Software Quality

"Quality is never an accident; it is always the result of intelligent effort."

John Ruskin, English writer, philosopher, and art critic

Typically, you get paid when you deliver a software suite to a client

- What must happen before you get paid?

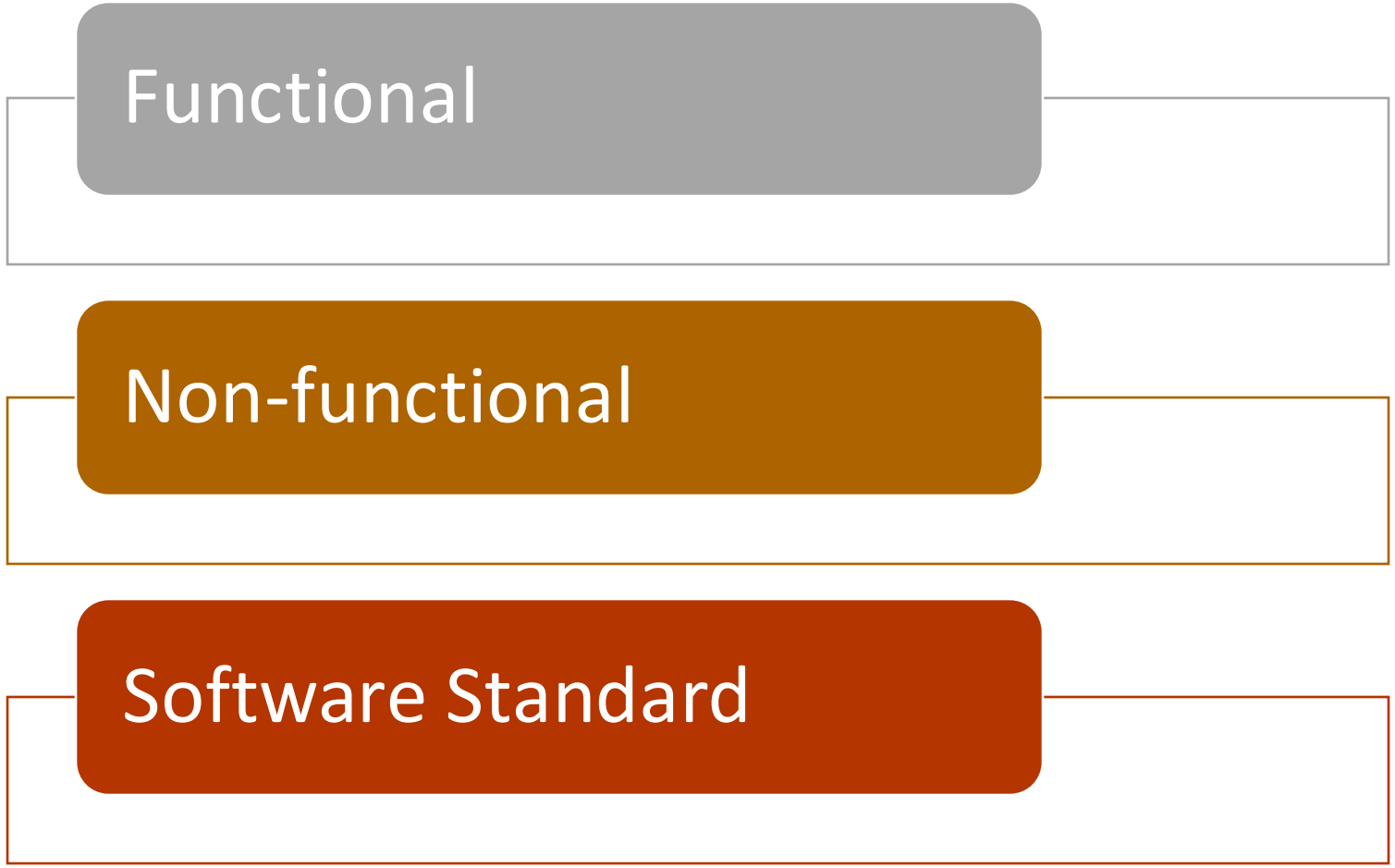
Requirements

Functional

Non-functional

Test/Validation

Requirements



Software Standards – 1,000's

International Organization for Standardization

Institute of Electrical and Electronics Engineers

International Electrotechnical Commission

National Institute of Standards & Technology

