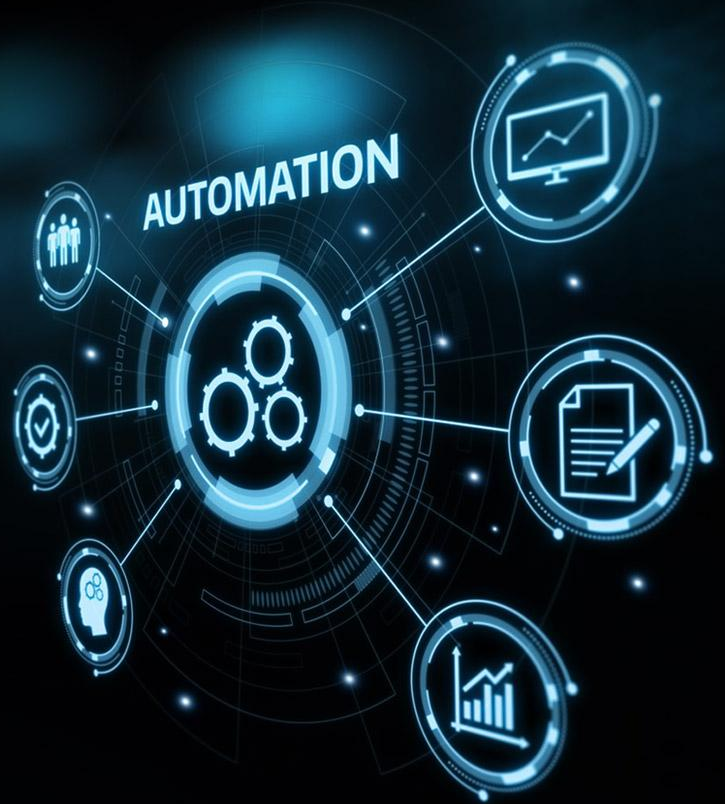




Advanced Automated Visual Regression Testing

— Shweta Sharma




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 [@shwetaneelsharma](https://github.com/shwetaneelsharma)

 @shweta_ns

Shweta Sharma

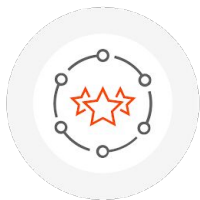
Director of QA Services
India, Pune



Axelerant from above



Fully-distributed, 6 Time Zones



10 Years Of Growth



110+ Enthusiastic, Kind,
Open Professionals



150+ Partner Engagements



1,000+ Open Source
Contributions

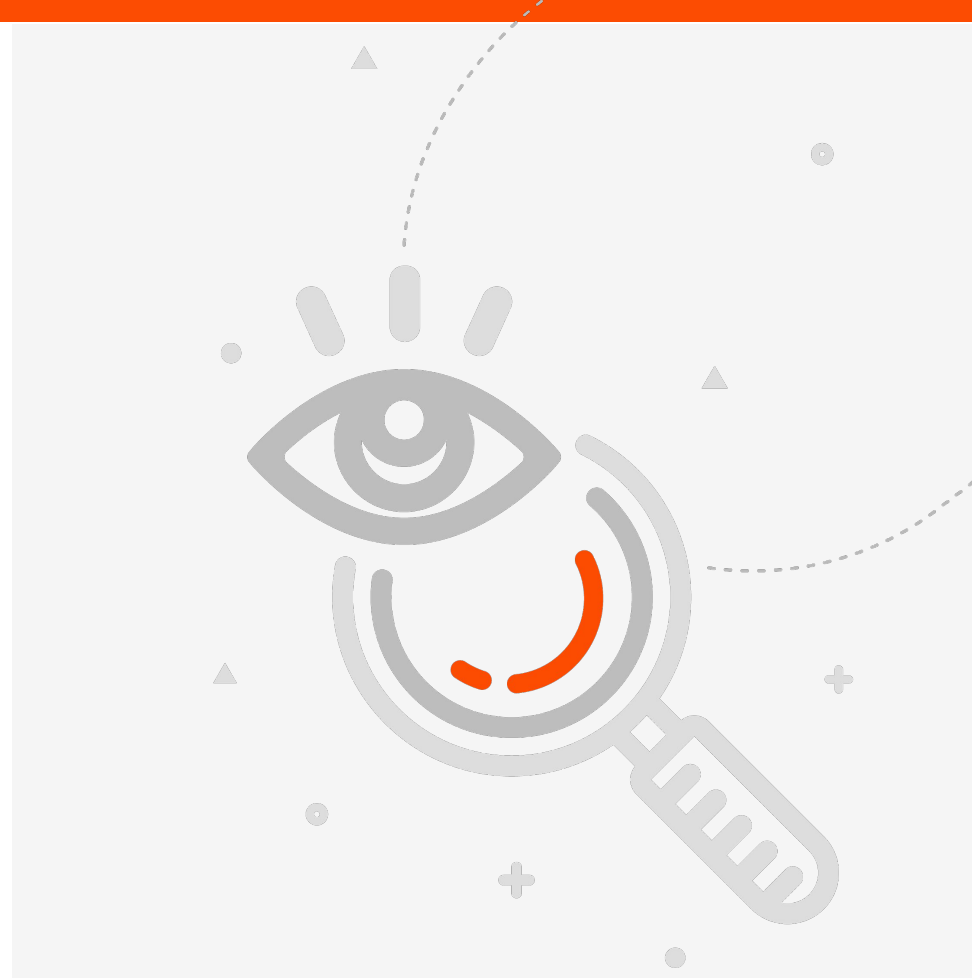
Agenda

- | | | | |
|-----------|------------------------------------|-----------|---|
| 01 | What is Automated Visual testing? | 07 | Automated visual tests in the Continuous Integration Pipeline |
| 02 | Why do we need it? | 08 | Key results achieved |
| 03 | How does it work? | 09 | The biggest limitation and resolution |
| 04 | Primary Challenges and Resolutions | 10 | When to use what? |
| 05 | Testing Strategy | 11 | Facts |
| 06 | Good Practices | 12 | Where to go from here? |

What is Automated Visual testing?

Validate the following:

- Visual content
- Page layout
- Responsive design of Web App



Why do we need it?



