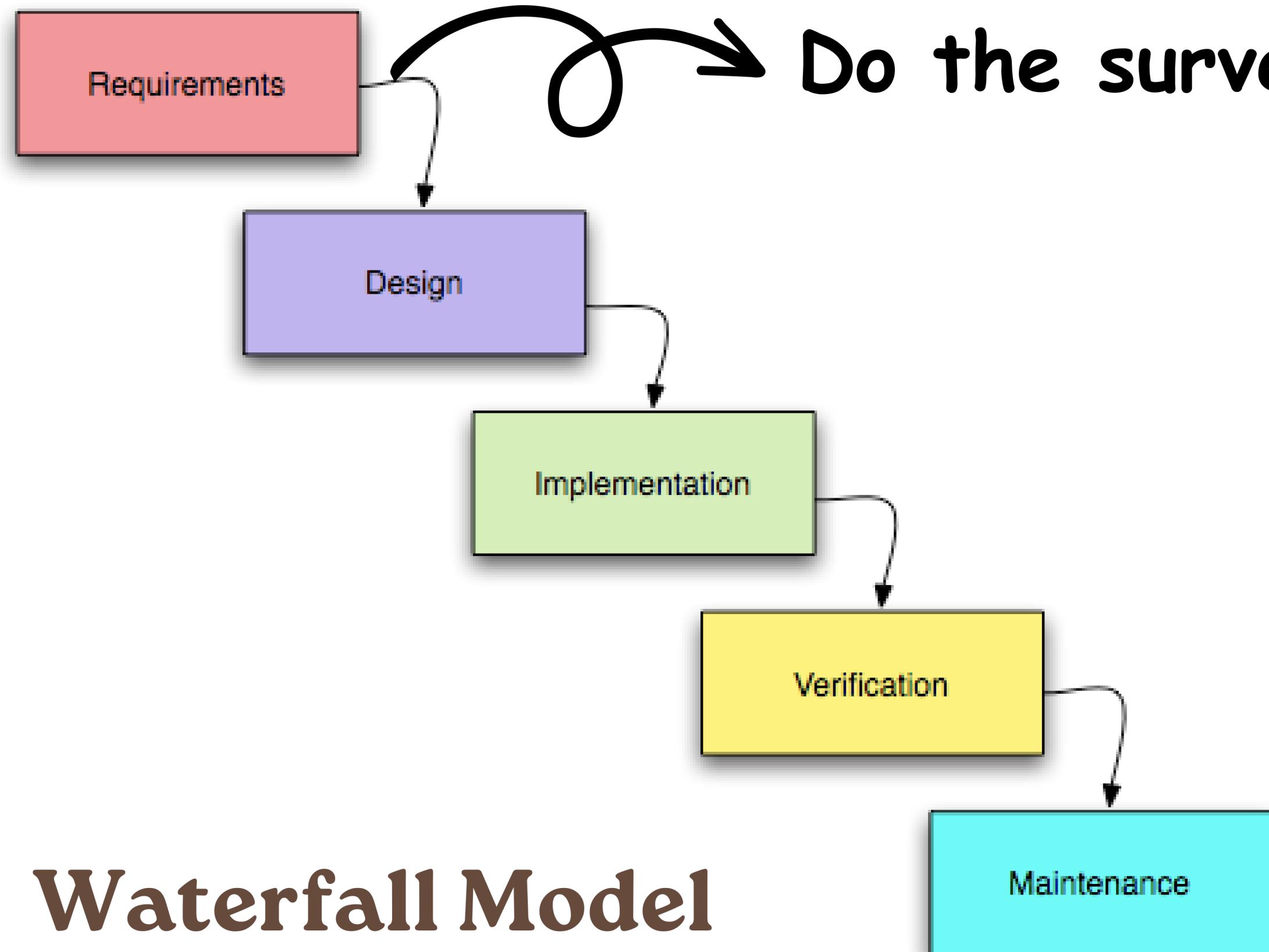
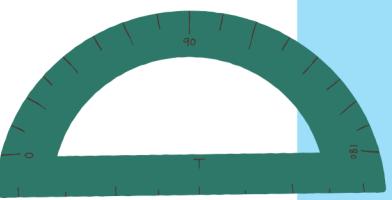
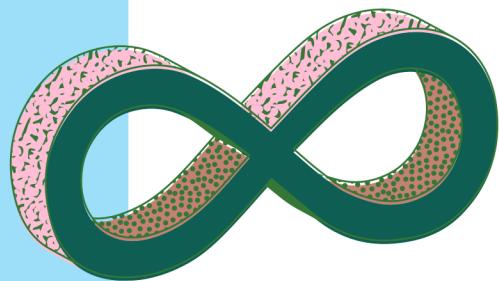
System Design

- Water-fall model
- Implementations
 - Mobile-app core techs
 - Hybrid-ViT model
- Process diagram

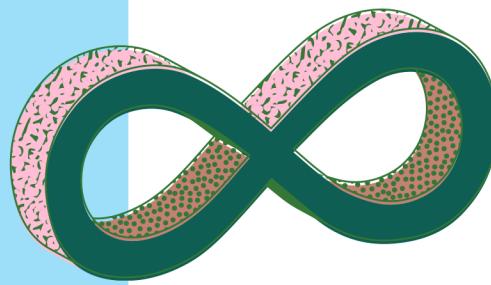




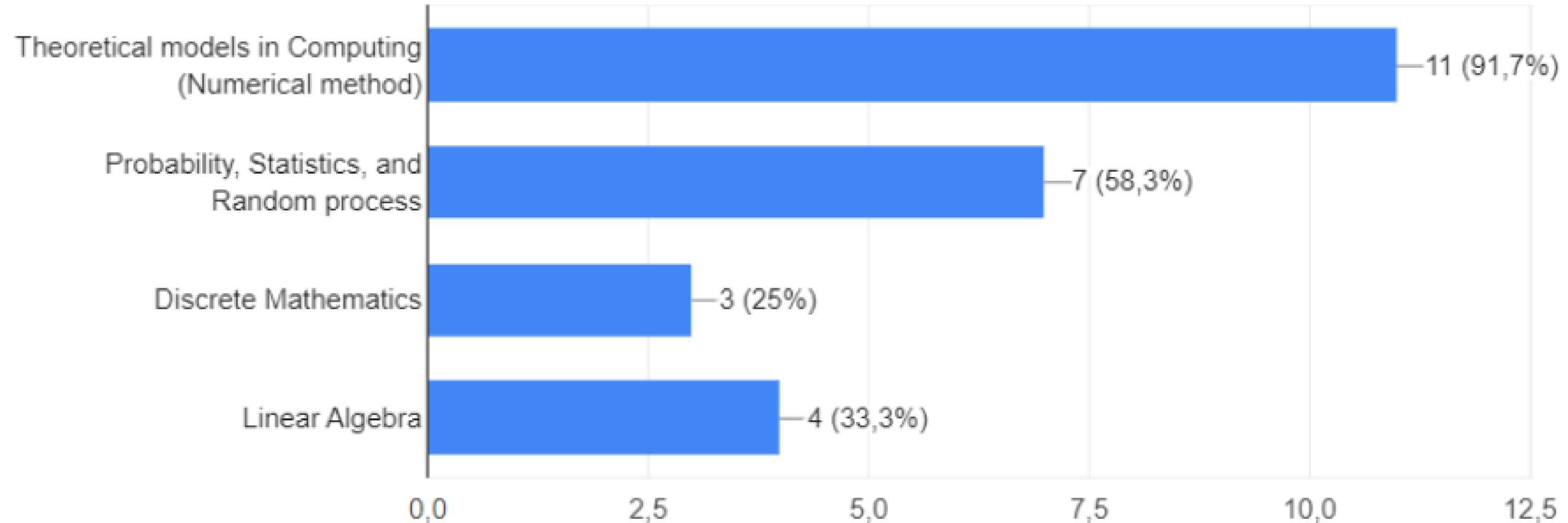
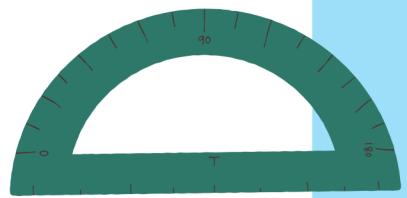
Waterfall Model



