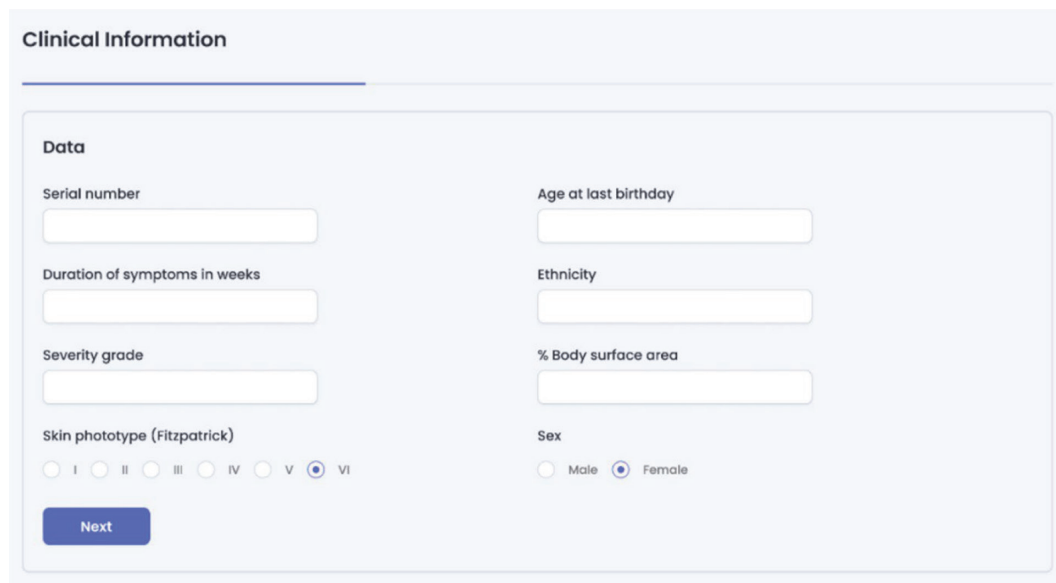


## Supplementary material

### Step-by-Step Workflow:

1. **User Input (Client Interface):** The healthcare provider accesses the web-based client application and uploads relevant patient demographic and clinical history data (Supplementary Figure S1A-D). A high-resolution image in JPEG, PNG, or GIF format of the affected skin region is then uploaded.
2. **Data Transmission:** All clinical data and image files are transmitted from the client to the server using encrypted communication protocols to ensure confidentiality and data integrity.
3. **Image Preprocessing Module:** Uploaded images are uniformly resized to fixed a dimension (640 x 640 pixels) compatible with the CNN input layer and then centrally cropped to 500 x 500 pixels to isolate the primary region of interest, typically the lesion site affected by atopic eczema, thereby enhancing the model's focus and disease-specific features. Afterwards, the images undergo normalization whereby the pixel values are scaled to a standardized range to improve consistency in feature extraction. Filters are then employed to remove image artifacts while preserving lesion boundaries for accurate morphological assessment.
4. **CNN Model Processing:** The processed image is analyzed by a CNN architecture (EfficientNet B0), selected for its proven performance in texture and morphological feature recognition in dermatological imaging. The model outputs a probability score reflecting the likelihood of atopic dermatitis.

A screenshot of a web-based clinical information form. The form is titled 'Clinical Information' and contains several input fields and a 'Next' button. The fields are: 'Serial number', 'Age at last birthday', 'Duration of symptoms in weeks', 'Ethnicity', 'Severity grade', and '% Body surface area'. There are also radio buttons for 'Skin phototype (Fitzpatrick)' (I, II, III, IV, V, VI) and 'Sex' (Male, Female). The 'Next' button is located at the bottom left of the form area.

A. Biodata and Clinical Information Page.

**Figure S1(A-D).** System Architecture and Processing Workflow Overview: The implemented diagnostic platform integrates clinical data entry, automated image preprocessing, and CNN-based diagnostic inference within a modular client-server architecture. The system was developed to function in real-time clinical environments, ensuring rapid analysis and user-friendly operation for healthcare providers.

**Clinical Information**

---

**Essential Details**

1. Typical morphology and distribution:  
Lesion distribution infants < 2yrs any one of: cheeks, elbows, knees, chest, trunk, or generalized