**Human
Factor**



**Larger device/OS
matrix and
release cycles**

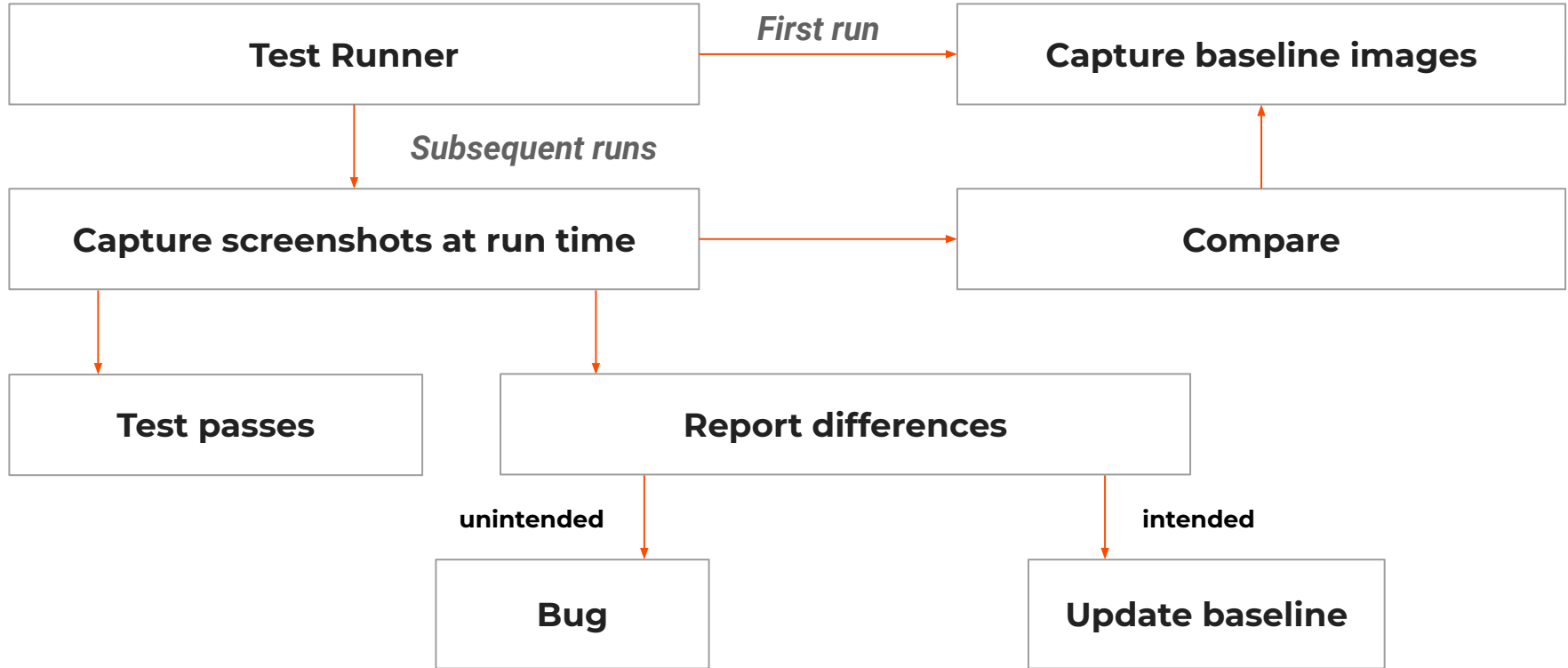


**Insufficient
automated
functional suite**



**Invest time
to verify new
features**

How does it work?



Site for demo

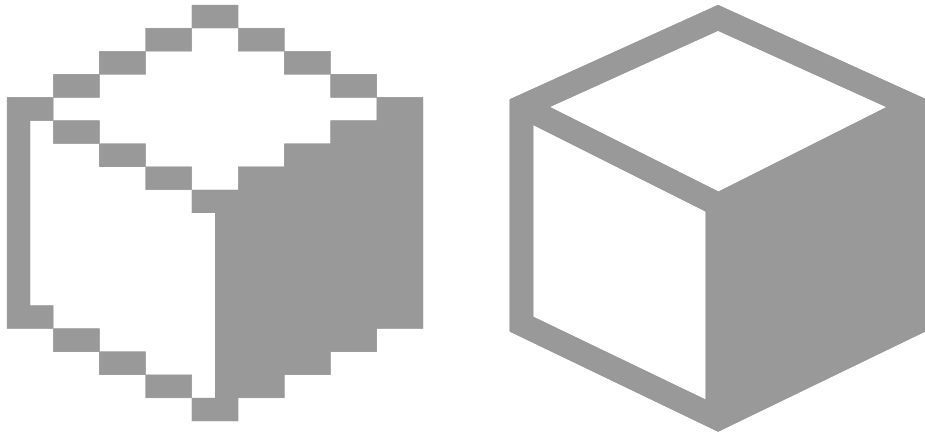
The screenshot shows a web browser displaying a demo site for 'Urban Hipster'. The browser's address bar shows 'commerce.acromedia.com'. The site's header includes the 'URBAN HIPSTER' logo with the tagline 'Chiché Since Before It Was Cool'. Navigation links for 'WOMEN', 'MEN', 'APOTHECARY', 'URBAN LIVING', 'AUDIO & FILM', and 'PRINT SHOP' are visible. A top navigation bar contains 'DRUPAL COMMERCE Demo by Acro Media | view details >', 'Customer Service', 'About Us', and 'Blog'. Utility links include 'Contact Us', 'Live Chat', 'Cart' (showing 0 items), and 'Log In'. A phone number '1.877.763.8844' and a 'Site Search...' field are also present. The main content area features a large hero image of hands typing on a laptop keyboard, with the text 'Drupal Commerce LIVE DEMO' overlaid. A button labeled 'ABOUT THIS SITE' is centered below the text. A 'FLASH SALE 20% Off Everything in your Cart!' banner with a 'Shop Now >' button is positioned below the hero image. The footer contains a row of three small product images.

