SAN JOSÉ STATE UNIVERSITY

AI Testing

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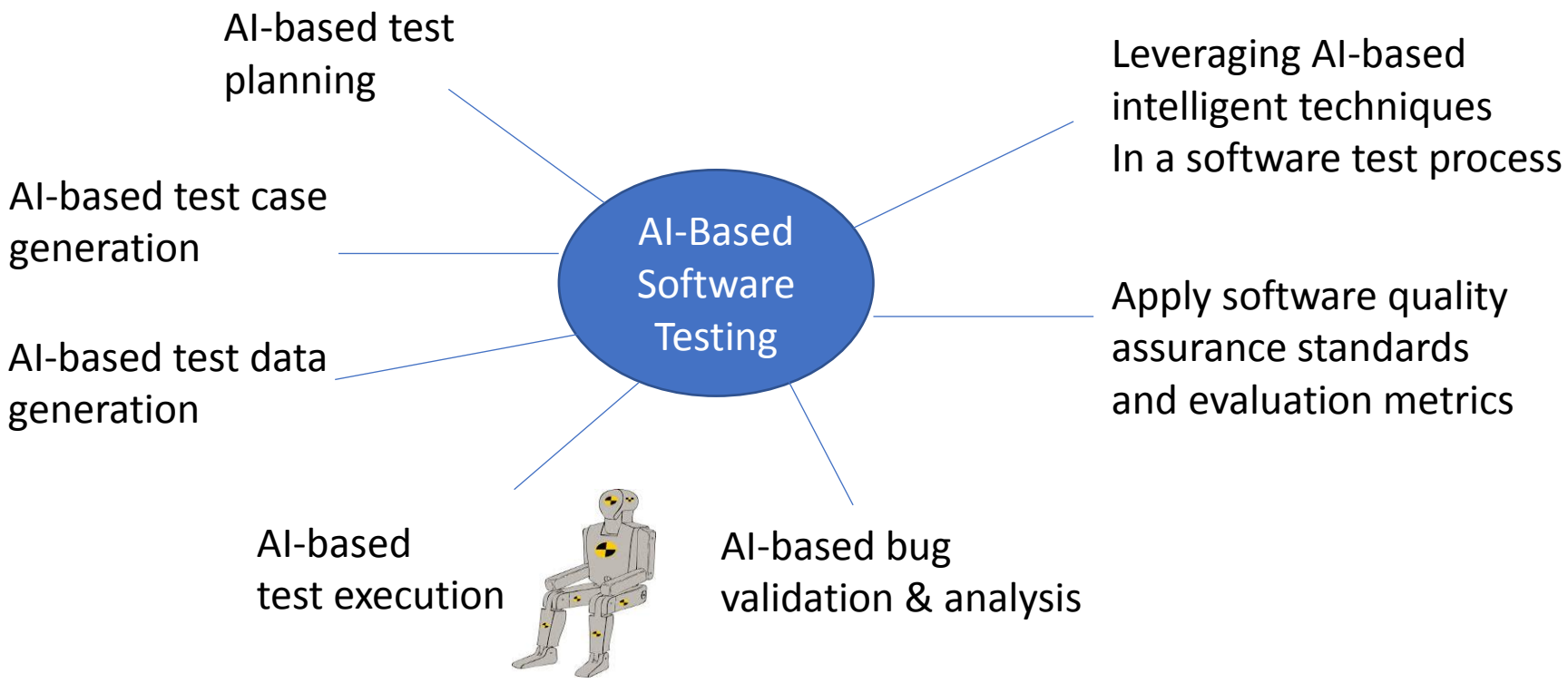
What Is AI-Based Software Testing?