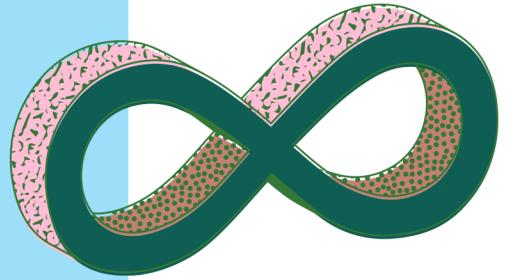
Waterfall Model



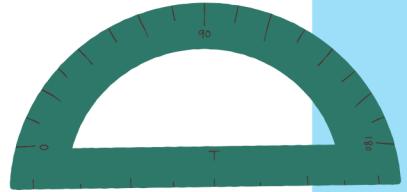
Do the survey



The bar chart indicates students' interest in areas of need



Mobile-app core techs



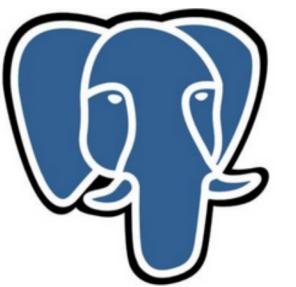
Client



Server

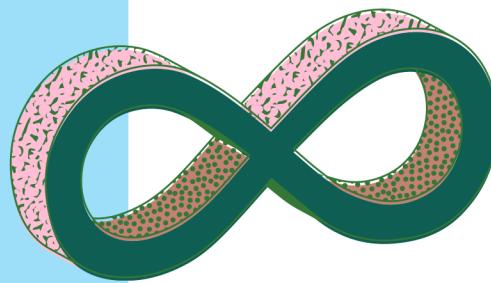


Database

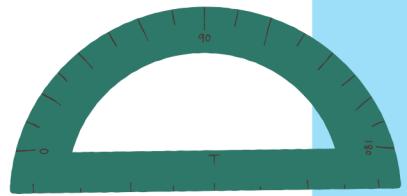


Cloud-based
platform

