

# AI-YM: AI-based Solutions for Kazakh Sign Language

STUDENTS: Aruzhan Kaltay, Bekzat Ongdassynov, Dilnaz Sembekova, Yerzhan Yerbatty, Karina Iskakova

ADVISORS/CO-ADVISOR: Anara Sandygulova, Antonio Cerone

# Review: The problem statement



## 1. A GAP IN INCLUSIVE COMMUNICATION

People with hearing loss cannot rely on other modes for effective communication and hearing people do not know sign languages.

## 2. SIGN LANGUAGE PROCESSING

Interdisciplinary field focusing on creating technology for sign language recognition and translation.

## 3. EDUCATION TOOLS

Technologies greatly impact the learning and teaching processes.

# Review: What we developed? Fall semester 2024



# Now to Current Semester

## 1. AI-YM LEARN FOR STUDENTS

- Developed in the Fall Semester;

## 2. AI INTEGRATION

- feedback model for sign-language;

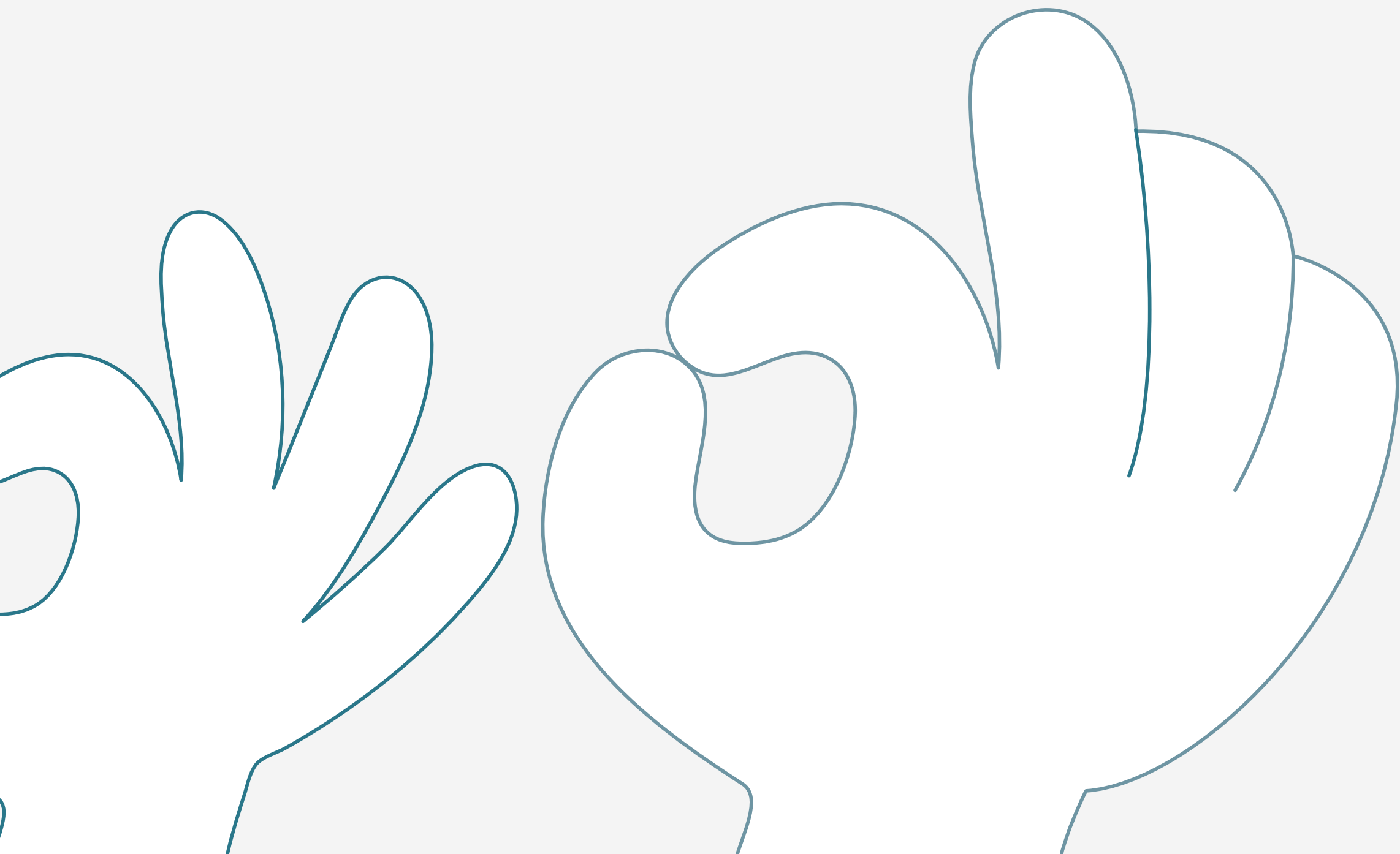
## 3. AI-YM FOR TEACHERS

- content creators for AI-YM learn, not only students!

**Developed in the Spring Semester!**



# AI Integration: How we did it? How it works?



## 1. VIDEO PROCESSING & LANDMARK EXTRACTION

We use **MediaPipe** to detect and extract:

- Full-body pose landmarks (33 points).
- Up to 2 hands (21 landmarks each).

## 2. PREPROCESSING & FEATURE ENGINEERING

- We **read CSV data** and clean it, then normalize it.

## 3. FEATURE EXTRACTION

- We compute joint angles between body landmarks to describe posture.
- We extract **trajectory features**.
- We generate speed-invariant features.