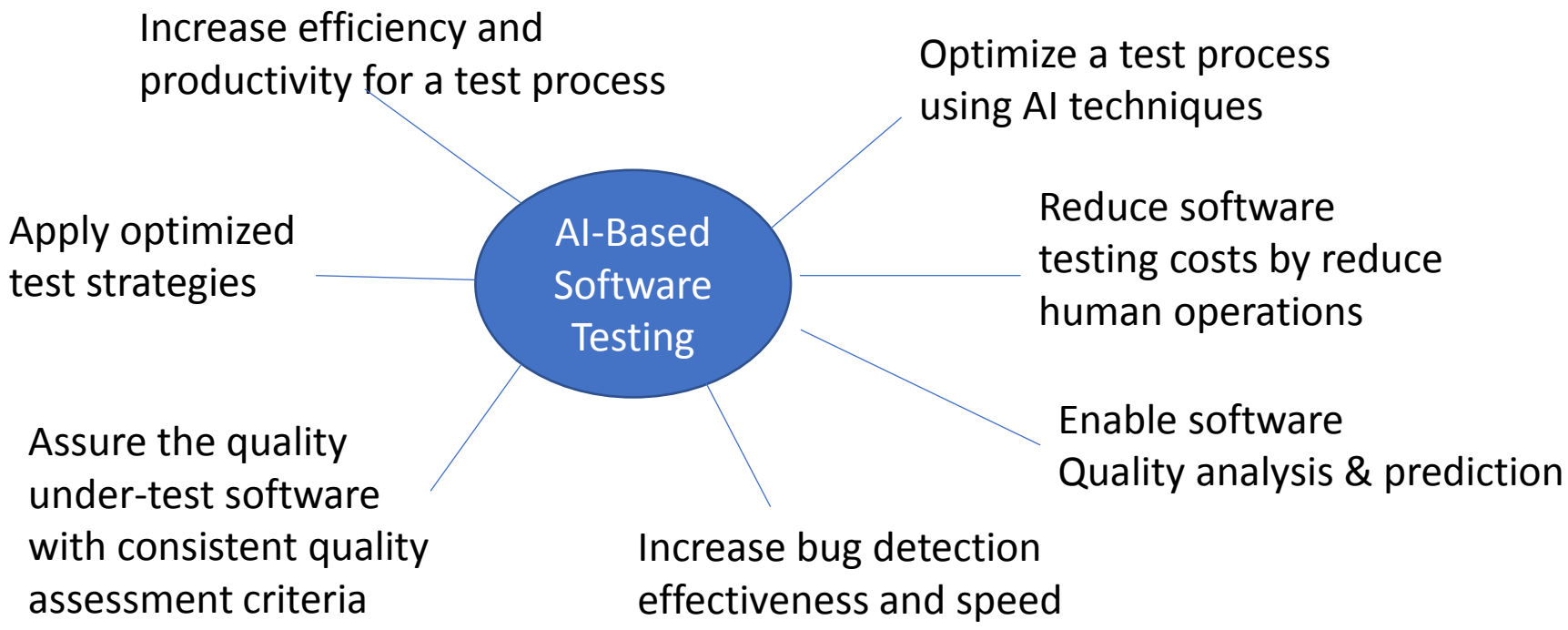
Definition:
“It refers to the leverage and applications of AI methods and solutions to automatically optimize a software testing process in test strategy selection, test generation, test selection and execution, bug detection and analysis, and quality prediction.”



Why Is AI-Based Software Testing Important?

Major objectives include:

- **Test selection and test set optimization using data-driven AI techniques**
- **Test data selection and recommendation using data-driven AI solutions**
- **Automatic test execution using AI techniques**
- **AI-based test result validation**
- **Bug detection, analysis, and prediction based on large-scale testing history data**
- **Adequate quality and complexity prediction using data driven AI approaches**



Testing AI Software/Systems

Definition:

“Testing AI software refers to diverse testing activities for AI-based software/systems. Well-defined quality validation models, methods, techniques, and tools must be developed and applied for AI-based software to facilitate the test activities to achieve well-defined test requirements and meet pre-selected adequate testing criteria and quality assurance standards.”