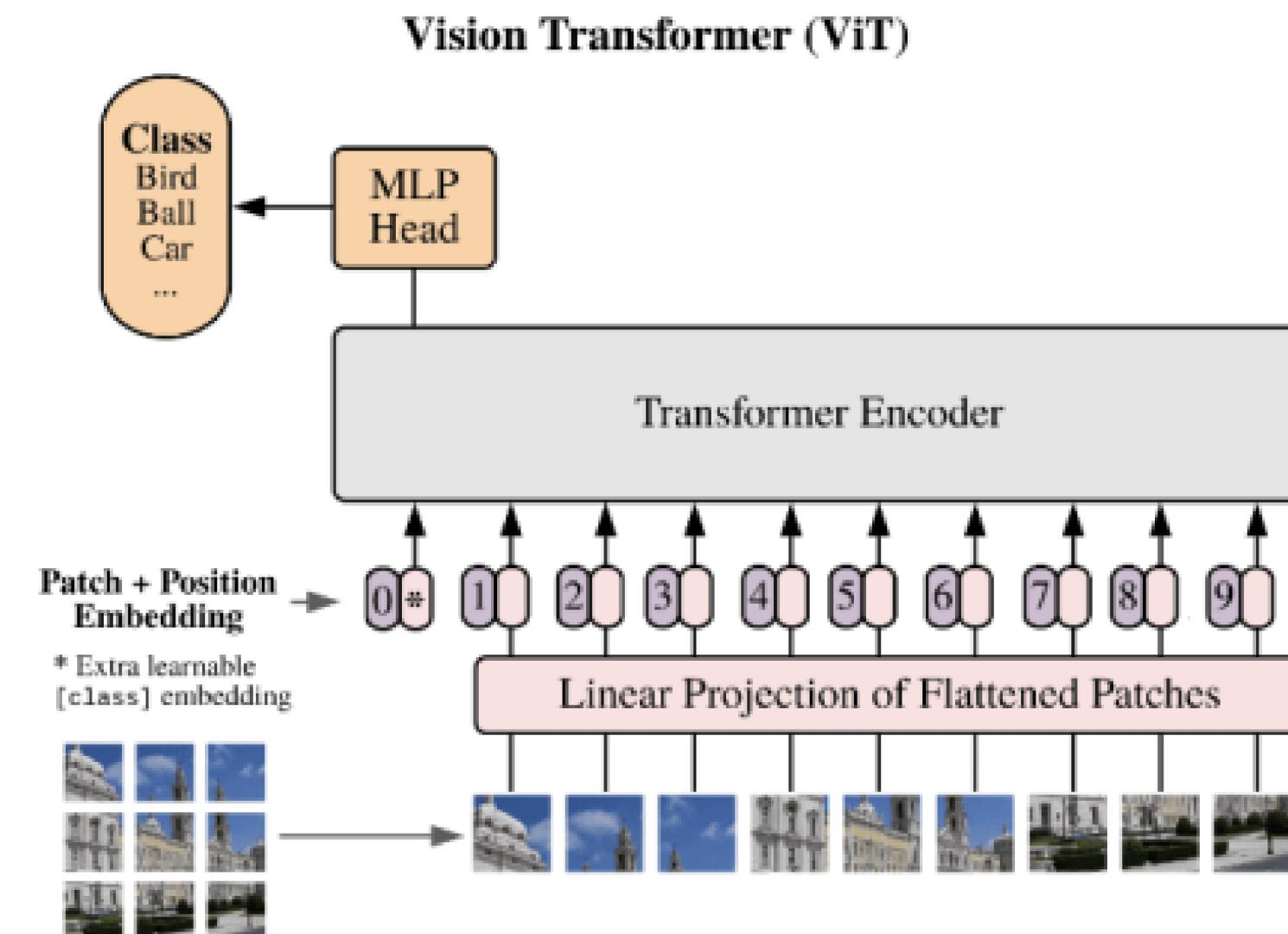




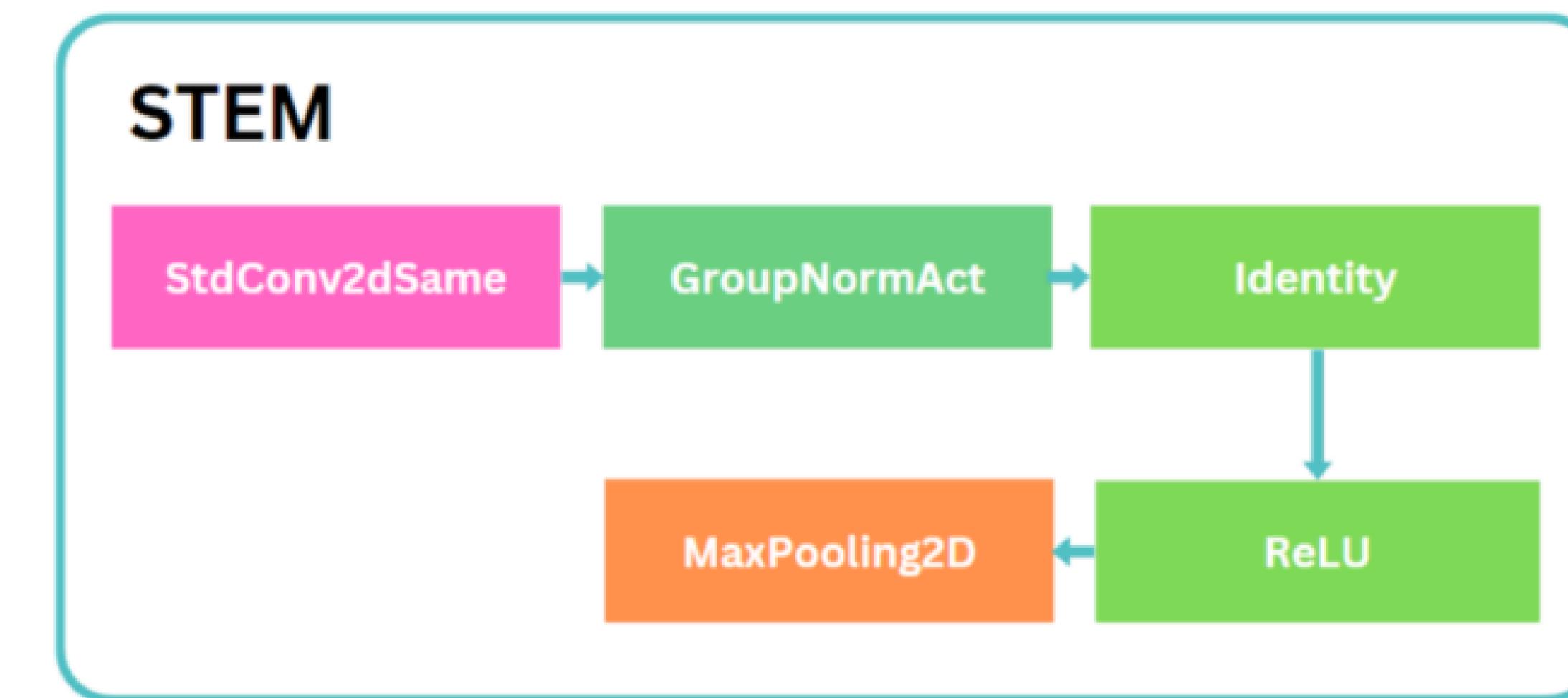
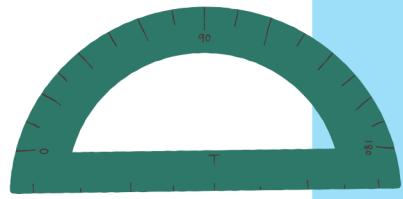
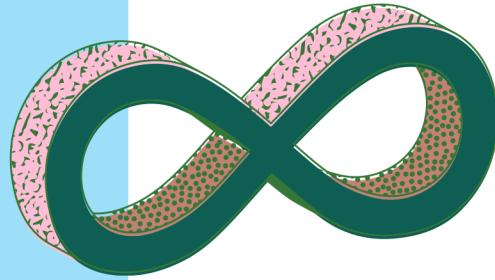
Hybrid-ViT architecture

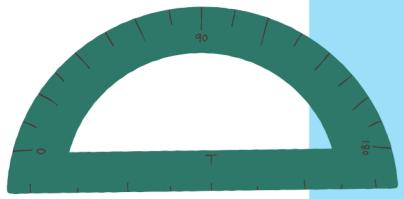


Backbone +

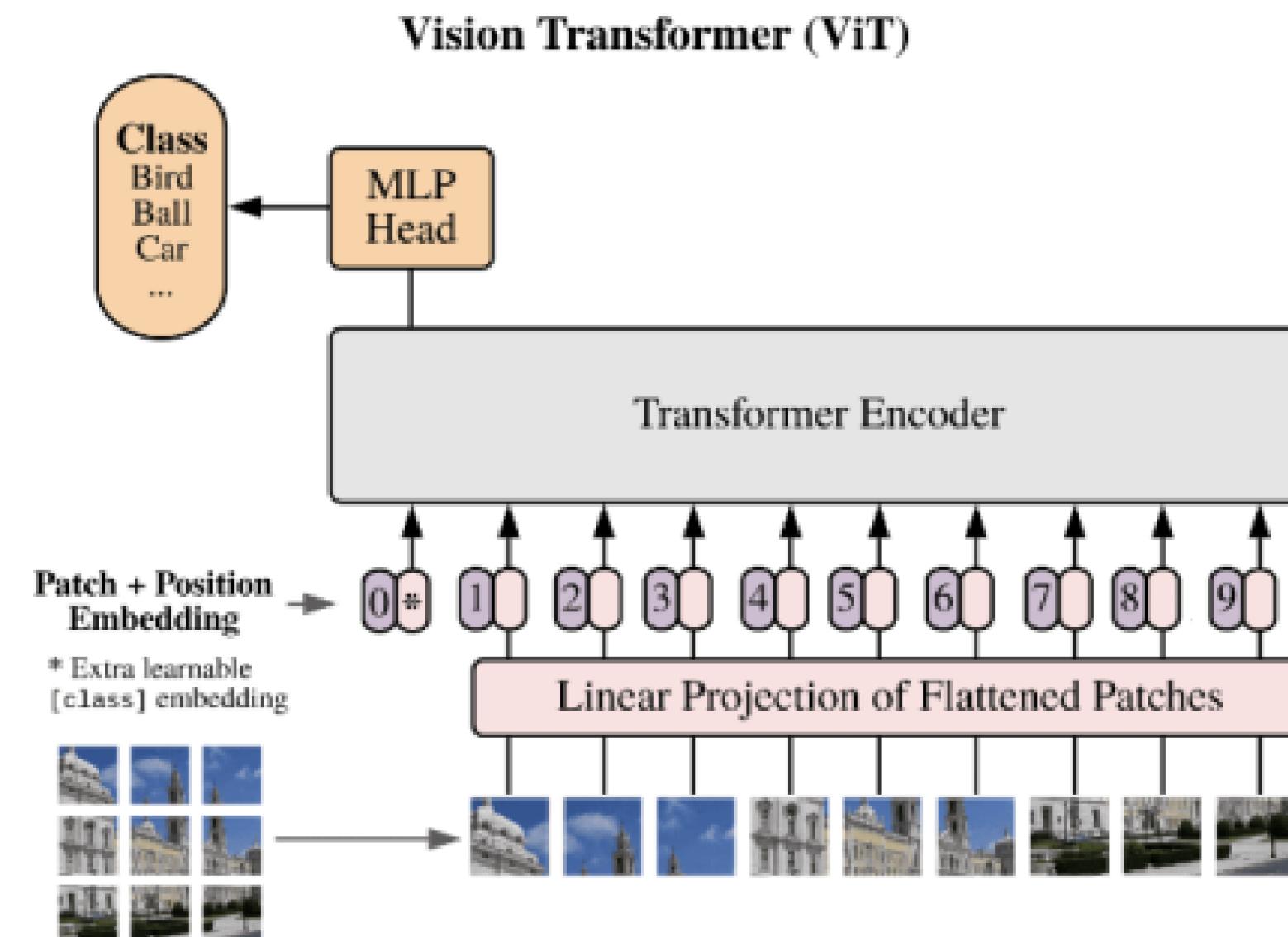


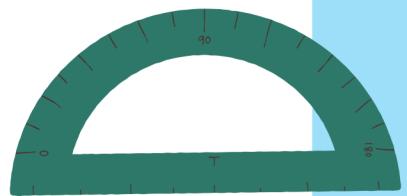
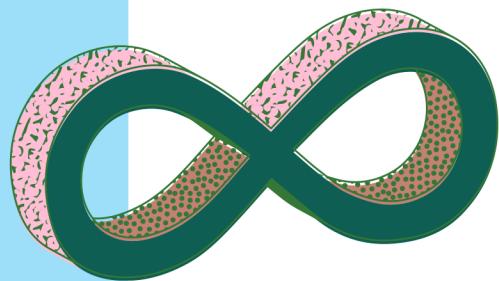
Backbone