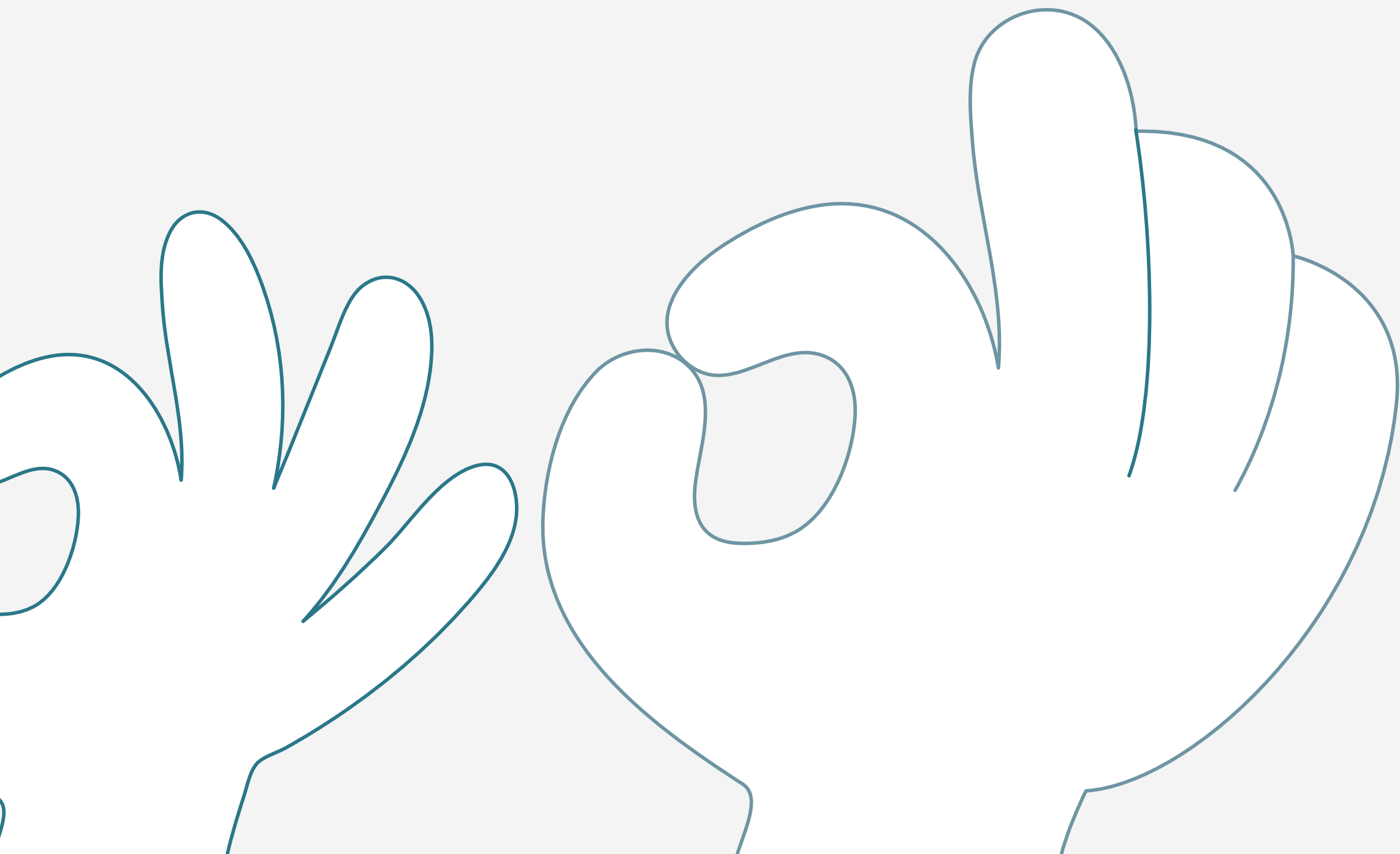
# AI Integration: How we did it? How it works?

