CLINICIAN BRIEF · RESEARCH & ENGINEERING

Evidence-informed design and the logic that runs under My Voice and The Bridge

A concise map from peer-reviewed AAC, partner-training, speech-practice, toileting, and water-risk literature to LuminAAC's shipped mechanisms—with explicit validation status. For SLPs, OTs, pediatric clinicians, and school teams.

LuminAAC

Not a clinical efficacy claim

https://luminaac-web.vercel.app/

App tip v0.18.0 (e83189a) · Nov 2026 · Free for families

SCOPE

How to read this brief

LuminAAC is an AAC talker (**My Voice**) plus a care-circle portal (**The Bridge**). This document explains (1) peer-reviewed literature that motivates design choices and (2) advanced logic verified in source at commit **e83189a**. **App behavior was not changed for this document.**

Boundary conditions (non-negotiable)

Implementing ideas from the literature does **not** establish clinical efficacy of this app. No guaranteed speech gains, continence outcomes, emotion accuracy, or drowning prevention. No HIPAA/FERPA/COPPA certification or regulatory clearance is claimed. Cited authors do not endorse LuminAAC. Autistic and non-speaking people are heterogeneous—mechanisms must be individualized. Communication remains available without earned rewards.

Live production loads `bridge-r2.js` (Home Handoff + View roles). Potty Path and Sound Path are opt-in (off by default). Team chat needs a family account. Web geolocation runs while My Voice is open—not as guaranteed background GPS.

EVIDENCE

1. What the literature supports (and does not)

Aided AAC input / modeling

Meta-analysis and systematic reviews find that interventions including **aided AAC input** (partners modeling language on the child's system) are associated with improved communicative outcomes across ages and disability groups, often packaged with expectant delay, prompting, and contingent responding.[1–4] Effects are stronger and more consistent for packaged interventions than for augmented input in isolation; publication bias is a documented risk.[4]

AAC and speech production

Best-evidence and systematic reviews report that AAC intervention does **not** impede speech production; many cases show modest speech gains.[5,6] Expectations for speech change should remain realistic.

Communication-partner / caregiver instruction

Partner-instruction meta-analysis and reviews report large effects on partner skills and child communication when partners are taught aided modeling, expectant delay, and open-ended questions, with guided practice and role-play common training activities.[7–9]

Intonation-based speech practice (AMMT)

Proof-of-concept and a small comparative study of Auditory-Motor Mapping Training (AMMT) report improvements in syllable approximation and consonants/vowels correct for some minimally verbal children with autism versus a non-intoned control in matched subsets.[10,11] Samples are small; AMMT is clinic-delivered therapy—not an app outcome.

Supportive toileting

A 2022 systematic review of toilet-training interventions for children with ASD synthesizes behavioral and related approaches; intensity and individualization matter, and outcomes vary.[12] Continence is not required for dignity. LuminAAC's Potty Path is framed as communication-first support, not forced compliance.

Water / wandering risk (epidemiology ≠ product proof)

Observational work on fatal unintentional drownings in children with ASD (U.S. newspaper reports) describes wandering to nearby water as a recurrent pattern—useful for hazard awareness, with clear selection-bias limits.[13] **This is not evidence that geofencing apps prevent drowning.**

MAP

2. Research → mechanism → clinical implication → status

Literature theme	LuminAAC mechanism (code)	Clinical implication	Validation status
Aided input / motor-stable boards[1–4]	Fixed core-word grid; Fitzgerald colour; Talk strip; OBF import/ export	Partners can model on the same layout the child uses	**SHIPPED** — layout usability not equated to modeled-input RCT efficacy
Partner training & carryover[7–9]	Roles/invites; Team chat; Home **Handoff** (12 h window) + **Copy for the next person**; View presets; + Log	Scaffolds shift notes across home/ school/clinic	**SHIPPED** — **HYPOTHESIS** that Handoff improves fidelity vs paper
Caregiver interpretation of idiosyncratic signals	Moment capture → meaning; signal library; suggest() ranking; “Not these”; blind agreement/kappa tool	Human-in-the-loop meanings; inter-rater check before trusting app guesses	**SHIPPED TOOLING** — prospective kappa study **NOT CONDUCTED**
AMMT / structured sound practice[10,11]	Sound Path (Sing and Tap, Word Train, Sound World); caregiver Got it/Close/Tried; optional mic loudness/pitch	Optional practice support; family-judged, not auto-scored “wrong”	**OPT-IN** — **NOT VALIDATED** as AMMT equivalent
Supportive toileting / dignity[12]	Potty Path: ask-first tokens; add-only World; sit caps; stage recommend→confirm; school sheet	Communication preserved; medical red flags pause plan	**OPT-IN** — clinical outcomes **UNVALIDATED**
Water / place awareness[13]	Consented zones; freehand polygons; water buffers; hysteresis; Bridge alerts	Supplemental situational awareness for open My Voice sessions	**SHIPPED (WEB LIMITS)** — **NO DROWNING-PREVENTION EVIDENCE**