BackstopJS Demo



Primary challenges

Anti Aliasing



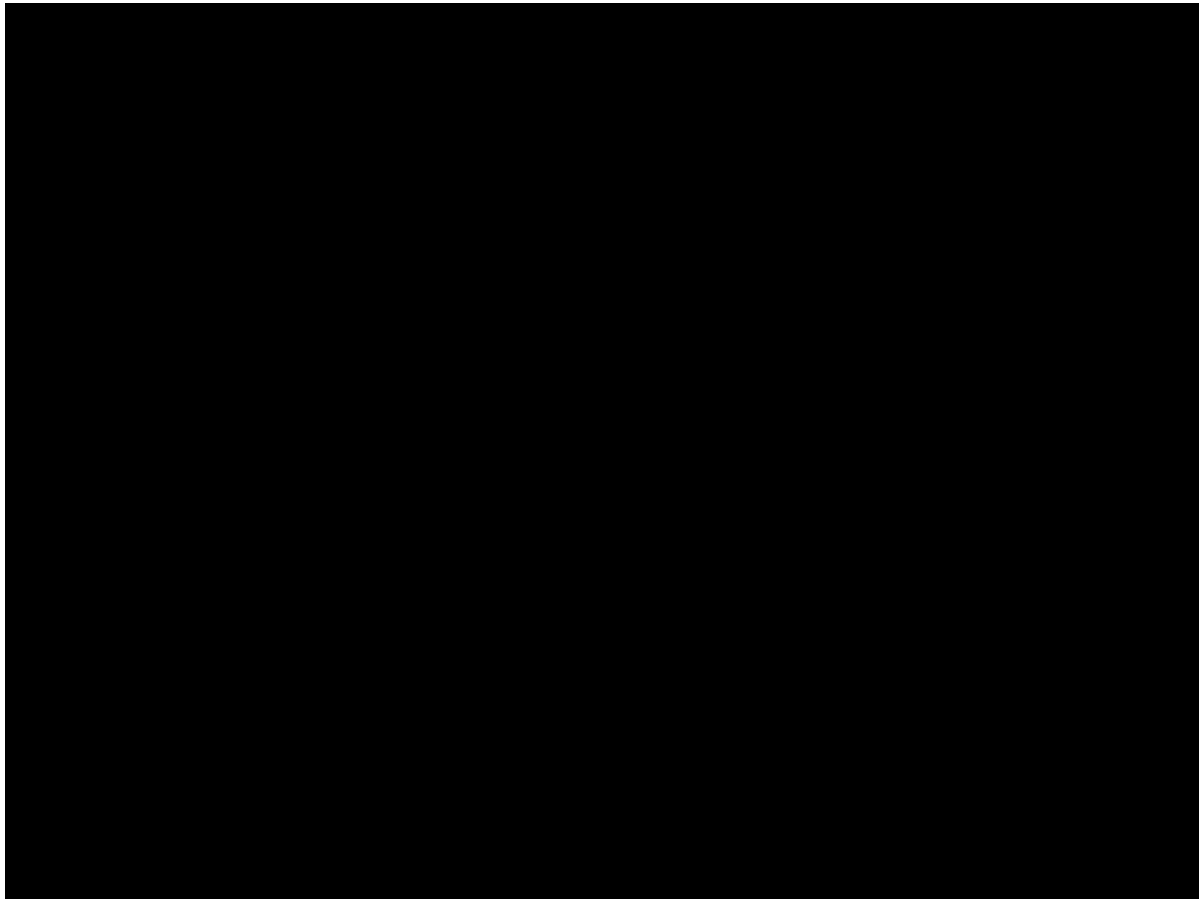
Dynamic Content



Resolution for anti aliasing

- Use of Docker
 - Environment is the same every time
- Run visual tests on cloud
 - BrowserStack
 - SauceLabs
 - AWS Device Farms
 - Cross Browser testing
- Select a tool which handles it implicitly

Demo Dynamic Content Using BackstopJS



Resolution for dynamic content

Hide

- Hide all elements queried by BackstopJS/WebdriverIO selector strategies
- Element's space is filled and considered in the layout of the screenshot captured
- Good candidates - Ad blocks, Images that change

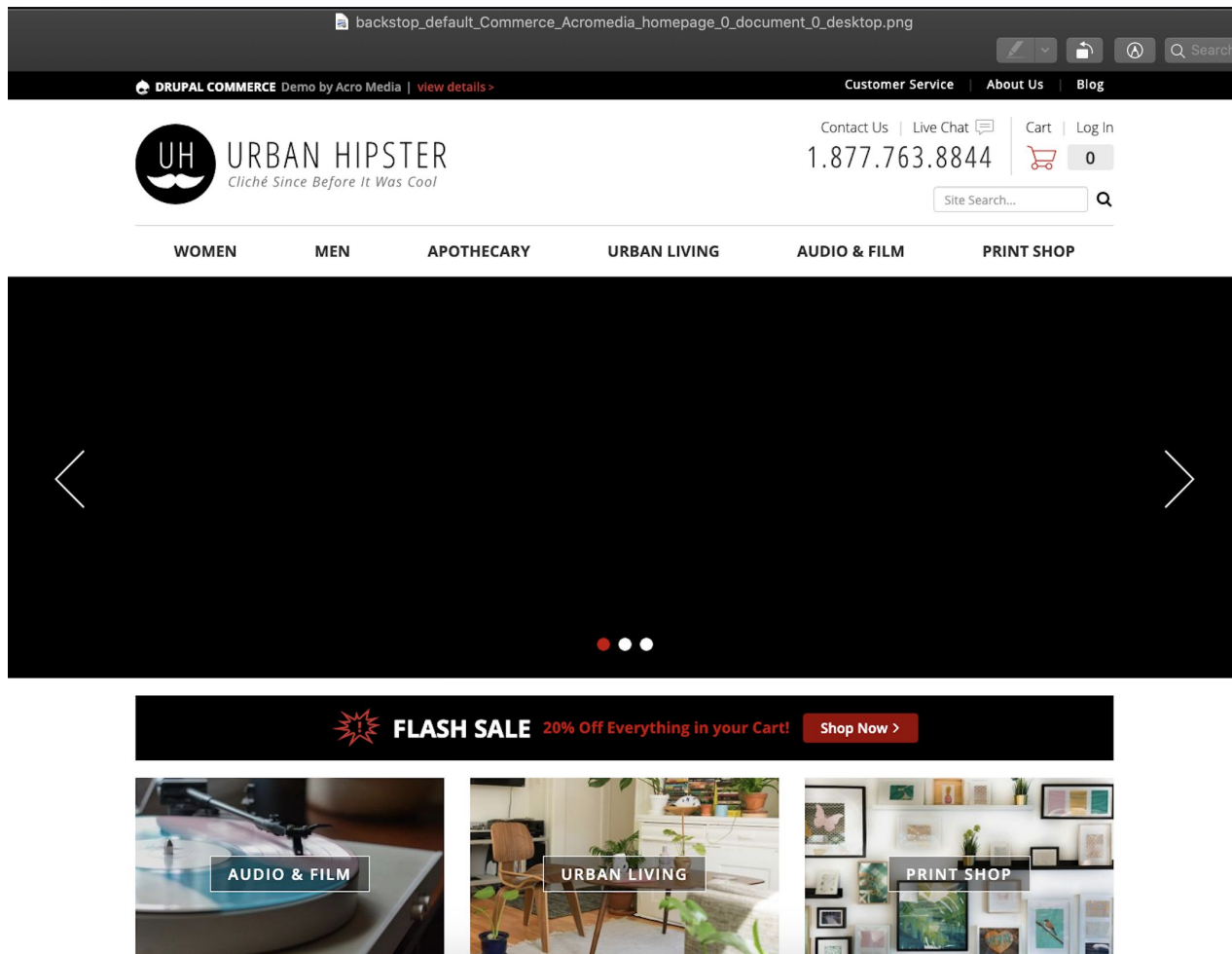
Remove

- Remove all elements queried by BackstopJS/WebdriverIO selector strategies
- Element is removed from the DOM - affects the design of the page
- Good candidates - Sticky headers/footers, popover help/chat windows

