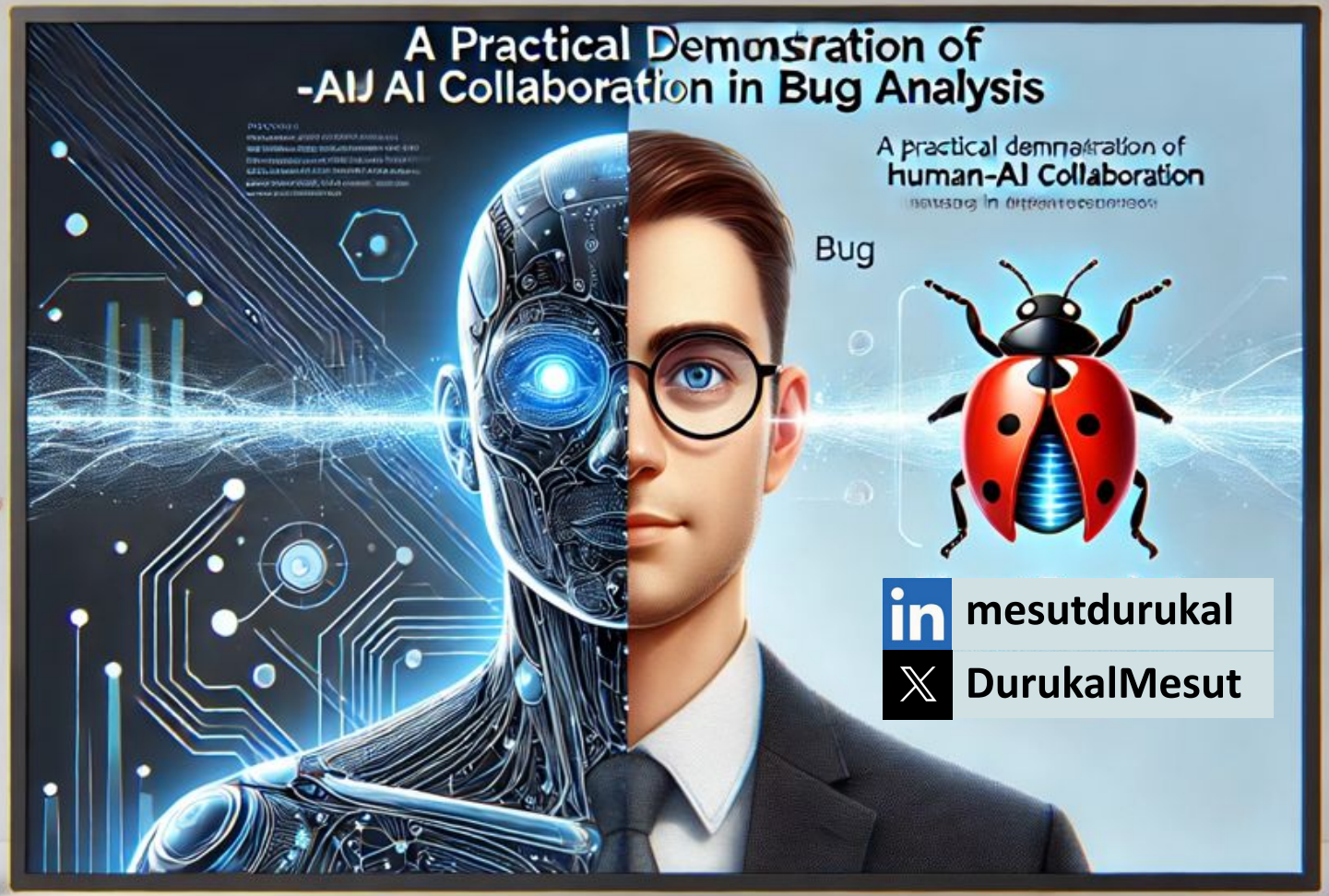
Mesut Durukal



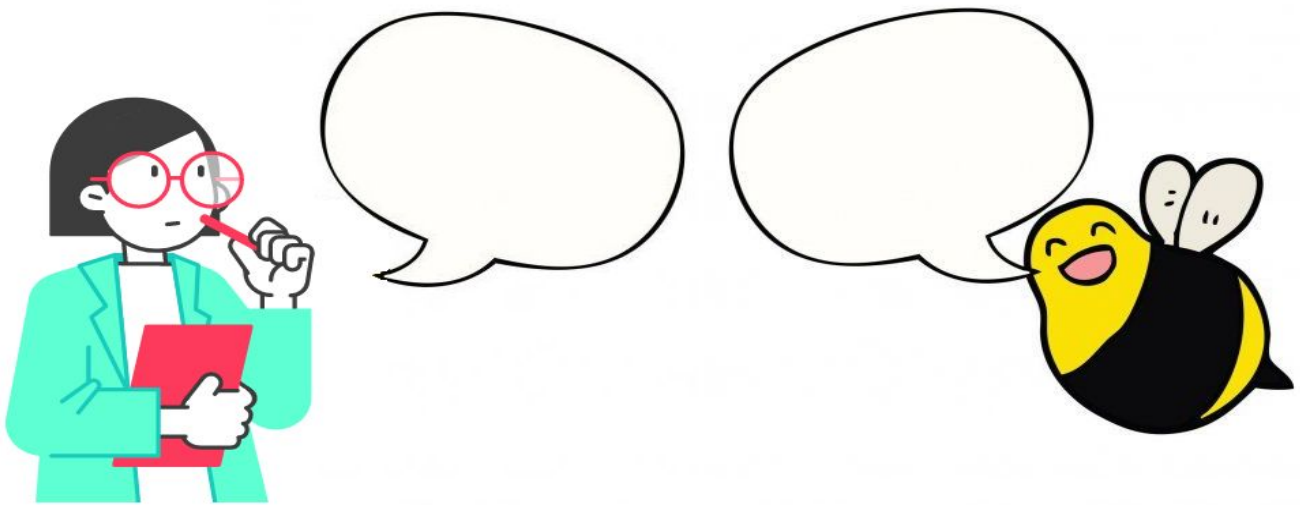
Improve Quality

Provide Insights

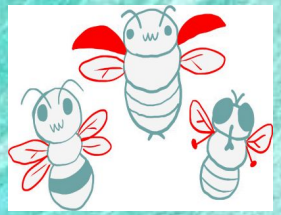
Bugs

Are they talking to us?

