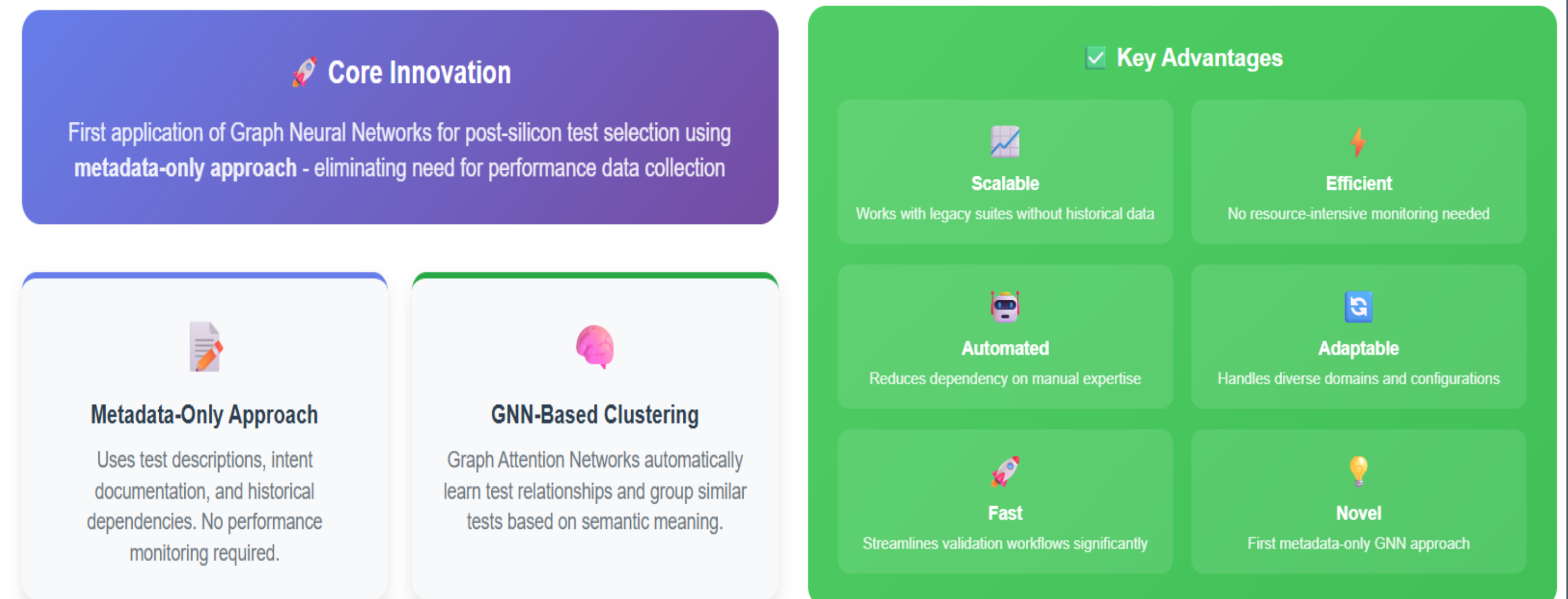


Problem Statement/Introduction

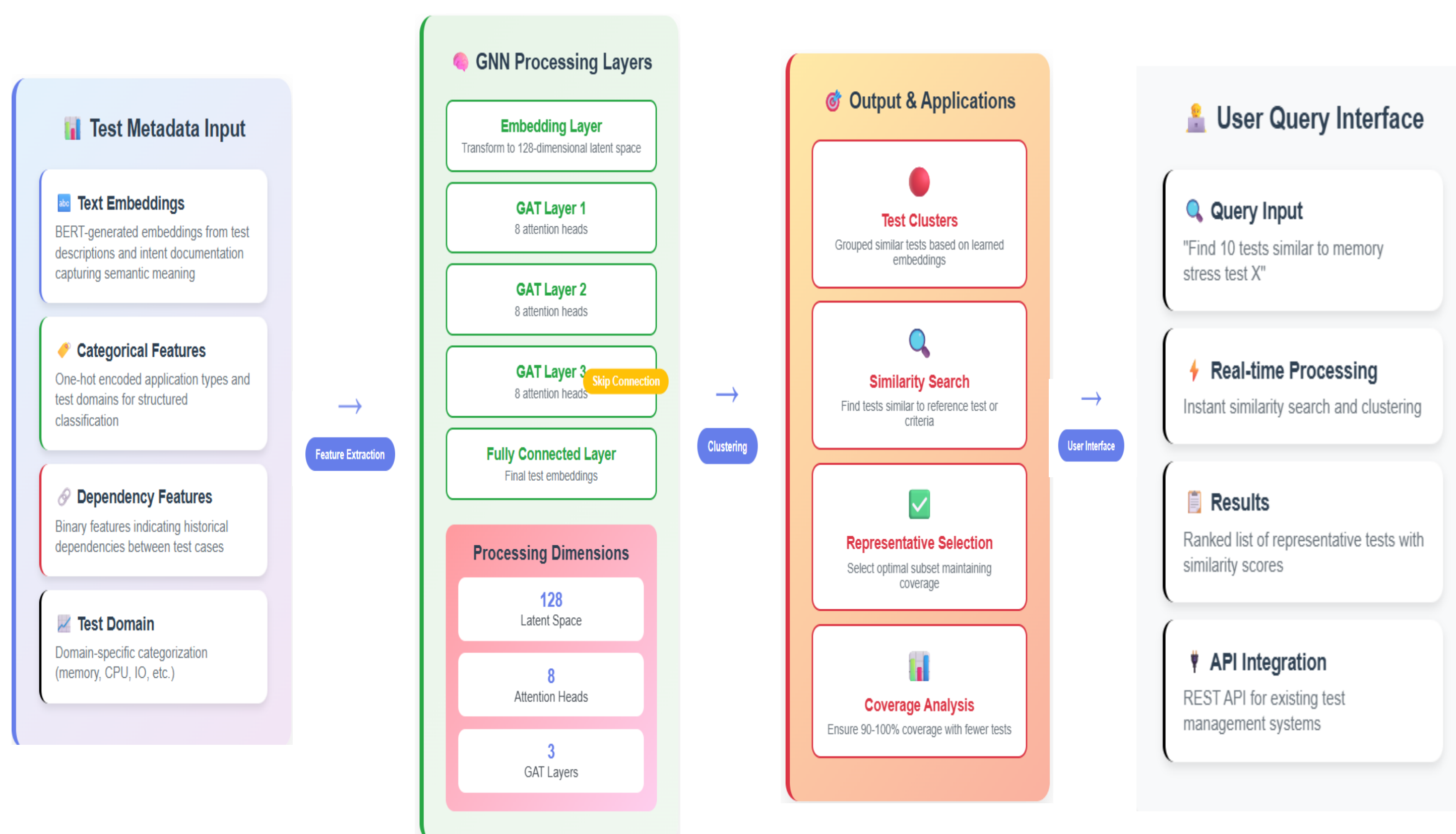
- Post-silicon validation requires executing thousands of tests across multiple domains and SKUs.
- Inefficiency: All tests are typically run, even if only a subset is relevant.
- Manual selection depends heavily on expert judgment → time-consuming, inconsistent, and error-prone.
- Existing ML approaches rely on real-time performance monitors or labeled data, which are costly and difficult to scale.
- Need: An automated, metadata-driven method that reduces redundancy while preserving coverage and validation quality.



