



Case Base Reasoning Tool Suite

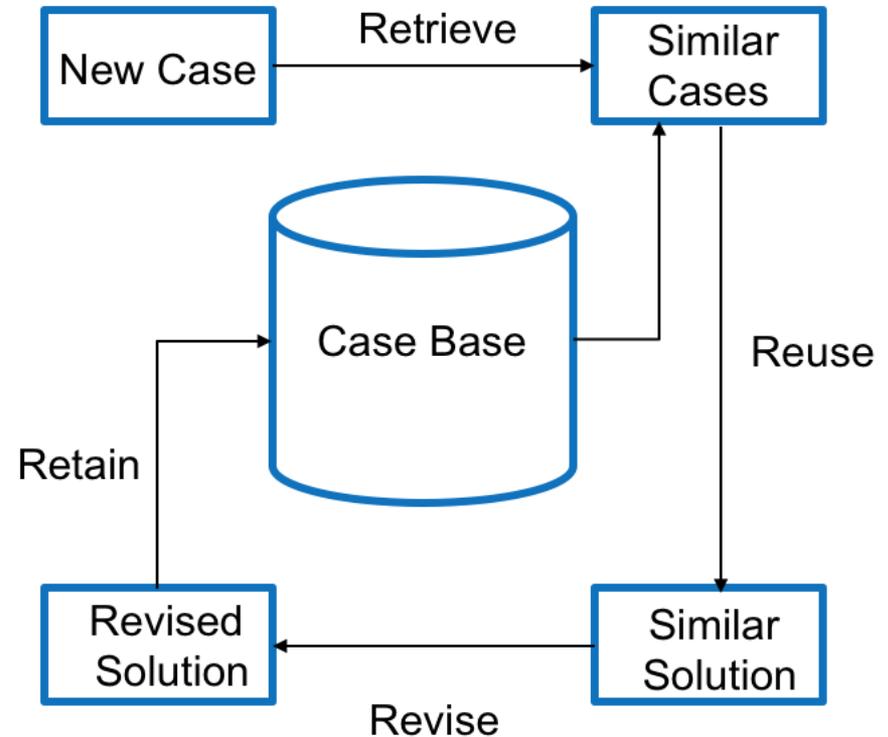
Pooja Srivastava

Jet Propulsion Laboratory, California Institute of Technology



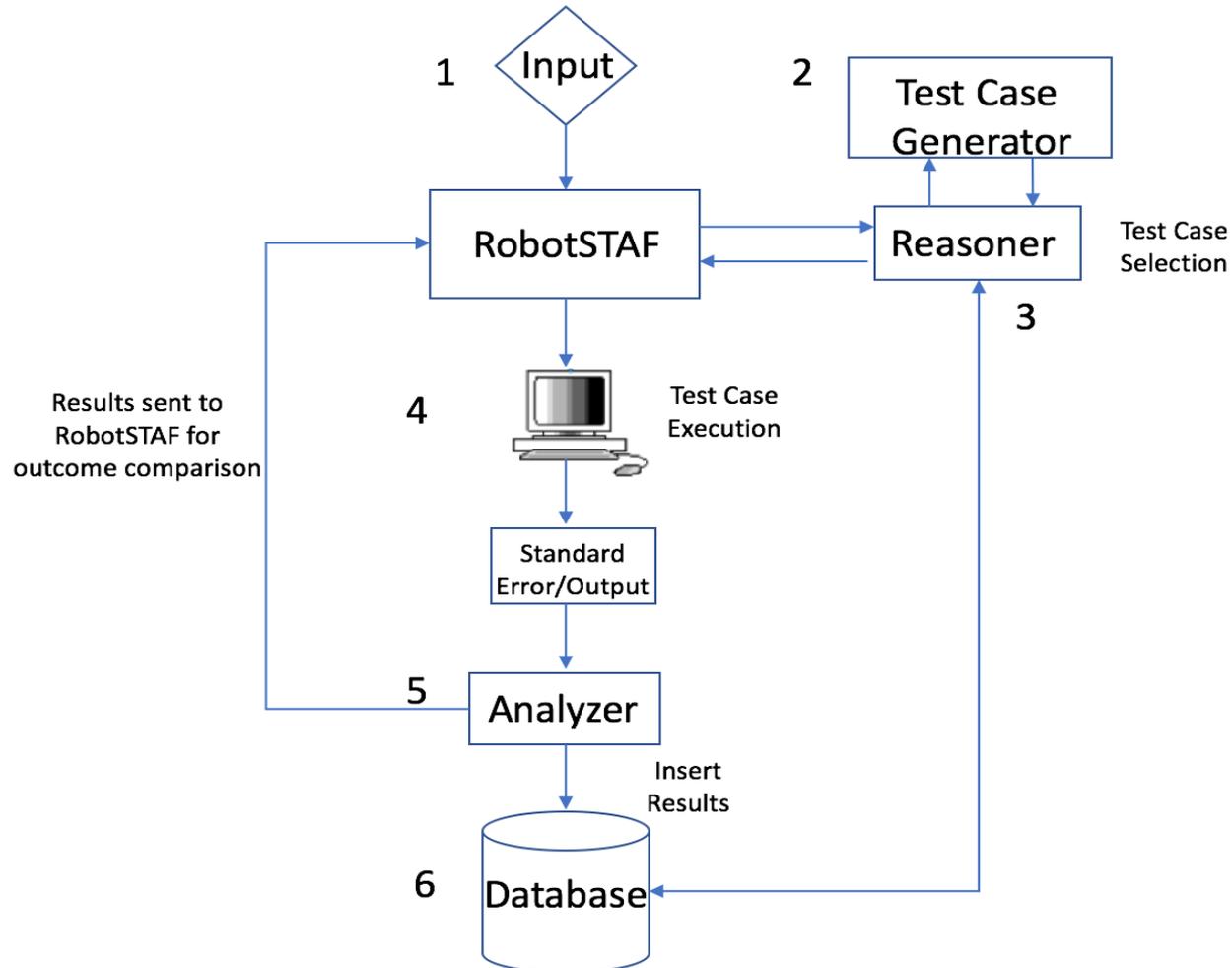
What is Case Based Reasoning?