Payment Card Industry Data Security Standard

FERPA: Family Educational Rights & Privacy Act

Health Insurance Portability and Accountability Act

General Data Protection Regulation

Center for Internet Security

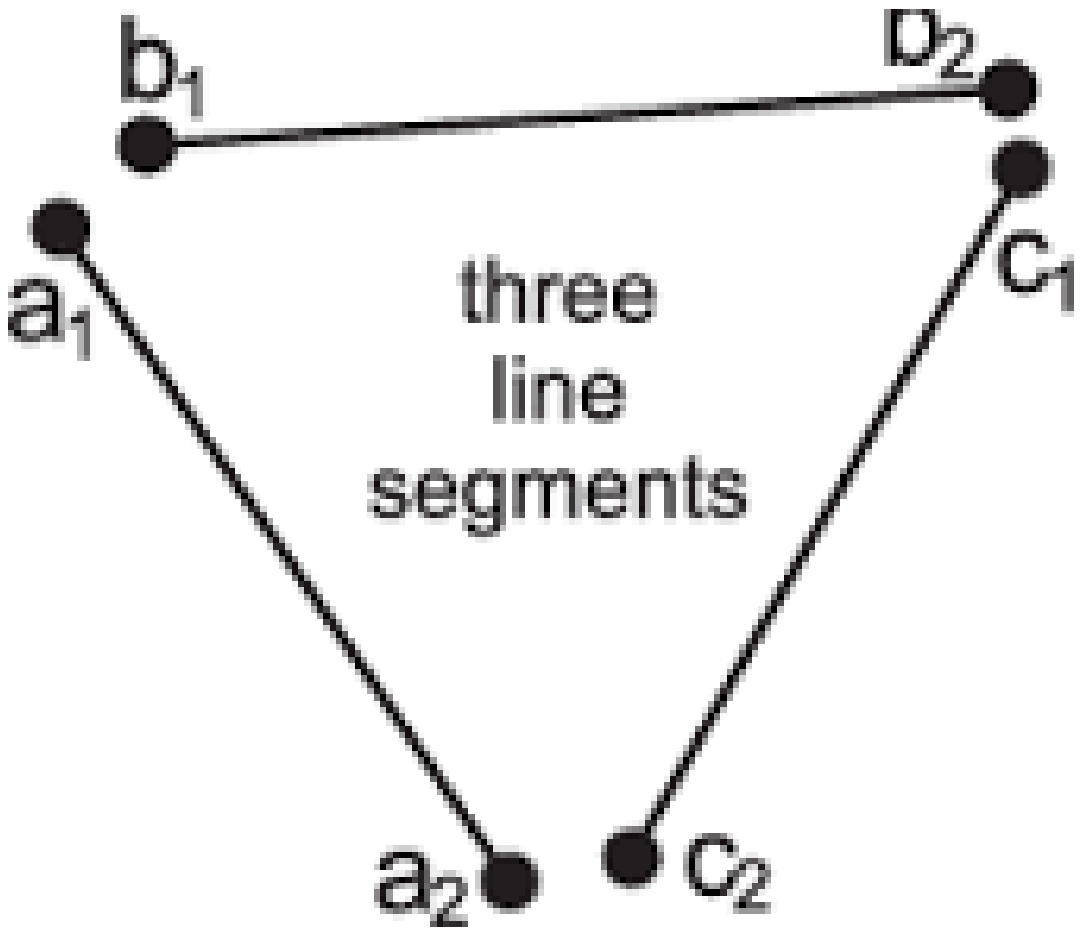
American Disability Act

Military Standard

Federal Information Security Management Act

Traditional Software Quality

- You've written a function that takes three lengths and returns true if they could be the sides of a triangle, and false otherwise.
- What tests do you write to check if your code is correct?