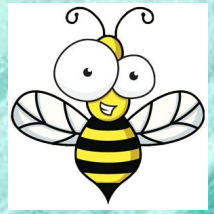
Always..



Some Stories



Best friends band



The sweet escape

Story of an old lady

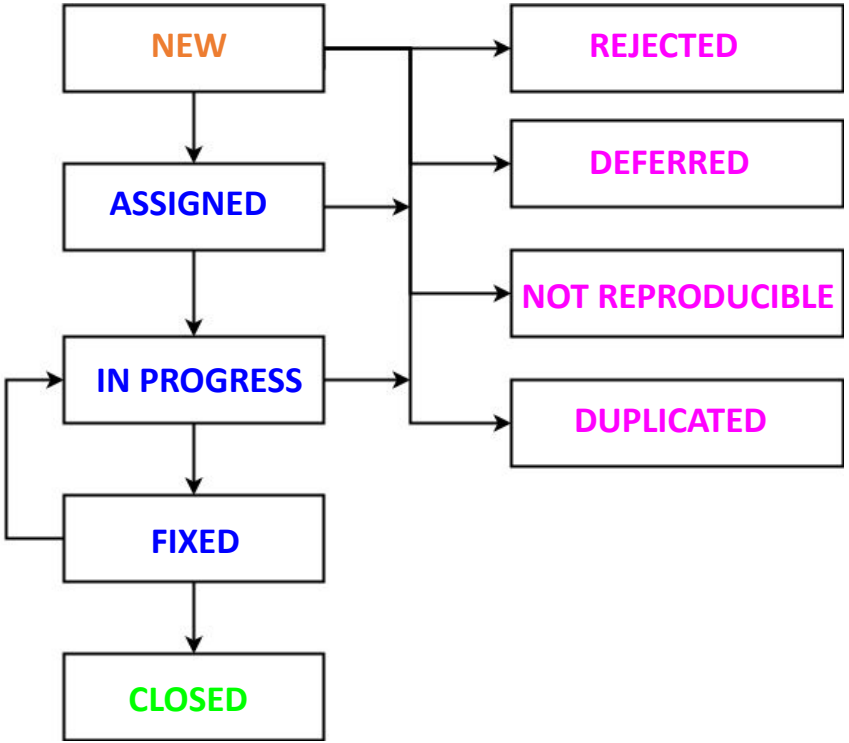
Did not know the gate change?

Miss the flight :(

- They don't have enough screens / loudspeakers
  - Did not see / hear
  - Visibility / Transparency
  - *Environment/Tooling problem*
- Announcement in only one language
  - Did not understand
  - Data transformation
  - *Bad formatting / protocol*
- Announcement too noisy
  - Could not pick
  - Noise reduction
  - *Data not clean*

Management of Bugs

Lifecycle



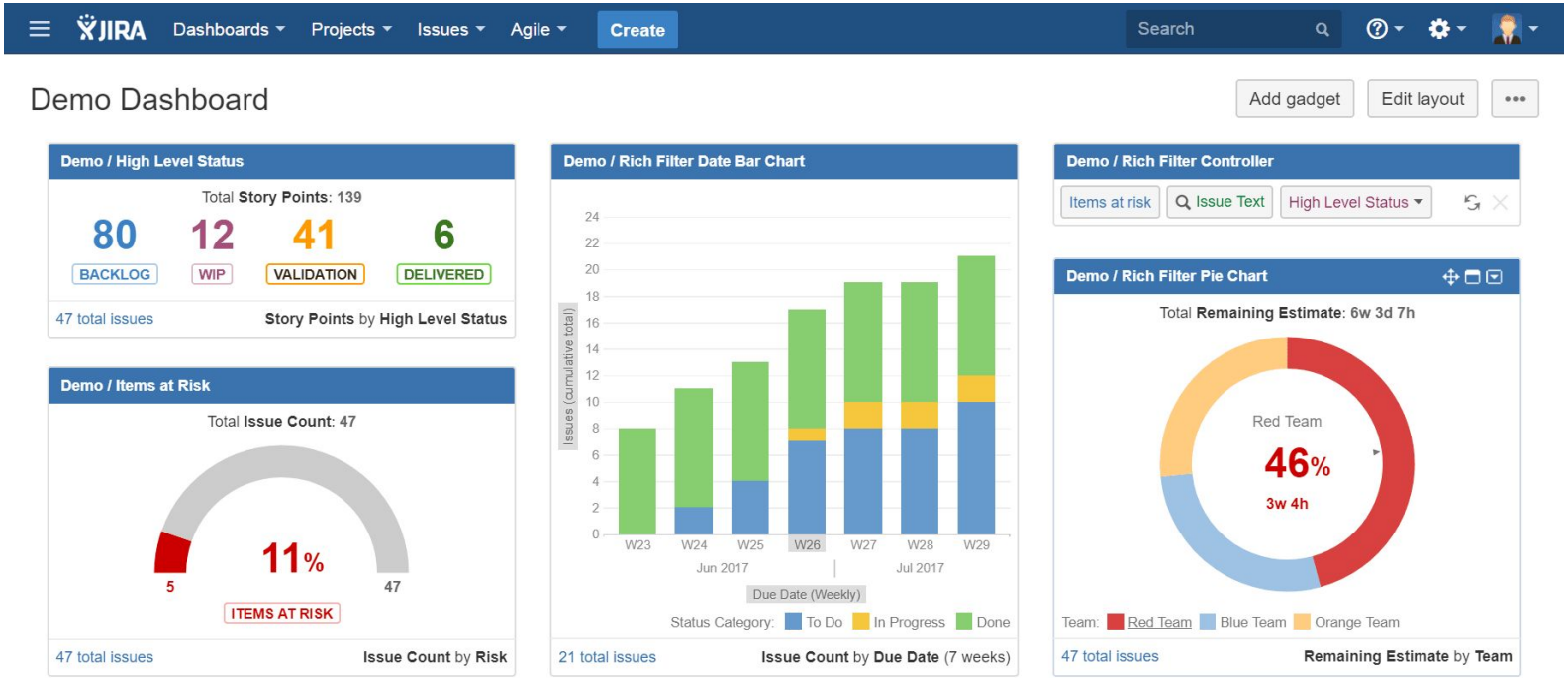
Automated Monitoring

```
public HashMap<String, Long> measureDefectResolutionDurationPerArea() {
    String jql = "type = Bug AND status in (Validated) AND creator in " + reporterList + " and area = ";

    ArrayList<String> suiteList = getSuiteList();
    HashMap<String, Long> defectResolutionDurations = new HashMap<String, Long>();

    for (String suite : suiteList) {
        Promise<SearchResult> searchJqlPromise = jiraRestClient.getSearchClient().searchJql(jql + suite, 1000, 0,
                null);
        SearchResult claim = searchJqlPromise.claim();
        int totalNumberOfBugsPerSuite = claim.getTotal();

        long totalResolutionDurationInHoursPerArea = 0;
        long avgResolutionDuration = 0;
        if (totalNumberOfBugsPerSuite != 0) {
            for (Issue issue : claim.getIssues()) {
                DateTime creationDate = issue.getCreationDate();
                LocalDateTime creationDateInLocalDateTime = LocalDateTime
                        .parse(creationDate.toString().substring(0, 23), DATETIMEFORMATTER);
                long creationDateInSeconds = creationDateInLocalDateTime.toEpochSecond(ZoneOffset.UTC);

                String resolutionDateInString = (String) issue.getFieldByName("Resolved").getValue();
                LocalDateTime resolutionDateInLocalDateTime = LocalDateTime
                        .parse(resolutionDateInString.substring(0, 23), DATETIMEFORMATTER);
                long resolutionDateInSeconds = resolutionDateInLocalDateTime.toEpochSecond(ZoneOffset.UTC);

                long diffInSeconds = resolutionDateInSeconds - creationDateInSeconds;
                long diffInHours = diffInSeconds / 3600;

                totalResolutionDurationInHoursPerArea = totalResolutionDurationInHoursPerArea + diffInHours;
            }
```