## 4. SEQUENCE MATCHING & COMPARISON

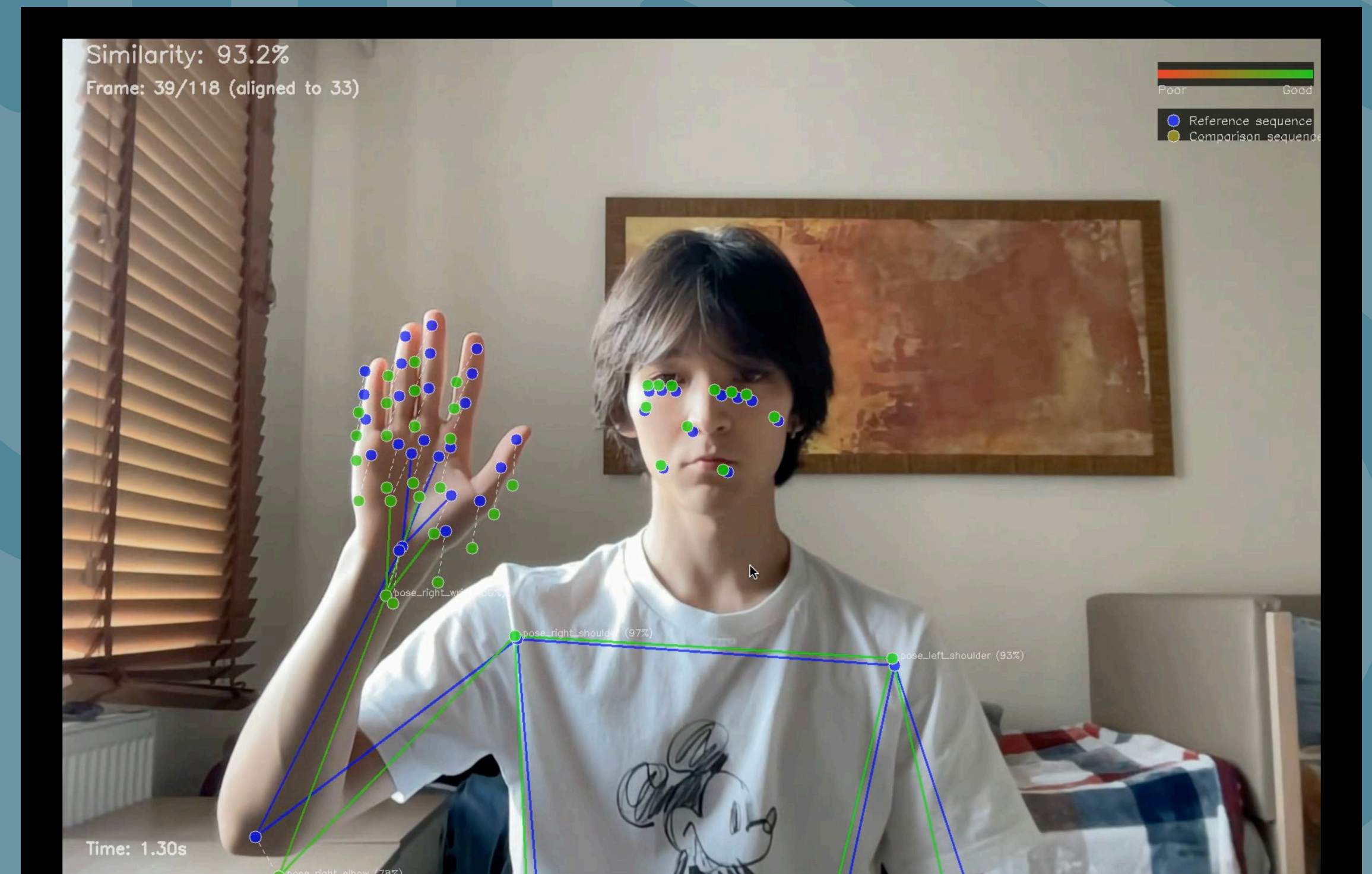
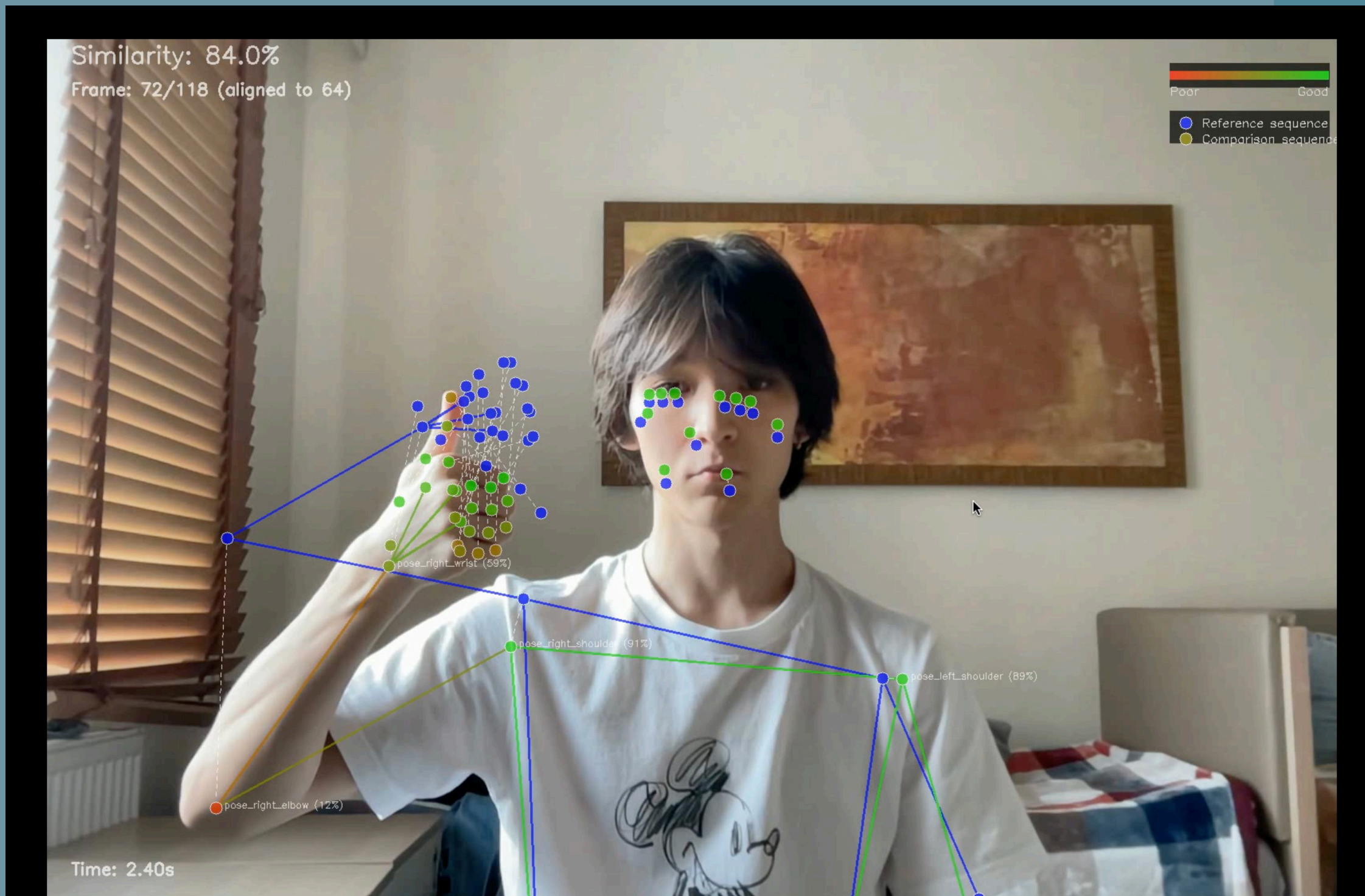
- We use **Dynamic Time Wrapping**.
- **To compare sequences even if they have different lengths or speeds**