Modern Software Quality

- Quality occurs at every stage of a project
- Quality starts with requirements

Agile values support software quality

Individuals & Interactions

Customer Collaboration

Working Software

Responding to Change

Software Processes

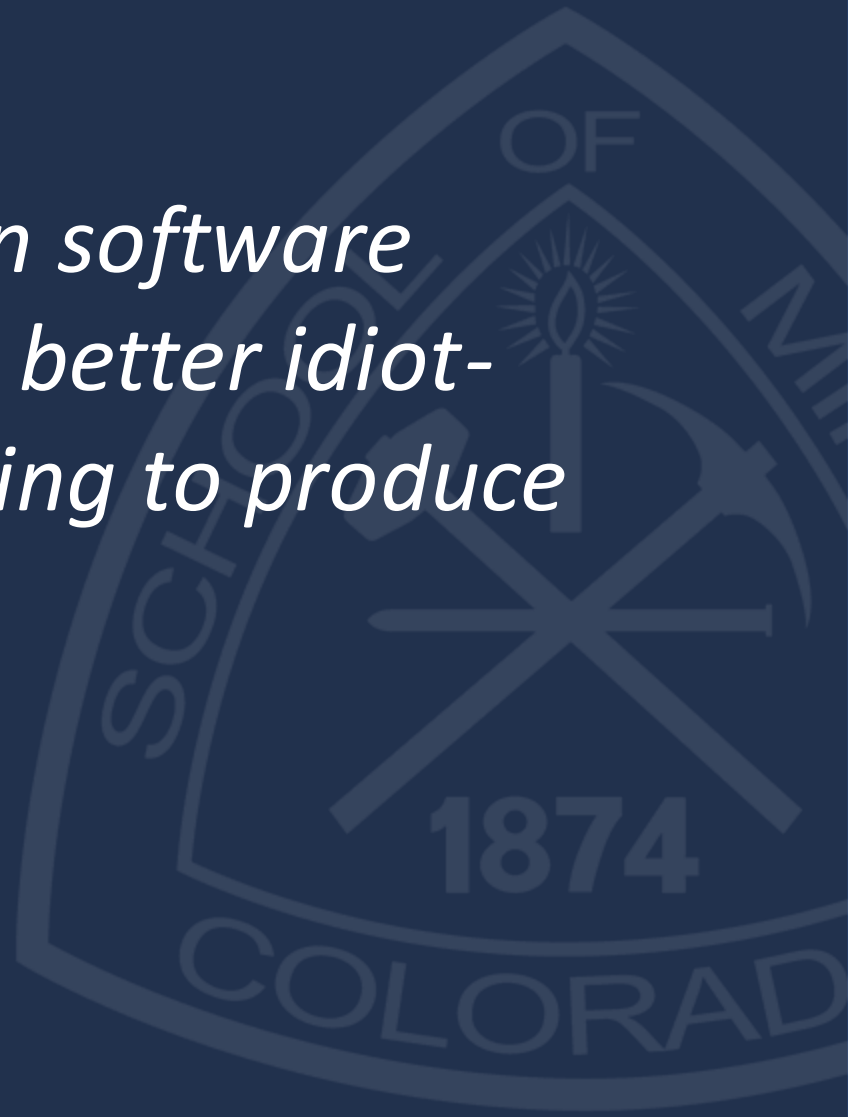
- Architecture and design
- Coding standards and practices
- Code complexity
- Human error – pair programming
- Version control
- Testing
- Code reviews

"Quality is not an act; it is a habit." *Aristotle*

Programming today is a race between software engineers striving to build bigger and better idiot-proof programs, and the Universe trying to produce bigger and better idiots.

So far, the Universe is winning.

— Rick Cook, author “The Wizardry Compiled”