How few tools handle some challenges

```
42 {
43   "label": "Commerce Acromedia homepage",
44   "cookiePath": "backstop_data/engine_scripts/cookies.json",
45   "url": "https://commerce.acromedia.com",
46   "referenceUrl": "",
47   "readyEvent": "",
48   "readySelector": "",
49   "delay": 5000,
50   "hideSelectors": [
51     ".homepage-carousel-slide"
52   ],
53   "removeSelectors": [
54     ".feature-beacon__marker"
55   ],
56   "hoverSelector": "",
57   "clickSelector": "",
58   "postInteractionWait": "",
59   "selectors": [],
60   "selectorExpansion": true,
61   "expect": 0,
62   "misMatchThreshold": 0.1,
63   "requireSameDimensions": true
64 },
```

New reference image using hide strategy



**Demo
resolution
for dynamic
content
using
BackstopJS**



Testing Strategy

- Capturing screenshots
 - Element level
 - Component based libraries
 - Storybook
 - Pattern Lab
 - Development in progress
 - Group the components logically (For e.g. Header, Footer etc.)
 - Full page
 - Comparing two similar environments
 - Entire page is developed

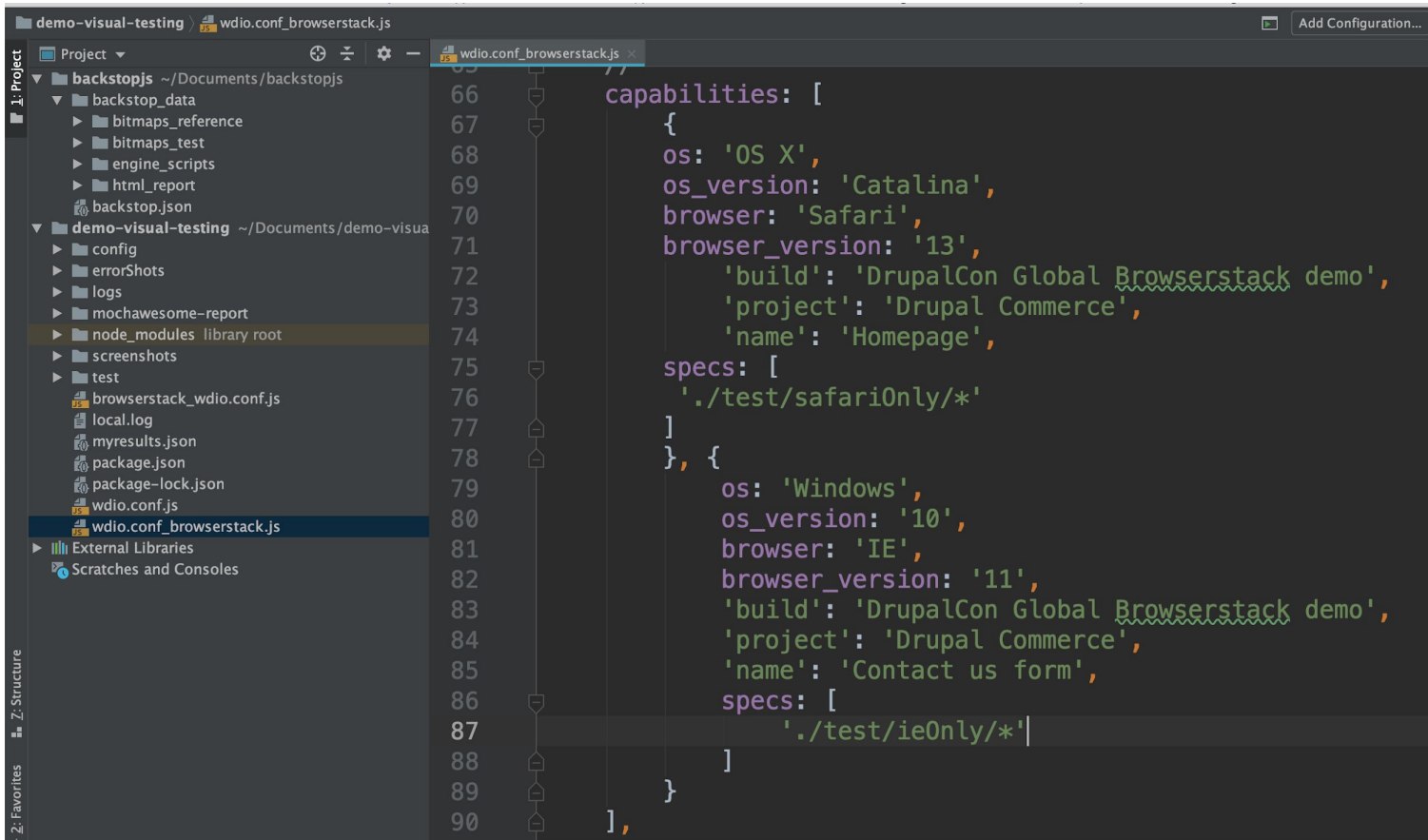
Testing Strategy contd...

