Conferenza GARR 2026
La forma del cambiamento

TaskLet

A Distributed and AI-Assisted Framework for Multimodal Psycholinguistic Tasks

Istituto di Linguistica Computazionale "Antonio Zampolli"
Consiglio Nazionale delle Ricerche

ComPhys
physiology of communication

Università Campus Bio-Medico di Roma

Ikram Massaoudi

CNR-ILC, Pisa

Università Campus Bio-Medico, Roma

The Challenge

Cognitive & psycholinguistic research needs flexible digital infrastructure

- Heterogeneous tasks (reading, lexical decision, questionnaires, gamified activities)
- Diverse populations: children, adults, elderly — across multiple languages
- Need for structured, reproducible, open data pipelines (Open Science)

Existing tools fall short

- Tightly coupled architectures: each task needs its own infrastructure
- No unified user & campaign management across studies
- Limited support for multimodal signals (touch, audio, eye-tracking)

TaskLet: What Is It?

Core platform

- Built on **Moodle** — open-source LMS
- Centralized user, campaign & task management
- Runs on desktop, laptop, tablet & mobile

Plugin architecture

- Each task = independent web app (plugin)
- Task-independent protocol via WEB-APIs
- JSON output — open data & reproducible science

Supported task types

- Reading assessment (finger-tracking + speech)
- Lexical decision tasks
- Questionnaires & gamified cognitive activities
- Rapid object naming, puzzle composition

Infrastructure

- Developed within **H2IOSC** (Italian Open Science Cloud)
- Hosted on **GARR Cloud**, ComPhys Lab (CNR-ILC, Pisa)

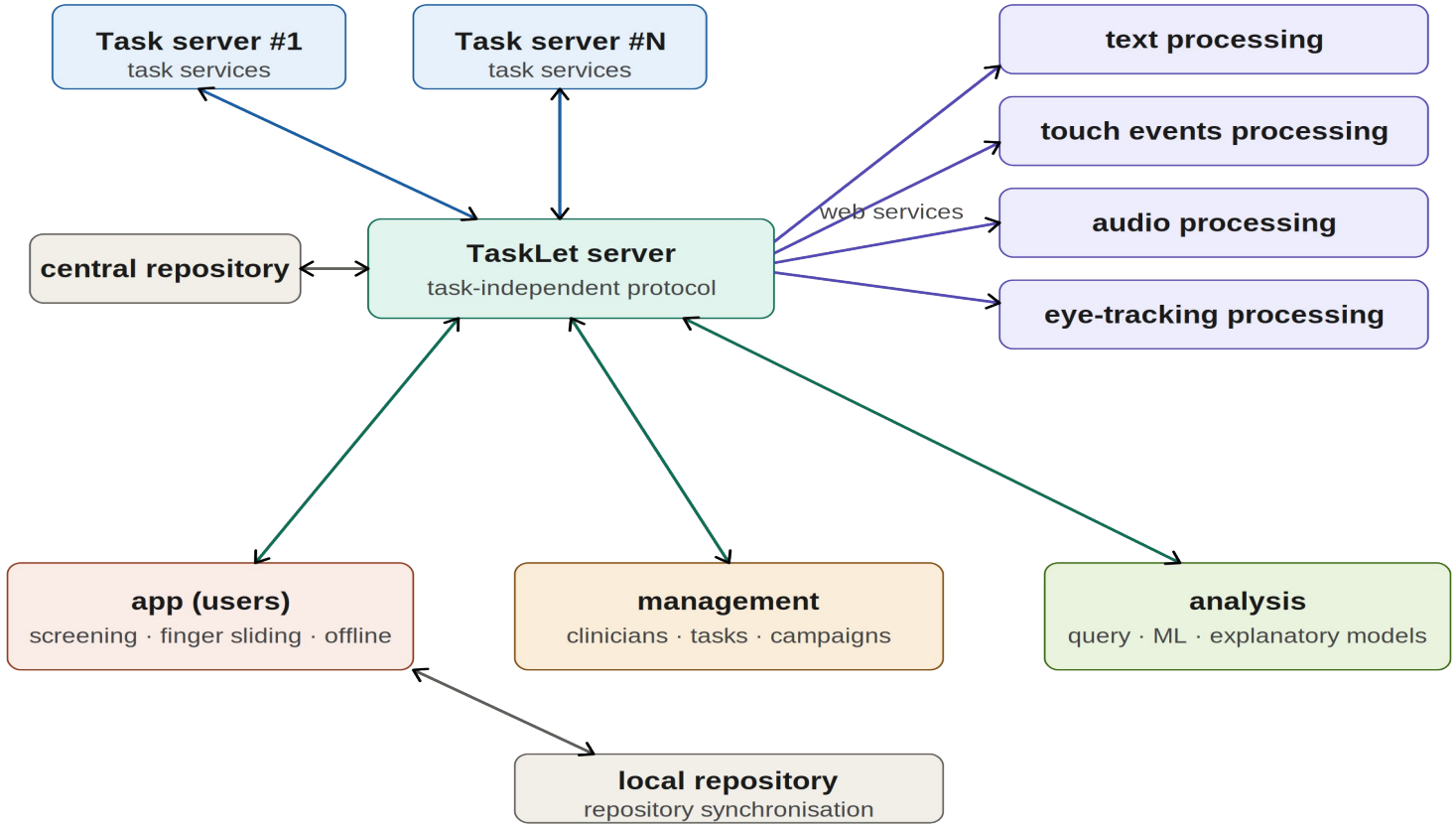
System Architecture

Three access layers

- **App (users)**: screening, finger-sliding, offline
- **Web (clinicians)**: manage users, tasks, campaigns
- **API (researchers)**: query, ML, analysis

