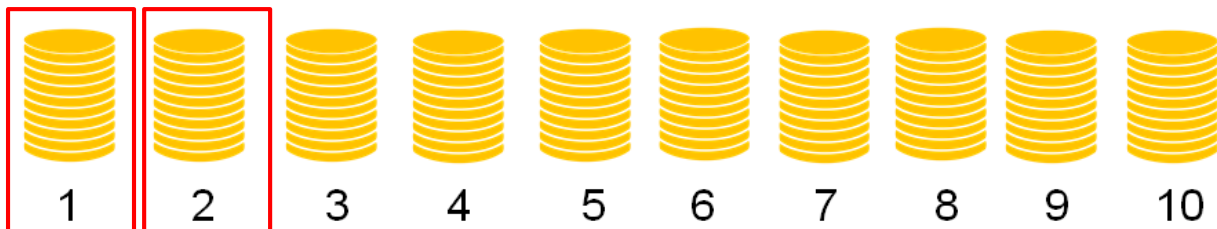


SAFFRON: Targeting Efficiently

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 Major: Computer Engineering
 Lab Mentor: Amir Reisizadeh
 Faculty Advisor: Professor Ramtin Pedarsani
 Department: Electrical and Computer Engineering
 Funding Source: University Grant



Let's Start Off With A Brain Teaser...



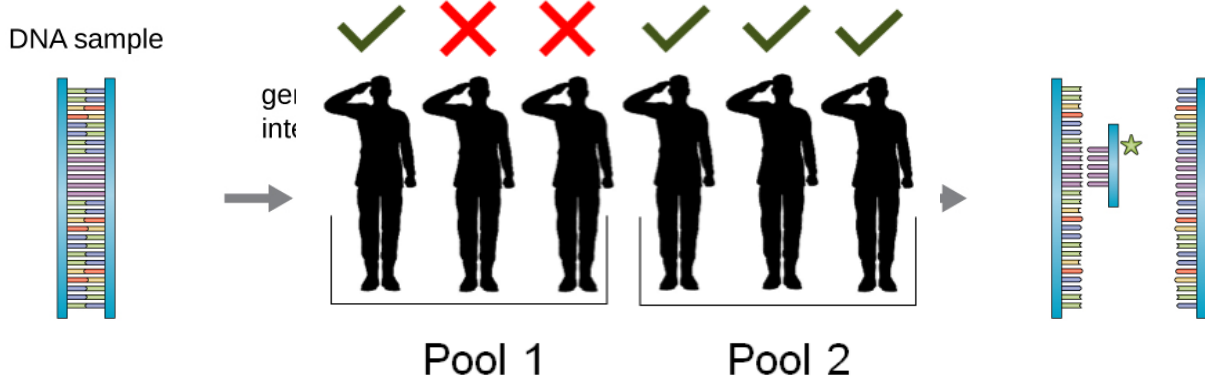
$$1(10) + 2(10) + \dots + 10(10) = 550 \text{ grams}$$

$$1(9) + 2(10) + \dots + 10(10) = 549 \text{ grams}$$

$$1(10) + 2(9) + \dots + 10(10) = 548 \text{ grams}$$

...etc.

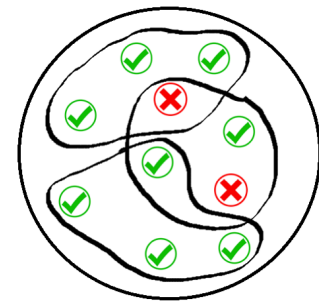
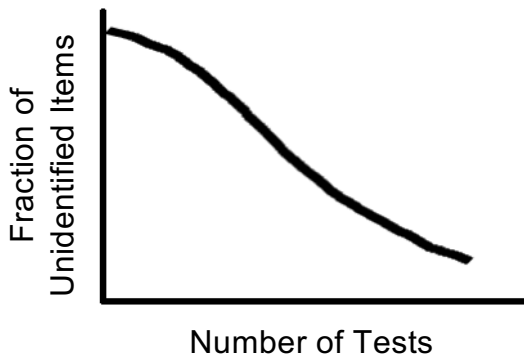
In Operation Since World War Two



What is Group Testing?

Procedure that tests items collectively in pools rather than individually

Minimise number of pools for efficiency



10 items, 2 defectives

n = total number of items in test group
 K = total known number of defectives in test group
 Binary-OR operation on pools

Project Goals

Theory

Linear Algebra
Algorithm complexity
Coding theory

Simulations

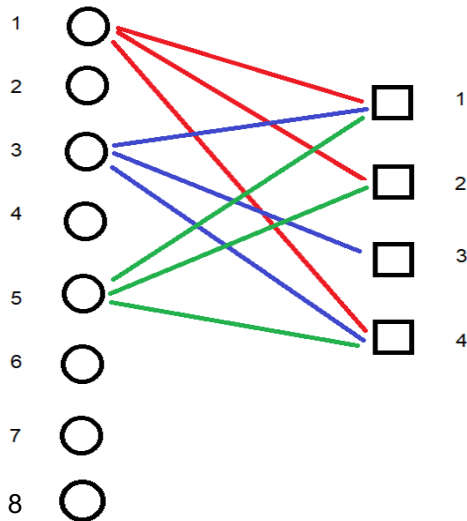
MATLAB
Implementing SAFFRON
Coding/Debugging



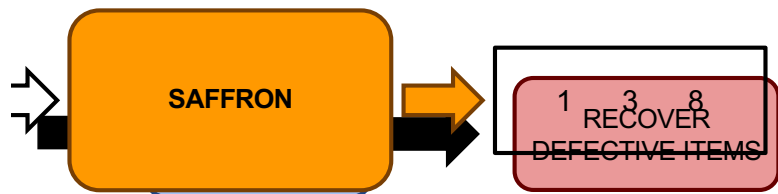
What is SAFFRON?