- Plan the level of visual coverage needed
 - Both for browsers and devices
 - Every project is different as our customers are different
 - Identify patterns from previously learned lessons
 - Application wide
 - Don't capture all pages
 - Identify appropriate samples

Good practices to follow

- Organize Test Suites
 - Browser wise
 - Feature wise
 - Device wise
- Speed up test execution by running tests in parallel
- Identify the frequency to run visual tests

Organizing tests as per browser



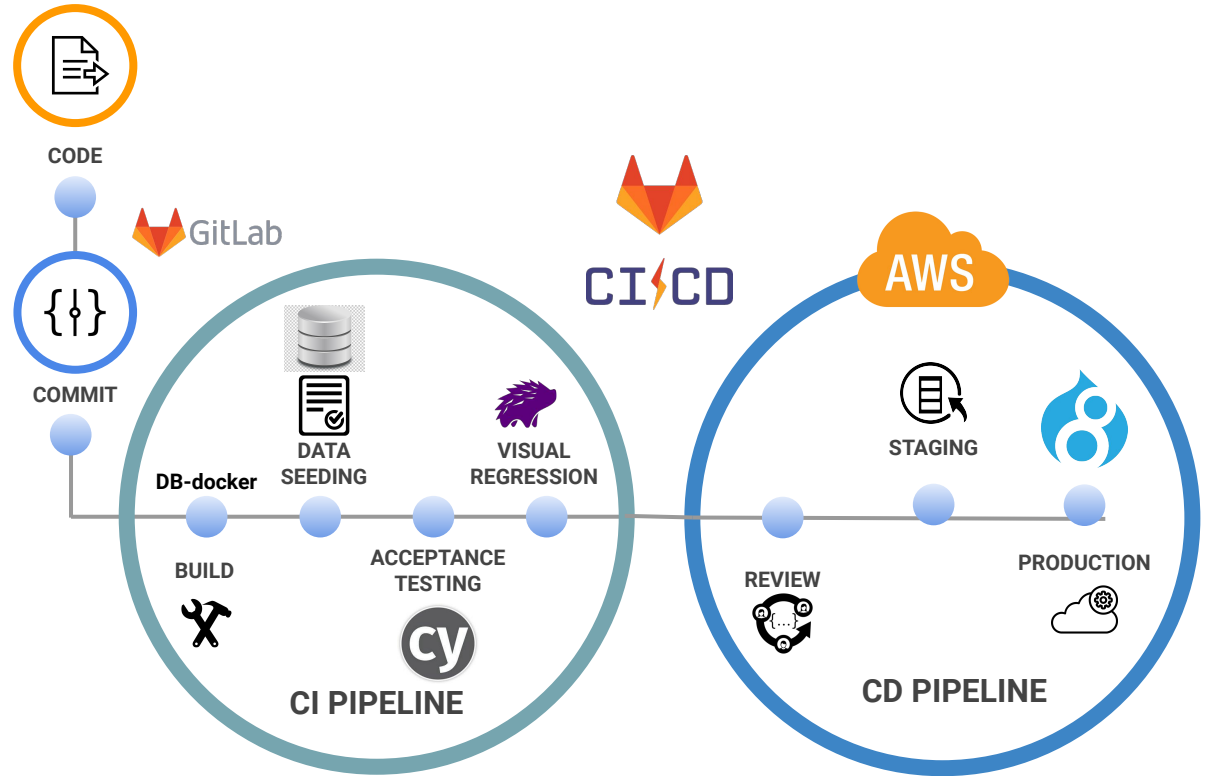
```
demo-visual-testing > wdio.conf_browserstack.js
Project
  backstopjs ~/Documents/backstopjs
    backstop_data
      bitmaps_reference
      bitmaps_test
      engine_scripts
      html_report
    backstop.json
  demo-visual-testing ~/Documents/demo-visual-testing
    config
    errorShots
    logs
    mochawesome-report
    node_modules library root
    screenshots
    test
      browserstack_wdio.conf.js
      local.log
      myresults.json
      package.json
      package-lock.json
      wdio.conf.js
      wdio.conf_browserstack.js
  External Libraries
  Scratches and Consoles

66 capabilities: [
67   {
68     os: 'OS X',
69     os_version: 'Catalina',
70     browser: 'Safari',
71     browser_version: '13',
72     'build': 'DrupalCon Global Browserstack demo',
73     'project': 'Drupal Commerce',
74     'name': 'Homepage',
75   }, {
76     'specs': [
77       './test/safariOnly/*'
78     ]
79   }, {
80     os: 'Windows',
81     os_version: '10',
82     browser: 'IE',
83     browser_version: '11',
84     'build': 'DrupalCon Global Browserstack demo',
85     'project': 'Drupal Commerce',
86     'name': 'Contact us form',
87     'specs': [
88       './test/ieOnly/*'
89     ]
90   }
91 ],
```

Creating suites

```
//  
specs: [  
  './test/**/*.js'  
],  
  
suites: {  
  blog: [  
    './test/ffOnly/blog_listing.js',  
    './test/specs/blog.js'  
  ],  
  
  smoke: [  
    './test/safariOnly/homepage.js'  
  ]  
},  
  
// Patterns to exclude.  
exclude: [  
  './test/specs/jasmine.js'  
],  
//
```

How we integrated in our development workflow?



Automated Visual Validation as part of the CI

- **Challenges:**
 - Storing and maintaining images
 - Identifying the comparison environment
- **Resolution:**
 - Use tools like Percy & Applitools that take care of the images and also provide you with inbuilt logic for comparison in CI



The actual implementation

Conversational AI

Articles Page



New snapshot

No comparison could be run, as the base build does not contain a snapshot with this name.

Articles
Resources and happenings shared

- Axelerant's Support For Drupal During COVID-19**
As the Drupal community responded with real care and compassion in the wake of COVID-19, Axelerant took the Open Source Makers' approach to contribute to the cause.
- Sustaining Hope At Work In A Post-COVID World**
COVID-19 has changed our world. Here's a raw, personal reflection from the perspective of one of our team members on the reassurances and commitments only leaders can give.
- Axelerant Partnering With DigitalOcean For Effective DevOps Services**
The first engagement as part of the Axelerant - DigitalOcean collaboration is a DevOps webinar series about creating a CI/CD pipeline with GitLab and DOKS.
- Living Our Values At The Axelerant Retreat 2020**
- Axelerant at DrupalCamp London 2020**
- Join Us At The Agency Leaders Dinner 2020 In London**


The actual implementation

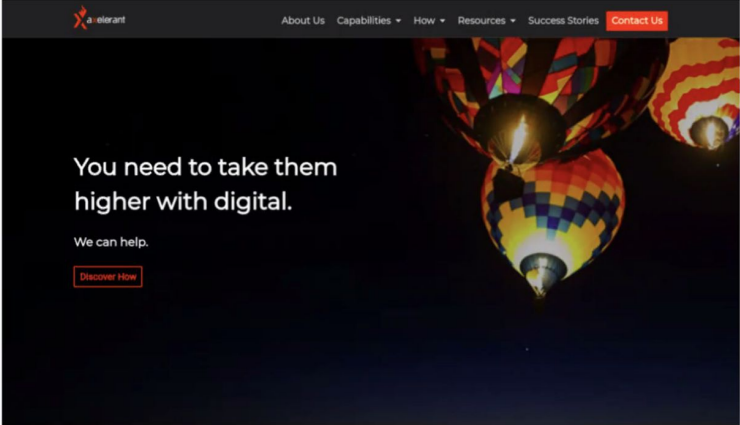
Build 121 [i](#) No changes to review
3 days ago

Baseline from `deveLop`
Build 115 - 3 days ago

Changes from `deveLop`
3 days ago

Home 320px 1024px 1440px No changes


No visual changes
There are no visual changes detected for this snapshot.



