

iGAIT: A Smartphone-accessible Early Screening Tool of Autism for Children Using Video-based Gait Analysis

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The Public Health Crisis of Timely, Equitable Autism Diagnosis

- About **1 in 31 (3.2%)** children aged 8 years are autistic (CDC, 2025)
- First signs of autism: before **2 years** of life
- Waiting from initial screening to formal diagnosis: **>2 years**
- Average diagnosis age: **4-years and 4-months**
- Children from minority, low-income, and rural backgrounds: **8-years-old**
- Autistic girls: average of **10-years** from first autistic traits to a formal diagnosis

The Critical Need for Innovative, Accessible, Less Subjective, and More Inclusive Screening Tools

- Affordability** of diagnostic services
- Equity & Inclusivity** concerns of existing screening & diagnostic tools
 - Gender bias
 - Cultural bias
 - Linguistic bias
- Subjectivity**: Current practices rely solely on parent reports and clinician observations

Motor skills & Autism: 88% of a large sample of children between the ages of 5- to 15-years-old were at risk for motor impairment

The iGAIT Web App

With just **two short videos of the child walking**, the iGAIT web app gives an autism screening result, by performing:

- Full-body **pose estimation**
- Walking gait** parameterization
- Machine learning** based prediction
- Data-driven detection** of autism