ENGINEERING

3. Advanced logic verified in code

Architecture / data flow

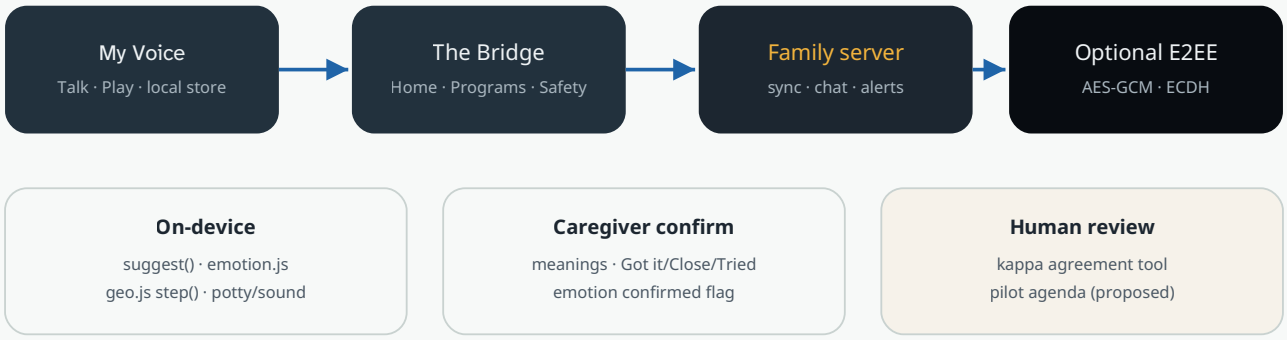


Figure. Local-first devices exchange optional synced documents/alerts via the family server. Ranking, emotion, and geofence decisions are computed on device unless a caregiver enables sync/account features. E2EE seals adult vs child document subsets when turned on.

Personalized ranking (explainable, bounded)

Predictions for the “Next” row score caregiver-taught signals with transparent additives—not an opaque neural net:

```
score = confidence(signal)
     + 25 if time-of-day matches · + 15 if place matches
     + 20 if recent caregiver-confirmed mood matches
     + round((fl_predict - 0.5) * 20)  // only if opt-in local FL weights exist
sort descending · show top suggestions · “Not these” logs feedback
```

Federated learning (`fl-core.js`): local weight deltas can be clipped, Gaussian-noised (DP), and securely aggregated—**opt-in**, not required for AAC. Do not describe default ranking as “AI diagnosis.”

Emotion estimates require confirmation

`emotion.js` maps on-device prosody (pitch, variability, loudness, tempo) to arousal/valence labels relative to a child-specific baseline when available; optional face estimates use a vendored on-device model. Results are labeled estimates. Caregiver confirmation (or rejection) gates how feelings enter ranking—never as clinical affect diagnosis.

