



A Consolidated Competence Assessment System for Seafarers Using Eye-Tracking, Speech Analysis and EEG-Based Stress Evaluation

SP Singapore Polytechnic

Technology Licensing Opportunity

Technology Overview

Maritime training institutions face significant challenges in assessing seafarer competence objectively. Traditional evaluation methods are subjective, based on instructor observations, leading to inconsistent scoring across different instructors and training centres. This lack of standardisation makes it challenging to determine whether seafarers are prepared for critical situations they may encounter at sea, particularly in demanding scenarios such as equipment failures or severe weather conditions.

Components of trainee behaviour such as visual attention patterns, communication effectiveness and cognitive stress levels are not readily apparent to instructors. Therefore, paper-based checklists and observation sheets face challenges in the rigour and consistency of the assessment, making it difficult to establish reliable benchmarks for competency evaluation.

This technology addresses these limitations by providing an integrated system for objectively assessing seafarer competence. By combining multiple sensor technologies with artificial intelligence, detailed competence assessment reports can be generated. Additionally, training recommendations are provided based on the performance breakdowns, benefitting both instructors and seafarers. This enables maritime training institutions to move from subjective evaluations to evidence-based assessments, ensuring more reliable preparation of seafarers for operational duties.

Potential Applications

This technology can be deployed across maritime industries to provide more accurate evaluation of seafarer competency and performance.

- Maritime training programmes
- Shipping company crew assessments
- Regulatory certification standards
- Maritime software integration

Commercialization / R&D Opportunities

- ✓ Ready for commercialization
- ✓ Looking collaborators for further development / to develop new applications
- ✓ Available for licensing
- ✓ Accepting business plans from interested parties

Intellectual Property -

- Know-How

Technology Features & Specifications

- **Single Cohesive System:** Combines eye-tracking technology, speech analysis, and EEG monitoring into a unified framework that seamlessly integrates multiple competency evaluation components.
- **Objective Assessment & Reporting:** Transforms traditionally subjective evaluation processes into data-driven assessments through comprehensive reporting that generates detailed analysis sections for each competency pillar.
- **AI Analytics:** Employs advanced computer vision techniques to differentiate between casual glances and genuine attentional focus, uses EEG biosignal processing to detect stress/workload, and applies speech analytics (SEA accent-aware and maritime vocabulary) with LLM-based communication SOP compliance checking.
- **Boost Training Capabilities:** Enables maritime training institutions to quantify and assess aspects of seafarer performance that were previously difficult to measure objectively. This breakthrough creates new avenues for evidence-based training and development.
- **Enhanced Safety Standards:** By providing objective measurements and data-driven analysis of visual attention patterns, communication protocol compliance, and stress management, the system enables training institutions to ensure more thorough and reliable assessment of seafarer readiness for operational duties.

Unique Value Proposition

- By providing objective data-driven assessments using multiple sensor technologies brings greater consistency into instructor evaluations. Unlike current paper-based checklists that vary across education centres, this technology delivers standardised scoring ensuring consistent evaluation regardless of instructor or institution. Additionally, the assessments can be archived and retrieved digitally anytime, creating a permanent record for regulatory compliance and performance tracking.
- This technology enables automated evaluation with immediate post exercise scoring within 5 minutes after exercise completion, providing timely performance feedback.
- This addresses the critical need for automated communication and visual attention evaluation that current maritime training relies upon solely through physical observation.
- This AI based competency assessment capability complements the instructor's experience. The technology uses quantitative data and facilitates evidence-based recommendations and creates opportunities for improving maritime safety standards.
- The data invites further research into defining optimal stress levels and competency benchmarks across different operational scenarios.

Disclaimer

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