

Piano Coach for All: Using AI (Audio + Camera) to Support Acoustic Piano Practice

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1. Community Need (Why it matters)

Many kids want to learn piano, but not everyone can access music education or private lessons.

A national study found about **3.6 million U.S. public-school students** do not have access to music education, and the impact is not equal across communities.

Even with a teacher, most practice happens at home. Practicing alone can lead to repeated mistakes (wrong notes, inefficient fingering, poor hand position) that are hard to unlearn.

2. Our Idea (What we are proposing)

We propose a **Multimodal AI Piano Coach** for **acoustic piano**.

“Multimodal” means it uses two inputs at the same time:

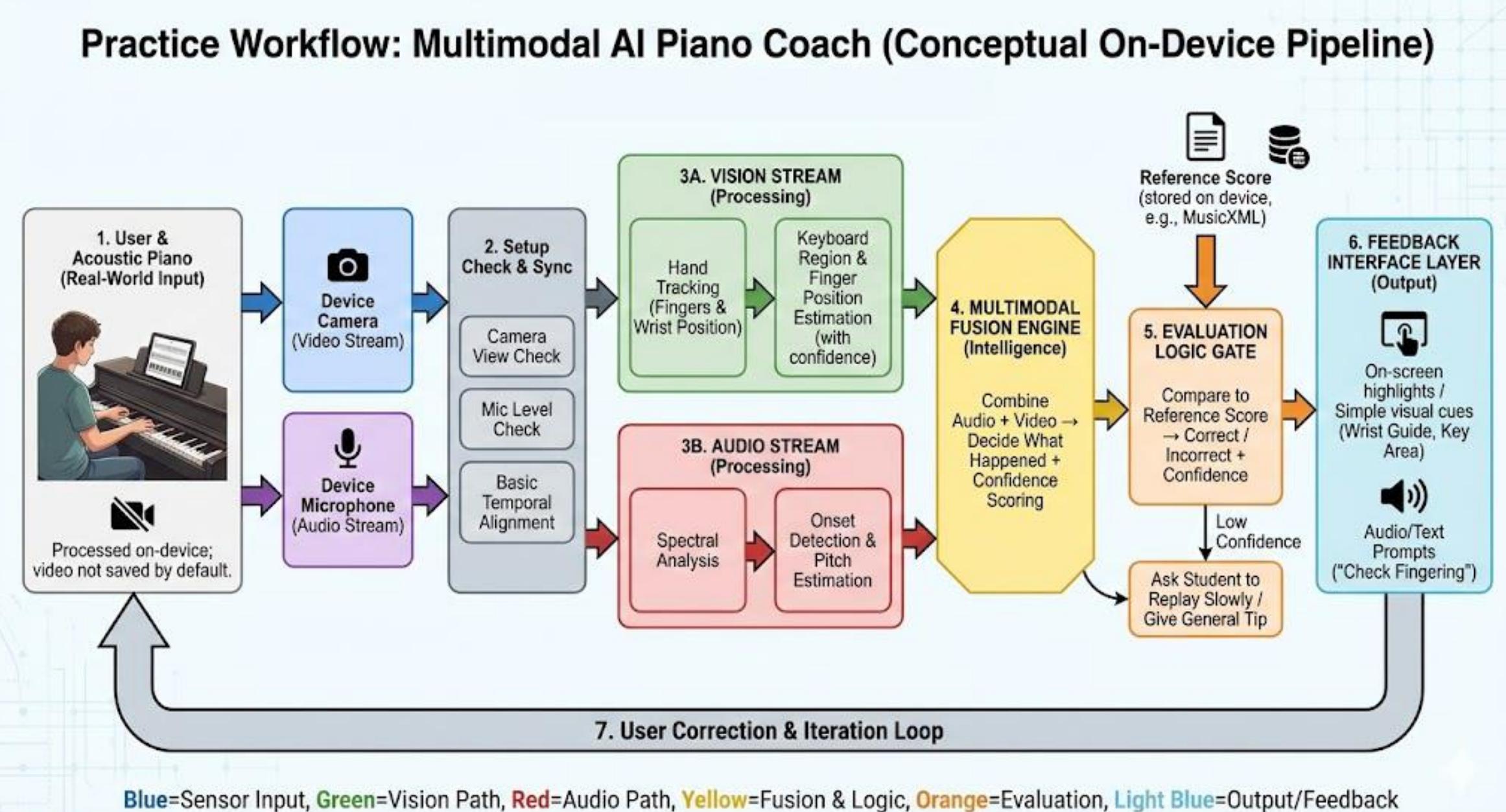
- **Microphone:** listens for notes and rhythm
- **Camera:** watches hands and keys to support fingering and basic technique reminders

Goal: help students practice with **clear, kind, real-time feedback**—not just whether a note was correct, but how to improve the next try.

