

# Universal Animal Language Translator (UALT) – Final Project Summary Group 6

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The **Universal Animal Language Translator (UALT)** project presents a comprehensive solution aimed at bridging the communication gap between humans and animals through advanced AI-driven translation of vocalizations, gestures, and biometric signals. The project began with a clear definition of purpose, focusing on enhancing human-animal interactions for pet owners, veterinarians, researchers, and animal trainers. The core objective is to deliver a real-time, intuitive system that interprets animal behavior and emotions, improving animal welfare, facilitating better care, and supporting wildlife research and conservation.

The **Project Description** outlined the background, goals, and scope, emphasizing the lack of existing systems capable of multi-signal, multi-species communication translation. Key stakeholders were identified, including clients, customers, end-users, and support personnel. Constraints such as security, privacy, and environmental considerations were documented, ensuring the system complies with legal standards while maintaining usability across diverse settings. A detailed glossary and data dictionary provided clarity on technical and domain-specific terms, supporting consistent understanding throughout the project lifecycle.

In the **Requirements** section, UALT's functional and non-functional requirements were thoroughly defined. Core functionalities include signal capture, AI-based translation, biometric integration, and data logging. Performance requirements addressed speed, accuracy, and capacity, ensuring real-time responsiveness and scalability. Dependability aspects, including reliability, availability, fault tolerance, and safety, were specified to guarantee system stability under varying conditions. Additional focus was given to maintainability, security, usability, and adaptability, ensuring that UALT remains user-friendly, secure, and future-proof.

The **Design** phase delivered detailed system and object designs. The architecture follows a modular client-server model with clear subsystem decomposition, covering UI, signal processing, AI translation, data management, and device integration. Class diagrams, sequence diagrams, and hardware/software mappings were developed to illustrate system structure and data flow. Design goals prioritized real-time performance, extensibility, and cross-platform compatibility. Key design patterns, such as Observer and Strategy, were applied to enhance flexibility and maintainability.

In addressing **Project Issues**, open concerns like data availability, regulatory compliance, and third-party integration were documented, alongside risk assessments covering scope creep, technical limitations, and market challenges. The project evaluated off-the-shelf solutions, reusable components, and internal assets to optimize development efforts. Potential new problems, such as user overreliance on AI interpretations and environmental limitations, were identified with mitigation strategies proposed.

Migration was deemed not applicable, as UALT introduces a novel solution rather than replacing an existing system. Cost estimations accounted for development resources, infrastructure, and data acquisition, while a "waiting room" captured future feature ideas like gesture recognition and smart home integration. Suggestions for implementation tools and frameworks were noted to guide future development phases.

The **Project Retrospective** highlighted strengths in structured design and documentation, while recommending improvements in scope management and team coordination. The comprehensive glossary ensures clarity for both technical and non-technical audiences.

In conclusion, the UALT project delivers a well-defined, scalable, and innovative system design ready for implementation. It addresses a unique market need with clear requirements, robust design, and forward-thinking considerations, laying a strong foundation for transforming human-animal communication through technology.