- CBR is a machine learning methodology
- **Process** of solving new problems based on solutions of similar past problems
- CBR is founded upon the observation that humans are much more capable of recalling experiences than of articulating internal rules



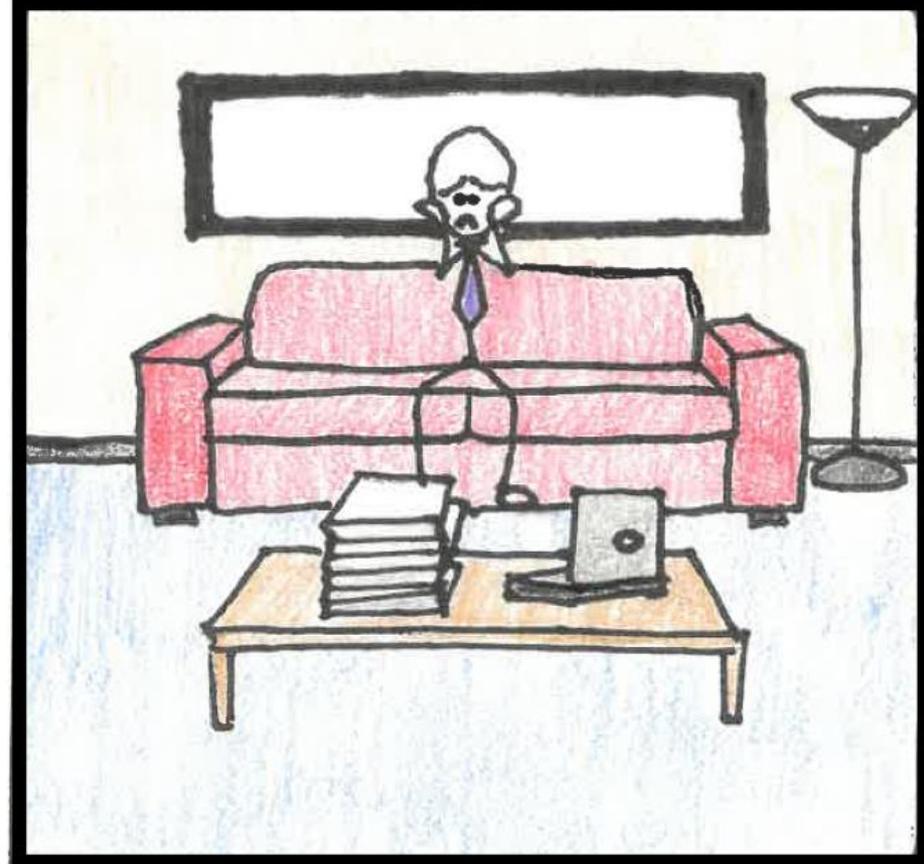


General Overview



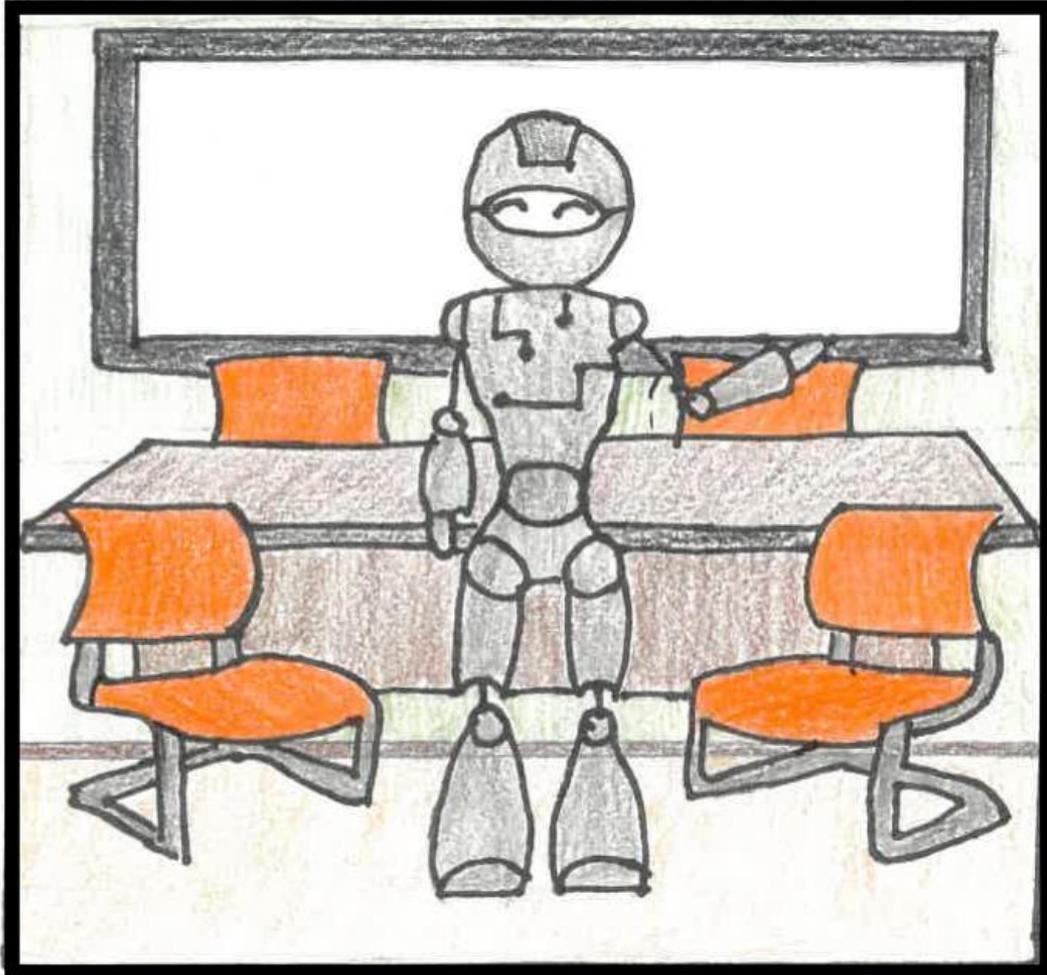


Meet the Test Team





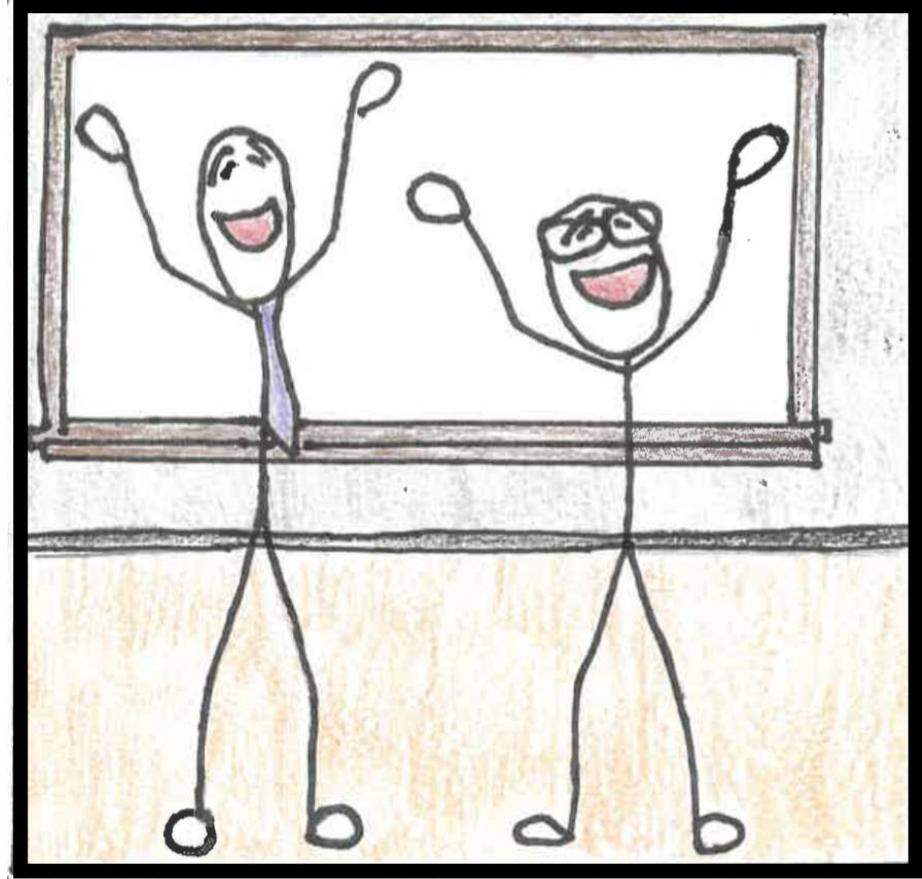
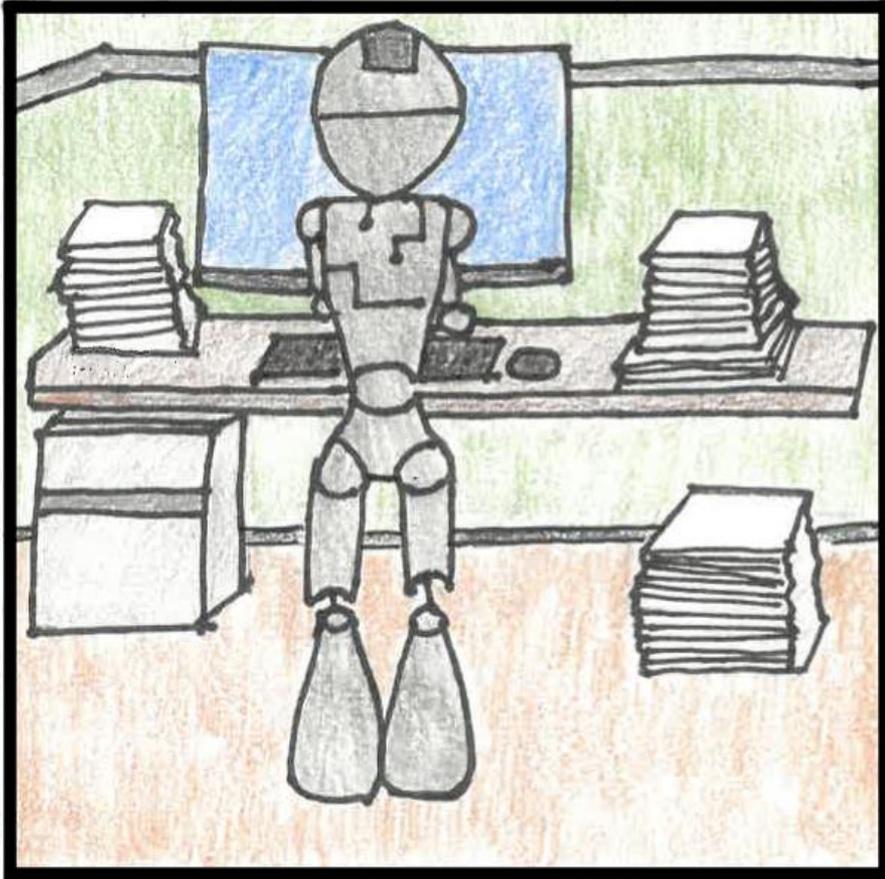
Meet CBR