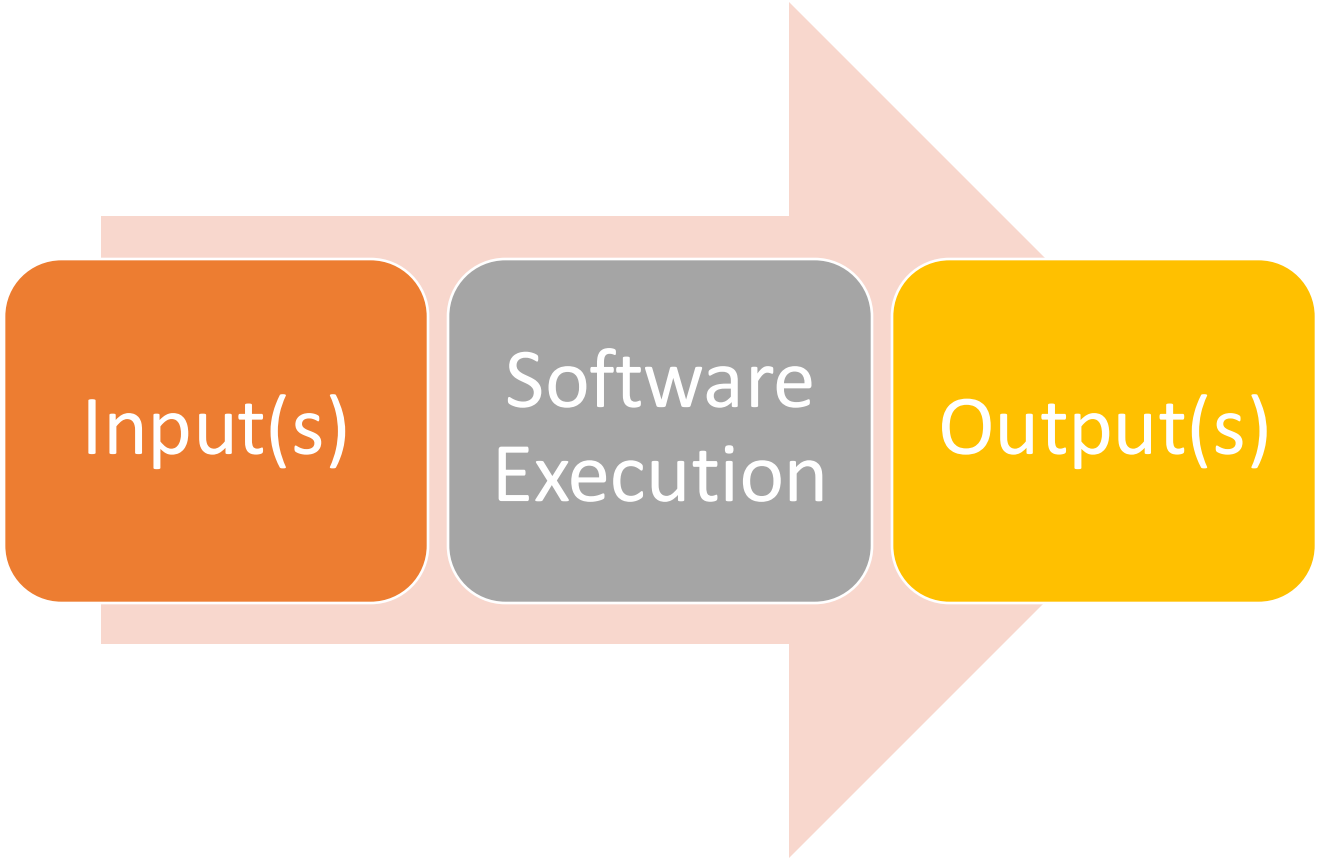


Create a test plan!

"If you don't like testing your product, most likely your customers won't like to test it either." - Anonymous

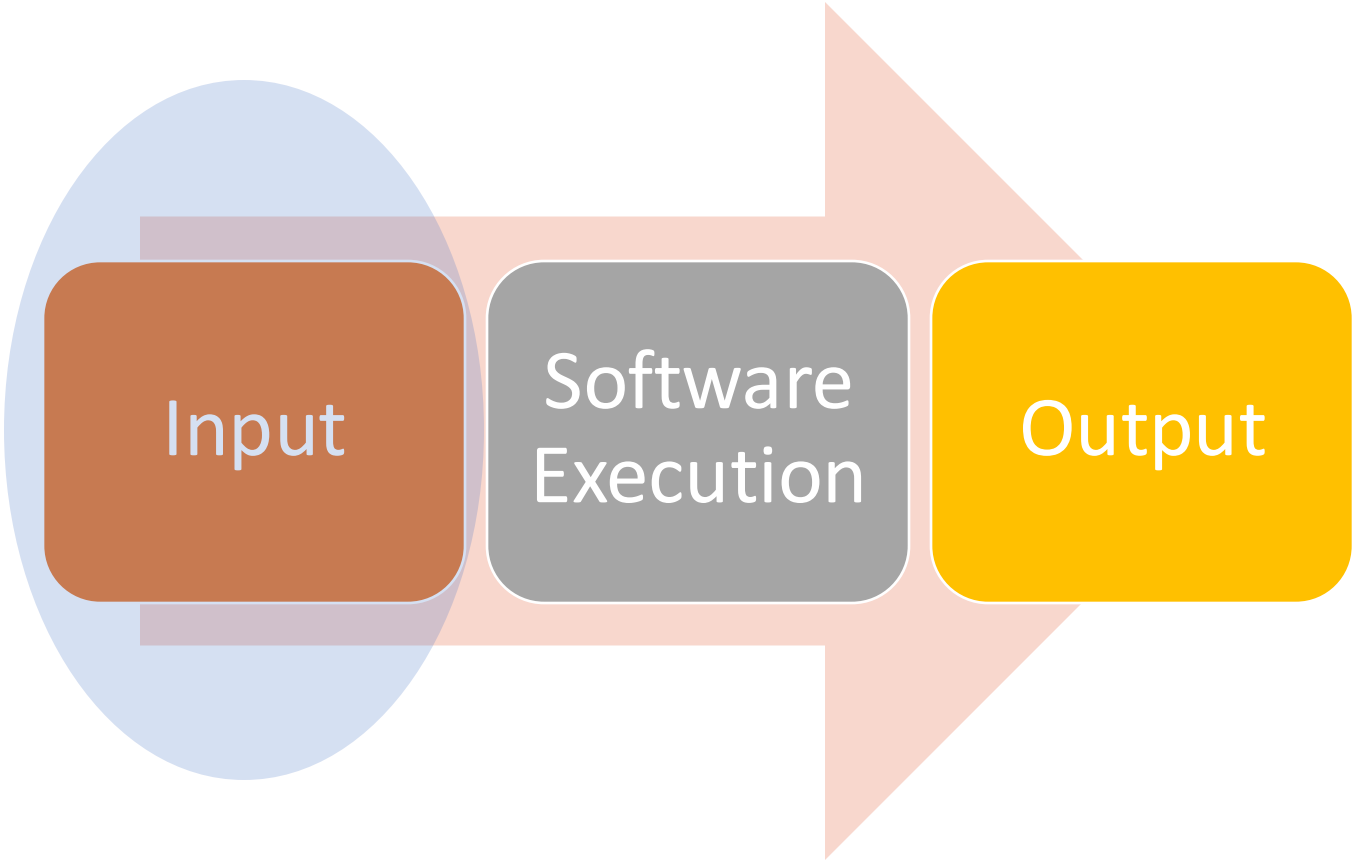
Test Evaluation

- How do you know if your software execution is sufficient?
- How do you document your test results?



