**Solution Requirements (Functional & Non-functional)**

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Team ID: LTVIP2025TMID22707

Project Name: SmartSDLC: AI-Enhanced Software Development Lifecycle

**Functional Requirements**

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| ID | Type | Requirement | Rationale / Notes |
| F1 | **Functional** | **Real‑time grammar & spelling correction: user submits text → system returns corrected text with inline explanations.** | **Core value: instant feedback for writing improvement.** |
| F2 | **Functional** | **Language detection using langid, with displayed language + confidence score.** | **Enables accurate multilingual feedback (6 languages).** |
| F3 | **Functional** | **Multilingual exercises (Grammar, Sentence Formation, Verb Tense) for 6 major languages, with explanations, examples, and answer keys.** | **Supports diverse learning needs.** |
| F4 | **Functional** | **Text analysis: calculate word count, average word length, sentence complexity.** | **Adds writing awareness and insight.** |
| F5 | **Functional** | **Visual feedback: render bar charts for metrics and radar chart for competency dimensions.** | **Enhances understanding through visuals.** |
| F6 | **Functional** | **Edge‑case input handling: empty, gibberish, emojis only input → show helpful prompt “Please enter valid text.”** | **Prevents system errors, improves UX.** |
| F7 | **Functional** | **Gradio UI integration: support text entry, language selection, exercise** | **Enables rapid deployment and user-friendly interface. Requirement** |

**Non-functional Requirements**

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| Requirement ID | Type | Requirement | Rationale / Notes |
| NF1 | **Performance** | **Response time < 2 sec for 80% of requests; cold‑start model load < 10 sec, subsequent < 2 sec.** | **Ensures real‑time feel and smooth user experience.** |
| NF2 | **Scalability** | **Modular, cacheable, and async‑ready design; able to extend languages/exercise types easily.** | **Makes future expansion and porting beyond Colab feasible.** |
| NF3 | **Reliability & Availability** | **System uptime ≥ 99% during active sessions; recover within < 30 sec on failure.** | **Ensures dependable learning experience.** |
| NF4 | **Usability** | **Intuitive Gradio UX; keyboard-friendly; clear prompts and error messaging; optional WCAG accessibility.** | **Improves user satisfaction and inclusivity.** |
| NF5 | **Maintainability** | **Modular Python code, clear documentation, unit/integration tests for each module (detection, correction, exercise, viz).** | **Supports iterative development and easier upkeep.** |
| NF6 | **Security & Privacy** | **All processing in Colab VM; no PII persisted; secure transport (HTTPS) for Hugging Face API calls.** | **Complies with user privacy expectations.** |
| NF7 | **Portability** | **Pure Python, standard libs; containerizable for future deployment outside Colab.** | **Increases deployment flexibility and longevity.** |