I have *smartly* automated the process of test case generation, selection, execution, and result analysis!

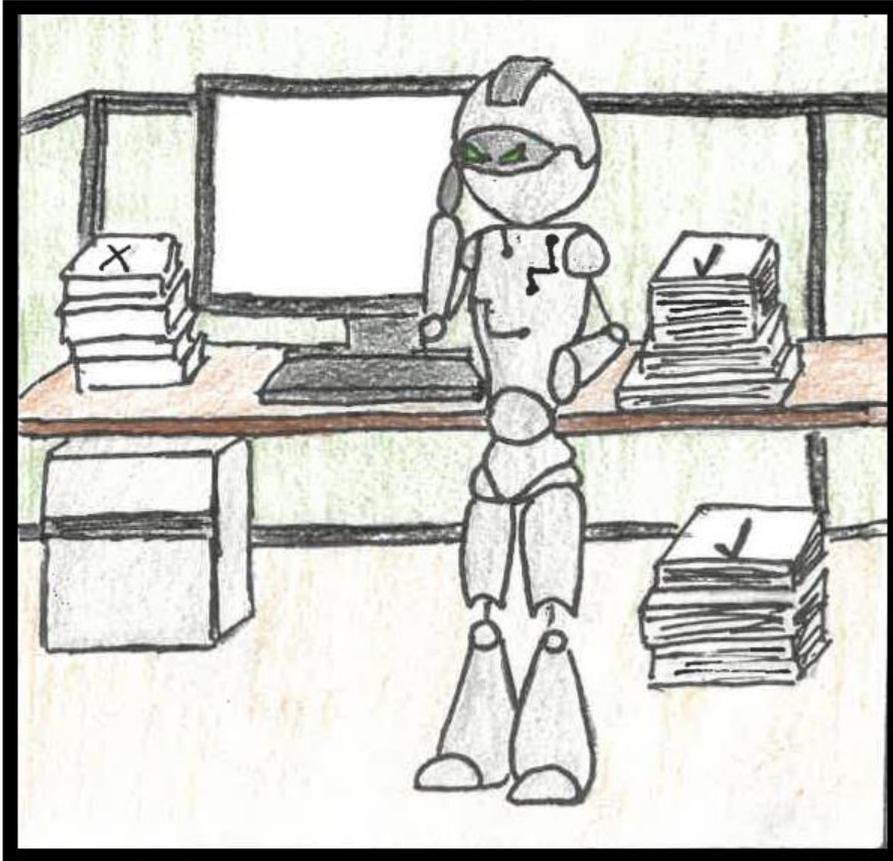