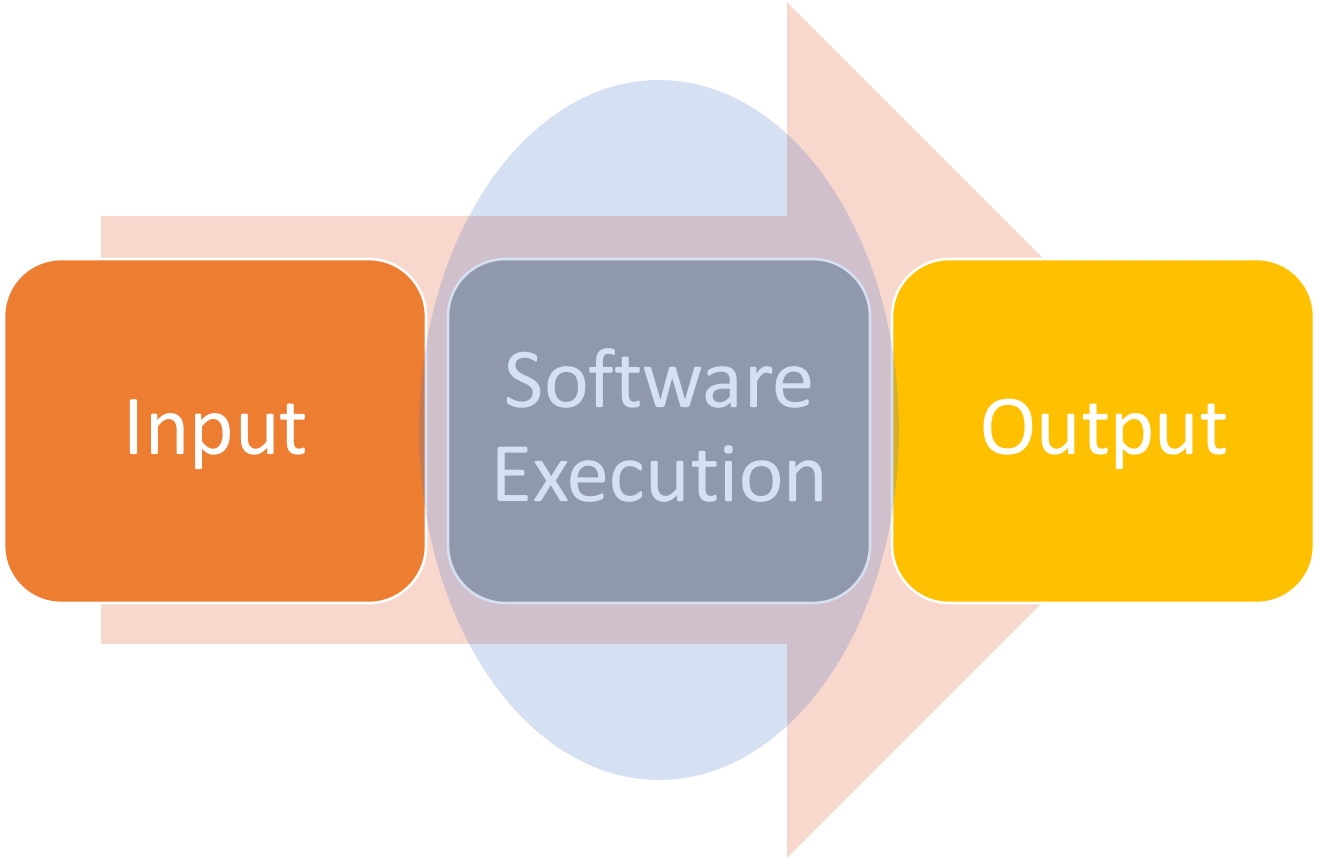
How do you define the inputs?

- Definition of edge cases?
- Where do you get data to feed to AI model?
- Are there any compliance standard data sets?