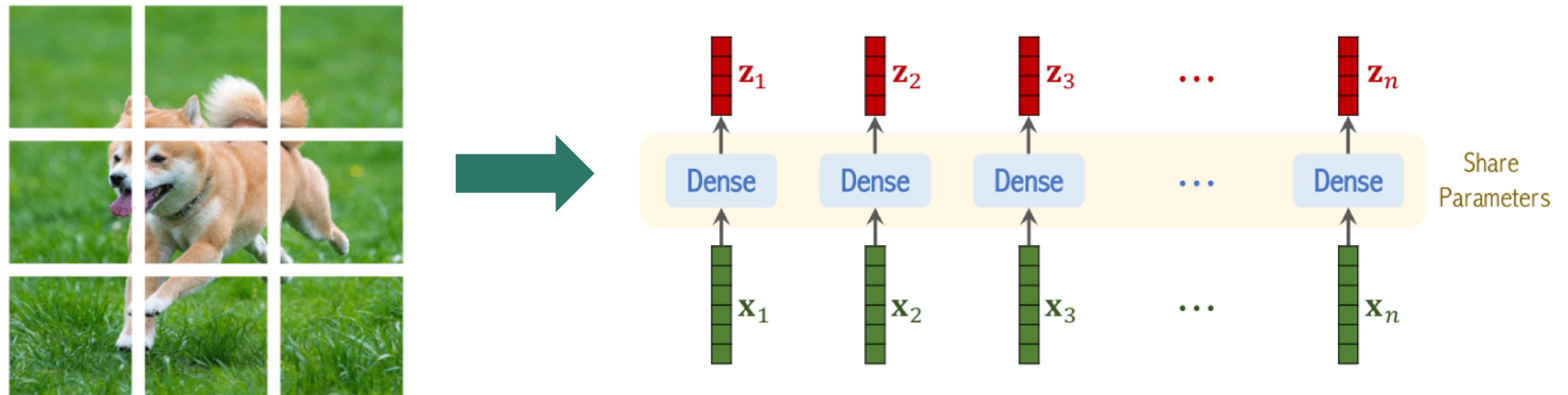


ViT architecture

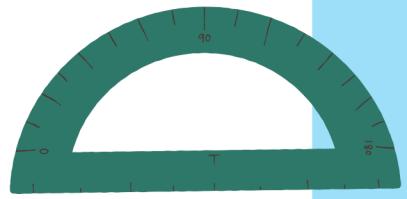




ViT architecture

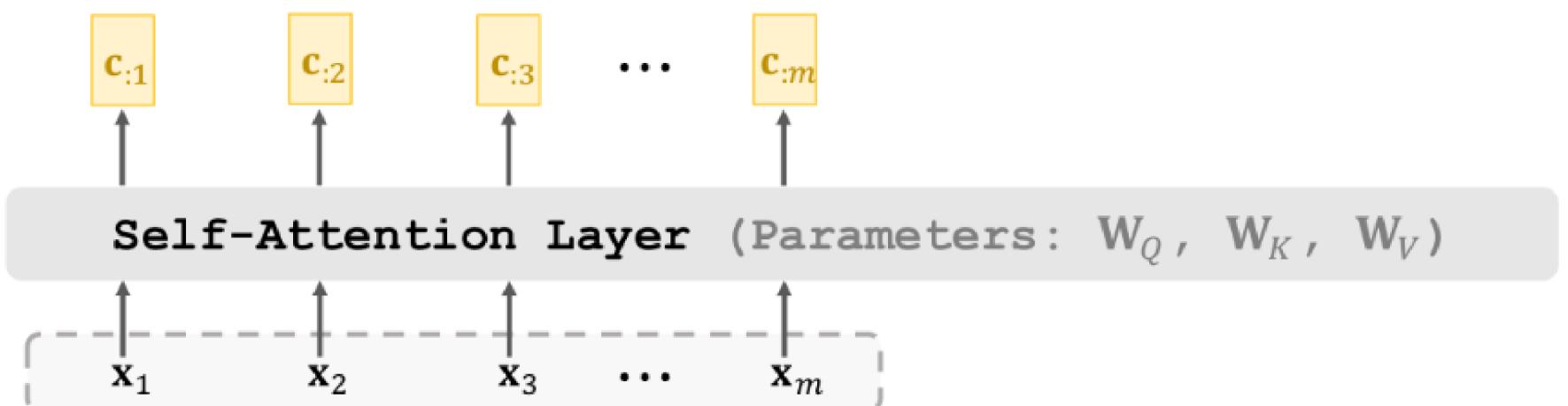
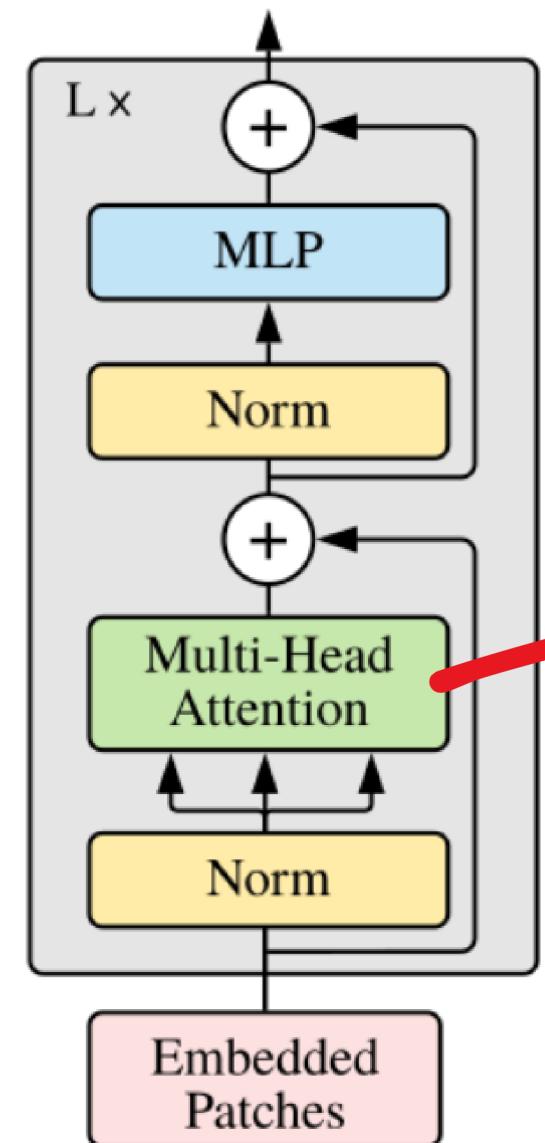