Signal processing

- Text, touch events, audio, eye-tracking
- Decoupled: TaskLet has no task knowledge



Use Case: ReadLet — Multimodal Reading Assessment

What ReadLet captures

- Finger-tracking on text (touch events)
- Speech during silent & aloud reading
- Comprehension questionnaires
- Figures, oral & text annotation tasks

Post-processing outputs

- Speech transcription (ASR)
- Reading time on letters, syllables, words
- Finger-to-text alignment & reading speed

Languages supported

- Italian, Bulgarian, Hebrew, Arabic
- French, German, English + more

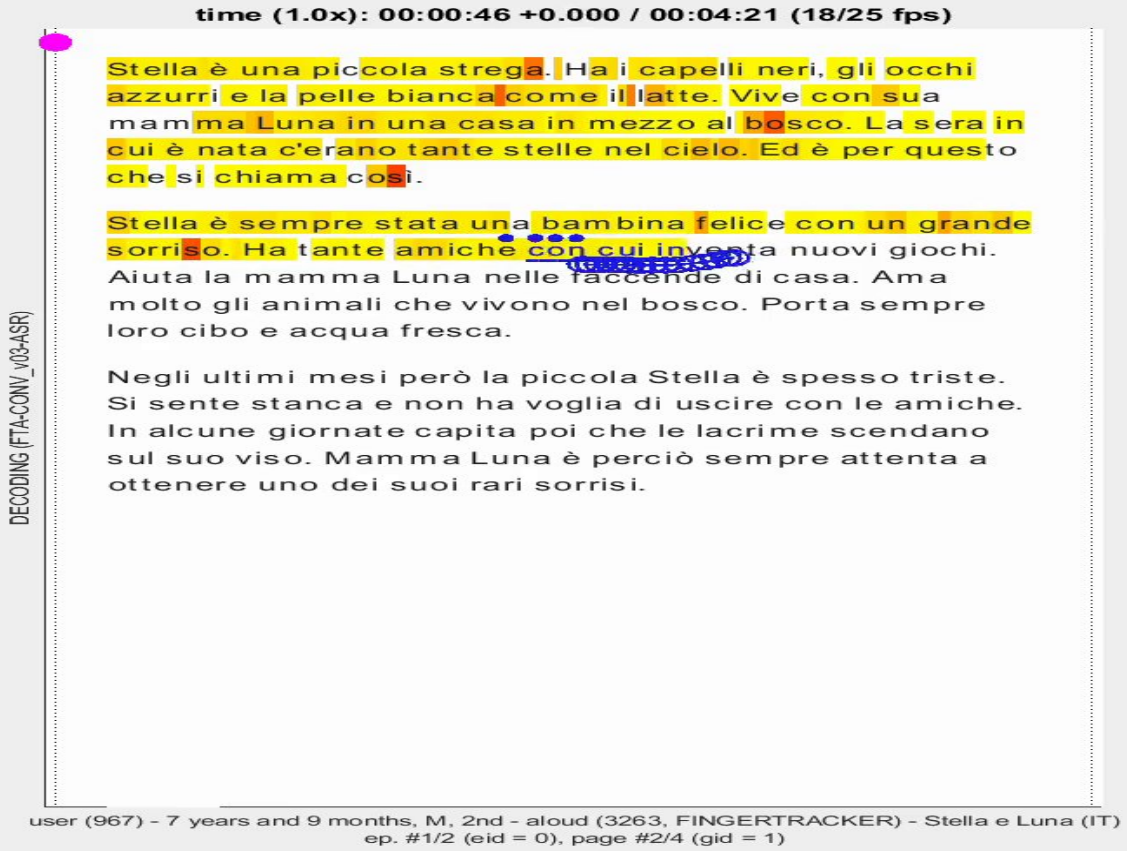
Hosted & published

- GARR Cloud • ComPhys Lab, CNR-ILC
- Dataset published at LREC-COLING 2024

Reading as a multi-sensory task

- Visual + motor + linguistic signals combined
- Markers for reading difficulties & dyslexia

ReadLet — Post-Processing Visualization



Who Does It Serve?

🧒 Preschool & school-age children

Early literacy precursors • Reading difficulties • Dyslexia • DLD • Multimodal signals for diagnosis

🌍 Multilingual learners

Cross-linguistic reading development • Italian, Bulgarian, Hebrew, Arabic studies

🧓 Adults & elderly

Cognitive decline monitoring • MCI screening • Aphasia • Executive-function deficits

AI Integration & Future Directions

Current capabilities

- Automated speech recognition (ASR) on reading recordings
- Token boundary detection in disfluent speech
- Machine learning on multimodal trial data for statistical analysis

Next steps

- AI-driven literacy assessment for early precursors in preschool children
- Natural language interfaces to query the platform (researchers & clinicians)
- Explainable AI models for cognitive assessment
- Integration of new task types as plugins (expandable ecosystem)

Conclusions

What TaskLet delivers

- Scalable, plugin-based infrastructure
- Multimodal data collection across populations
- Open Science data sharing via WEB-APIs
- Foundation for AI-driven cognitive assessment

Ethics

- Declaration of Helsinki • CNR Ethics approval
- Anonymised data • Responsible handling for sensitive populations

Key references

[1] Ferro et al. (2024). ReadLet dataset. LREC-COLING 2024.

[2] Marzi et al. (2026). Bulgarian-Italian reading. Languages, 11(3).

[3] Marzi et al. (2025). Oral reading as multi-sensory task. Lingue e Linguaggio.

[4] Srivastava et al. (2025). Token boundary detection. Intelligent Systems.

Contact

ikram.massaoudi@ilc.cnr.it

ikram.massaoudi@unicampus.it