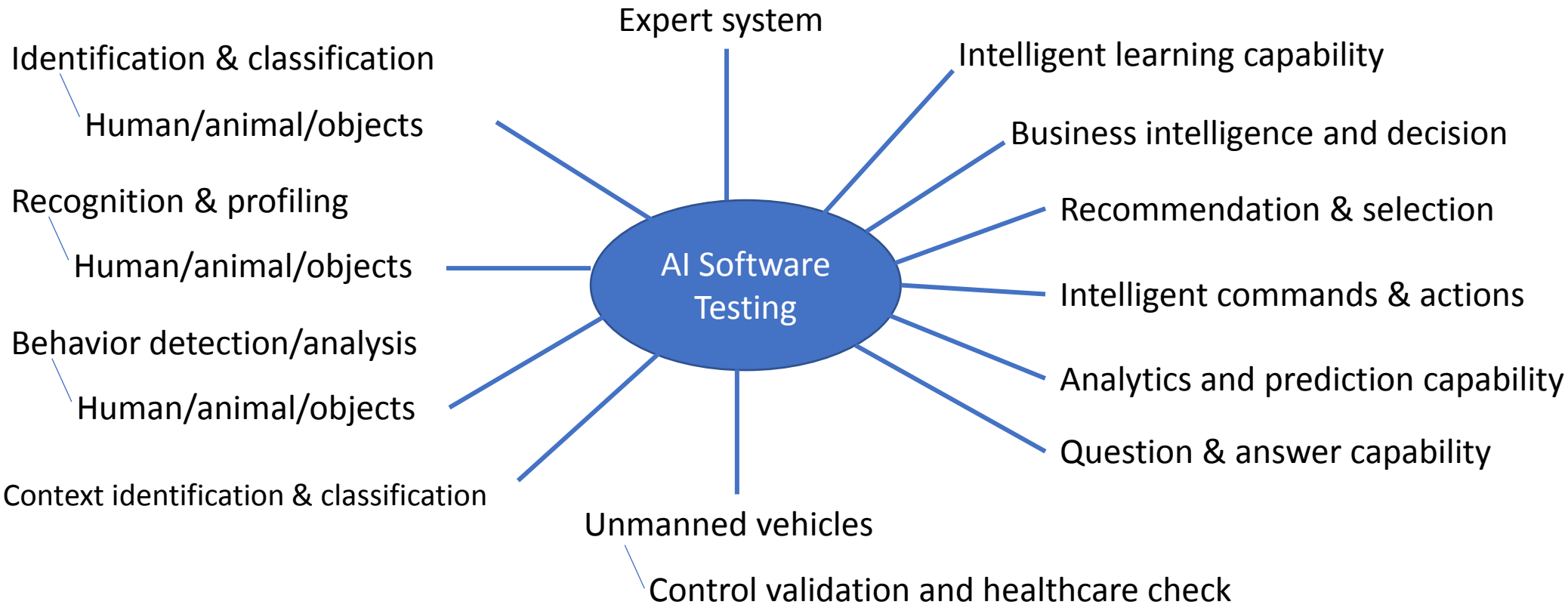
Major Focuses:

(a) Testing AI functional features to assure their adequate quality in accuracy, consistency, relevancy, timeliness, correctness, and so on using data-driven and AI approaches

(b) Testing AI software’s quality of system service parameters based on well-defined quality standards and assessment criteria. These include: system performance, reliability, scalability, availability, robustness, and security, and so on.

(c) Apply data-driven AI techniques to facilitate AI testing processes and test automation

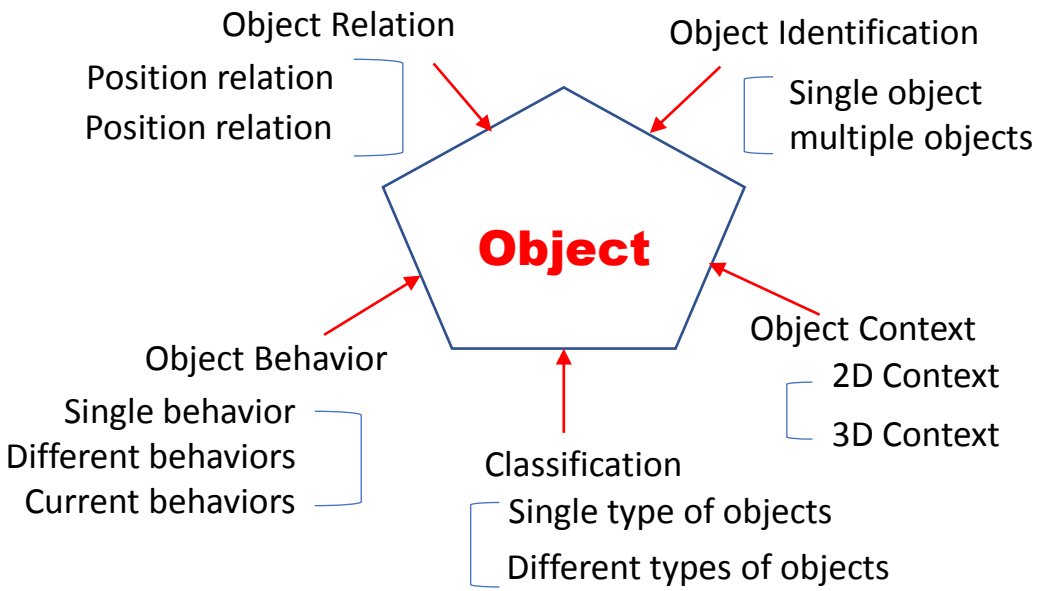
What to Test in AI Software?
– The Scope of AI Software Testing