Patch Embedding



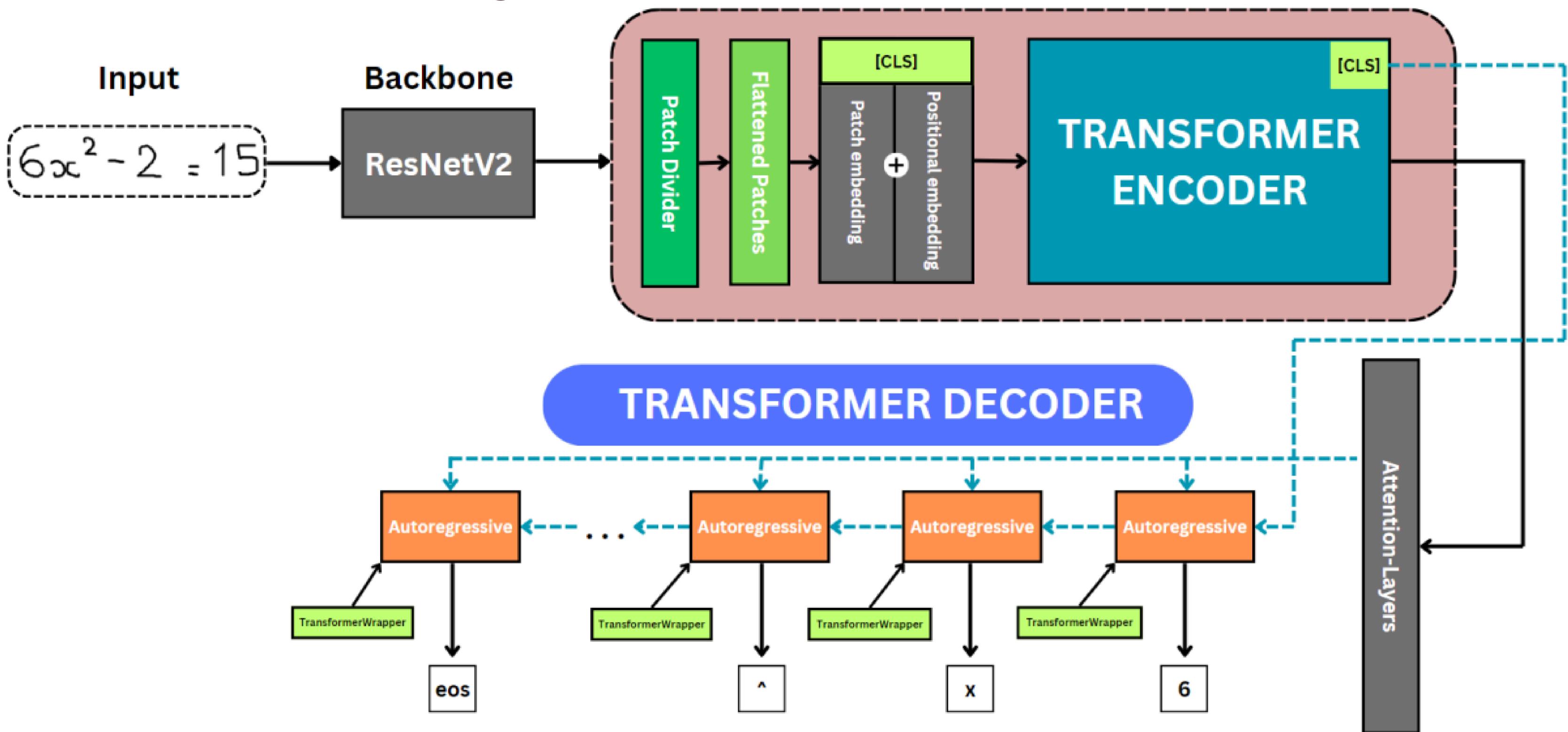
ViT architecture

Transformer Encoder

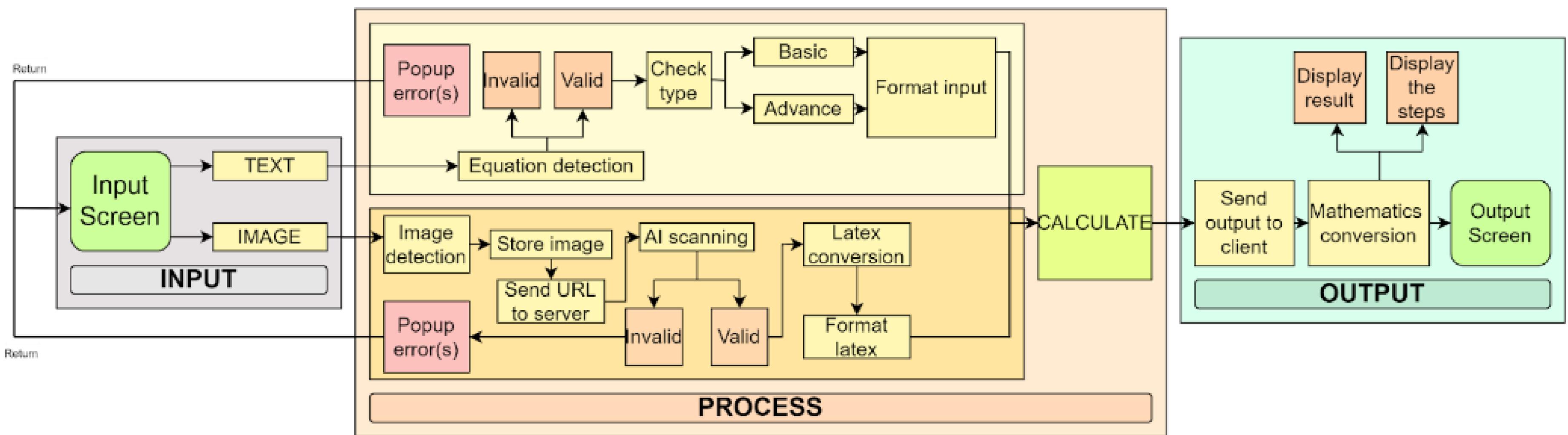


Transformer encoder

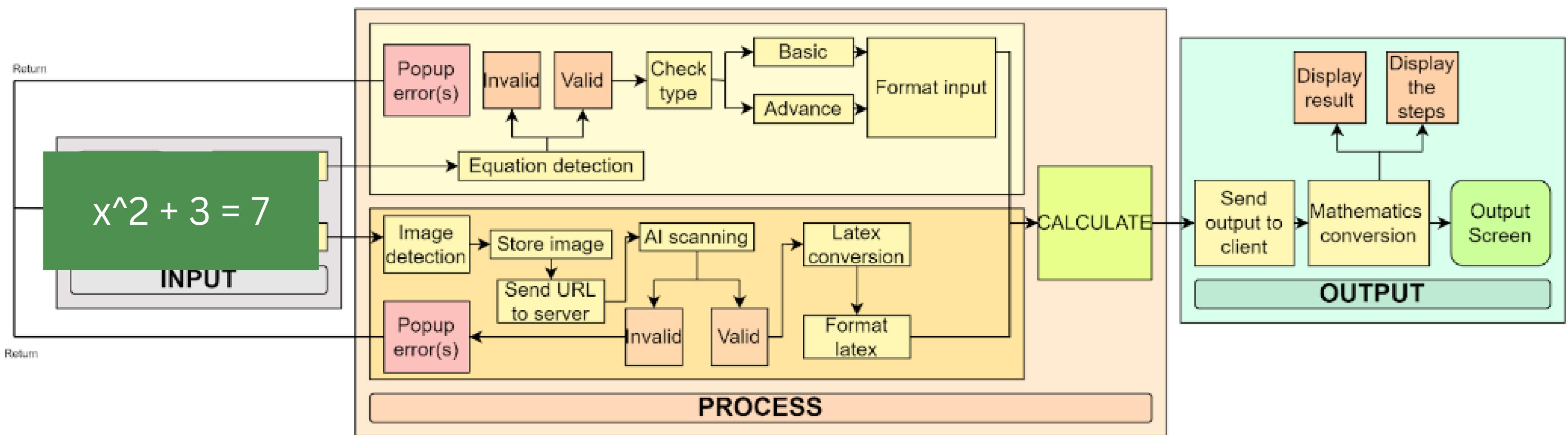
Hybrid-ViT architecture



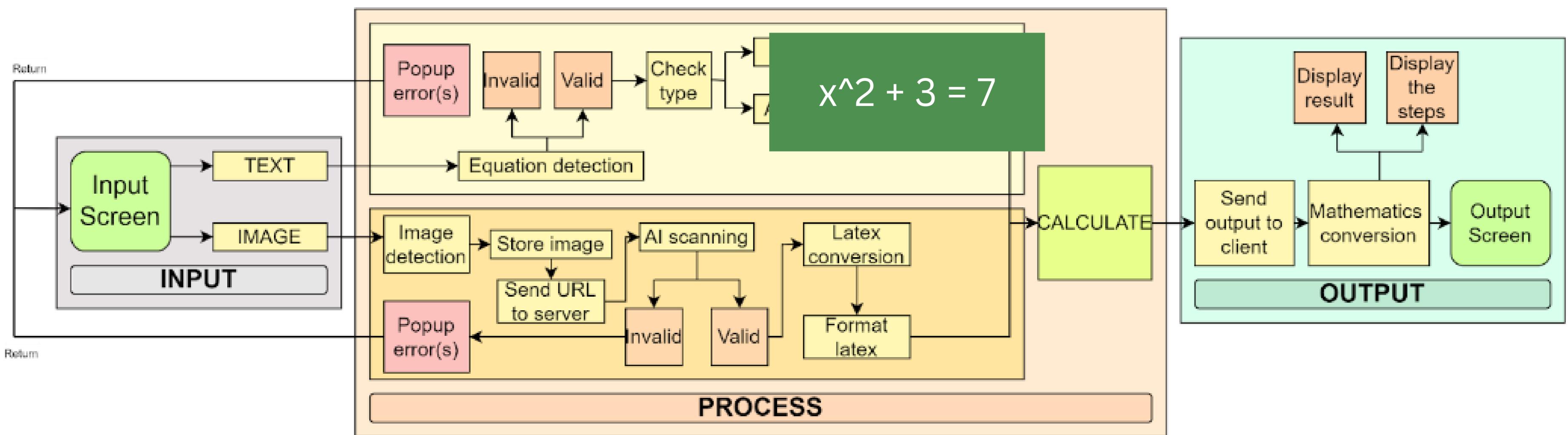