Intellectual Property

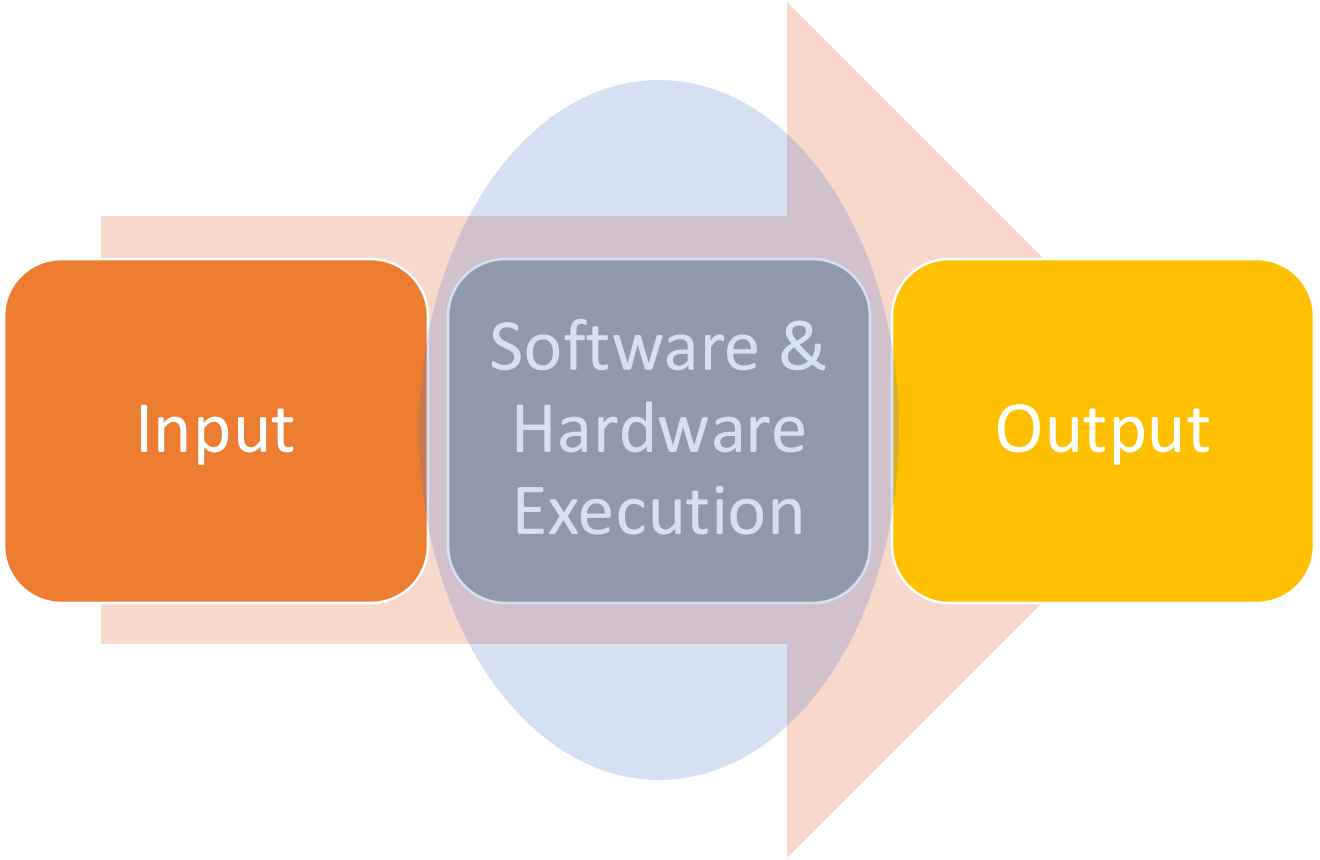
What if the software execution is protected by intellectual property?



How do you prove software works without disclosing algorithms?