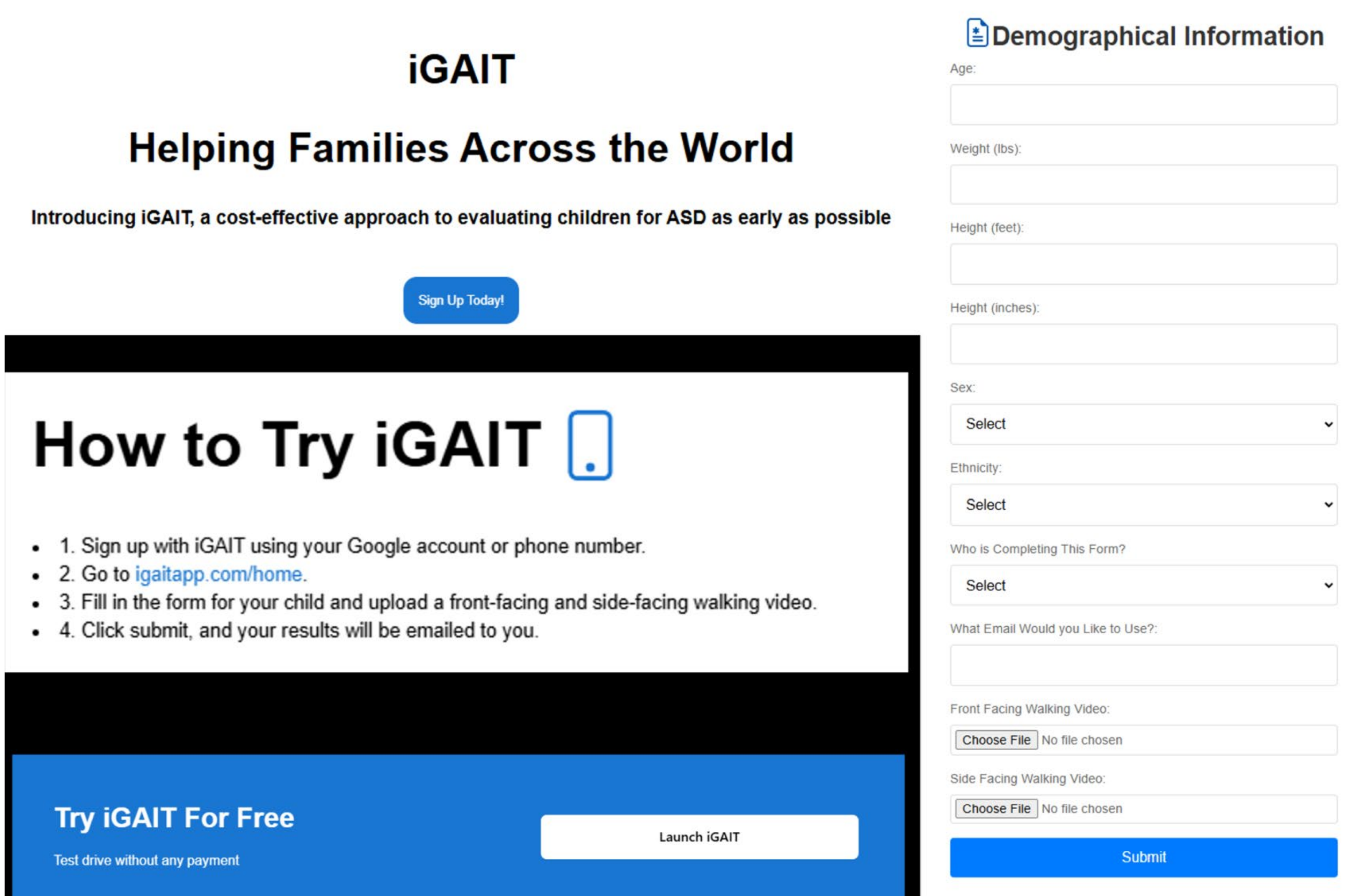
Accuracy: ~80%

Front Videos:

- Left & right knee abduction/adduction