Process diagram



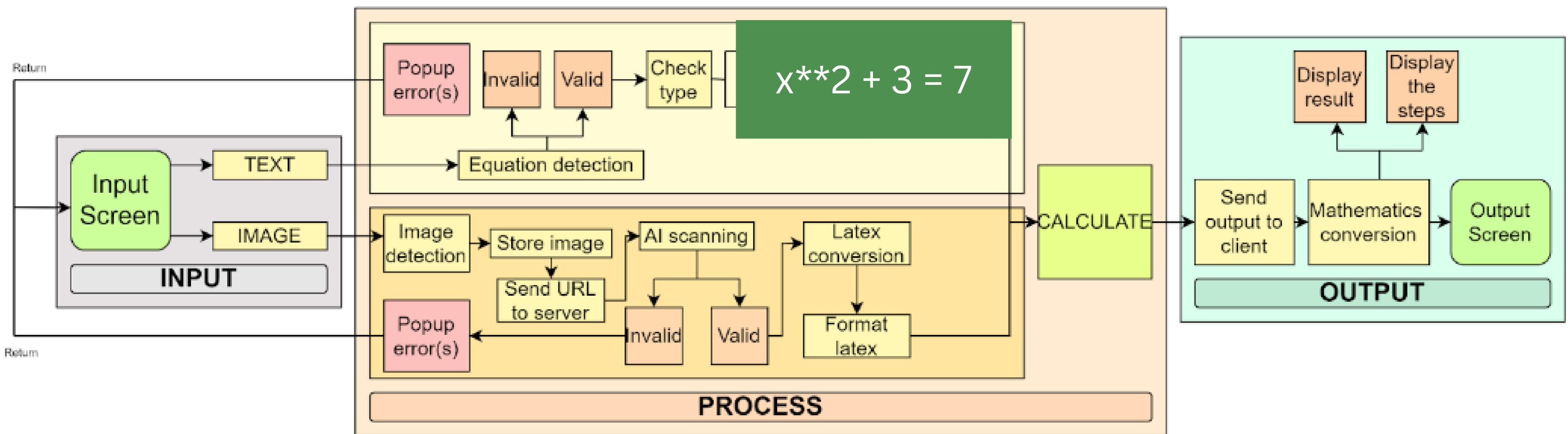
Process diagram



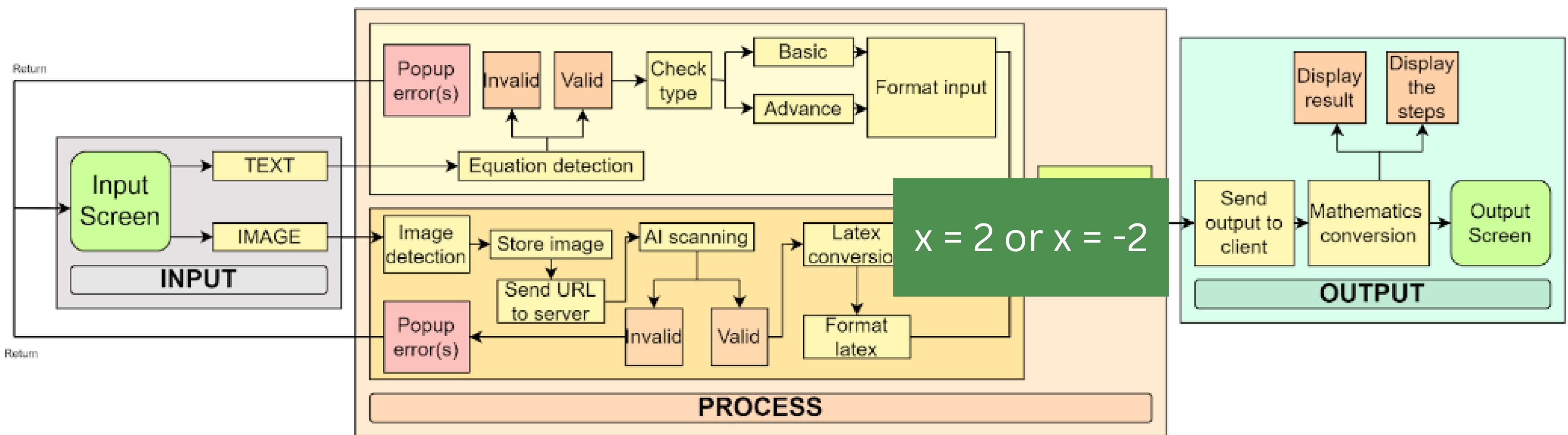
Process diagram



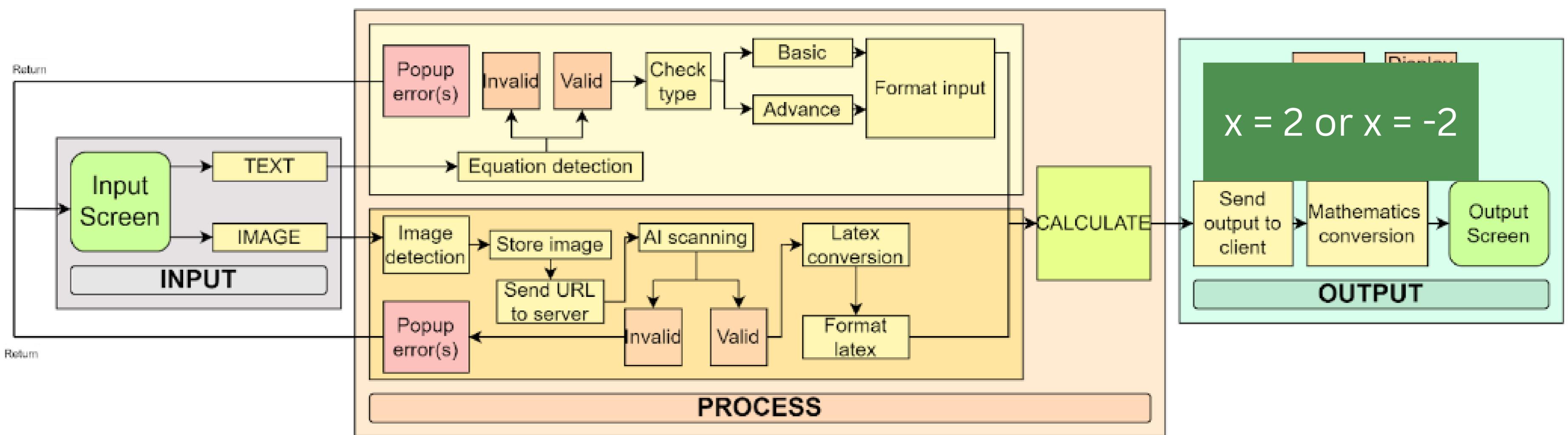
Process diagram



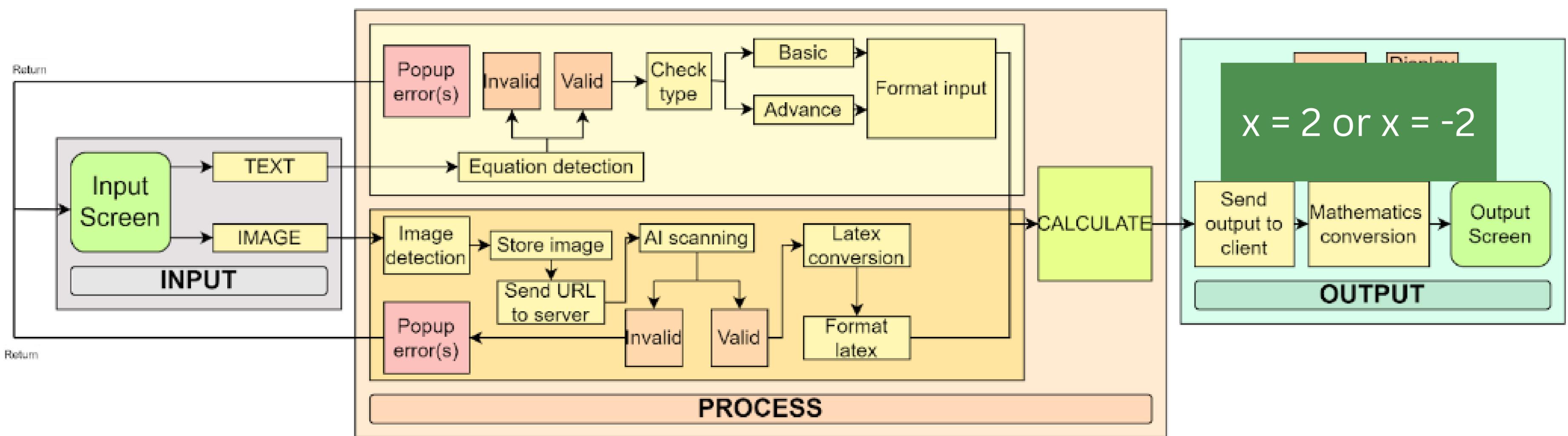
Process diagram