## 5. VISUALIZATION

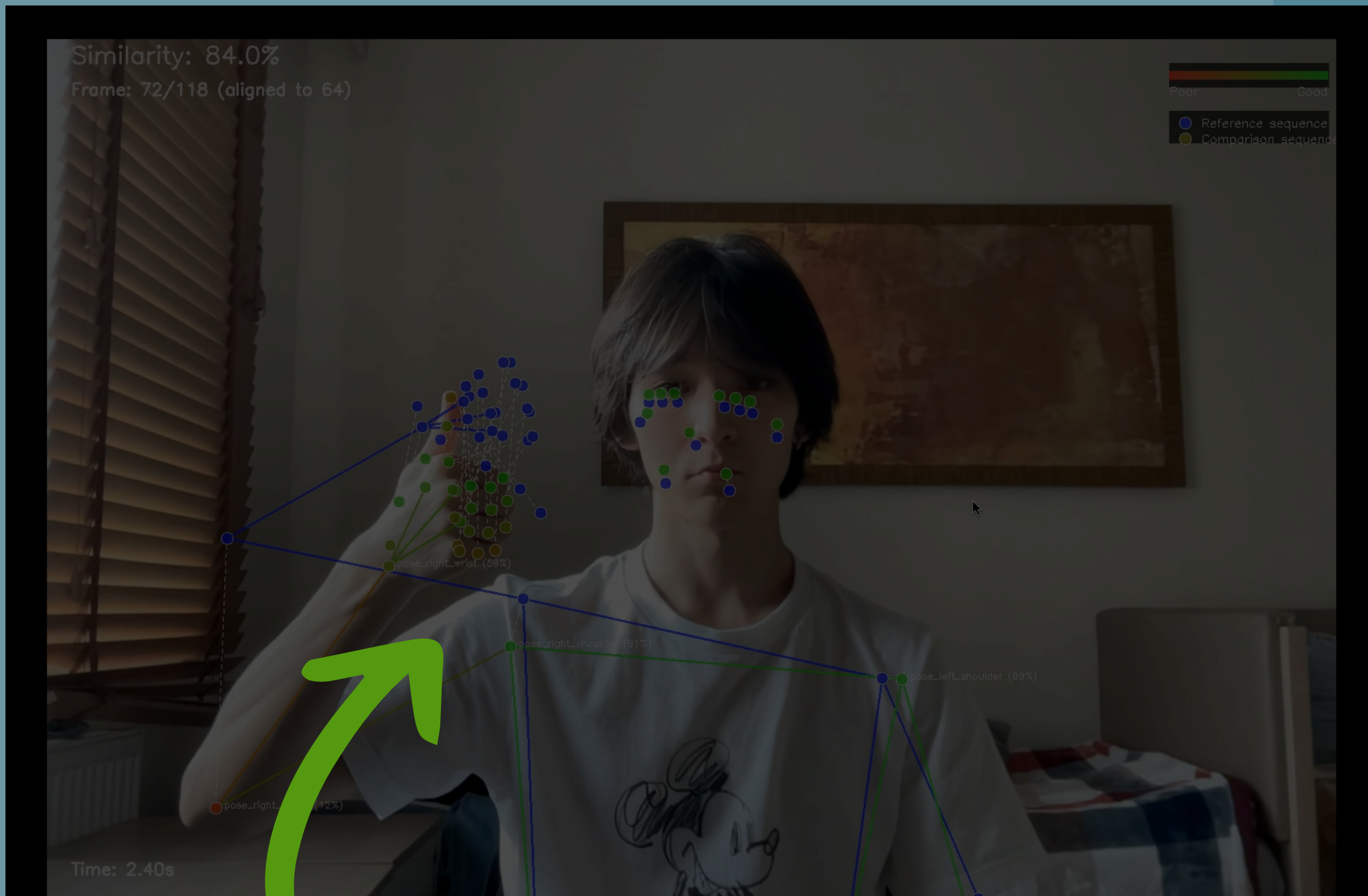
- We shows landmarks and skeletons from both sequences: real-time and from database.
- We display **similarity scores and aligned frames**.