- Left & right hip abduction/adduction

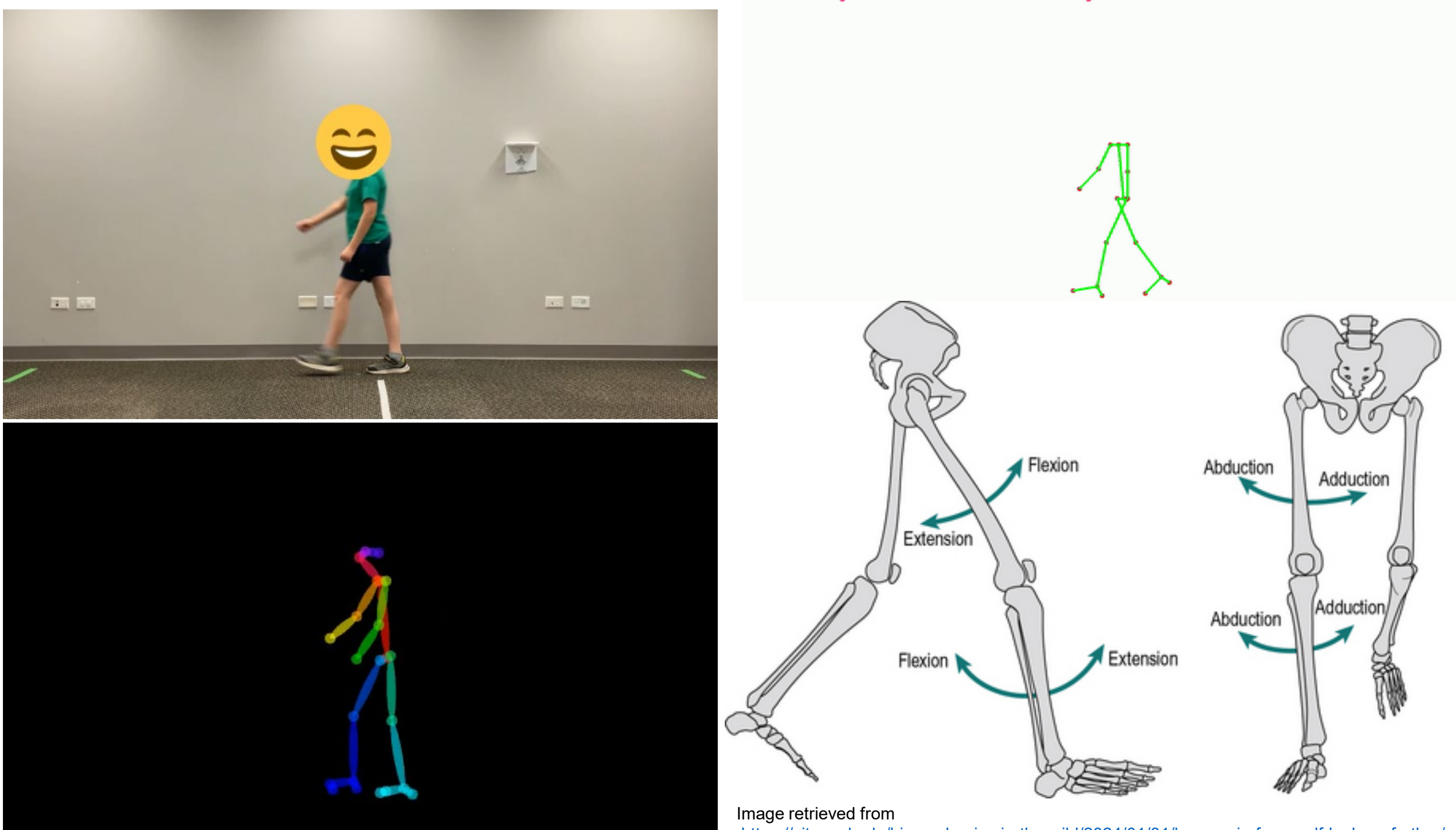
Side Videos:

- Left & right knee flexion/extension
- Left & right hip flexion/extension



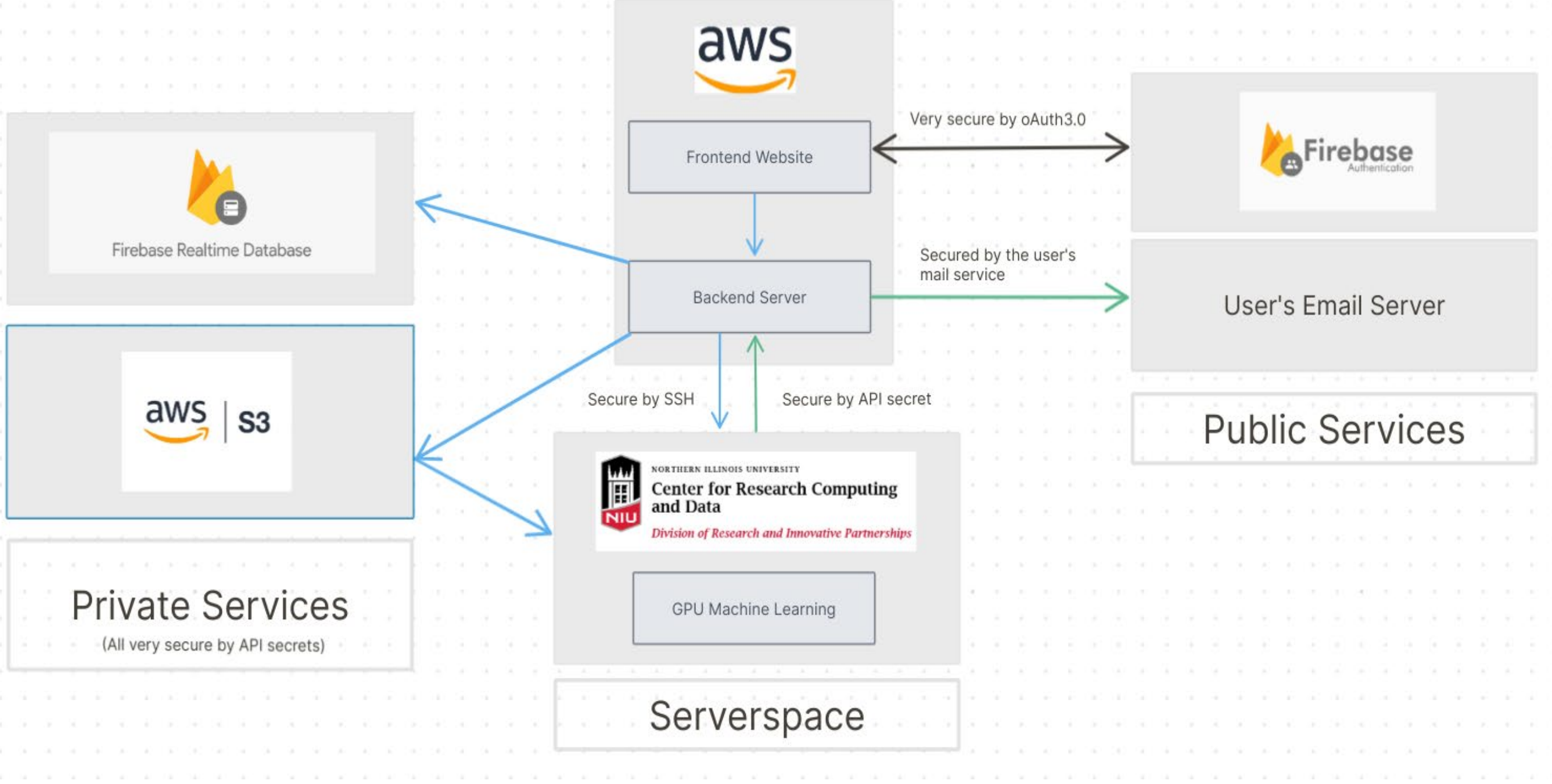
The screenshot shows the iGAIT web application interface. It includes a header with the title 'iGAIT' and the tagline 'Helping Families Across the World'. Below this is a 'Sign Up Today!' button. A section titled 'How to Try iGAIT' lists four steps: 1. Sign up with iGAIT using your Google account or phone number. 2. Go to igaitapp.com/home. 3. Fill in the form for your child and upload a front-facing and side-facing walking video. 4. Click submit, and your results will be emailed to you. To the right of this section is a 'Demographical Information' form with fields for Age, Weight (lbs), Height (feet), Height (inches), Sex, Ethnicity, Who is Completing This Form?, and What Email Would you Like to Use??. Below the form are two file upload buttons for 'Front Facing Walking Video' and 'Side Facing Walking Video', each with a 'Choose File' button and a 'No file chosen' status. At the bottom, there is a 'Try iGAIT For Free' section with a 'Launch iGAIT' button.