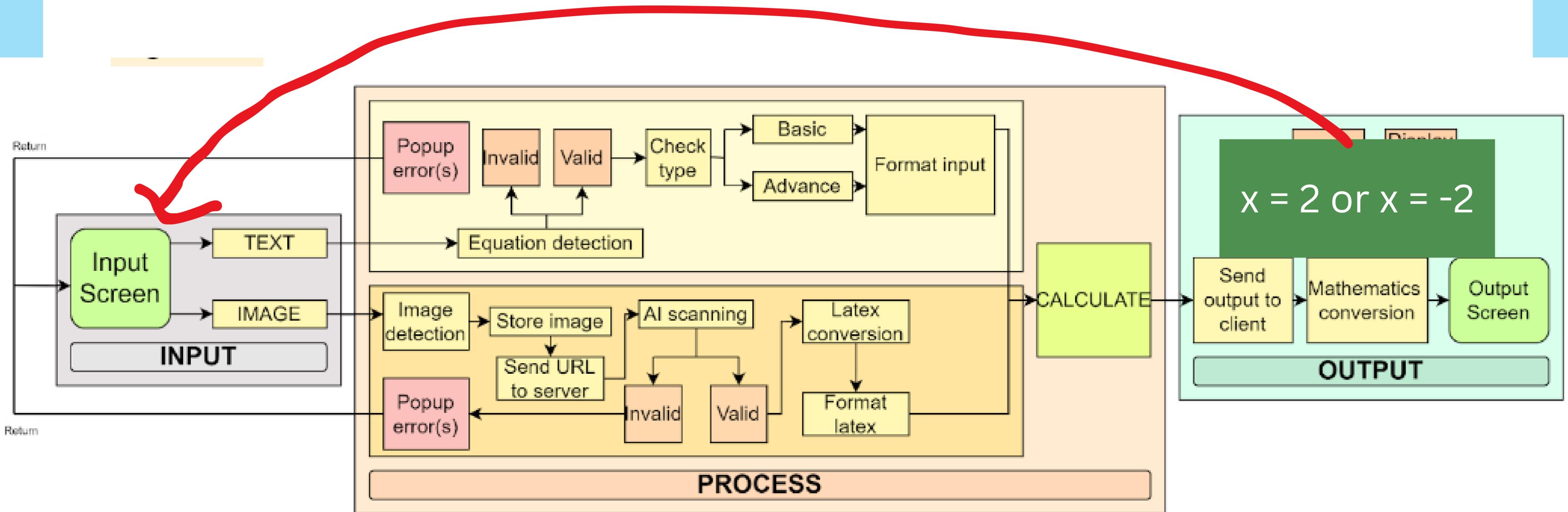
Process diagram



Process diagram

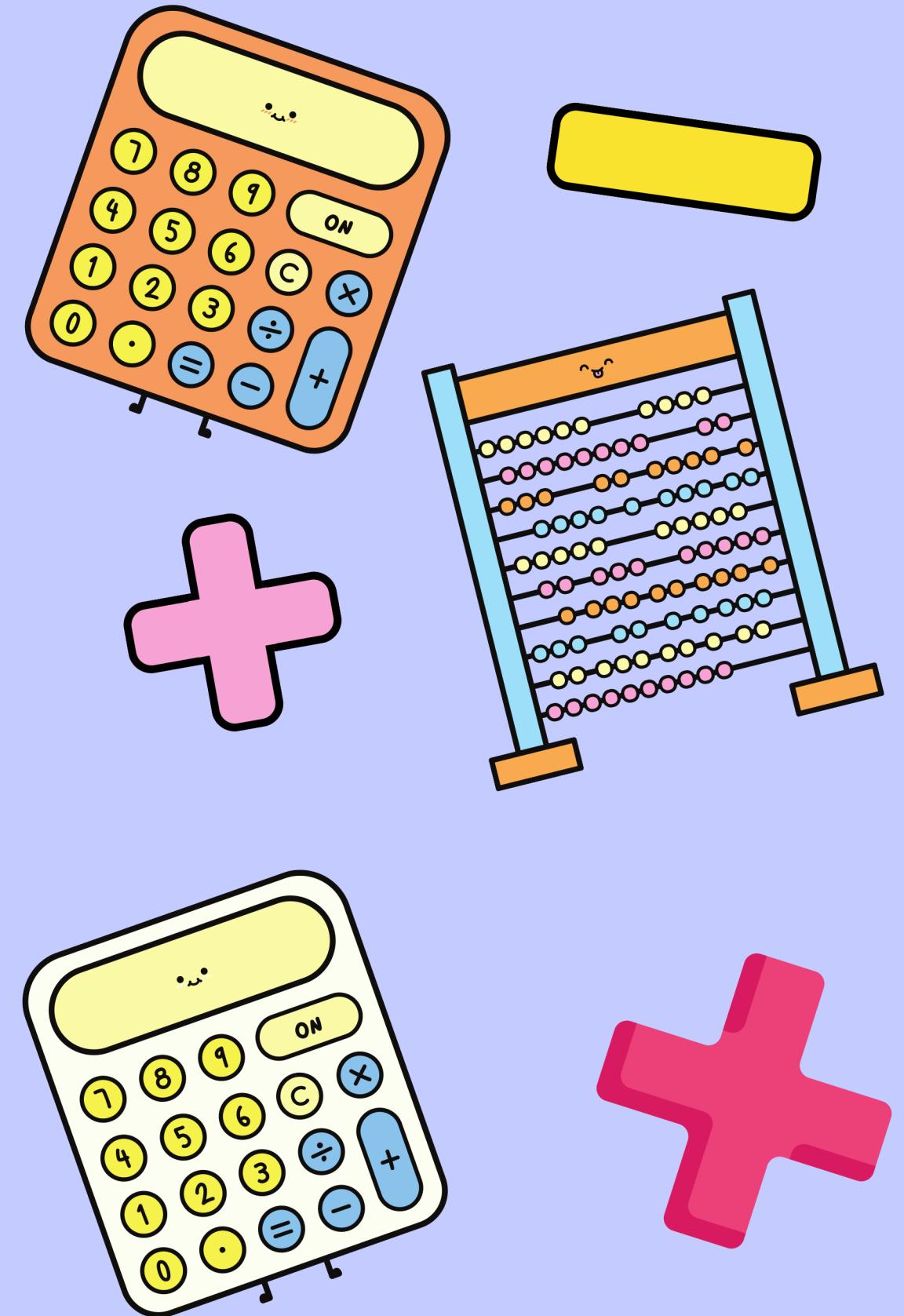


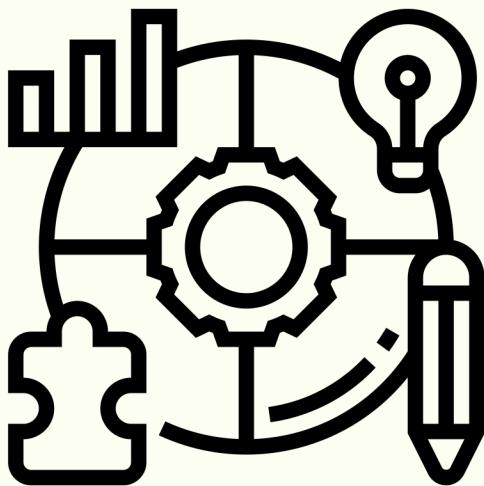
Process diagram



Results

- Mobile app
- AI model
 - Accomplishments
 - Limitations
- Evaluation
- Conclusion