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In order to comply with your preferences, we'll have to use just one tiny cookie so that you're not asked to make this choice again.

[Accept](#) [Decline](#)

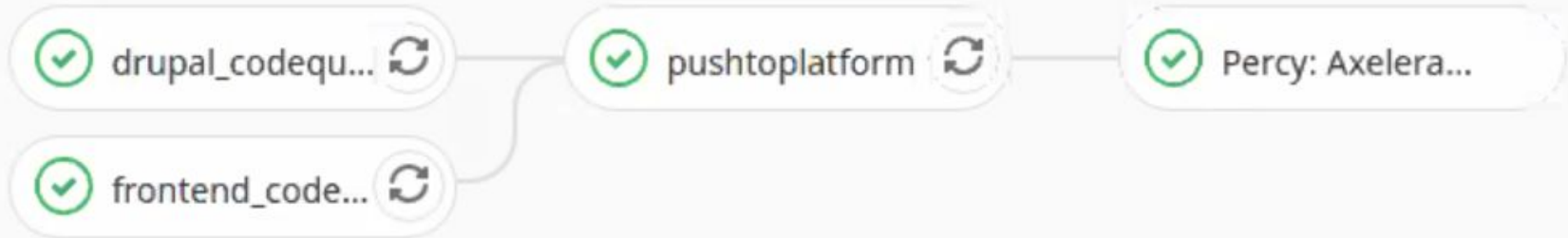
The actual implementation

Pipeline Jobs 5

Test

Deploy

External



The actual implementation

The screenshot displays the GitLab CI/CD interface for the 'Axelerant Website' project. The left sidebar shows navigation options: Project overview, Repository, Issues (0), Merge Requests (31), CI / CD (selected), Pipelines, Jobs, Schedules, Operations, Packages & Registries, Analytics, Wiki, Snippets, and Members. The main area shows a list of pipeline runs with the following details:

Job Name	Status	ID	Author	Commit	Message	Duration	Time
AXL-1262	failed	#22193	[User]	99cec9c2	AXL-1240: BE: Hide Block tags ...	00:00:30	4 days ago
1338	failed	#22192	[User]	576fe810	Pin dependency cypress-select...	00:09:21	4 days ago
renovate/no...	failed	#22191	[User]	576fe810	Pin dependency cypress-select...	00:01:06	4 days ago
phase-2	passed	#22186	[User]	5a52930c	Merge branch 'develop' into '...	00:04:00	4 days ago
1378	passed	#22182	[User]	f879bf85	Merge branch 'AXL-1262' into ...	00:07:58	4 days ago
deveLoP	passed	#22179	[User]	f879bf85	Merge branch 'AXL-1262' into ...	00:11:48	4 days ago
deveLoP	passed	#22176	[User]	f106e8b7	Merge branch 'AXLPORTAL-12...	00:14:23	4 days ago
1377	passed	#22174	[User]	5bf1d459	AXL-1262: Featured Image to ...	00:08:07	4 days ago
AXL-1262	passed	#22173	[User]	5bf1d459	AXL-1262: Featured Image to ...	00:00:27	4 days ago
1376	passed	#22170	[User]	e18fa715	AXLPORTAL-1251: Podcast epl...	00:07:11	4 days ago
deveLoP	passed	#22169	[User]	9cb3d7cc	Merge branch 'AXL-1240' into ...	00:13:36	4 days ago
1338	failed	#22166	[User]	b4ec84aa	Pin dependency cypress-select...	00:20:29	4 days ago

The actual implementation

The screenshot displays a Drupal website interface. At the top left, the breadcrumb trail shows 'drupal-demo-project'. A green notification bubble in the top right corner contains a document icon and the number '1'. Below the header, a navigation bar includes a 'CHANGES REQUESTED' button and a 'Contact Us Page' link. The main content area is divided into two columns. The left column features a contact form titled 'Message Axelerant' with fields for 'First Name*', 'Last Name', 'Email*', and 'What can we help you with?'. To the right of the form is the 'Where are we?' section, which lists the company's address: 'Axelerant Technologies, Inc., 177 Huntington Ave Ste 1703 #64041, Boston, MA 02115-2153, United States', along with a phone number '+1 678 535 7435' and a website 'hello@axelerant.com'. Below the form is a 'Contact Axelerant' button. The right column shows a comment thread with a '3 days ago' timestamp and a 'Padding issue' title. A reply input field is visible. At the bottom of the page, a footer contains a 'Quality Assurance' link on the left and a 'Request changes' button on the right. The bottom right corner of the page features a 'Quality Assurance' link and a 'Request changes' button. The bottom right corner of the page features a 'Quality Assurance' link and a 'Request changes' button.

The actual implementation

The screenshot displays a Drupal website interface. At the top left, there is a breadcrumb trail: [drupal-demo-project](#). The main content area is titled "Contact Us Page" and features a form for contacting Axelerant. The form is divided into two columns: "Message Axelerant" and "Where are we?". The "Message Axelerant" column contains fields for "First Name*", "Last Name", "Email*", and "What can we help you with?". The "Where are we?" column provides contact information for Axelerant Technologies, Inc., including the address "177 Huntington Ave Ste 1703 #64041 Boston, MA 02115-3153 United States" and phone number "+1 678 935 7435". Below the form, there is a "Contact Axelerant" button and a link to "Careers".

The footer of the website is dark and contains three columns of navigation links: "Axelerant" (About Us, Success Stories, Plugin Store, Careers, Articles, Team Blog), "Capabilities" (Artique Products, Big Data, Conversational AI, Drupal, DevOps, Quality Assurance), and "Credentials" (ISO 9001:2015, Security Partner, ACCU...). Social media icons for Facebook, Twitter, LinkedIn, and YouTube are also present. A "Quality Assurance" link is located at the bottom left of the footer.

