

The Role of Artificial Intelligence in Early Detection of Child & Adolescent Psychiatric Disorders

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Introduction

- **Early detection is critical in autism, ADHD, depression, anxiety, and psychosis.**
- **AI offers faster, more objective, and scalable screening tools.**
- **Traditional diagnosis relies on interviews and reports → subjective and time-consuming.**
- **Uses text, speech, video, wearables, and risk-prediction models.**

Types of AI Models

Classical Machine Learning

SVM, Decision Trees, Random Forest

Deep Learning

CNNs, RNNs, Transformers

Graph Neural Networks

Capture complex relationships

Reinforcement Learning

Smarter conversational agents

Hybrid Models

e.g., CNN + XGBoost for text/speech

NLP & Text Analysis (I)

AI can analyze teenagers' social media posts.

A hybrid CNN + XGBoost model:

92%

Depression Accuracy

90%

Anxiety Detection

81–86%

**Bipolar / Schizophrenia
Signals**

NLP & Text Analysis (II)

Analysis of 1M multilingual posts:

Identified mental-health crises **7 days earlier** than clinicians

Suicidal ideation detection: **93%**

Depressive episodes: **~91%**

Shows potential for **digital early-warning systems**.



NLP in Clinical Interviews

AI analyzes transcripts of youth at risk for psychosis.

Using semantic coherence:

Predicts psychosis within 2 years with
79–83% accuracy

Outperforms many traditional psychological tests.

Speech & Voice Analysis (I)

AI extracts features: pitch, intensity, pauses, MFCC patterns.

Depression detection from neutral reading tasks:

AUC \approx 0.77

Overall detection performance

MFCCs = Most Important Marker

Key acoustic feature for depression

Speech & Voice Analysis (II) — Autism

Young children with ASD show unique patterns in crying and early vocalizations.

AI model results:

85%

Boys Sensitivity
with 100% specificity

71%

Girls Sensitivity
with 100% specificity

Non-invasive early screening tool.



Computer Vision & Video (I)

- AI tracks eye contact, facial expressions, gestures, social attention.
- Can reduce the age of ASD detection.
- Video-based home screening + parent questionnaires = strong diagnostic accuracy.

Computer Vision & Video (II): Canvas Dx (FDA)

First FDA-cleared AI tool for autism.

Inputs:

1. Parent questionnaire
2. Short home videos
3. Clinician questionnaire

Results:

98%

Sensitivity

79%

Specificity

98%

Negative Predictive Value

Cuts wait-time from months → weeks.

Social Robotics

Measuring Imitation & Behavioral Differences in Child Development

Human-like robots are revolutionizing how we assess developmental differences in children, providing standardized and unbiased observations through interactive play and movement imitation.



Social Robotics in Child Assessment

Human-like robots mimic movements to measure imitation ability in toddlers, offering a novel approach to early detection.

Animal-like robots detect behavioral differences with remarkable precision:

AS D Classification

Accuracy: ~90%

This technology provides standardized, unbiased observations that can be replicated across different clinical settings and populations.

Wearables & Digital Phenotyping (I)

Continuous data collection from daily life captures sleep patterns, activity levels, heart rate, GPS location, and phone usage—creating a comprehensive digital profile of each child.

A Random-Forest model for ADHD detection demonstrates exceptional performance:

0.95

AUC Score

88%

Accuracy

90%

Recall

These metrics show that wearable technology can reliably identify ADHD Patterns in real-world settings.

Wearables & Digital Phenotyping (II)

A landmark study involving 6000 children aged 9–11 evaluated the effectiveness of wearable-based screening:

75%

Sensitivity

72%

Specificity

97%

Negative Predictive Value

This approach is ideal for large-scale, low-cost screening programs that can reach underserved populations and identify at-risk children early in their development.



Chatbots & Interactive Apps

AI chatbots can engage in natural conversations with children and adolescents, asking screening questions from validated instruments like the PHQ-9 and GAD-7 in friendly, accessible language.

These tools are particularly valuable for schools and universities, enabling repeated mental-health check-ins throughout the academic year. Their highly scalable and accessible nature makes them ideal for reaching large populations of young people.

Risk-Prediction Models

Advanced machine learning models leverage electronic health records, school performance data, family history, and lifestyle factors to predict mental health risks.

A Gradient-Boosting model predicting suicide risk in youth shows powerful predictive capability:

88%

Accuracy

97%

Sensitivity

These models help identify high-risk youth early, enabling timely clinical intervention and support.

Multimodal & Multi-Output Models

The most advanced AI systems combine multiple data streams to improve diagnostic accuracy and clinical utility:

Text + Speech + Video Integration

Combining multiple modalities significantly improves overall accuracy compared to single-modality approaches.

Graph Neural Networks

Model complex relationships between risk factors to identify interconnected patterns.

Transfer Learning

Helps address challenges with low-data disorders by leveraging knowledge from related conditions.

Reinforcement-Learning Chatbots

Intelligently choose the "best next question" to optimize screening conversations.

Clinical Success Stories

Real-world applications demonstrate the transformative potential of AI in child and adolescent psychiatry:

Canvas Dx (FDA-Approved)

Autism screening tool

NEBA EEG

Supports ADHD diagnosis

NLP Psychosis Prediction

83% accuracy in detecting early psychosis

Instagram Image Analysis

Detects depression better than general practitioners



Current Challenges

Despite remarkable progress, significant obstacles remain in implementing AI for child mental health screening:

Data Limitations

Small and non-diverse datasets limit generalizability across different populations and clinical settings.

Overfitting Risk

Models may perform well on training data but fail to generalize to new populations.

Ethical Concerns

Privacy risks associated with GPS data, social-media monitoring, and continuous health tracking.

Transparency Requirements

Need for explainability tools like LIME and SHAP to understand model decisions.

Clinical Oversight

Risk of misinterpretation without proper clinical supervision and professional judgment.

Thanks for your attention

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