CBR to the Rescue



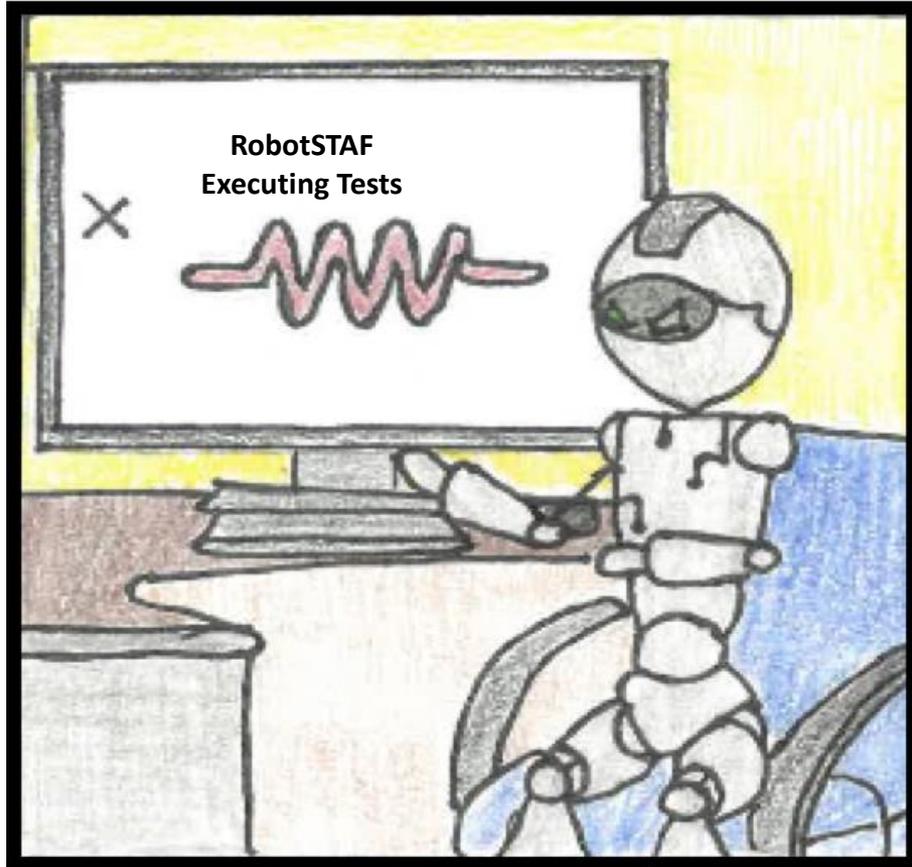


Test Case Selection



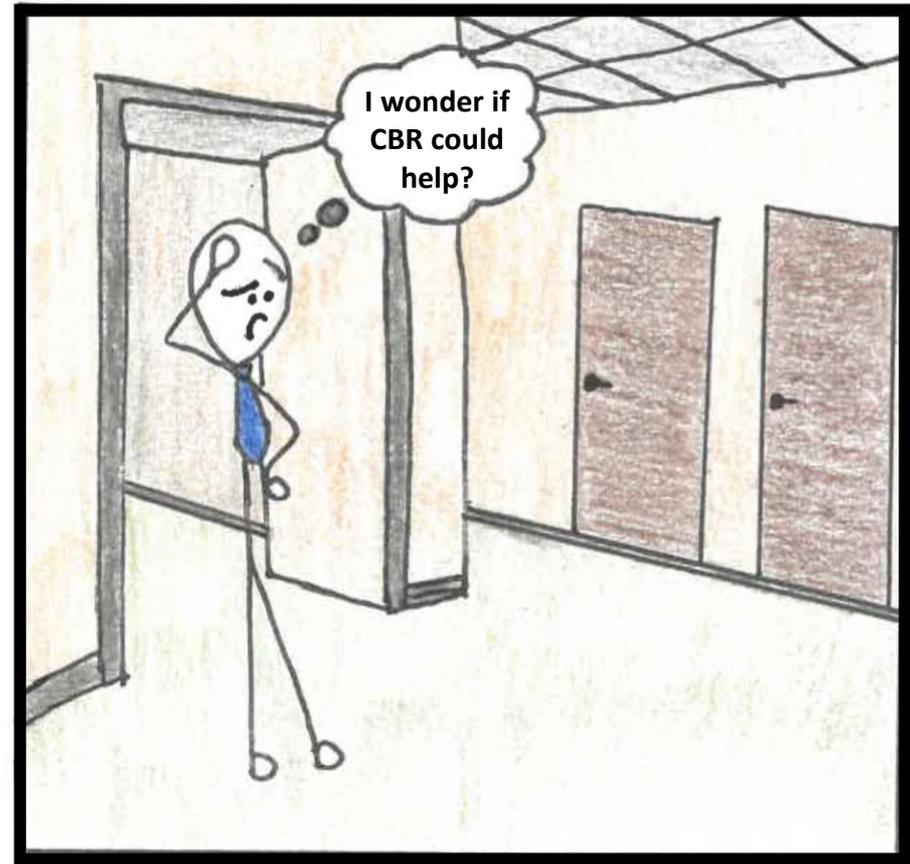
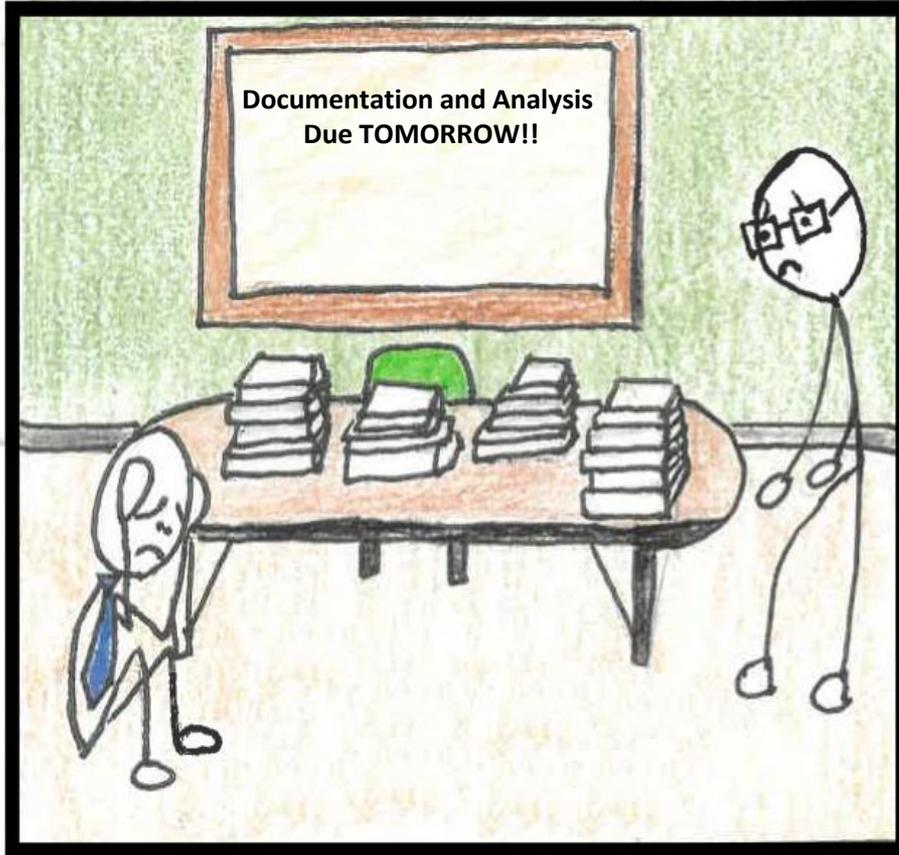