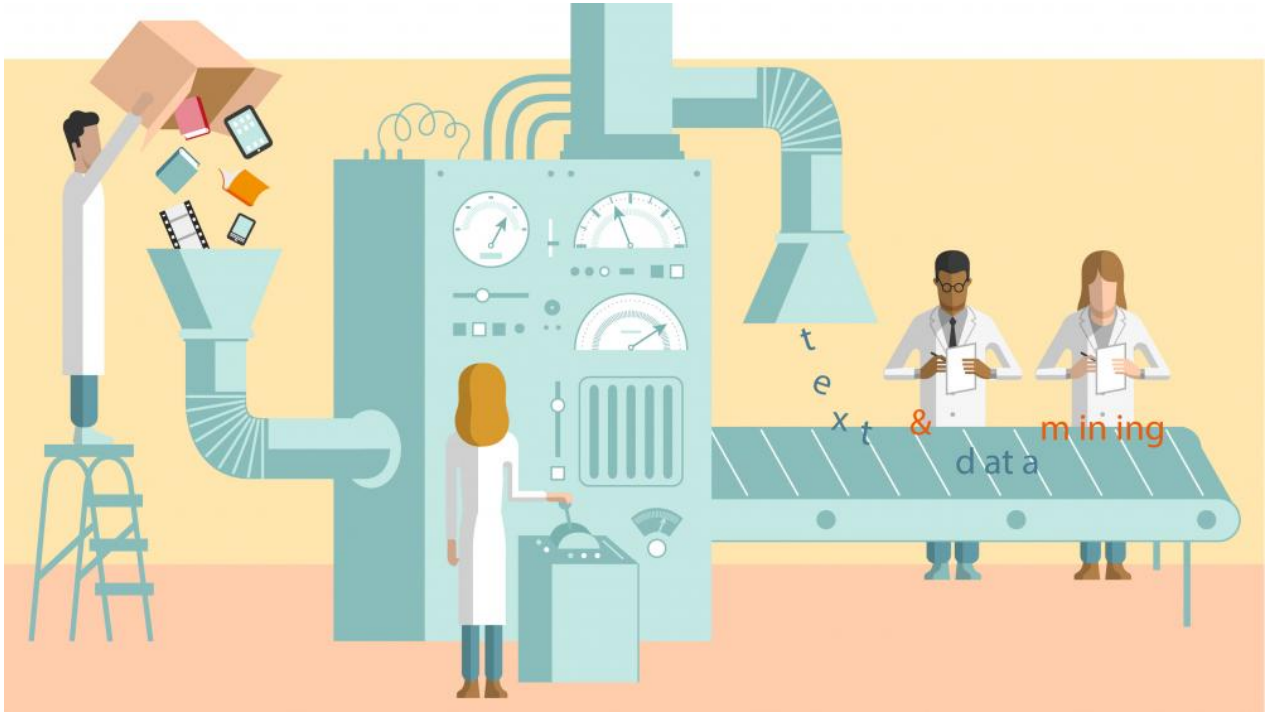
"totalNumberOfBugsPerSuite"= 94

94

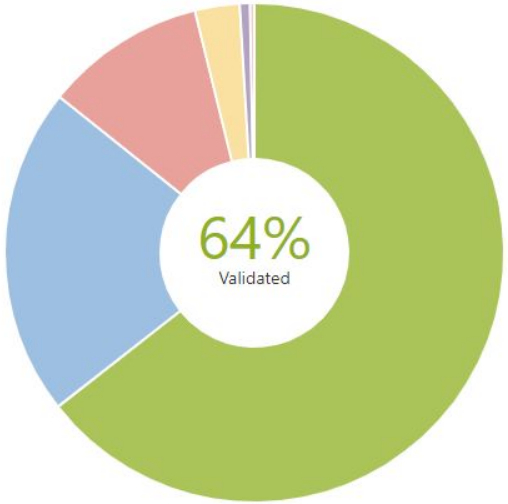
Use Dashboards
for Monitoring



Information Underlying Bugs

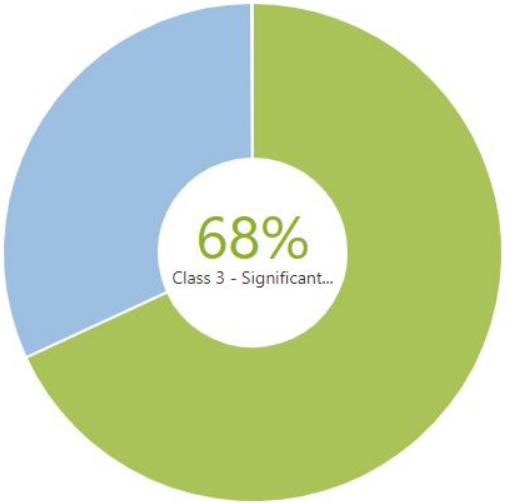


Bugs
by Status and Severity



Status
Total Issues: **18437**

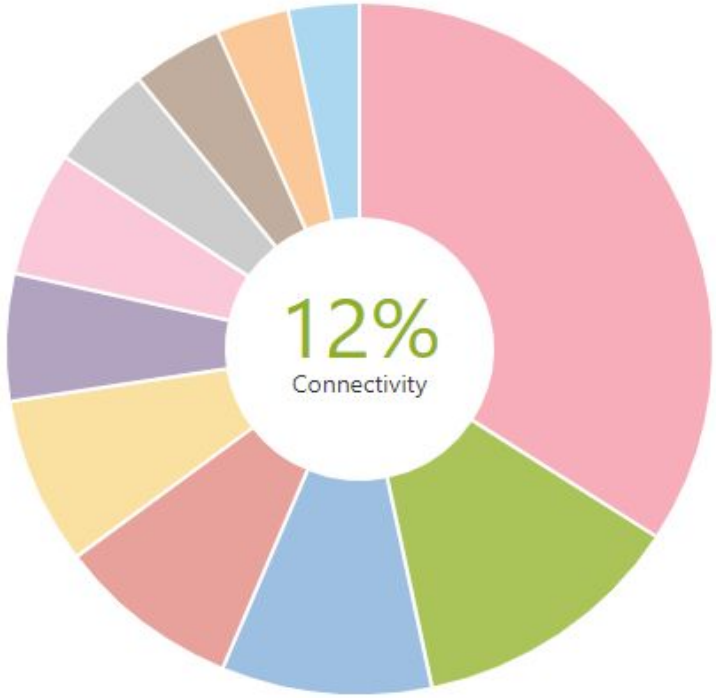