n TOTAL ITEMS

M POOLS

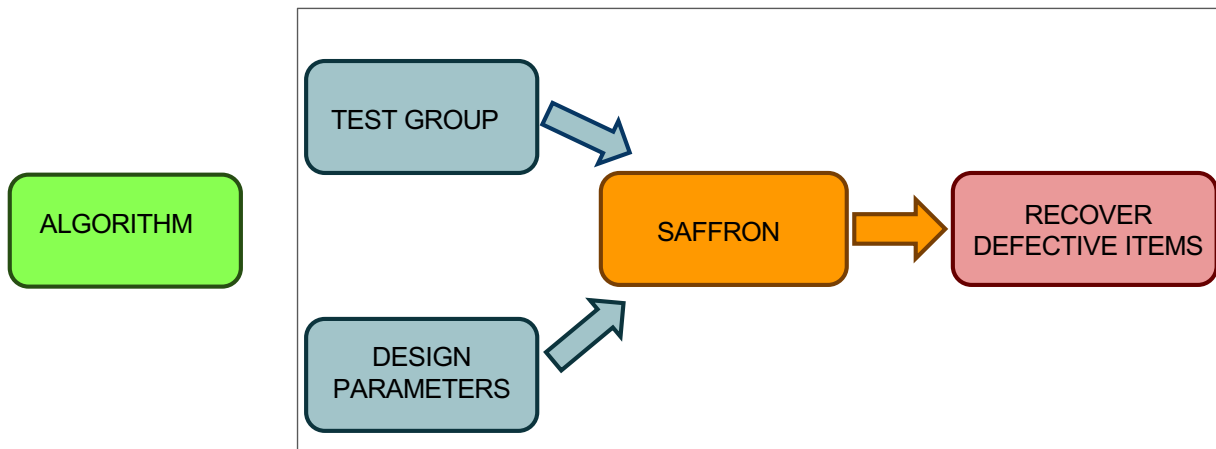


Left nodes = items from test group
Right nodes = pools (bundles of tests)
 d = order of left nodes (number of pools to which each item belongs)



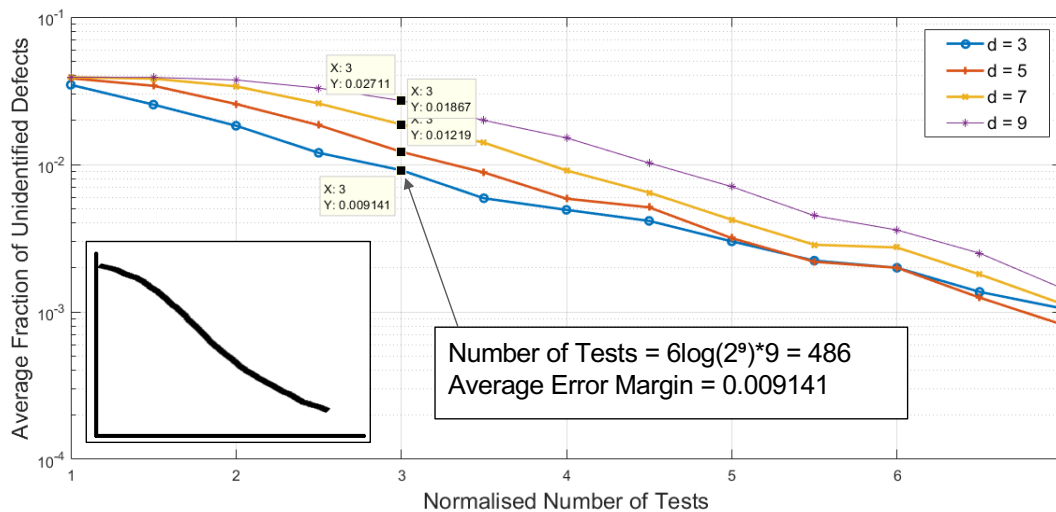
RON: $K \log n$
BUS: $K^2 \log n$

Designing and Implementing SAFFRON



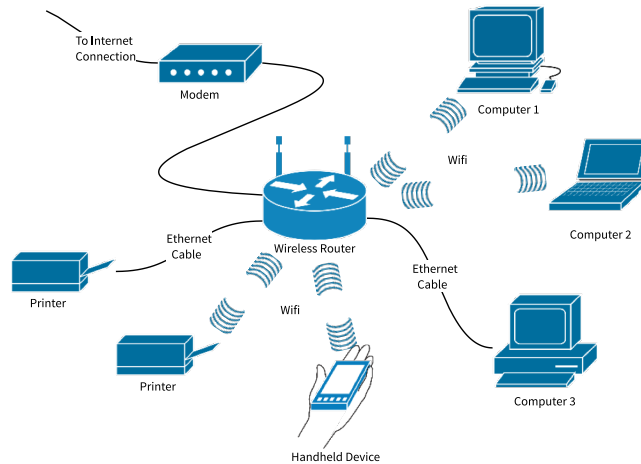
SAFFRON: Simulation

$$n = 2^9, K = 3$$



The Significance of Group Testing

Active Neighbour Discovery



My Takeaways

- Learned about prevalent engineering problem in depth and its applications
- More Intensive MATLAB programming
- Apply coding and linear algebra concepts learned in classes

In the Future...

- Implement with real measurements
- Design theory type algorithms for many variations of group testing problem