The actual implementation



Percy APP 1:04 PM

Axelerant: Build #71 approved



15 visual changes approved by Axelerant Technologies

PR #349 - AXL-1052

Commit: `f6f2eaf1` [Sadeesh Kumar MN] - AXL-1052: Add invert option in package.json and analyze cypress grap variable



15 total snapshots

[View Build](#)

[View Pull Request](#)



1 reply 3 days ago

Key results achieved

- Test data
 - Time saved to handle dynamic content scenarios because of data consistency
 - Minimal efforts for Visual tests
- Seamless integration of Automation tools involved
- Visual tests validated for the site which is a replica of the wireframe
- Less number of assertions required for the Acceptance test Automation suite

Example - No functional assertion

```
demo-visual-testing | test | ieOnly | contactUs.js | Add Configuration... | Database
┌─ wdio.conf.js | contactUs.js
1  let assert = require(id: 'assert');
2  let expect = require(id: 'chai').expect;
3  let should = require(id: 'chai').should;
4  const visreg = require(id: '../config/globalHides.js');
5
6  describe('Contact Us', function () {
7
8      it('submit contact form', function () {
9          browser.url('/contact-us')
10         .setValue('#edit-name', 'Shweta Sharma')
11
12         browser.setValue('#edit-email', 'shwetasharma@axelerant.com')
13         browser.setValue('#edit-message', 'Hi, I am testing Contact us form using automated visual
14         browser.click('#edit-actions-submit');
15
16         const confirmationMessage = $( selector: '#block-commerce-2-demo-mainpagecontent h1 span');
17         confirmationMessage.waitForExist({timeout: 5000})
18         browser
19         .checkDocument({hide: visreg.hide, remove: visreg.remove})
20         .forEach((item) => {
21             expect(item.isWithinMismatchTolerance).to.be.true;
22         })
23     })
24 });
```


The biggest limitation



© Can Stock Photo

40+ SDKs available	AI-based comparison technique and in-built support for anti-aliasing	Ultrafast Cloud	Match levels
Better support for floating and dynamic content	PDF testing	Support for Mobile applications	Excellent baseline image maintenance
A highly collaborative dashboard	Codeless solution available as a browser extension	Seamless integration with source control, build servers and collaboration tools	Free Support for Open source projects

Match Levels in AppliTools

Strict

- Recommended
- Content
- Font
- Layout
- Color
- Position of elements

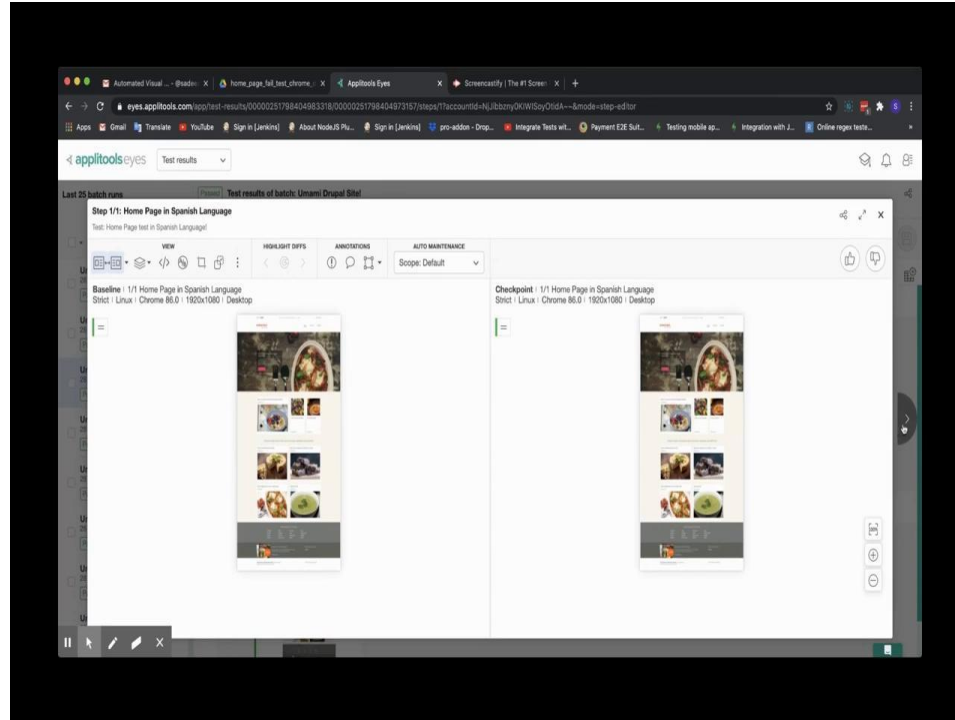
Content

- Similar to Strict
- Compares content but ignores colors

Layout

- Tests the layout
- Validates the alignment and relative position of all elements on the page, such as: buttons, menus, text areas, paragraphs, images, and columns
- Ignores the content, colour and other style changes between the pages

Cypress + Applitools - Demonstration



Applitools Ultrafast Grid

ts

Passed Test results of batch: **Ultrafast Batch**

Tests: 7 in total | 0 unresolved | 7 new Steps: 7 in total | 0 unresolved | 7 new Batch duration: 00:00:58

SELECTED TESTS VIEW TEST RESULTS AUTO MAINTENANCE A/B TESTING

Scope: Default


Group by: Test name Expand all / Collapse all X Ungroup all

Status Test Branch OS Browser Viewport Device Started

Test name: **Home Page test!**
Tests: 7 | New: 7

<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> New	Home Page test!	default	Linux	Chrome 86.0	1920x1080	Desktop	23 Oct 2020 at 10:42 AM			
☆ 1/1 Login Page												
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> New	Home Page test!	default	Linux	Firefox 81.0	1024x768	Desktop	23 Oct 2020 at 10:43 AM			
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> New	Home Page test!	default	Mac OS X 10...	Safari 13.0	1440x900	Desktop	23 Oct 2020 at 10:43 AM			
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> New	Home Page test!	default	Windows 10	Edge 86.0	1200x800	Desktop	23 Oct 2020 at 10:43 AM			
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> New	Home Page test!	default	Linux	Chrome 86.0	768x1024	iPad (Chrom...	23 Oct 2020 at 10:43 AM			
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> New	Home Page test!	default	Linux	Chrome 86.0	375x812	iPhone X (Ch...	23 Oct 2020 at 10:43 AM			