Validated	11877	Open	534
CANCELLED	3933	In Progress	122
Done	1921	To Do	50



Severity Class
Total Issues: **1329**

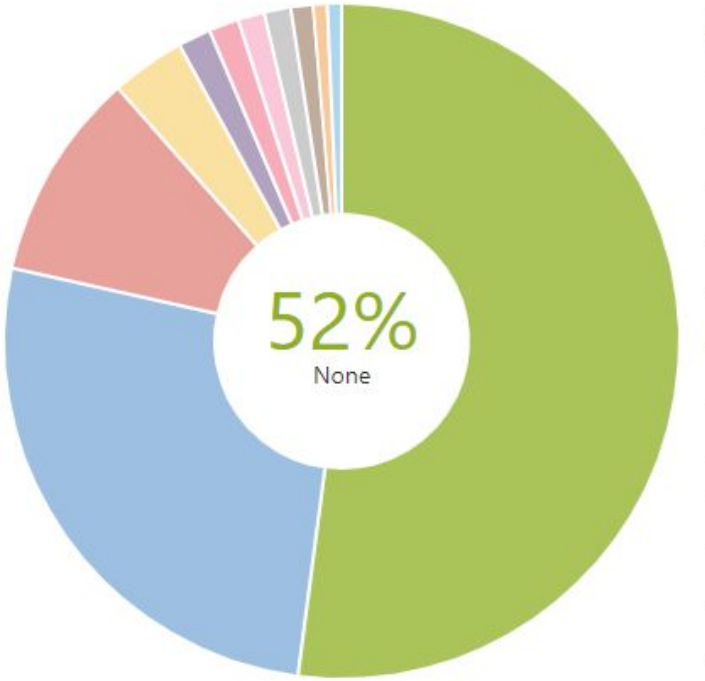
Class 3 - Significant functional limitati...	905
Class 2 - Critical function defect	423
Class 1 - Defect relevant for service and ...	1