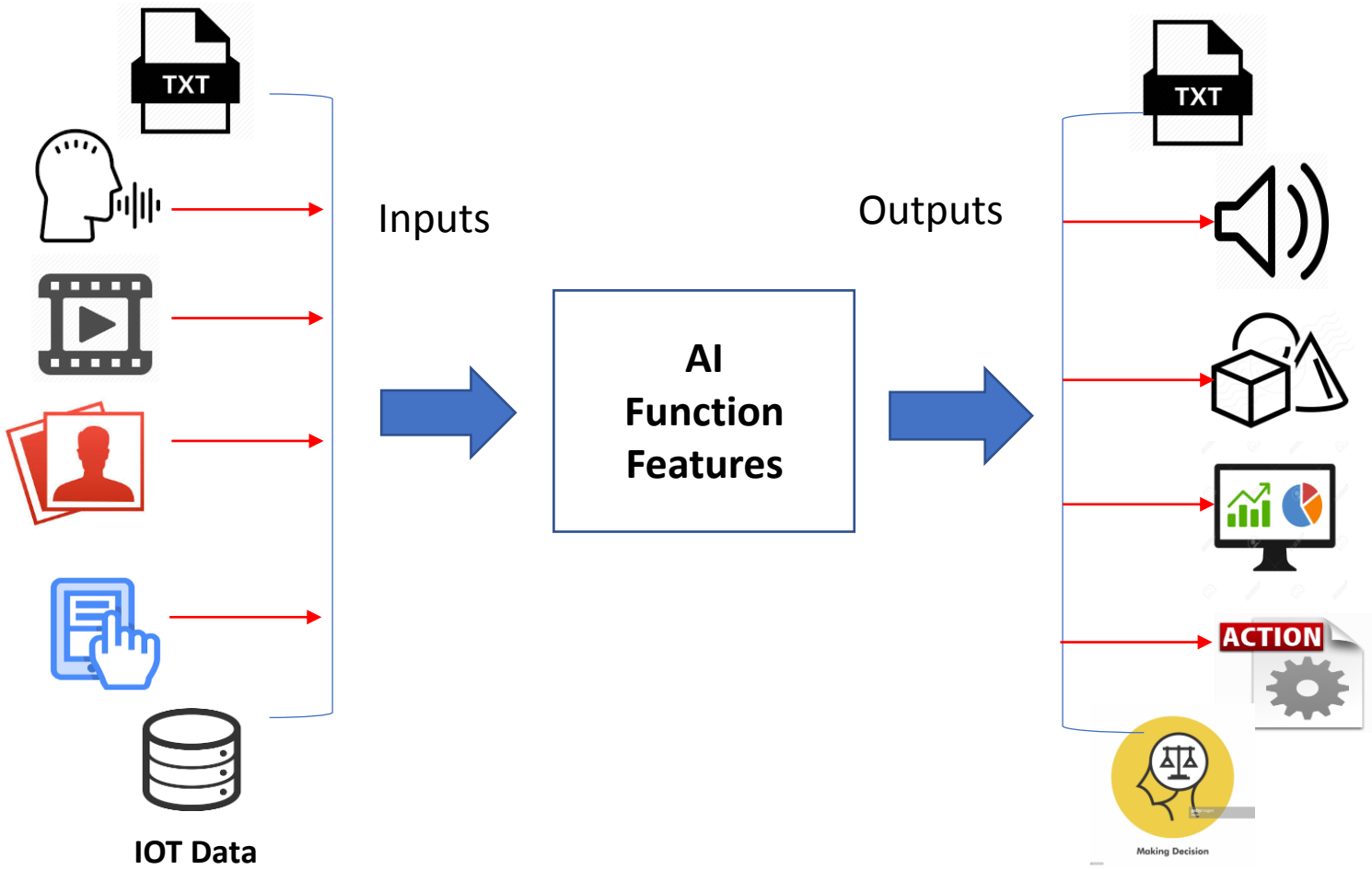
Testing Requirements Analysis for AI Software

Identifying AI features

- **For each identified feature, identify its AI testing requirements**
- **Knowledge-based modeling for AI testing**