Yes  
 No

Adults: cubital fossae, popliteal fossae, neck, generalized

Yes  
 No

2. Pruritus

Yes  
 No

3. Chronic or relapsing course

Yes  
 No

4. Personal history of Atopy

Yes  
 No

5. Family history (1st degree relative with atopy)

Yes  
 No

B. Clinical Information Page.

**Clinical Information**

---

**Important Criteria**

1. Family history (1st degree relative with atopy)

Yes  
 No

2. Dry skin

Yes  
 No

3. Ichthyosis

Yes  
 No

4. Hyperlinear palms

Yes  
 No

5. Keratosis Pilaris

Yes  
 No

6. Age at onset less than 2 years

Yes  
 No

7. Prone to recurrent skin infections

Yes  
 No

8. Prone to hand and foot eczemas

Yes  
 No

9. Nipple eczema

Yes  
 No

10. Cheilitis

Yes  
 No

11. Recurrent conjunctivitis

Yes  
 No

12. Prominent infraorbital folds

Yes  
 No

13. Keratoconus

Yes  
 No

14. Anterior subcapsular cataract

Yes  
 No

15. Periorbital darkening

Yes  
 No

16. Pityriasis alba

Yes  
 No

17. Itching while sweating

Yes  
 No

18. Intolerance to wool and lipid solvents

Yes  
 No

19. Food allergy

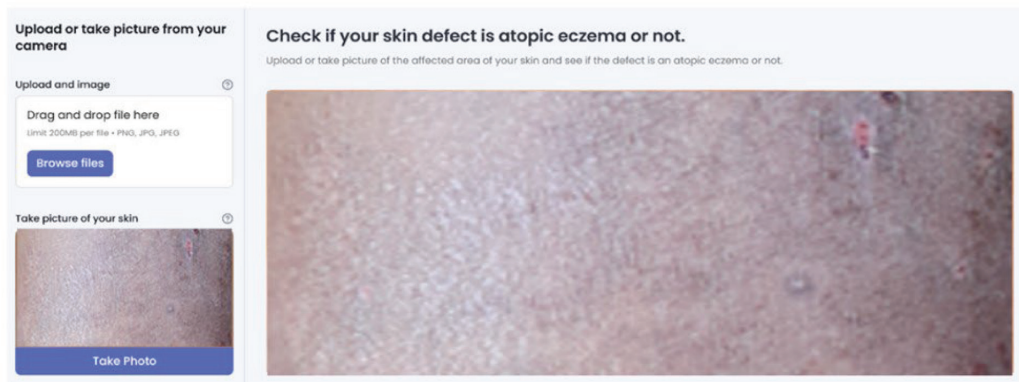
Yes  
 No

20. Environmental or emotional triggers

Yes  
 No

C. Clinical Information Page featuring the Hanifin and Rajka criteria.

Figure S1(A-D). Continued



D. Image Upload Page.

Figure S1(A-D). Continued

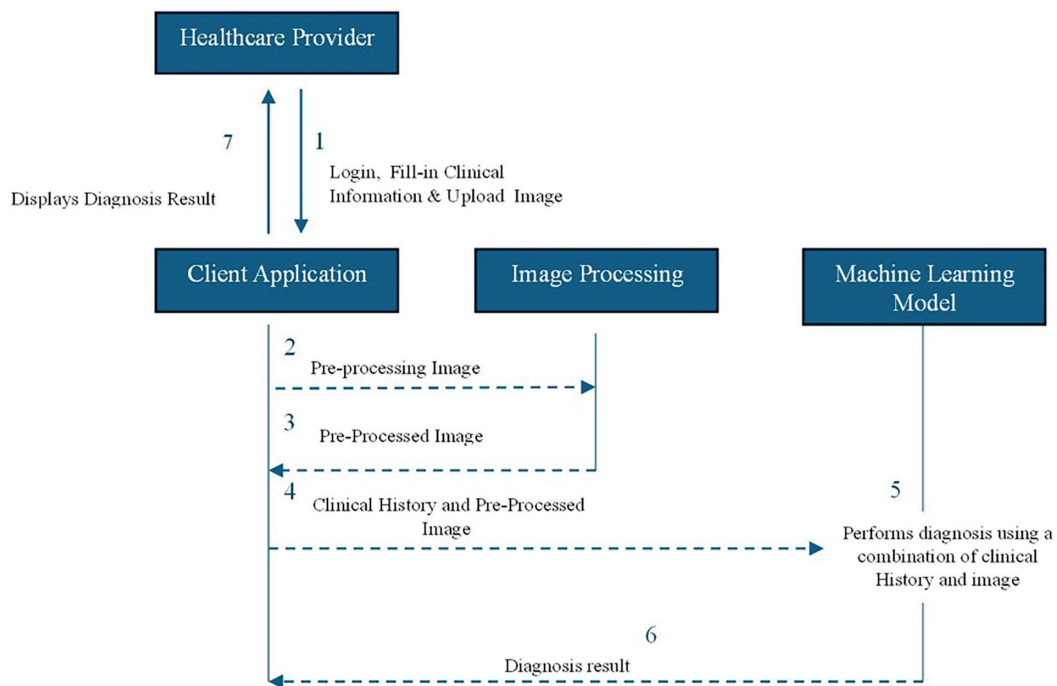


Figure S2. Sequence diagram illustrating the flow of data among the user interface, ML model, and diagnoses display.

- 5. Integration with Clinical History: The model output is integrated with the patient's clinical data to support comprehensive diagnostic interpretation. All processed images and associated metadata are stored in a secure database, enabling efficient retrieval, longitudinal case tracking, and scalability for future datasets.
- 6. Output Display: the client interface presents the probability score as a percentage, allowing clinicians to

- incorporate the AI-driven assessment into their diagnostic decision-making.
- 7. Data Management: All cases are stored using anonymized identifiers to protect patient privacy. The curated dataset supports ongoing model retraining, continuous performance monitoring, and quality improvement.