Bugs
per Service



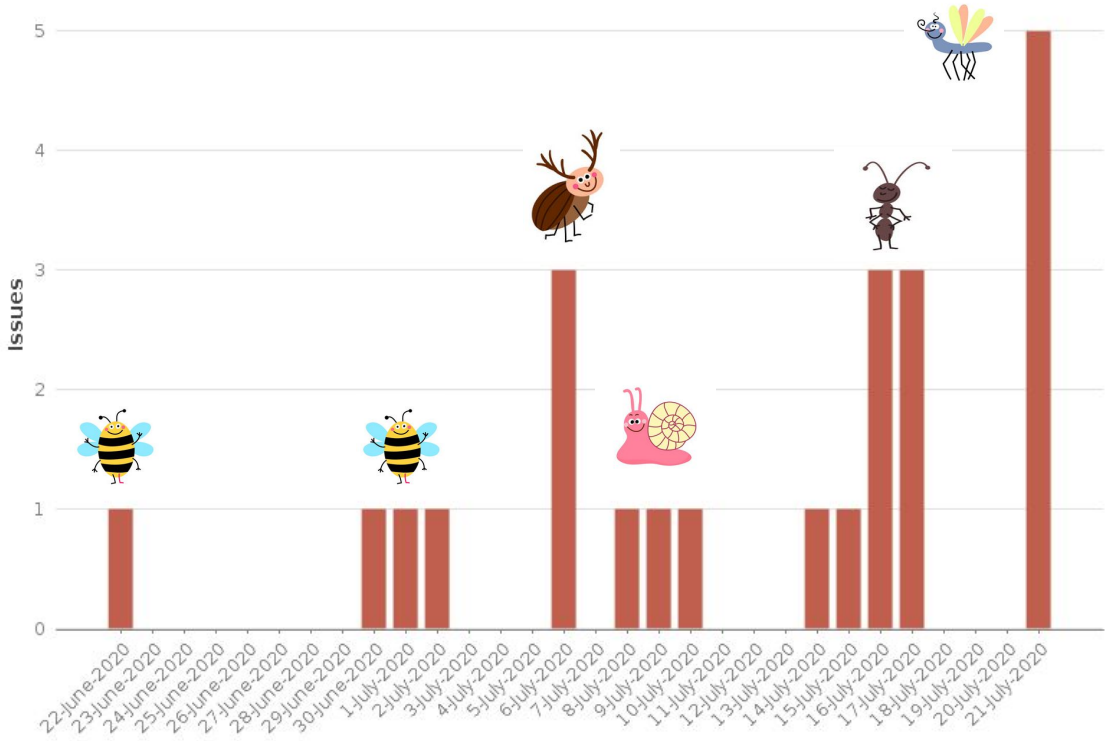
Connectivity	327
Core	250
IoT	219
Operator	203
Starter	154
Developer	152
Edge	127
Ops	108
Onboarding	87
Analytics	84

Bugs
per Type

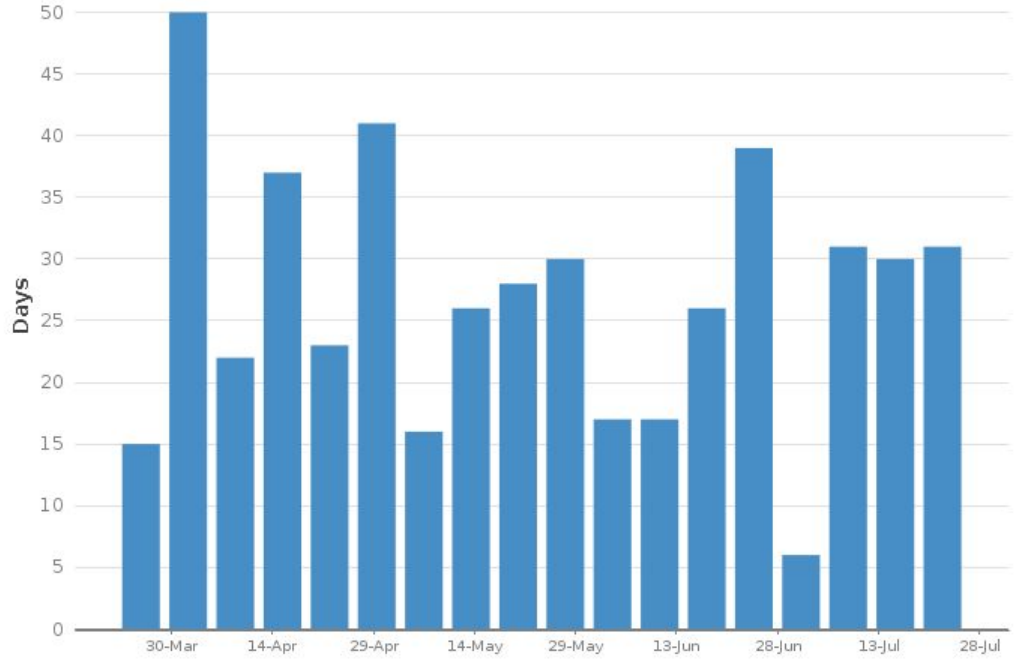


None	692
Functionality	351
Reliability	133
Documentation	47
Usability	21
Integrity	17
Performance	17
Maintenance	14
Requirements	9
Security	9