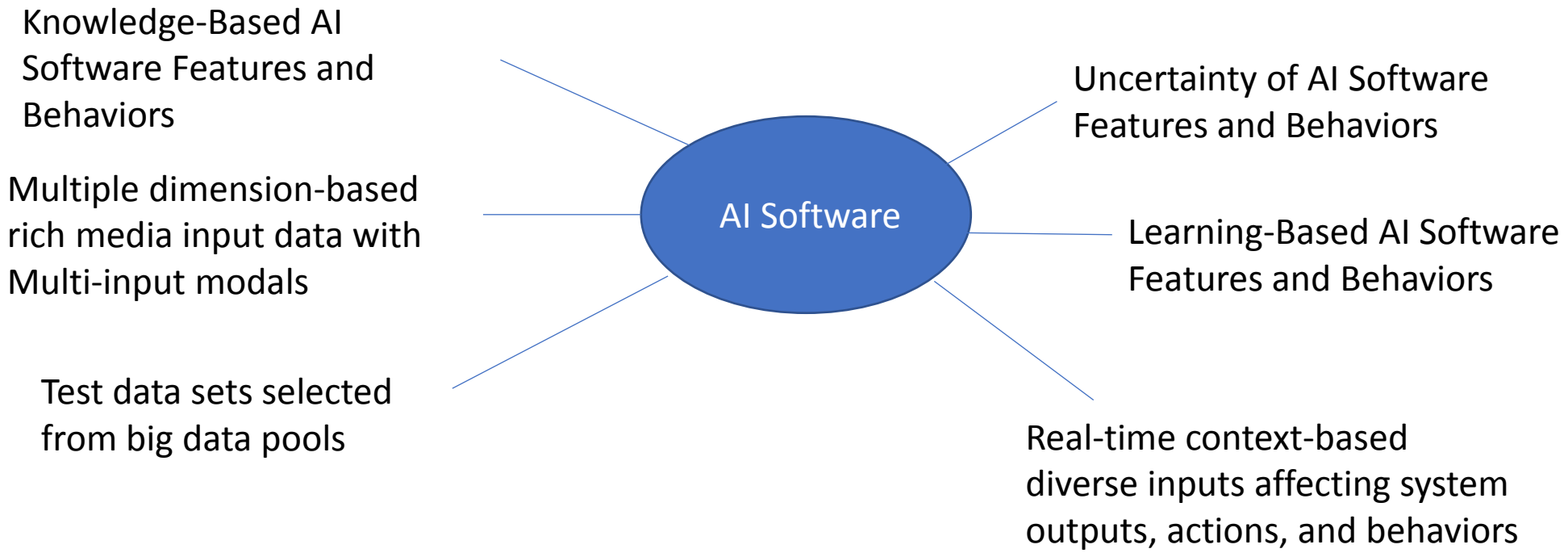


AI Software Feature Testing



Why Do We Need AI Testing?

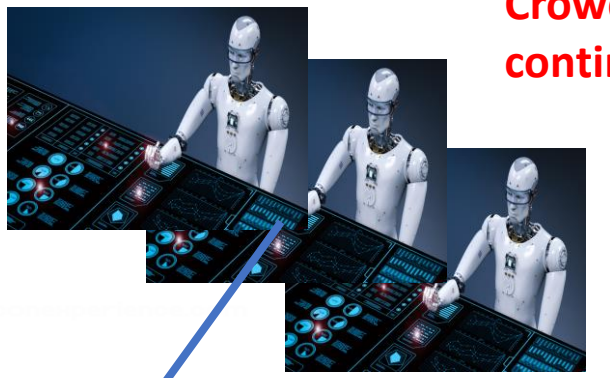
- **Many current and future software will be built with AI-based features and functions.**
- **Existing techniques and tools are not adequate to test AI-based features and functions**
- **Lack of well-defined and experience approved quality validation models and assessment criteria**
- **Lack of AI-based testing methods and solutions for AI software**



AI Software Quality Validation Approaches

Crowd-Sourced Testers

Crowdsourced Test Robots without continuous learning capabilities



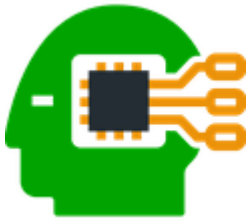
AI based Test Automation

Cloud-Based AI Software

Metamorphic (Non-Oracle) Testing

Data Model Based Testing

Classification Testing



Rule-Based Testing

Learning-Based AI Testers

Quality Parameters for AI Software

Function/System Accuracy

Function/System Correctness

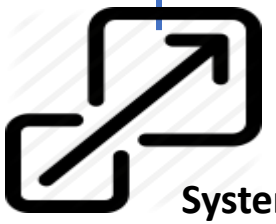
System Reliability

Function/System Consistency

AI Software

System Performance

Function/System Relevancy



System Scalability

System Robustness

Smart AI Software/System Quality Testing and Assurance - Challenges, Issues, and Needs

Lack of AI-Based Test Automation Tools

Testing Modeling & Requirement Analysis

Testing Adequacy?? Coverage? Measurement?

Lack of Quality Validation & Assurance Standards

Lack of Certified Training Data for AI Software

Where are the automatic quality tools/methods for training data?

AI Software Quality Validation Process