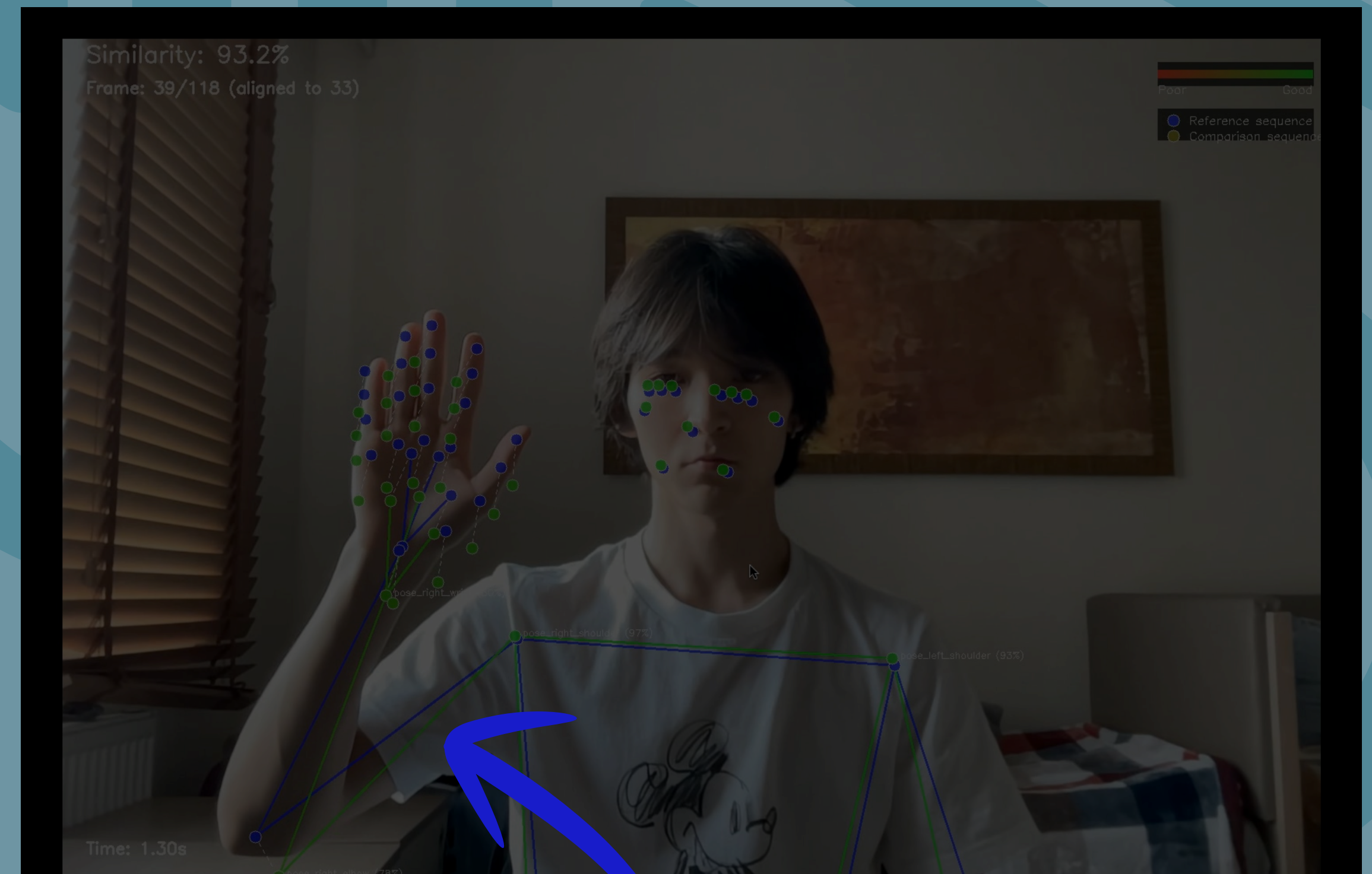
# Let's see results. Test Cases with Known Labels



# Let's see results. Test Cases with Known Labels



Green landmarks are video real-time marks



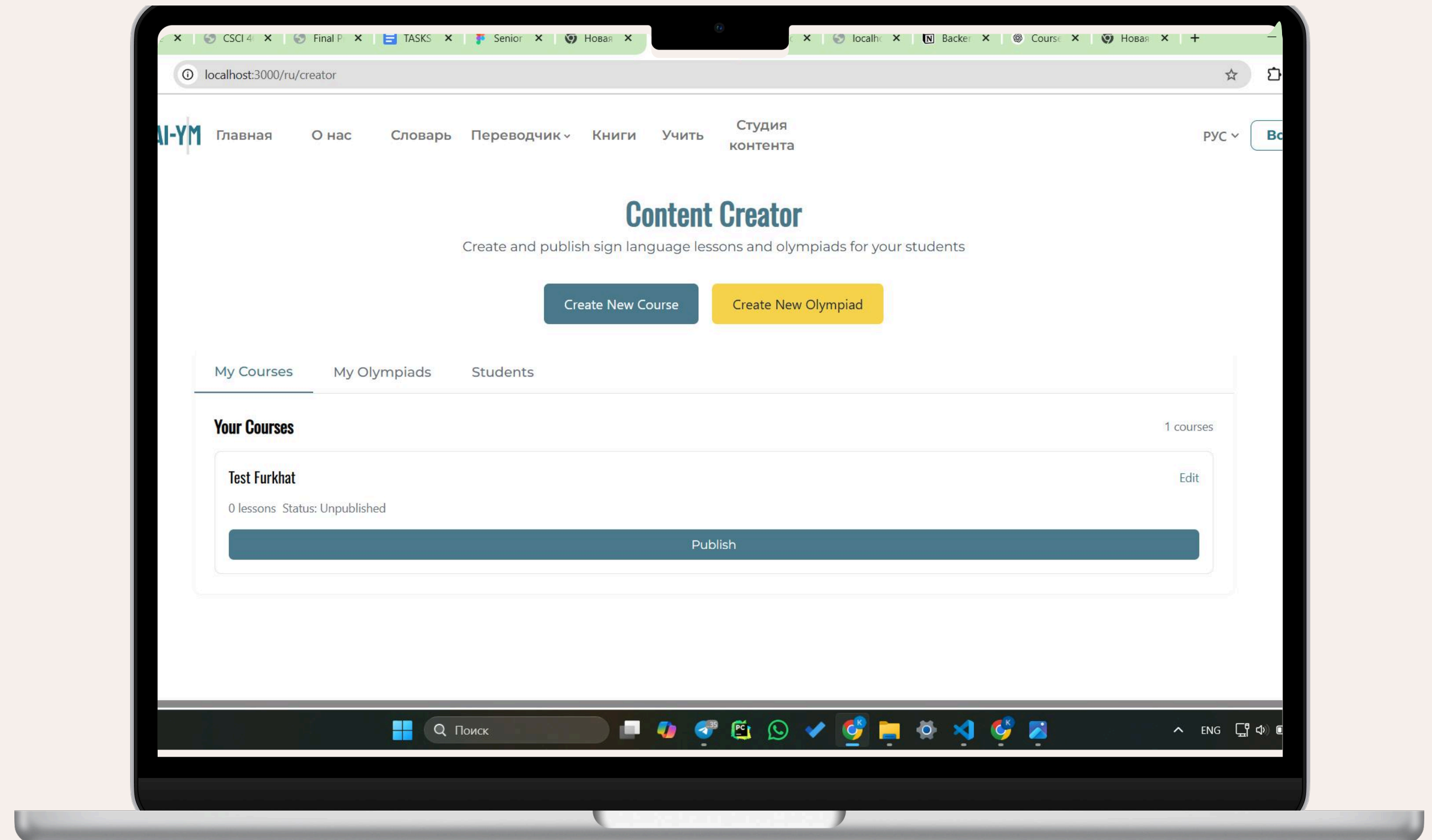
Blue landmarks are marks of correct sign