Bugs
detection progress

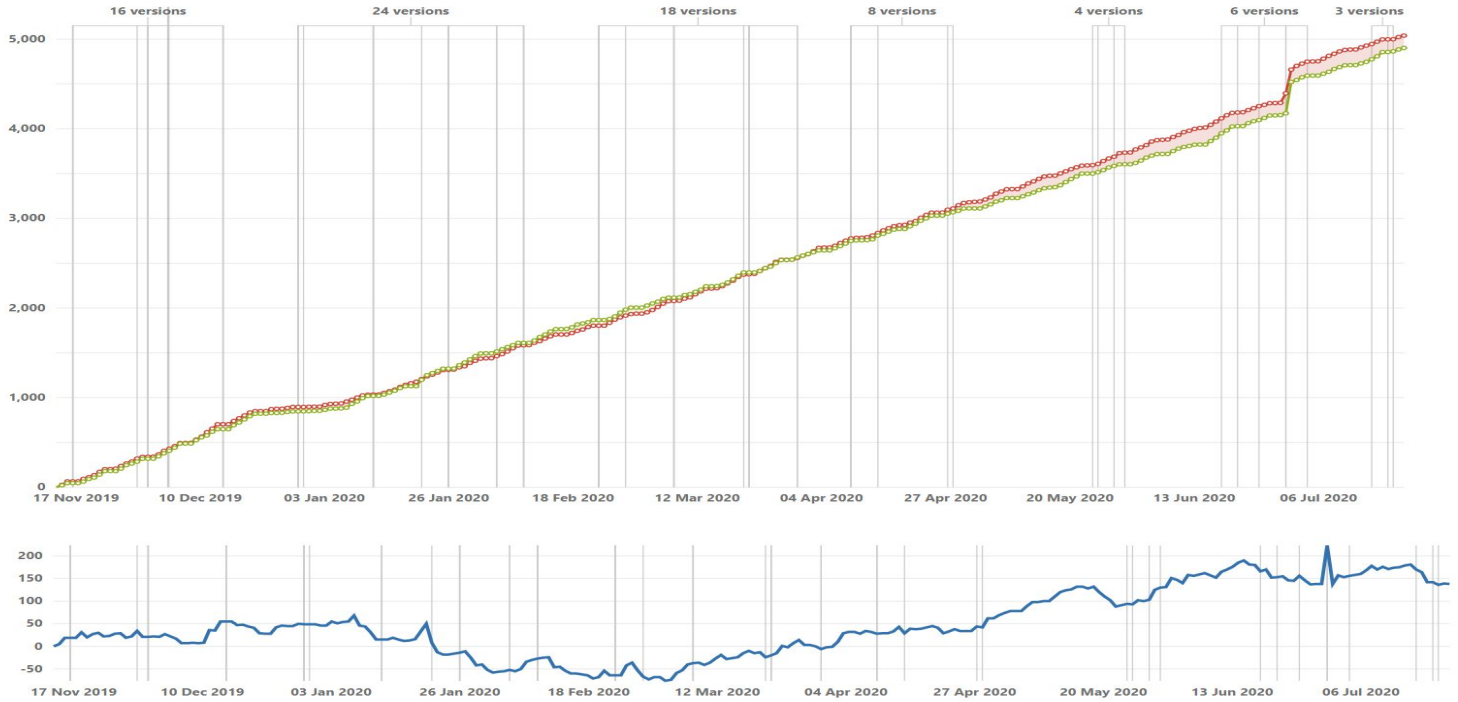


Bugs
by Resolution Duration



Bugs

Created vs Resolved



Bugs: OPEN

Clustered by Severity Class & by Age

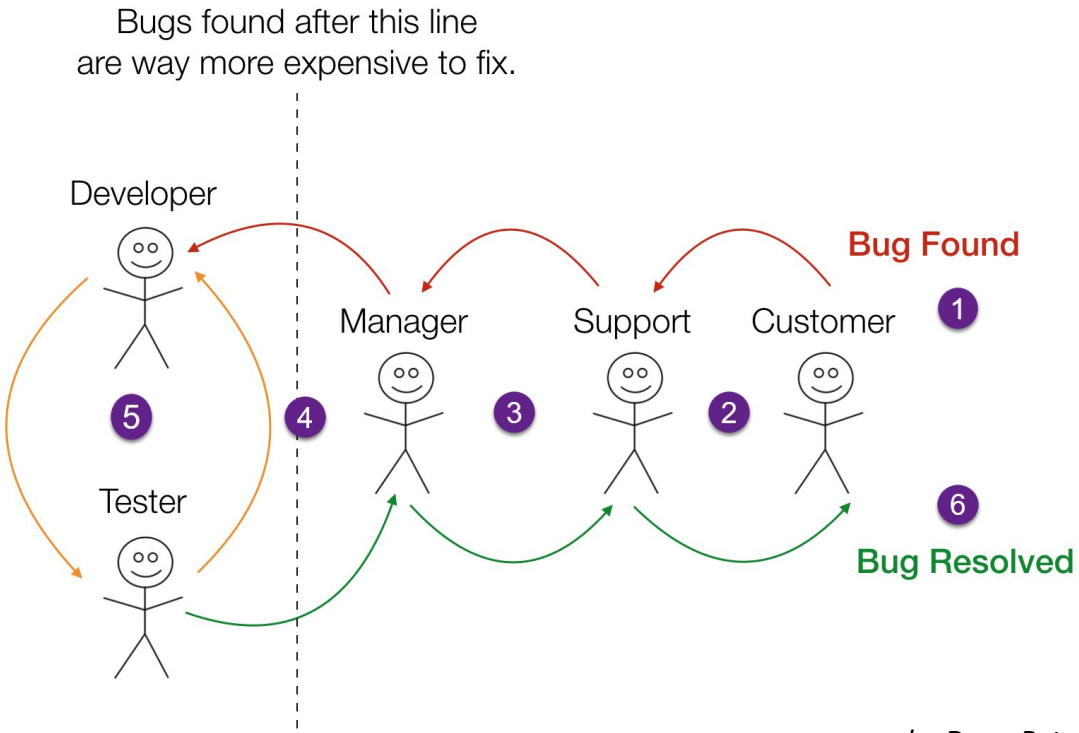
Severity Class	0-30 Days	31-60 days	>60 Days	Total ages
1	0 issues	0 issues	1 issue	1 issue
2	19 issues	2 issues	23 issues	44 issues
3	105 issues	47 issues	204 issues	356 issues
4	46 issues	24 issues	164 issues	234 issues
5 → 7	21 issues	4 issues	49 issues	74 issues
[EMPTY}				0 issues
Total	191 issues	77 issues	441 issues	709 issues