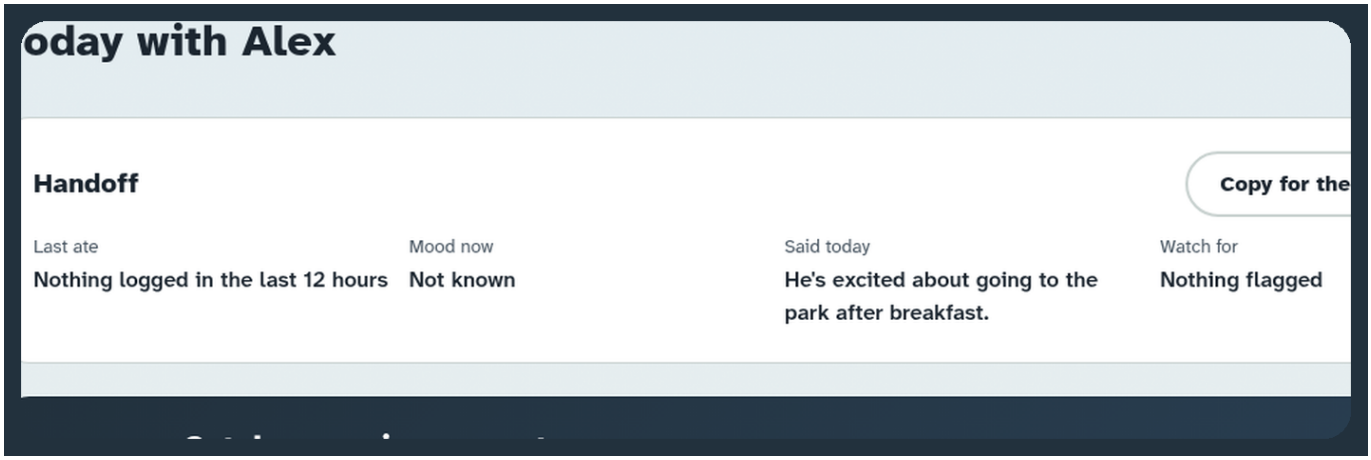
Geofencing geometry, water buffers, hysteresis

`geo.js` evaluates circle, polygon, and water-feature distances. Default water buffer is `30` m. **Hysteresis** (default margin 25 m) requires clear entry (`d < 0`) and clear exit (`d > margin`) for safe zones to reduce GPS edge spam. Danger/water is stricter: first interior fix can alert; fixes worse than `150` m accuracy are used only if the error circle could still reach danger. Alerts raise through the Bridge while My Voice location watch is active on the web.

> **Web location limit**
> Browsers stop geolocation when My Voice is closed, the screen locks, or the tab is hidden. Native background geofencing exists as a Capacitor scaffold and is **not** store-released. Safety screenshots in family collateral show zones **Off** (setup)—not active alerts.

Handoff aggregation (shipped)

`handoff()` builds a 12-hour window summary: last meal note, optional toilet event, mood, up to three unacknowledged alerts/behaviour notes (“Watch for”), and up to three recent explained moments (“Said today”). `bridge-r2.js` renders the Home card and clipboard copy. **View** reorders hubs; it does not expand server permissions.



Home → Handoff (demo Alex/Jordan). Engineering artifact for care-circle carryover—not evidence of clinical outcome improvement.

E2EE scope (optional)

When enabled: parent-created AES-GCM-256 family key; ECDH P-256 device key exchange with a 6-digit safety code; server stores ciphertext/public keys. Documents seal full adult Bridge state and a reduced child subset (`CHILD_KEYS`). Potty log sync can be locked separately. This is transport/storage protection for opted-in sync—not a compliance certification.

PRACTICE

4. Opt-in programs clinicians may co-supervise

SOUND PATH

Ladder + human judge

Off until `access.sound`. Games inspired by AMMT-style intonation/motor mapping concepts[10,11] but **not** a validated AMMT protocol. Caregivers mark Got it / Close / Tried; the app does not auto-fail speech. Mic measures loudness/pitch on device when allowed.

POTTY PATH

Ask-first, add-only

Off until guardian consent. Tokens prioritize telling before voiding; late tells are thanked but never paid better than early tells. World only grows; sit timers hard-cap; stages recommend then require Confirm. Printable school sheet for carryover.[12]

PILOT

5. Proposed clinician evaluation agenda (not a completed study)

Framed as a **proposal** aligned with the in-repo agreement protocol:

1. **Process:** aided-input fidelity (partner models on device), Handoff copy use at transitions, Log completeness.
2. **Communication outcomes:** spontaneous AAC acts, repair success, novel word combinations (individualized goals)—not app vanity metrics.
3. **Inter-rater:** blind caregiver agreement (Cohen's kappa) on moment meanings vs app suggestions before trusting ranking.
4. **Safety process only:** time-to-ack for water/zone alerts while My Voice is open; never claim injury reduction without prospective ethics-reviewed study.
5. **Consent & access:** guardian location consent; child assent where possible; Still/Movement settings; no withholding AAC for noncompliance.