Meet RobotSTAF



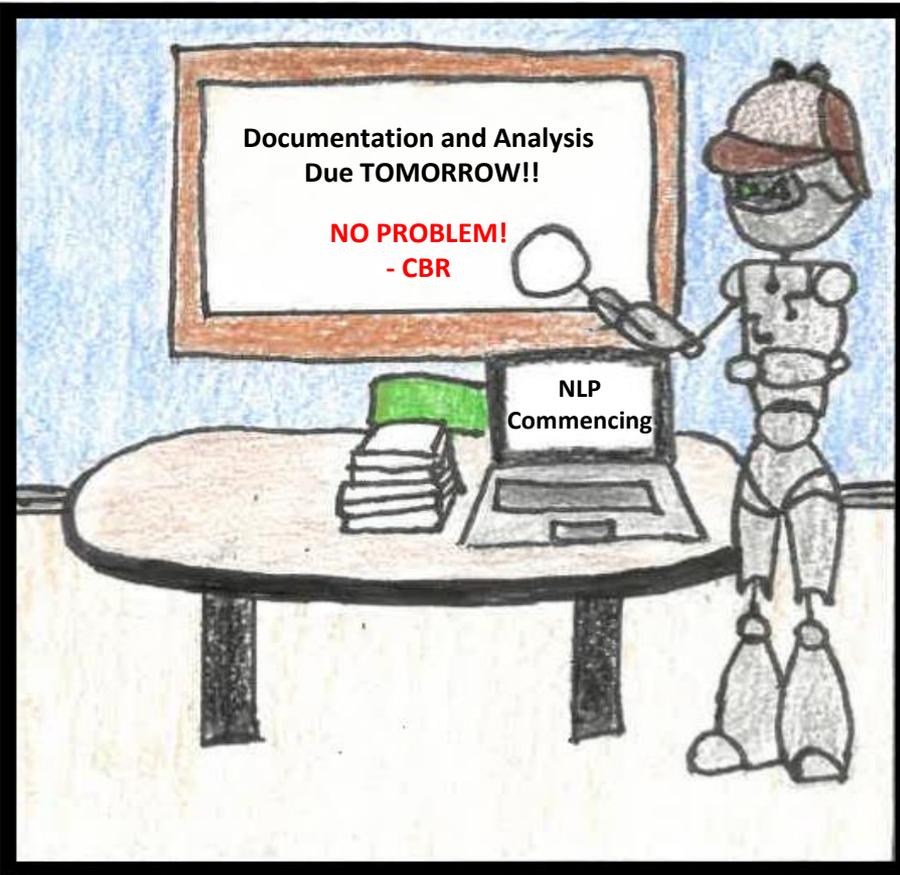


More Deadlines!