Bugs: RESOLVED but Not Validated

Clustered by Severity Class & by Age

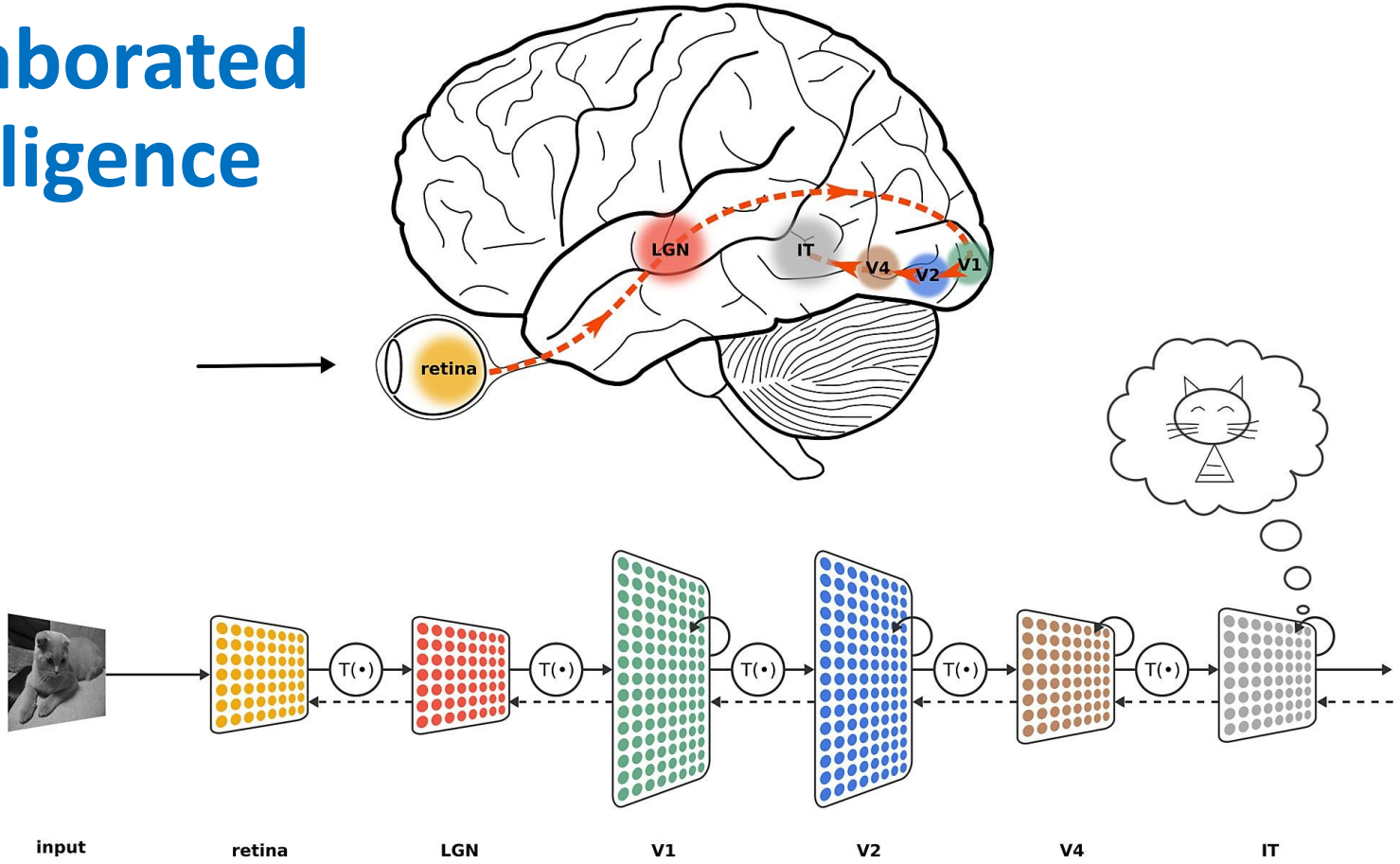
Severity Class	0-30 Days	31-60 days	>60 Days	Total ages
1	0 issues	0 issues	2 issues	2 issues
2	17 issues	10 issues	297 issues	324 issues
3	78 issues	39 issues	671 issues	788 issues
4	37 issues	33 issues	671 issues	571 issues
5 → 7	1 issue	2 issues	203 issues	206 issues
[Empty]	0 issues	0 issues	26 issues	26 issues
Total	133 issues	84 issues	1700 issues	1917 issues

Escaped Bugs



by Dean Peters

Collaborated Intelligence



Kubilius, Jonas (2017): Ventral visual stream. figshare. Figure. https://doi.org/10.6084/m9.figshare.106794.v3

Bug Severity Estimation

- 889 open bugs
- 4: Severity levels

  (1 never used)

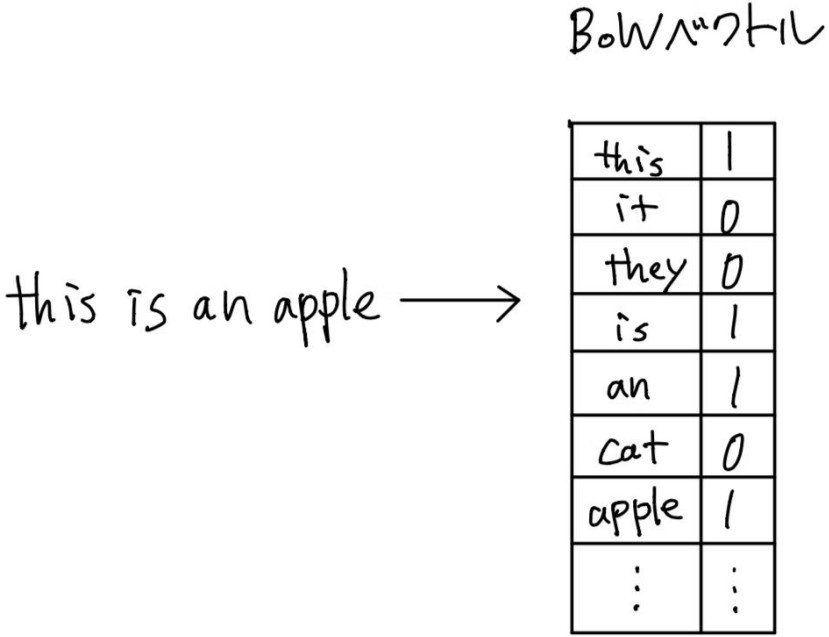
Preprocessing

- **Text**: This is a cat. --> **Word Sequence:** [this, is, a, cat]
  - remove punctuation
  - make each word lowercase

- This is not a sentence.<\div> --> [this, is, not, a, sentence]
  - Evaluate your own case & relevant steps

Feature Extraction

BOW (Bag of Words)



