

# SuperLap Racing Line Optimization System

EPI-USE



## Quintessential

Amber Ann Werner [u21457752]

Milan Kruger [u04948123]

Qwinton Knocklein [u21669849]

Sean van der Merwe [u22583387]

Simon van der Merwe [u04576617]



Testing Policy

Testing Scope & Levels

Level	Focus	Tools/Methods	Owners
Unit Testing	Individual functions (e.g., track image processing, RL reward function).	Pytest (Python), JUnit (Java).	Developers
Integration Testing	Interaction between services (e.g., track processor → RL engine).	Postman, Jest (API tests), Selenium (UI flows).	QA Team
System Testing	End-to-end workflows (e.g., upload image → simulate → visualize).	Cypress, Robot Framework.	QA Team
Performance Testing	Scalability (e.g., 50 concurrent users), RL training speed.	Locust (load testing), NVIDIA Nsight (GPU profiling).	DevOps
Security Testing	Data encryption, auth vulnerabilities.	OWASP, ZAP, SonarQube.	Security Team
User Acceptance (UAT)	Real-world usability (by target users).	Beta releases, A/B testing.	Product Team

Testing Types & Frequency

Test Type	Description	Frequency
Automated Regression	Validate existing features after updates.	On every Git commit (CI/CD).
Manual Exploratory	Unscripted UX/edge-case testing.	Before major releases.
Physics Validation	Compare AI racing lines against known heuristics (e.g., apex accuracy).	Per RL model update.
Hardware Compatibility	GPU/CPU performance benchmarks.	Quarterly.

## Entry & Exit Criteria

### Entry Criteria (Tests Start When):

- Requirements are documented (e.g., FR/NFRs).
- Code is merged to the test branch.
- Test environment mirrors production (GPU-enabled).

### Exit Criteria (Tests Pass When):

- **Unit/Integration:** ≥90% code coverage (measured via Coveralls).
- **Performance:** <2s response time for track processing; RL training FPS ≥30.
- **Security:** Zero critical OWASP vulnerabilities.
- **UAT:** ≥80% positive feedback from beta testers.

## Defect Management

- **Severity Levels:**

- **Critical** (Crash/data loss): Fixed within 24h.
  - **Major** (Feature failure): Fixed in next sprint.
  - **Minor** (UI glitch): Backlogged for prioritization.
- **Tracking:** Jira/Linear with labels (bug, reproducible, blocker).

Environments

Environment	Purpose	Access
Development	Feature development.	Engineers only.
Staging	Pre-production (mirrors prod).	QA/Product Team.
Production	Live user-facing system.	Automated deployments only.

Test Data Management

- **Realistic Datasets:**
  - 10+ sample tracks (F1, MotoGP circuits).
  - Synthetic data from racing sims (Assetto Corsa).
- **Anonymization:** User-uploaded tracks scrubbed of metadata.

Compliance & Reporting

- **Audits:** Monthly test coverage/review meetings.
- **Reports:** Dashboards (Grafana) for:
  - Test pass/fail rates.
  - Performance trends (e.g., lap time prediction accuracy).

Policy Exceptions

- **Emergency Fixes:** Hotfixes may bypass some tests but require:

- Post-deployment regression testing.
- Retrospective review.