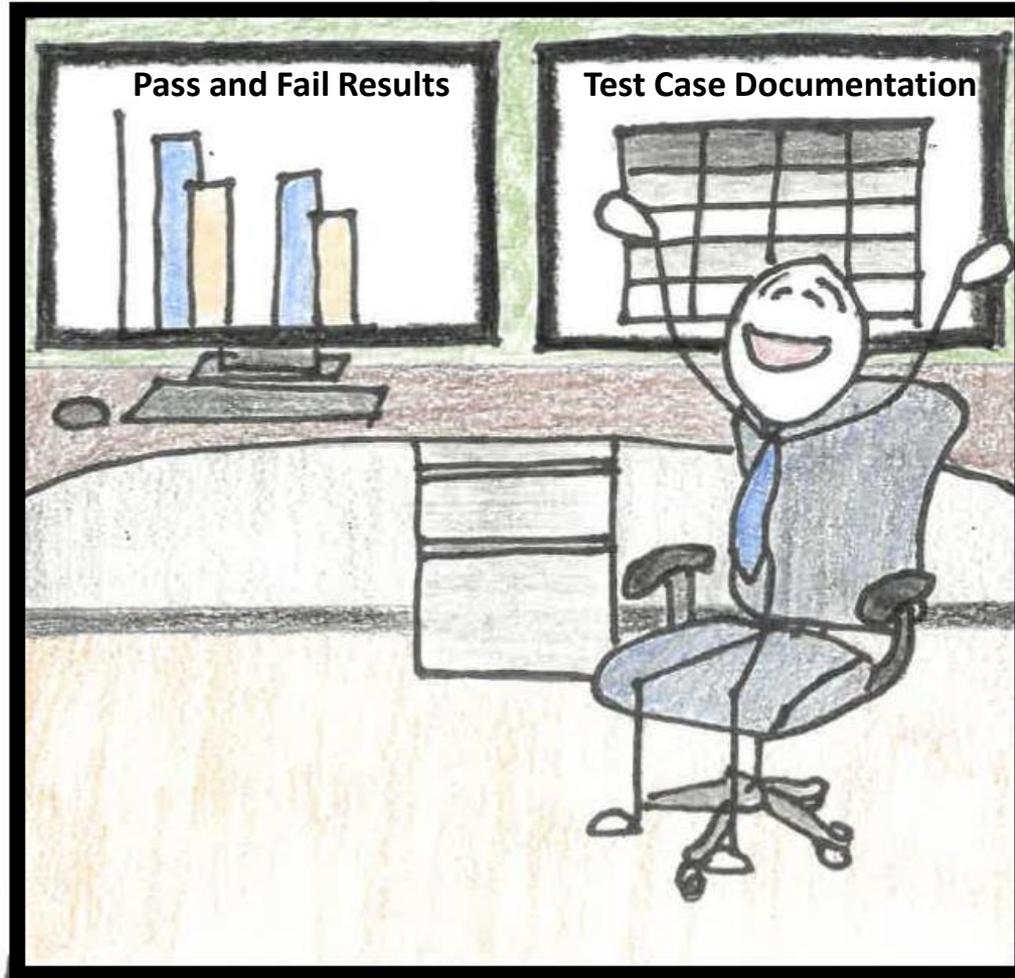


Detective CBR to the Rescue



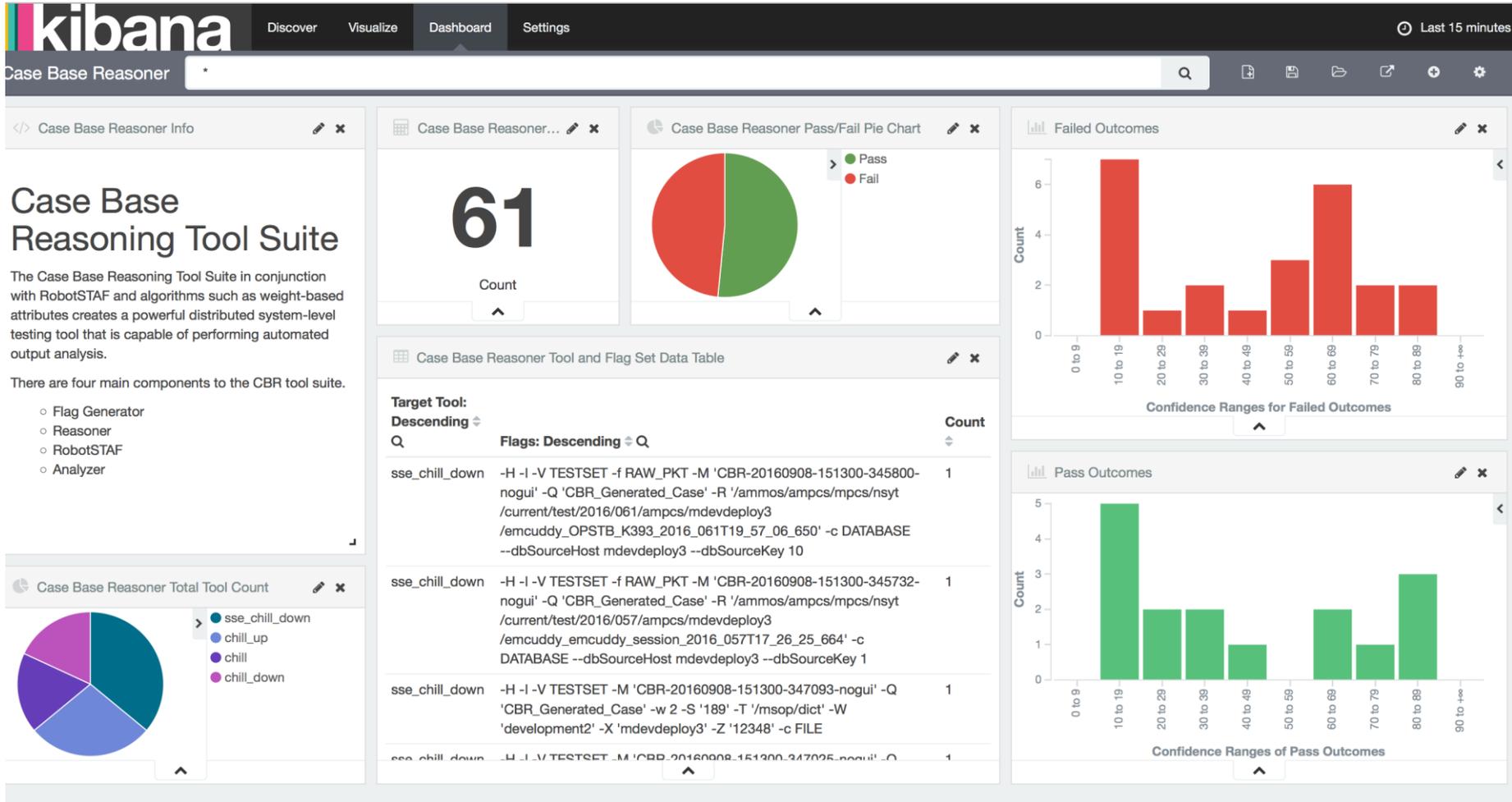


We Finished!





Kibana Dashboard





Test Case Generation and Selection Metrics

Run #	Commands in Case Library	Commands Reasoned	Time
1	0	50	.2267 sec
2	23	50	.3359 sec
3	49	50	.3620 sec
4	84	50	.4574 sec

'CBR-20171001-182256-580856-nogui'

```
{  
  chill_down --noGUI --venueType ATLO --testbedName ATLOC --inputFormat RAW_TF --sessionDssId '10' --downlinkConnectionType CLIENT_SOCKET  
  chill_monitor --venueType 'ATLO' --types 'BacklogSummary' --testbedName 'ATLOC' --sessionDssId '10'  
  chill_get_chanvals --orderBy 'Station' --outputFormat 'sr_csv' --channelTypes 'm' --channelIds 'MHLI-%,ACS-%,HGA-%,RSB-%',  
  chill_get_sessions --orderBy 'SseVersion' --outputFormat 'xml',  
  chill_get_packets --orderBy 'SCET' --outputFormat 'onelinesummary' --packetApid '257..556' --timeType 'LST',  
  chill_get_commands --orderBy 'EventTime' --outputFormat 'sr_csv' --timeType 'RCT' --commandStringPattern 'MRDI_NO_OP'  
}
```