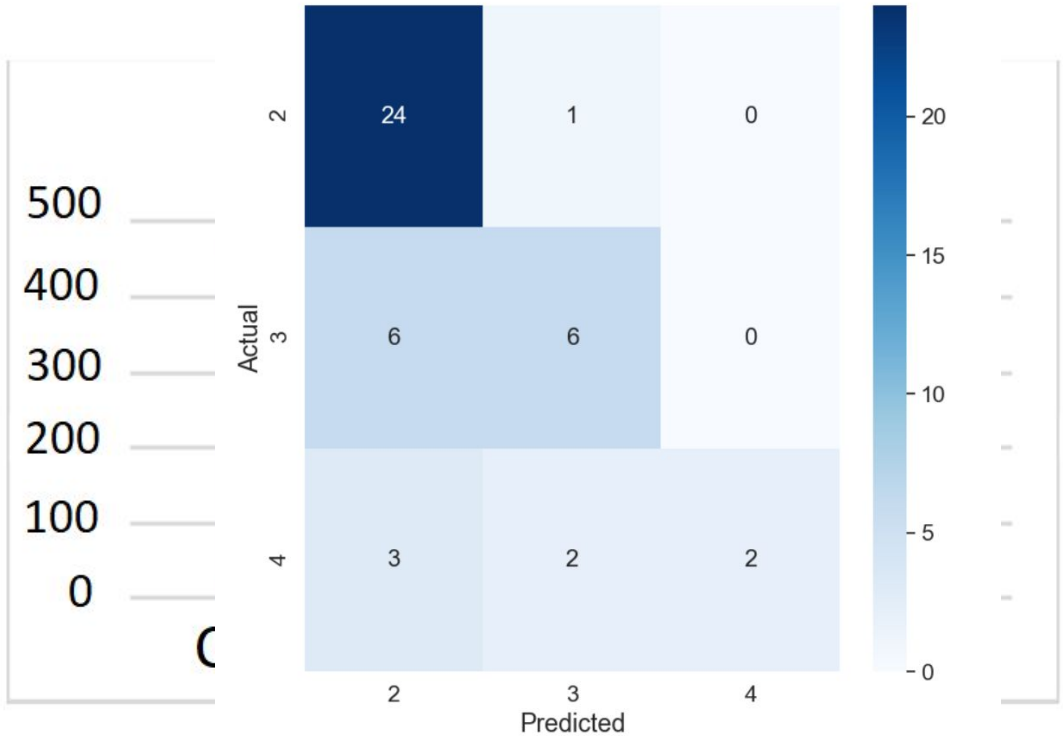
Classification

- KNN
- Naive Bayes
- K Means Clustering
- Decision Tree
- LogisticRegression
- RandomForest
- SVM
- Voting Classifier

```python
import numpy as numpy
import sklearn.svm
import sklearn.metrics


def TRAIN(data_set, c):
    model = sklearn.svm.LinearSVC(C=c, max_iter=100000)
    model.fit(data_set[0][0], data_set[1][0])
    return model


def PREDICT(model, data_to_be_predicted):
    return model.predict(data_to_be_predicted)


def search_for_best_c_parameter(data_set, start_point, step_size, endpoint):
    search_for_best_c = list()
    label_predictions = list()
    c_distribution_error_list = []
    current_c = start_point

    while current_c < endpoint:
        label_prediction = TRAIN(data_set)
        label_predictions.append(label_prediction)
        acc = sklearn.metrics.accuracy_score(data_set[1][1], label_prediction)
        search_for_best_c.append(acc)
        c_distribution_error_list.append(numpy.mean(label_prediction != data_set[1][1]))
        current_c = current_c + step_size

    max_accuracy = max(search_for_best_c)
    index_max_accuracy = search_for_best_c.index(max_accuracy)
    best_c = start_point + step_size * index_max_accuracy

    return best_c
```

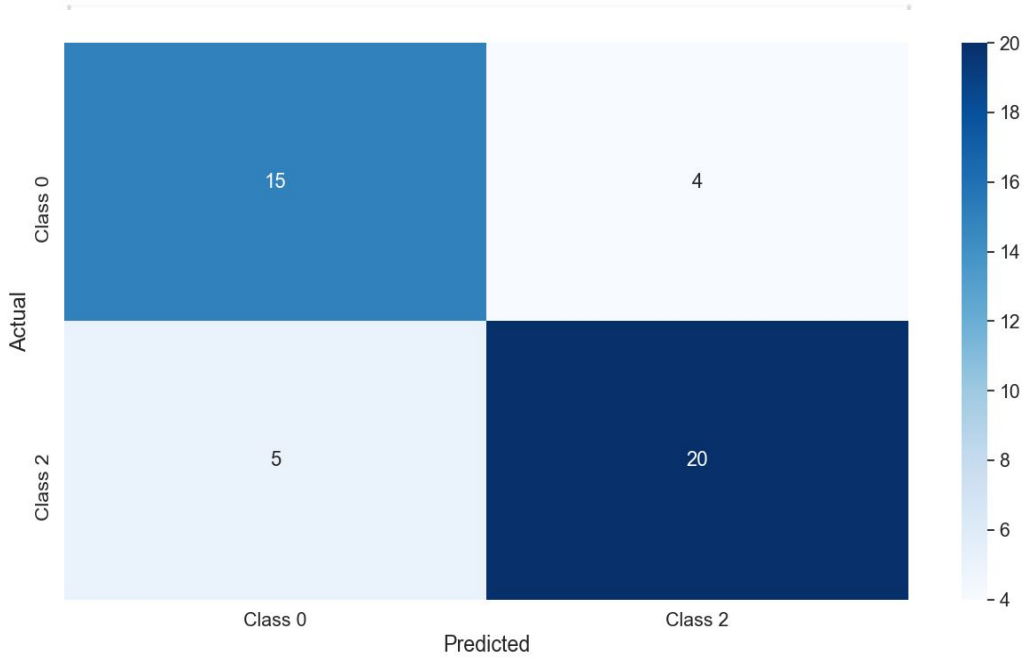
Bug Severity Estimation

73%



Bug Severity Estimation

82%



Clustering

Cluster 0
- error message
- returns 504
- wrong error
- gateway error
- create agent
- ms gateway
- service returns
- event management
- visual explorer
- different queries

Cluster 1
- internal server
- server error
- 500 internal
- returns 500
- management returns
- endpoint returns
- responded 500
- service responds
- event returns
- asset management

Cluster 2
- timeseries
- fleet manager
- yaml
- wrong data
- stream deployment
- time series data
- returns 400
- bad request
- response code
- information yaml

Summary

- Talk to bugs
- Prepare the best environment
- Learn lessons
  - Types
  - Components
  - Status
  - Escaped Bugs
- Use ML
  - Clustering
  - Association (reporter vs resolution duration)
  - Classification (bug triage)

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