INTEGRATION

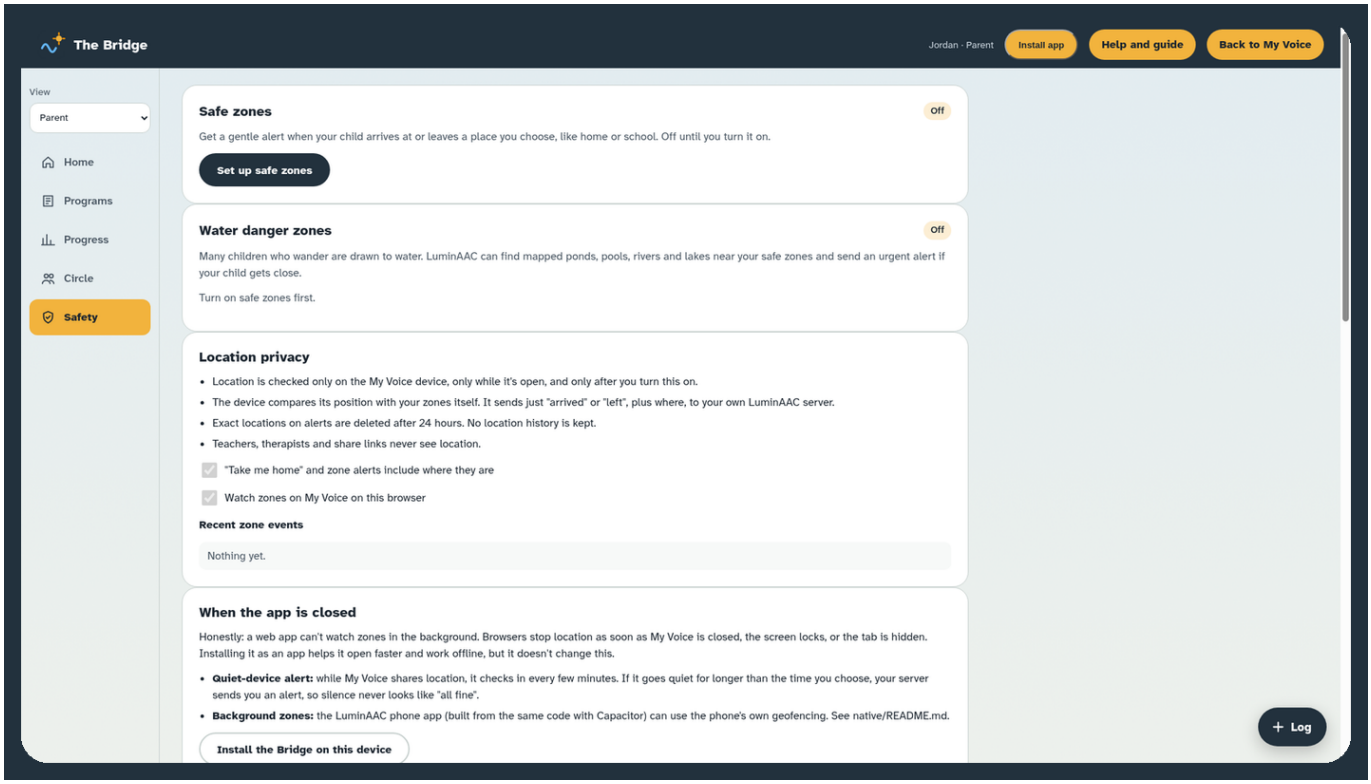
6. Evidence → app integration agenda (discussion next)

App code was not modified. Suggested future work for product discussion:

Candidate	UI / explanation only	Requires validation gate before logic change
Clinician “Why this design” panels citing reviews 1–9	Yes — educational	No model change
Surface Handoff fields + 12 h window in Help	Yes	Outcome study if claiming care quality gains
Sound Path ↔ AMMT rationale disclosure	Yes — with non-equivalence disclaimer	Prospective speech outcomes before adaptive difficulty automation
Emotion estimate confidence UX	Clarify estimate/confirm	Any clinical triage use needs separate validation
Geofence/water copy	Strengthen drowning non-claim	Background GPS / predictive wander models need ethics + evidence
FL ranking weight display	Show score components	Remote FL participation expansion needs privacy review

Explanatory UI ≠ medical decision support

Disclosures and rationale screens can ship as education. Changes that alter suggestion ranking, emotion gating, toileting prompts, or safety alerts as clinical decision support should wait on prospective validation, accessibility review, and human oversight design.



Safety (demo / setup). Zones and water Off; honest “when the app is closed” limits. Not an active monitoring session.

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