# How about AI-YM for Teachers?

# We call it Content Creator Studio.



Let's demonstrate it!



# User evaluation with:

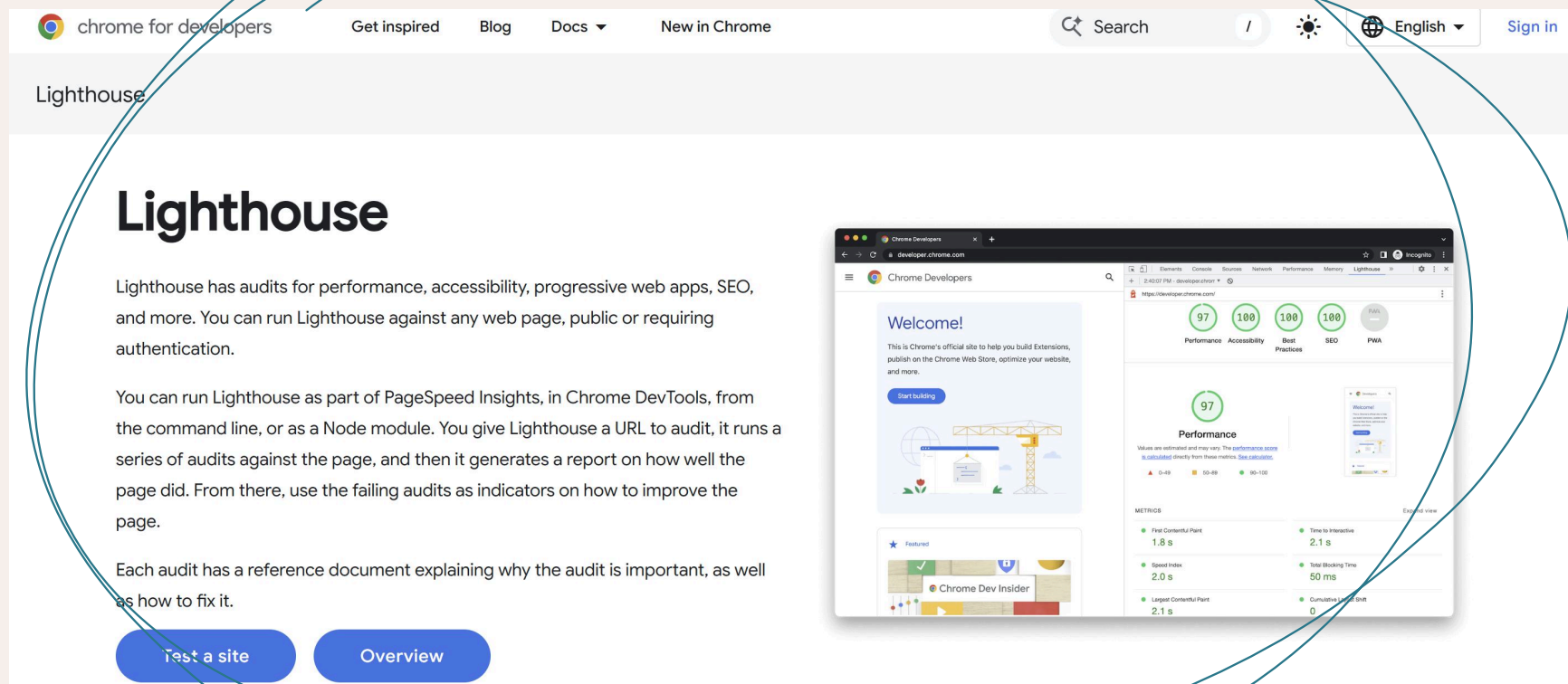
- students;
  - teachers;
  - Deaf community;
  - native sign language users;
  - sign language interpreters;
- 10 people in total;

# After evaluation:

- we enhanced and fixed design;