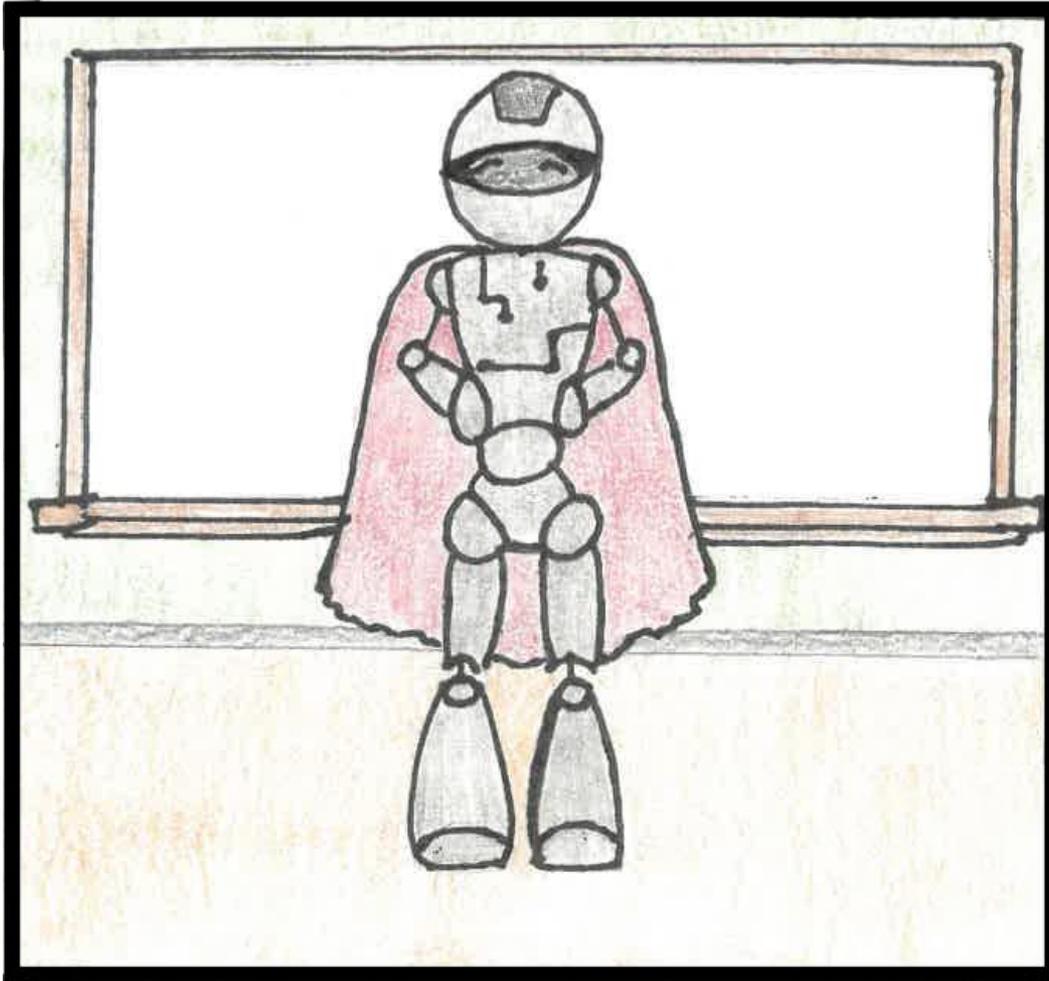


Benefits of the CBR Tool Suite

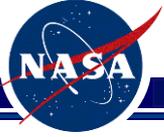
- **Adaptable:** Can be reused to test many different systems
- **Range:** Increases accuracy of testing and results in **greater test coverage.**
- **Regression Testing:** Test results can be reproduced to ensure software stability.
- **Fewer Resources:** **Less time** spent on running tests and less resources used to conduct the tests.



The End



Any Questions?



Backup



What is Artificial Intelligence?

Artificial Intelligence (AI): General Term

Relies on rules provided by domain experts to solve problems, such as medical diagnoses, by asking a series of questions.

Machine Learning: Beyond AI

The computer extracts knowledge through **supervised experience**.

Typically involves a human operator helping the machine learn by giving it hundreds or thousands of training examples, and correcting its mistakes.

Deep Learning: Machine Learning Technique

Deep learning is **unsupervised**. It involves creating large-scale neural nets that allow the computer to learn and “think” by itself without the need for direct human intervention.



Priority Based Algorithm

Algorithm

- Calculates an average impact value for each flag set
- Each flag in the AMPCS subsystem is assigned a weight value ranging from 1-5
- Algorithm is used to eliminate flag sets that do not contain significant values
- Threshold value is configured by the user

Flag	Weight
fswDictionaryDir	5
spacecraftID	3.5
sseDictionaryDir	5
sseDownlinkPort	2
testHostPattern	1
vcid	3
venueType	4



Analyzer

Parses files to **identify key words or phrases** that led to the final pass or fail outcome.

Naïve Bayes Algorithm

- A Naive Bayes Classifier predicts a class value for a given a set of attributes.
- Use Bayes rule to derive conditional probabilities for the class variable

Classification

- Task of choosing the correct class label for a given input.

Negative Class

- Java, AMPCS, and MySQL Error Messages
- Negative Statements
- Generic Negative Words

Positive Class

- Java, MySQL, and AMPCS Success Messages
- Positive Statements
- Generic Positive Words