Gait Analysis



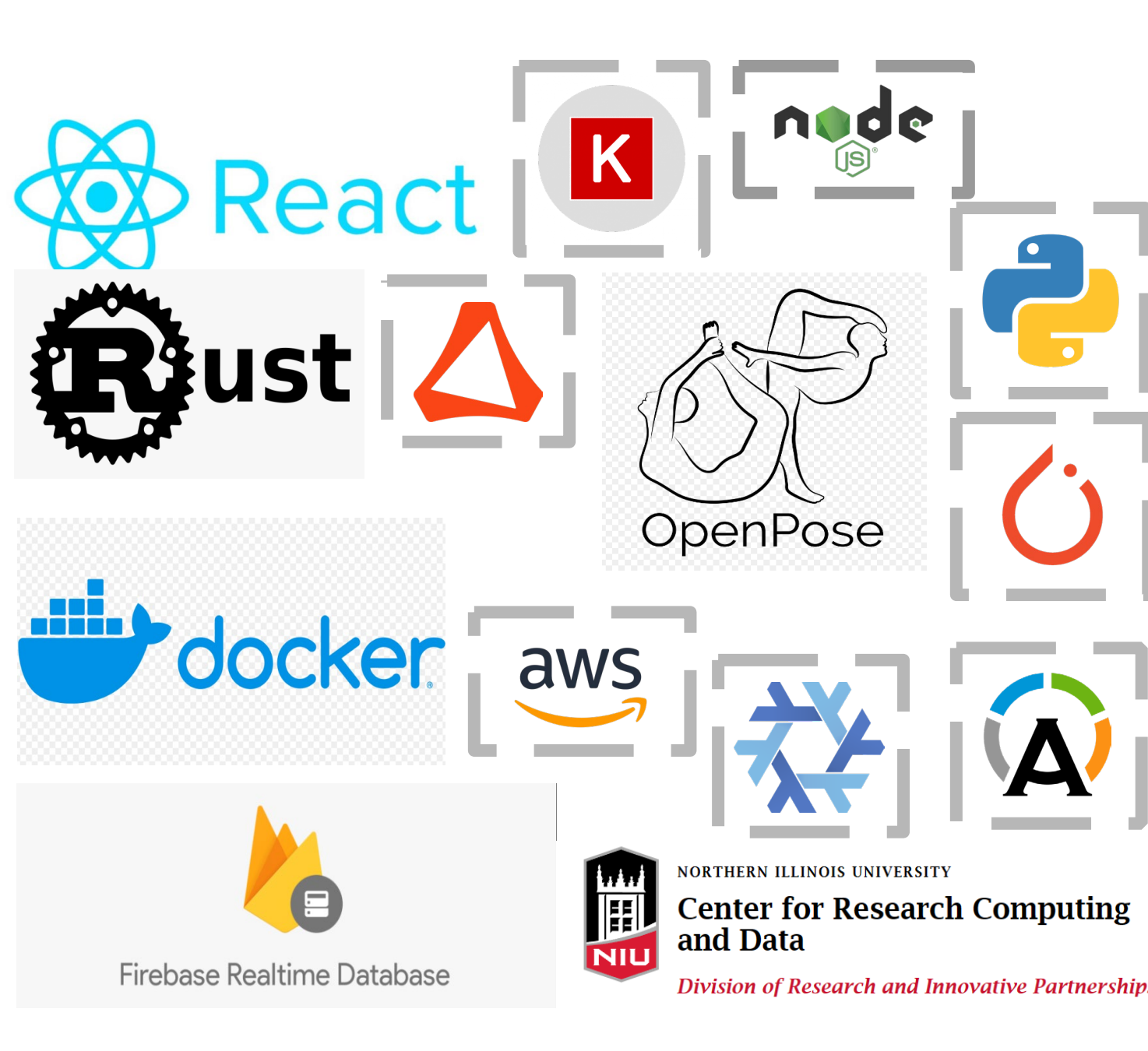
The diagram illustrates the gait analysis process. It shows a child walking on a treadmill, with a skeletal model overlaid. The model is labeled with 'Flexion' and 'Extension' for the knee and hip, and 'Abduction' and 'Adduction' for the hip. A legend at the top right lists the following parameters: Direction: left; Right Leg: Initial Swing->Swing, Right Hip Angle: 22.97->Extension; Right Knee Angle: 13.14->Flexion; Right Ankle Angle: 98.79->Plantar flexion; Left Leg: Initial Contact->Stance, Left Hip Angle: 25.1->Flexion; Left Knee Angle: 13.13->Flexion; Left Ankle Angle: 111.33->Dorsiflexion.

iGAIT Architecture



The diagram shows the iGAIT architecture. It is a cloud-based system. The Frontend Website is connected to the Backend Server via OAuth3.0. The Backend Server is connected to the Firebase Realtime Database, AWS S3, and the User's Email Server. The Backend Server is also connected to the Public Services and Private Services (All very secure by API secrets). The Backend Server is connected to the Serverspace via SSH and API secret. The Serverspace contains GPU Machine Learning. The Backend Server is connected to the User's Email Server via the User's Email Service. The Backend Server is connected to the Public Services via the Public Services.

Technologies



The diagram shows the technologies used in iGAIT. It includes React, Rust, Docker, AWS, Firebase Realtime Database, Node.js, OpenPose, and the Northern Illinois University Center for Research Computing and Data.

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Scan to watch a video about our story!

