

From Imitation to Ensemble

A proposed evaluation of improvisational responsiveness and musical autonomy in JamBot and Bot University

Nova Resonance Research Series; AI-assisted working manuscript

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Working paper; not peer reviewed. No new participant data collected.

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Abstract

The JamBot apprenticeship proposes a progression from attentive imitation through constrained playing to guided choices and collaboration. Bot University is proposed as a separate training and evaluation product that could reuse Core Resonance technology. This paper integrates published human-musician-computer research with a proposed longitudinal curriculum, emphasizing responsiveness, agency, human musical judgment, and transfer rather than anthropomorphic claims or a single model score.

1. Defined object of study

Project materials describe JamBot as a musical companion. Limited implementation inspection indicates deterministic symbolic scheduling and motif recall. It does not demonstrate neural training or learned policies, and does not constitute a comprehensive architecture or real-world performance audit. The curriculum below proposes future experiments; it is not a report of completed training. The intended interaction is not automatic song completion. It is reciprocal listen - respond - co-create, beginning with percussion and extending to melodic, harmonic and timbral participation.

The project handoff clearly separates Core Resonance (player-facing musical ecosystem and living album) from Bot University (bot teaching, assessment and development). Resonance Garden is a proposed reusable training biome, not an already validated pedagogy or a requirement for public game menus.

2. What the literature actually supports

Jourdan and Caramiaux [1] systematically review 69 NIME papers on machine learning for musical expression. They show that expressive ML interfaces involve multiple interaction modes and tasks; the literature does not specify a proven universal curriculum for AI musical companions.

Smith and Freeman [2] report a five-musician, multi-session evaluation of an adaptive gesture-based system, documenting how perceived autonomy and expectations evolve with use. This directly motivates longitudinal evaluation, but their findings do not validate JamBot itself.

Amerotti and colleagues [3] evaluate LOERIC, a rule-based real-time music co-creation system, with seven musicians; enjoyability and musicality were viewed more favorably than humanness and responsiveness. JamBot should prioritize measurable timing and musical fit without maximizing perceived humanness. Frid and Ilsar [4] also motivate accessible interfaces and user-defined input choices.

3. Curriculum as a testable intervention

Stage 0: audit baseline. Capture current JamBot behaviors without altering its persistent history. Run repeatable rhythm-call tasks, unfamiliar-meter tests, pause/turn-taking tests and recovery from intentionally delayed human input. Register which behaviors are hard-coded, prompted, stored as user state or learned.

Stage 1: guided imitation. Echo a phrase with controllable timing, silence and accent. Stage 2: constrained participation. Respond only on selected beats or timbral roles. Stage 3: shared decisions. Offer alternatives while honoring musician refusal and interruption. Stage 4: improvisational transfer. Reuse rhythmic principles in an unfamiliar ecosystem, tempo or instrument without copying the original phrase.

Stage 5: reciprocal co-creation. Evaluate multi-turn play where both participants change the outcome. Independence is a design property requiring user control and reset/opt-out, not evidence that a model has desires, feelings or consciousness. Separate session memory, experimental baselines and player-companion history.

4. Proposed evaluation protocol

Use repeated play sessions with consenting musicians and novices, counterbalancing curriculum order where feasible. Compare the inspected symbolic JamBot baseline with a separately specified adaptive-policy implementation only if one is built and verified, and with human-controlled or nonadaptive accompaniment as suitable baselines. Define adaptation separately from motif storage and recall before making a learning claim. Keep rhythmic challenge, instrumentation and level of task difficulty balanced.

Objective measures: onset deviation by beat, latency distribution, turn-taking violations, completion of imposed silence, response diversity, and transfer to unseen phrases. Human measures: perceived responsiveness, desired autonomy, controllability, musical enjoyment, ability to interrupt, and participant-defined success. Collect qualitative disagreement and examples of productive mistakes, not only mean scores.

For any future training implementation, learning evidence would require holdout tasks administered after training, plus follow-up sessions with a reset/consent-aware memory policy. For the symbolic implementation, evaluate scheduling, controllability and motif recall without interpreting recall alone as learned generalization. An apparent improvement may reflect cue leakage, easier tasks or memorization. Predefine which logs may persist and who owns them.

5. Risks and rival hypotheses

Imitation may be preferred over improvisation when users want reliable support; increasing autonomy may reduce perceived control. Higher timing precision is not synonymous with artistry. Some people may prefer quiet accompaniment or no AI. Training data from participants may carry music rights and personal behavioral signatures.

Bot University should not label generated persona behaviors as self-defined purpose without participant-centered evidence and explicit human safeguards. An AI collaborator can be treated respectfully while uncertainty about consciousness and self-directed experience remains.

6. Minimum publishable study

A well documented pilot could evaluate 10-20 consenting musicians with repeated tasks, randomized baseline order and independent musical ratings; this number is a feasibility suggestion, not a calculated powered sample size. Release only anonymized measures under consent, plus reproducible task descriptions and code versions.

H1, conditional on implementing and documenting a training procedure: guided training improves timing and turn-taking on held-out rhythms versus nonadaptive accompaniment. H2: user-rated control may peak at constrained or guided autonomy rather than unrestricted generation. H3, under the same training condition: transfer to unfamiliar musical environments will be smaller than within-training gains. Each prediction may be rejected.

Source provenance and research status

External literature establishes findings in related domains; it does not validate Nova Resonance implementations or outcomes. Project materials describe design intent. This paper reports no completed participant study or field pilot of the proposed system. The proposed protocols and hypotheses remain untested. No clinical, economic, cognitive or social effectiveness is established here.

Project provenance: this working paper draws on internal design briefs available to its editors. Those materials are not public evidence of runtime behavior or participant outcomes. Private operational details are omitted from this public working edition.

References

- [1] Jourdan, T., & Caramiaux, B. (2023). Machine learning for musical expression: A systematic literature review. NIME Proceedings, 319-331. <https://doi.org/10.5281/zenodo.11189198>
- [2] Smith, J., & Freeman, J. (2025). Adaptation and perceived creative autonomy in gesture-controlled interactive music. NIME Proceedings, 394-403. <https://doi.org/10.5281/zenodo.15698904>
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- [4] Frid, E., & IIsar, A. (2021). Reimagining (accessible) digital musical instruments: A survey on electronic music-making tools. NIME Proceedings. <https://doi.org/10.21428/92fbeb44.c37a2370>