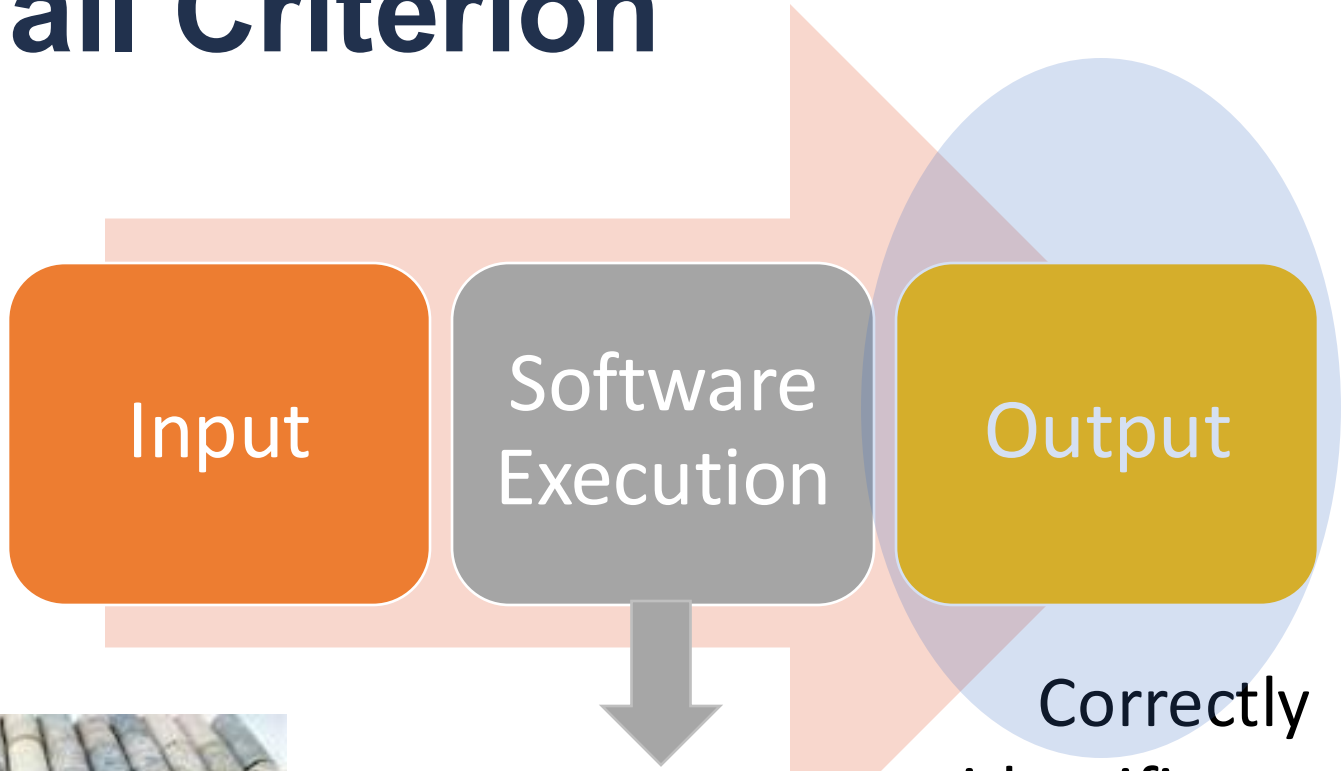
Software & Hardware Integration

What if the software and hardware are integrated?

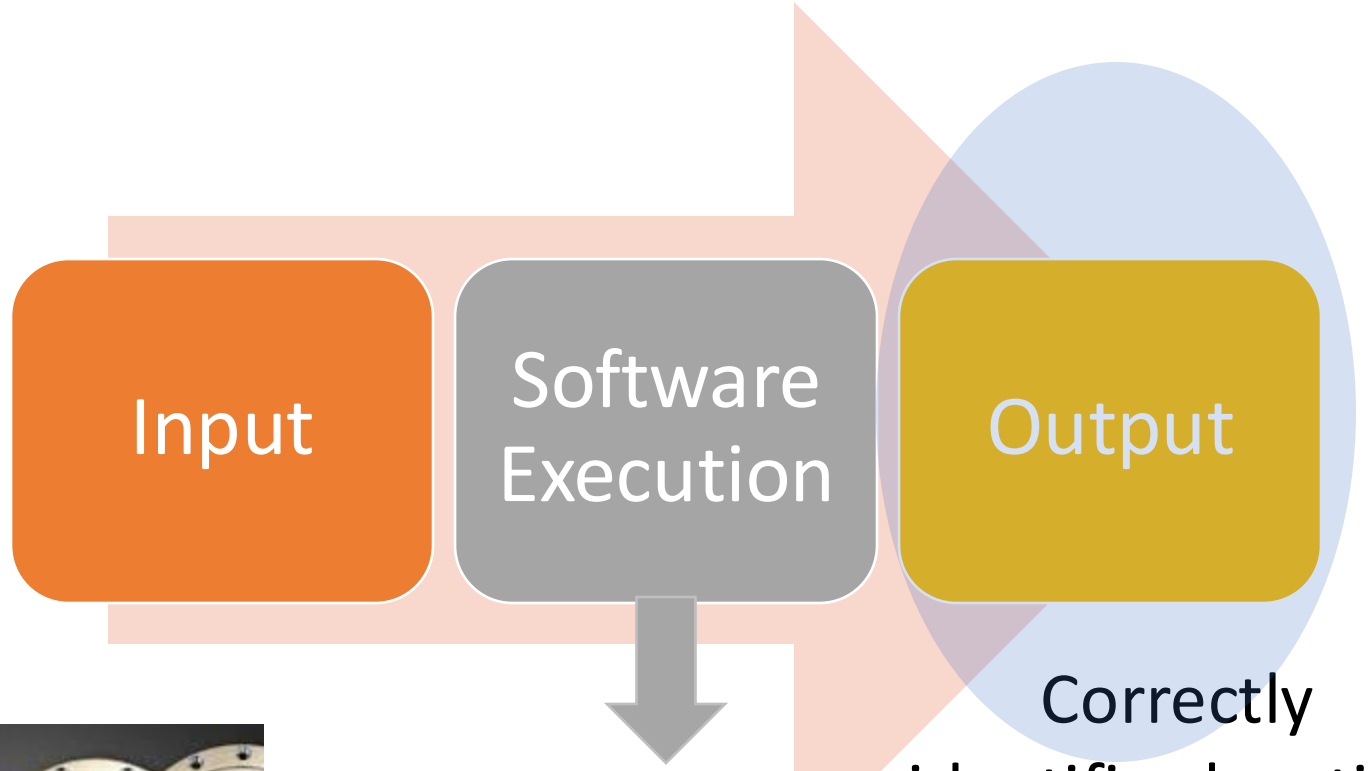


How do you isolate software and hardware performance?