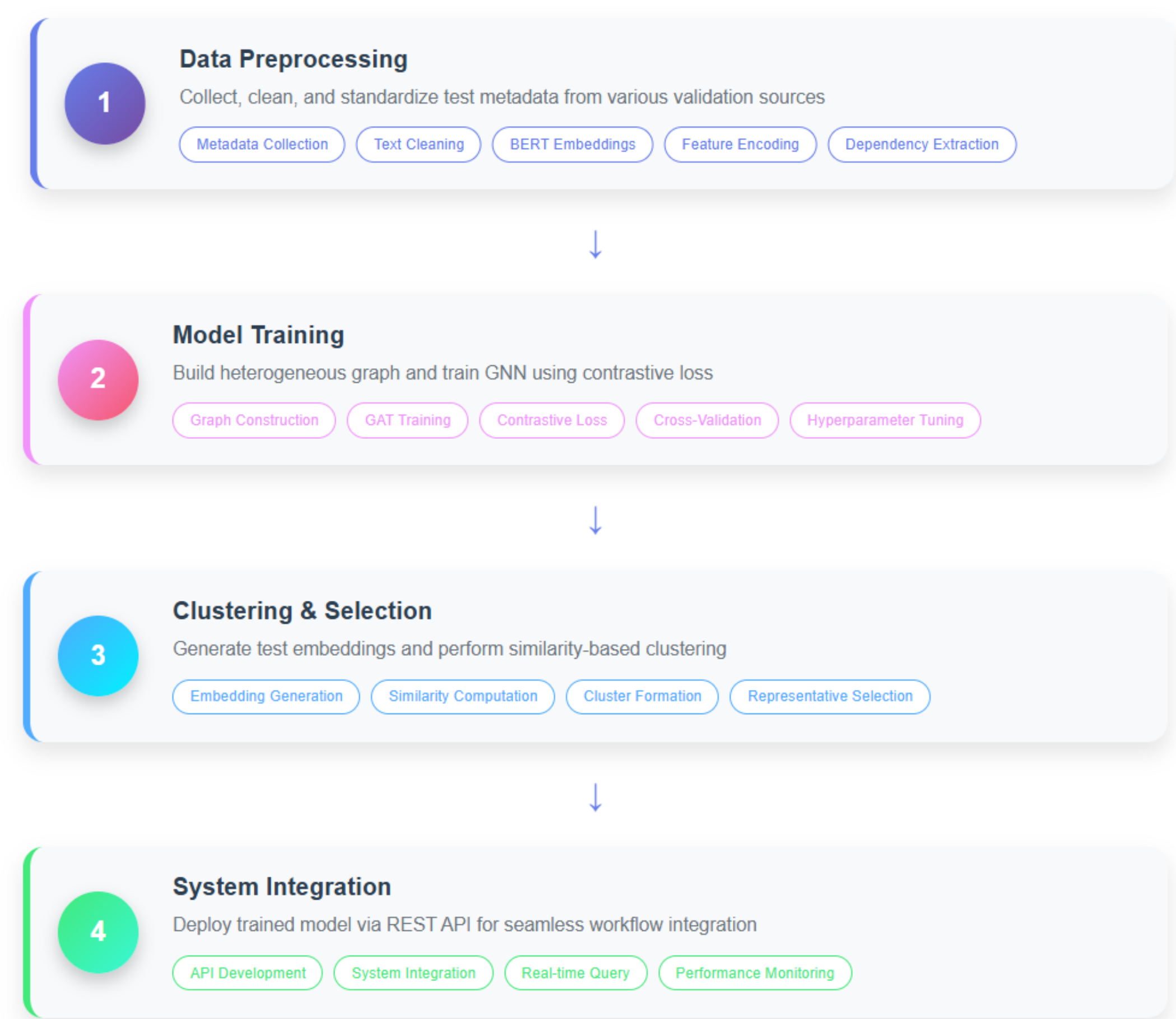
Proposed Methodology/Advantages



Implementation Details/Diagram



Implementation Details/Flow Chart



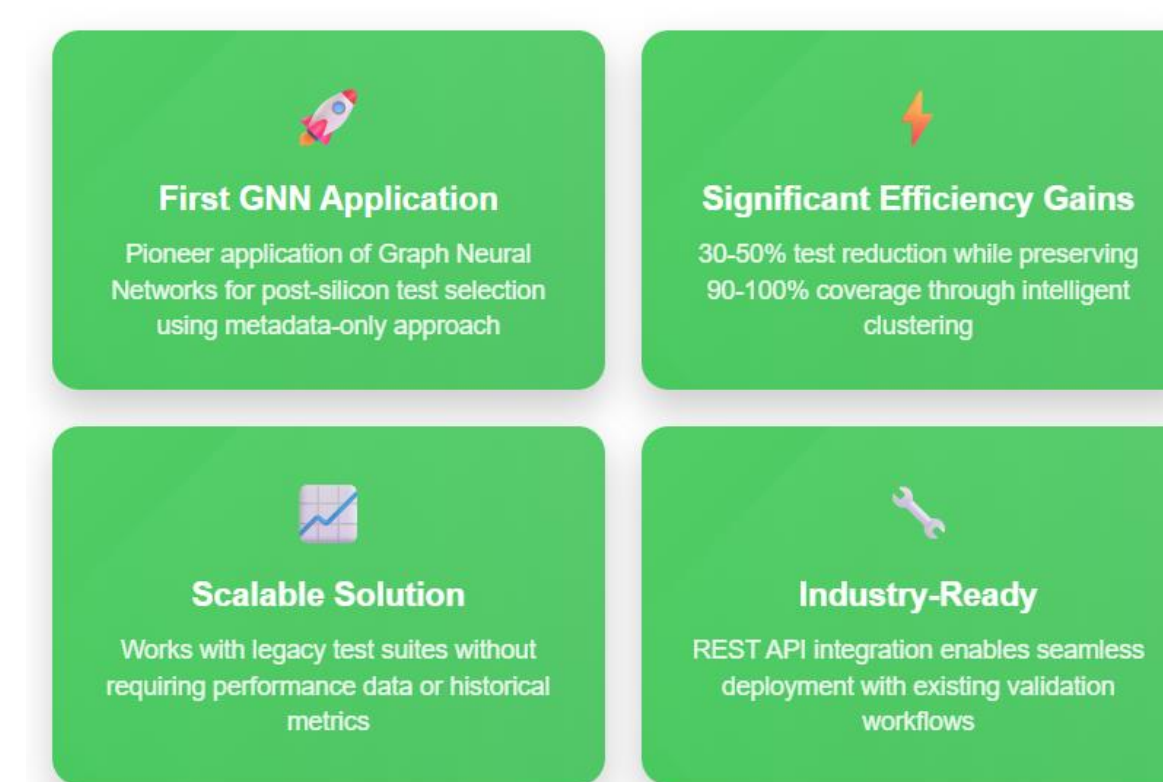
Results Table

| Detailed Performance Comparison | | | |
|---------------------------------|----------------------|---------------------|---------------------|
| Metric | Traditional Approach | GNN Framework | Improvement |
| Test Reduction | 100% (all tests) | 50-70% (selected) | 30-50% fewer tests |
| Coverage Efficiency | Variable | 90-100% | Maintained/Improved |
| Selection Time | Weeks (manual) | Minutes (automated) | 99%+ reduction |
| Execution Time | Baseline | 40-60% reduction | Significant speedup |
| F1-Score vs Expert | N/A | 0.78-0.85 | High agreement |
| Resource Dependency | High (expert time) | Low (automated) | Major reduction |
| Scalability | Limited | High | Legacy-friendly |

Key Performance Indicators:

- ✓ Clustering Quality: F1-scores 0.78-0.85 compared to expert groupings
- ✓ Efficiency Gain: 30-50% reduction in total test execution time
- ✓ Coverage Preservation: Maintains 90-100% of original test coverage

Conclusion



Impact:

- Transforms weeks of manual analysis into minutes of automated selection
- Optimizes expensive lab resources through intelligent test clustering
- Addresses critical industry need for faster validation cycles
- Provides sustainable solution for growing test suite complexity
- Future Work:**
 - Real-world validation with industrial test suites
 - Extended evaluation across multiple semiconductor domains
 - Integration with additional metadata sources

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[3] R. Ying, R. He, K. Chen, P. Eksombatchai, W. L. Hamilton, and J. Leskovec, "Graph convolutional neural networks for web-scale recommender systems," *Proceedings of the 24th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining (KDD)*, pp. 974-983, 2018.