# Website Performance Evaluation



**Lighthouse**

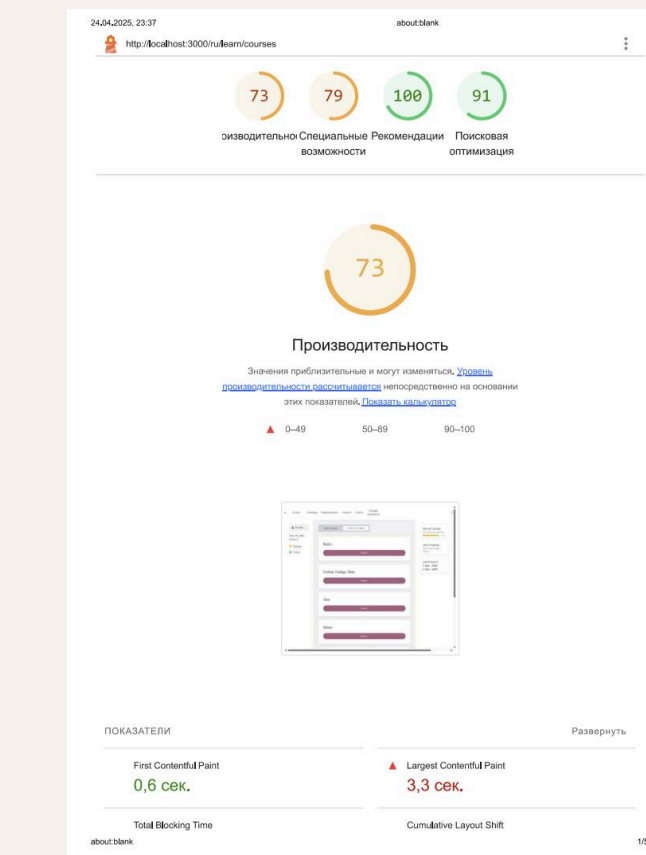
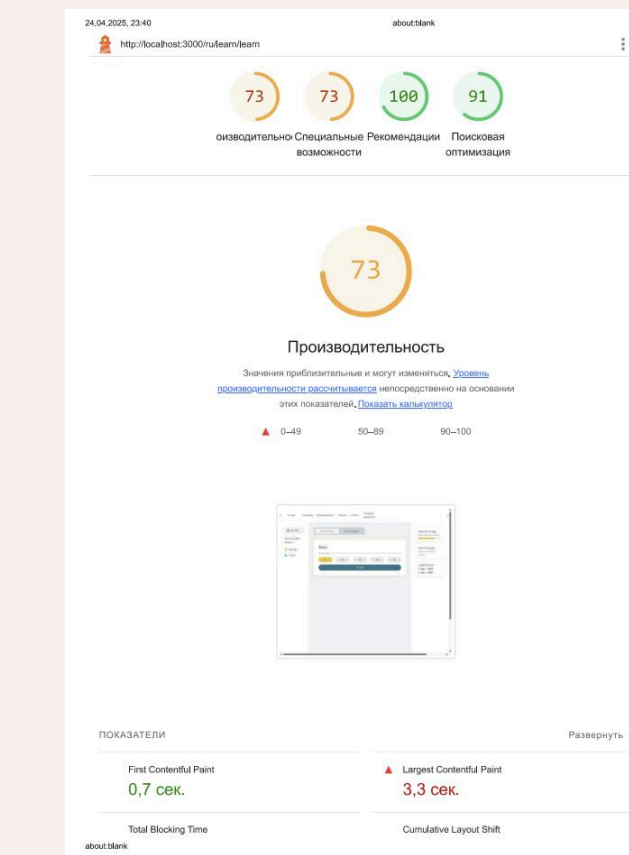
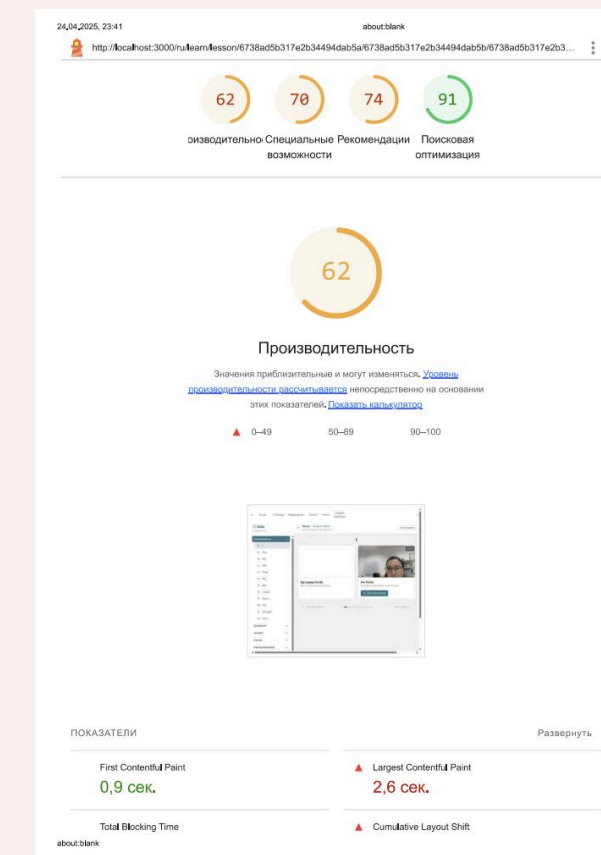
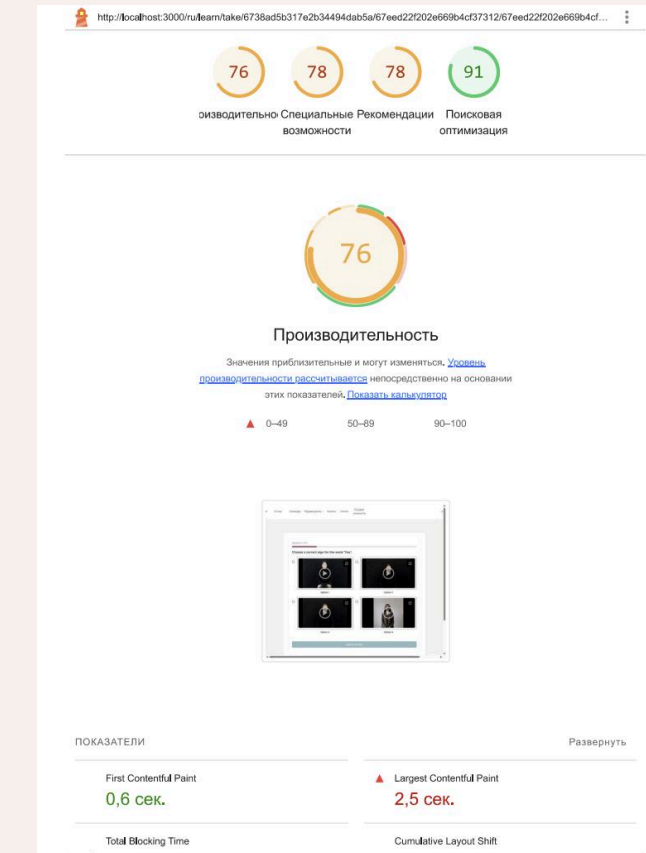
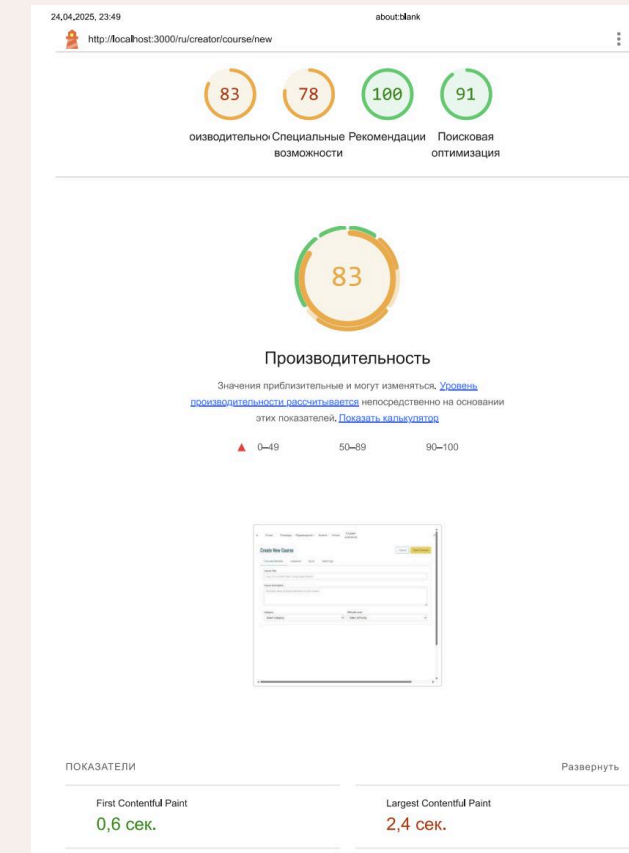
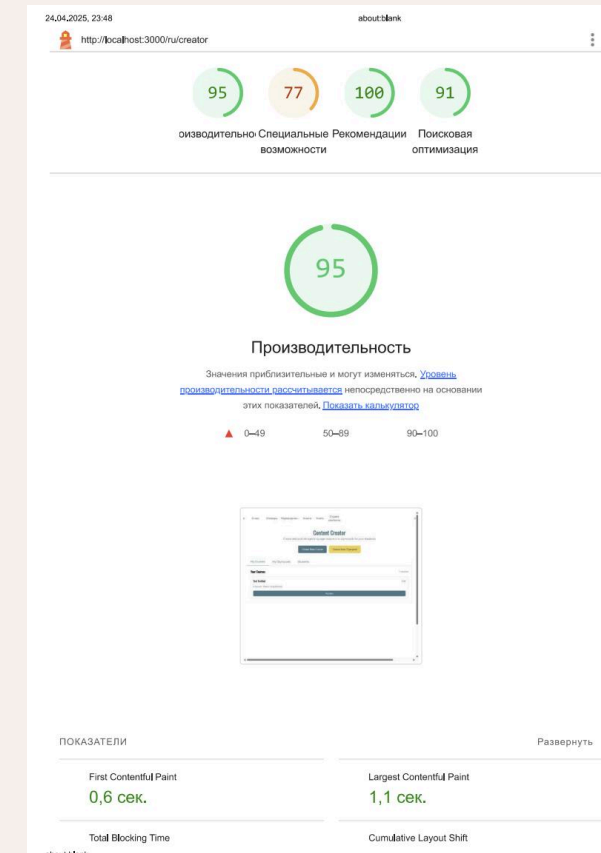
Lighthouse has audits for performance, accessibility, progressive web apps, SEO, and more. You can run Lighthouse against any web page, public or requiring authentication.

You can run Lighthouse as part of PageSpeed Insights, in Chrome DevTools, from the command line, or as a Node module. You give Lighthouse a URL to audit, it runs a series of audits against the page, and then it generates a report on how well the page did. From there, use the failing audits as indicators on how to improve the page.

Each audit has a reference document explaining why the audit is important, as well as how to fix it.

[Test a site](#) [Overview](#)

Lighthouse tool for web apps performance evaluation



Reports for each page

# Website Performance Evaluation

Page	Performance	Accessibility	Best Practices	SEO
Content Creator Dashboard	95	77	100	91
Create New Course	83	78	100	91
Exercise	76	78	78	91
Lesson	62	70	74	91
My Courses	73	73	100	91
New Courses	73	79	100	91
Review	78	72	78	91
Take Quiz	84	69	100	91

Table: Lighthouse Scores Summary per Page

# Conclusion

delivered fully functioning user-friendly platform for publishing and taking courses to learn sign language with feedback on the gesture accuracy.