Test Pass/Fail Criterion



Test Pass/Fail Criterion



How to present test data?

1. Written Test Plan
   - Well Documented
   - Client Approved
   - Repeatable

2. Test Data Results Table

Test Name	Category	Environment	Setup	Expected Results	Actual Results

Quality Characteristics ("-ilities")

Functional suitability

Performance Efficiency

Compatibility

Usability

Reliability

Complexity/Simplicity

Security

Maintainability

Portability

Pretty good testing is easy to do. Excellent testing is quite hard to do.

— James Bach, founder, Satisfice

(Some) Types of Testing

Code style

Code coverage

Unit testing

- These should mostly be developed in TDD
- Adding after the fact is a pain and hard to get right

Functional testing

- Testing requirements/user stories

Build, integration, deployment testing

- Do all the parts work together?
- Does it work in production?

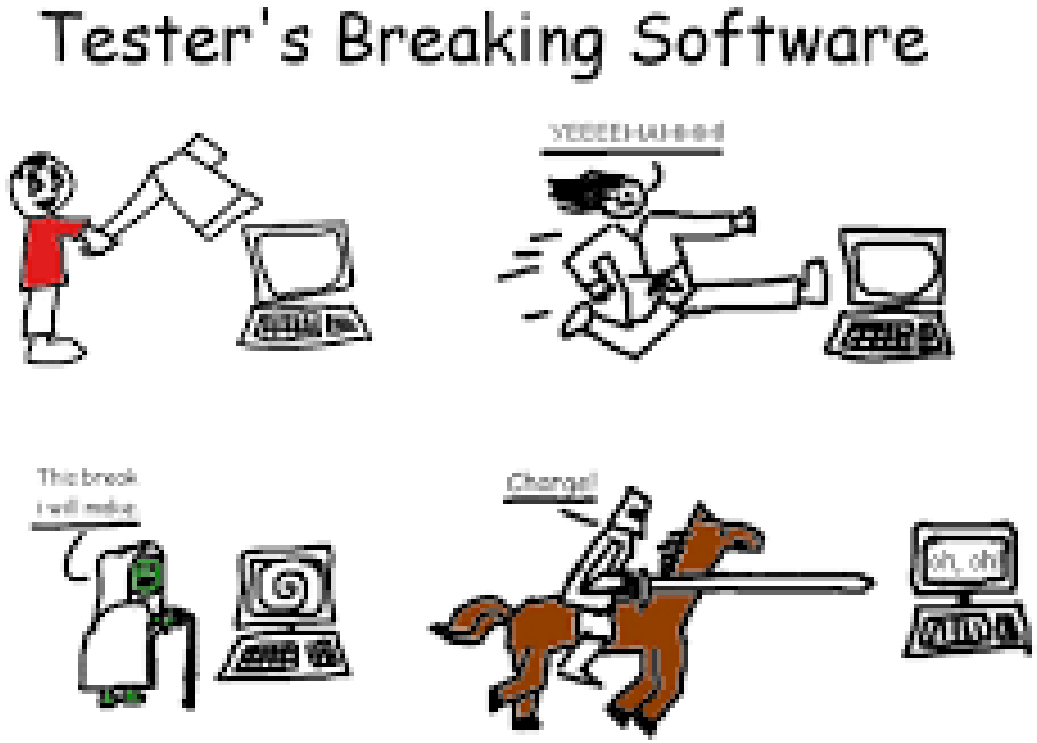
Load testing

Security testing

Usability testing

What to test

- Test one thing at a time so one error does not mask another error
- User stories
- The expected use cases
  - Edge cases
- Invalid inputs
  - Users can break anything…



When to test

- Validate requirements in functional review
- Validate functionality in design review
- Regression test with every code submission
  - to avoid taking a step backwards
  - fix bugs as they happen, not at the end
- Acceptance tests to determine client satisfaction

When is Testing Done?

Product Delivery

Audit

NIST

HIPAA COMPLIANT

CIS

DEPARTMENT OF EDUCATION
UNITED STATES OF AMERICA

PCI DSS COMPLIANT

DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

FISMA
FEDERAL INFORMATION SECURITY MANAGEMENT ACT

Final Thought

“The bitterness of poor quality remains long after the sweetness of meeting the schedule has been forgotten.” - Karl Wiegers