3. How it works

Practice Workflow (On-Device)

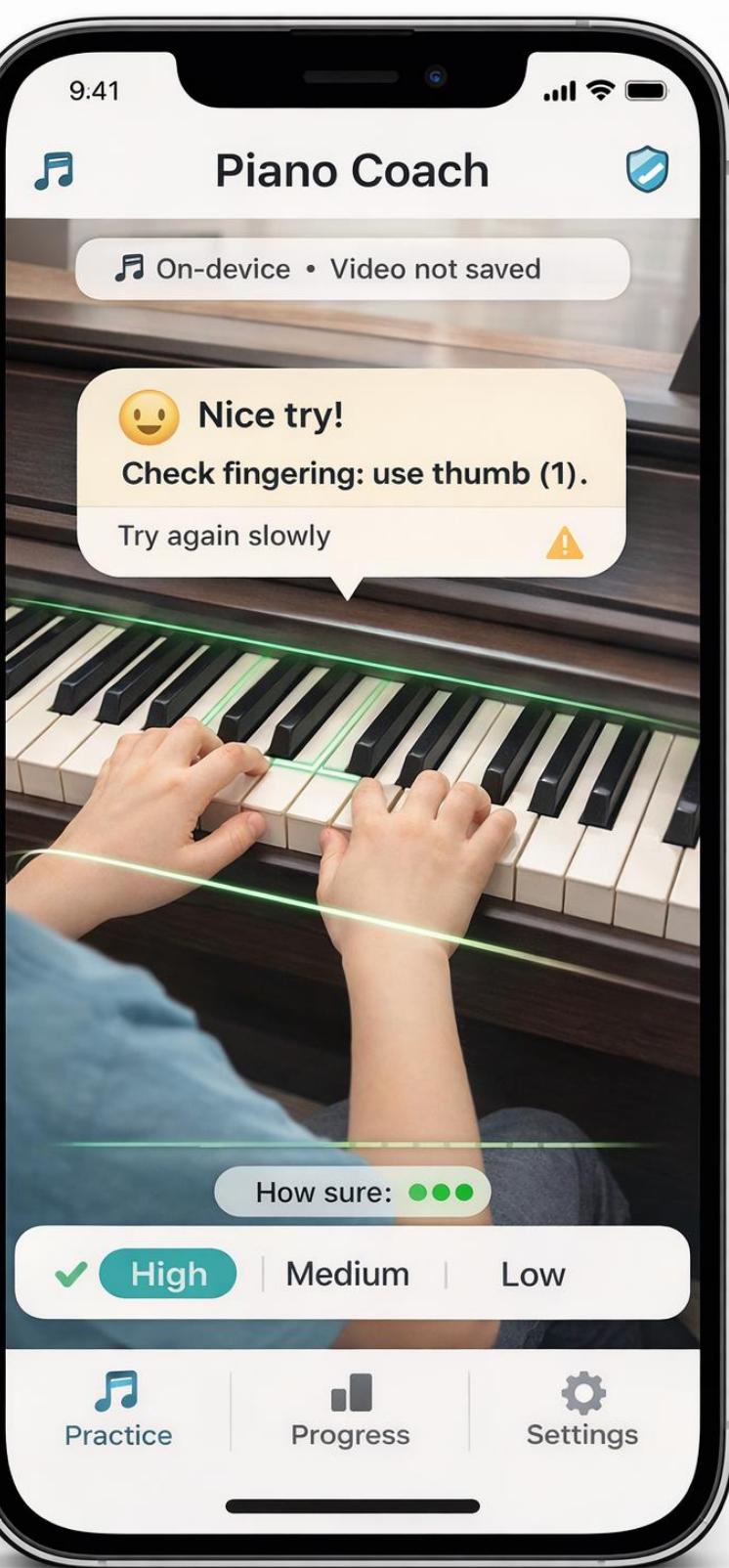
1. Student plays a short section
2. Setup check (camera view + mic level)
3. AI listens (notes/timing) + watches (hand position)
4. AI combines both and checks against the stored song file
5. Compare to reference score
6. Feedback: one helpful tip at a time, If not sure: “Replay slowly” (no guessing)



4. Example Screen (What the student sees)

Practice Mode Screen

- Shows hands + keys (no face)
- Highlights the note/area to focus on
- Gives a friendly tip (example: “Use thumb (1) here”)
- Shows “How sure” (confidence)
- Privacy badge: On-device • Video not saved



5. Obstacles & Responsible Use

Technical challenges (real homes):

- Pedal + overlapping notes can blur sound
- Hands can block the camera (occlusion)
- Different device angles and lighting

Our safeguards:

- Use “how sure” confidence; if low → replay slowly
- Setup guidance for camera placement
- Prefer simple, reliable feedback over guessing

Privacy & kid-safe design:

- Process on-device when possible; **video not saved by default**
- Collect the minimum data needed
- Encouraging feedback (no harsh “fail” messages)
- Parent/guardian permission required if saving anything

6. What success looks like + Next steps

What success looks like (simple measures):

- Fewer repeated mistakes over time
- Better note accuracy on short exercises
- More consistent practice (days per week)
- Higher student confidence (simple 1–5 check-in)

Next steps (phases):

- Phase 1: beginner melodies + setup + confidence prompts
- Phase 2: simple two-hand pieces + basic fingering reminders
- Phase 3: chords/pedal support + stronger fairness testing

References: <https://github.com/yu-liya-code/PianoCoach/blob/main/references.pdf>

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AI Tools Used (Disclosure): We used an image-generation tool to create the interface mockup and ChatGPT to revise wording, improve organization, and proofread. All project decisions and final content choices were made by our team.