Numerical Methods

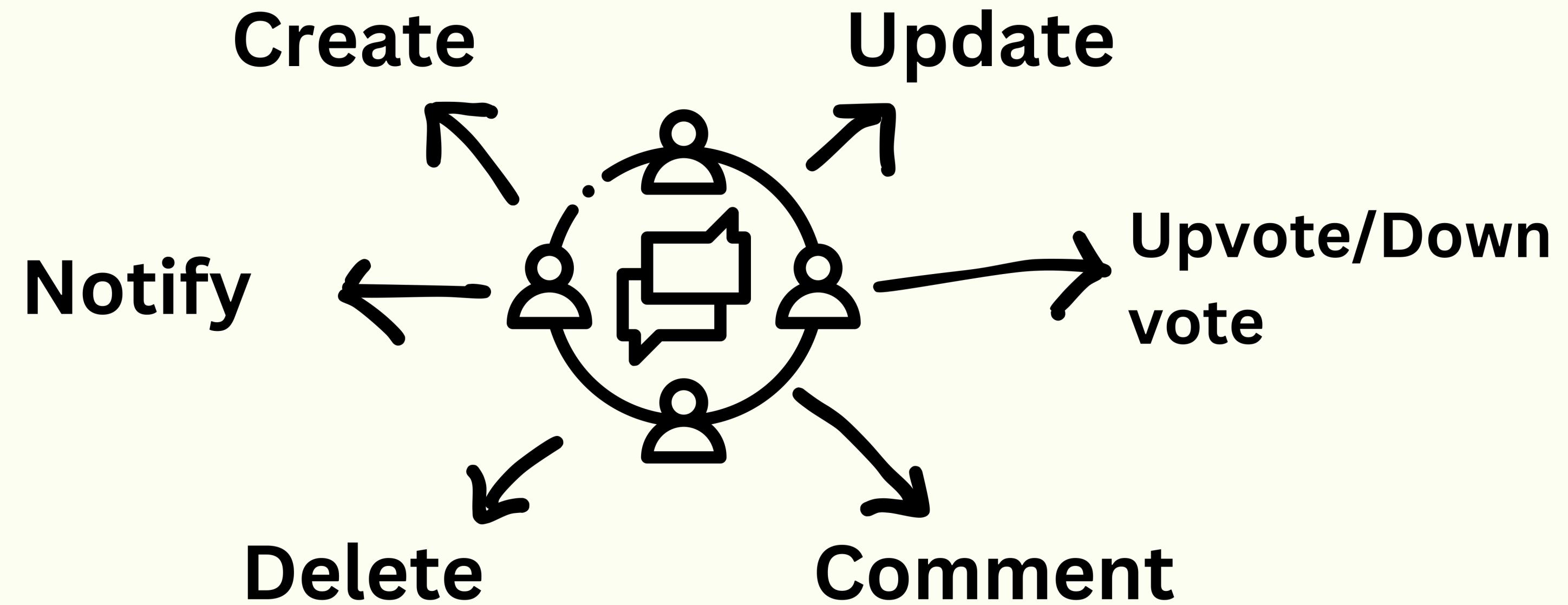
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Fields

18

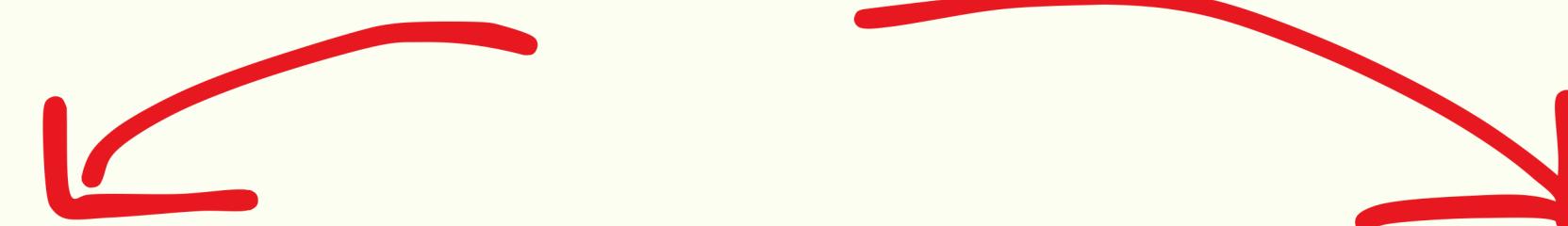
Algorithms

Functionalities



AI-scanner

Print
equations



Handwritten
equations

Evaluation

Function in general	Function in detail	AiMA	Photomath	Symbolab	Mathway
UI/UX	Easy to use	x	x	x	x
	Simple UI	x	x	x	x
	Smooth interaction	x	x	x	x
Response Time	Fast response	x	x	x	x
	Medium response				
	Low response				
Publication	Open-source	x			
Specialized Algorithms	Variety	x			x
Basic Algorithms	Complex equation	x		x	x
	Simple equation	x	x	x	x
AI Scanner	Gallery picker	x	x		x
	Camera scanning	x	x	x	x
	Response in time	x	x	x	x
	Handwriting recognition	x	x	x	x
Result/Steps showing	Correctness	x	x	x	x
	Completeness	x	x	x	x

Criteria	AiMA	pix2tex	CoMER	Khiem's model	Anh Duy Le's model
Handwritten recognition	x		x	x	
Color images recognition	x			x	
Various symbols recognition	x	x	x		x
Integrated products (math app)	x			x	
Ability to solve equations	x				x
Open-source	x	x	x	x	

Achievements

Related International Journal

Nam Anh Dang Nguyen, Binh Nguyen Le Nguyen, Duc Dang Khoi Nguyen, Le Duy Tan: “AiMA- An AI-Based Mobile System to Assist College Students with Math-Related Issues, Science and Technology Development Journal”, Accepted (July 2023).

Related Conferences

Nam Anh Dang Nguyen, Binh Nguyen Le Nguyen, Le Duy Tan: “AiMA- An AI-Powered Mobile System for Supporting Undergraduate Dealing with Mathematical Problems, The 7th International Student Science Forum 2023 (ISSF 2023)”. Accepted (September 2023).

Nam Anh Dang Nguyen, Binh Nguyen Le Nguyen, Le Duy Tan: “AiMA- An AI-Based Mobile System to Assist College Students with Math-Related Issues, The Conference on The Digital Transformation Capacity for Vietnamese Youth 2023 Vietnam”. Accepted (May 2023).

Achievements

Unrelated Conferences

Nam Anh Dang Nguyen, Binh Nguyen Le Nguyen, Pham Le Huy, Le Duy Tan: Automated Waste Management Application with Gesture Control: Intelligent Trash Bin System, DaMaS 2023 Scientific Conference: "Data-Driven Modeling and Simulation of Manufacturing Processes". Accepted (December 2023).

Nguyen Phuc Khang, Binh Nguyen Le Nguyen, **Nam Anh Dang Nguyen**, Le Duy Tan: Zalo Mini App International University Union - Effective information connection solution for union members and young people", School Level Scientific Conference - "Promoting the Role of Youth Union of Universities and Colleges In Improvement of Digital Competence And Innovation For Students In Ho Chi Minh City". Accepted (October 2023).

Binh Nguyen Le Nguyen, **Nam Anh Dang Nguyen**, Duc Dang Khoi Nguyen, Le Duy Tan: Real-time Air Quality Monitoring System using Fog Computing Technology (Vietnamese), The 16th National Conference on Basic Research and Application of Information Technology (FAIR 2023). Accepted (September 2023).

CONCLUSION

- 1 20% students get trouble with math
The trendy phenomena of AI currently
- 2 An AI-based mobile mathematics application is requirement
- 3 Core architecture: MVC architectures and Hybrid-ViT
- 4 Future works:
 - Improve AI model
 - Various instructions
 - Improve UX/UI