Applitools Dashboard

 Test results ▼ 🔔 ? 👤

Last 3 batch runs

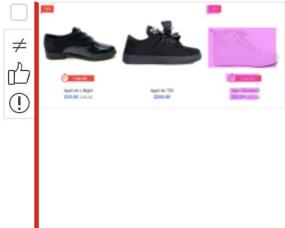
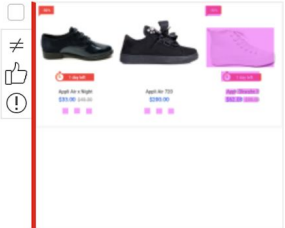
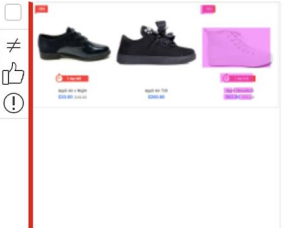
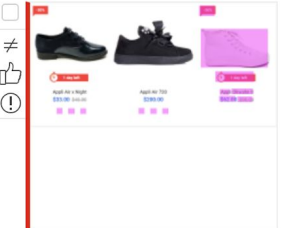
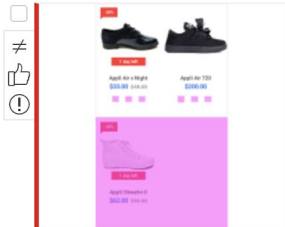
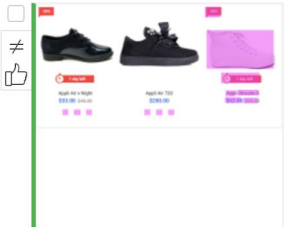
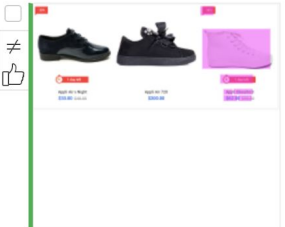
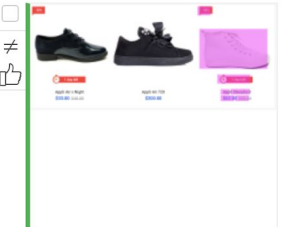




- UFG Hackathon
8 Jun 2020 at 11:34 PM
Failed
- UFG Hackathon
8 Jun 2020 at 11:26 PM
Failed
- UFG Hackathon
8 Jun 2020 at 11:15 PM
Passed

Failed Test results of batch: UFG Hackathon 🔗

Tests: 24 in total | 0 unresolved | 20 failed Steps: 24 in total | 0 unresolved Batch duration: 00:00:28

SELECTED STEPS VIEW TEST RESULTS AUTO MAINTENANCE A/B TESTING

Scope: Default ⏏ A/B

<input type="checkbox"/> 	<input type="checkbox"/> 	<input type="checkbox"/> 	<input type="checkbox"/> 
☆ 1/1 Filter Results	☆ 1/1 Filter Results	☆ 1/1 Filter Results	☆ 1/1 Filter Results
<input type="checkbox"/> 	<input type="checkbox"/> 	<input type="checkbox"/> 	<input type="checkbox"/> 
☆ 1/1 Filter Results	☆ 1/1 Filter Results	☆ 1/1 Filter Results	☆ 1/1 Filter Results
<input type="checkbox"/> 	<input type="checkbox"/> 	<input type="checkbox"/> 	<input type="checkbox"/> 

Applitools Dashboard - Collaborative

Step 1/1: Filter Results

Test: Task 2

VIEW: [Grid] [List] [Layers] [Code] [A/B] [Fullscreen] [Print] [More]

HIGHLIGHT DIFFS: [Left] [Refresh] [Right]

ANNOTATIONS: [Warning] [Comment] [Rect]

AUTO MAINTENANCE: Scope: Default

[Thumbs Up] [Thumbs Down]

Checkpoint | 1/1 Filter Results
Strict | Windows 10 | Edge 83.0 | 1200x700 | Desktop

[Not Equal]

[Thumbs Up]

[Warning]

Appli Air x Night
\$33.00 ~~\$48.00~~

Appli Air 720
\$200.00

Appli Okwahn II
\$62.00 ~~\$90.00~~

Incorrect filter results are displayed [Close]

Fail tests

Snooze failures

Monday, June 8th

shwetasharma@axelerant.com created this issue 11:29 PM

Say something

Follow [Post]

[100%]

[+]

[-]

Applitools Dashboard - Dynamic content

The screenshot displays the Applitools dashboard interface. At the top left, the logo 'applitools eyes' is visible next to a 'Test results' dropdown menu. On the top right, there are notification, help, and user icons. The main content area shows a 'Last 3 batch runs' section with a 'Failed' status for 'Test results of batch: UFG Hackathon'. A modal window titled 'Step 1/1: Filter Results' is open, showing a comparison of three shoe products. The products are 'Appli Air x Night' (priced at \$33.00, down from \$48.00), 'Appli Air 720' (priced at \$200.00), and 'Appli Okwahn II' (priced at \$62.00, down from \$90.00). A context menu is open over the 'Appli Air 720' product, listing options: 'Ignore region', 'Floating region', 'Strict region', 'Content region', 'Layout region', and 'Paste region'. The dashboard also features various toolbars for viewing, highlighting differences, annotations, and auto-maintenance, along with thumbs up/down icons for feedback.

Applitools Dashboard - Match levels

The screenshot displays the Applitools dashboard interface. At the top, the browser address bar shows "Getting Started" and "Newsletter - test.ai ...". The Applitools logo and "eyes" branding are visible, along with a "Test results" dropdown menu. The main content area is titled "Last 3 batch runs" and shows a "Failed" status for "Test results of batch: UFG Hackathon". A modal window titled "Step 1/1: Product Details Test" is open, showing a "Test: Task 3" and a "VIEW" toolbar. A context menu is open over the toolbar, listing options: "Test details", "Show baseline", "Show baseline history", "Preview match level", "Undo changes in test", and "Download image". The "Preview match level" option is selected, opening a sub-menu with "Exact", "Strict" (checked), "Content", and "Layout". The background of the modal shows a product page for a dark blue shoe, with a red error indicator and a "100%" match level shown. The bottom of the dashboard shows a navigation bar with four tabs, each labeled "1/1 Product Details Test".

When to use what?

Static content

- Use any tool

Dynamic content

- WebdriverIO Visual regression service
- Shoov
- BackstopJS
- WebdriverCSS
- Gemini

Shifting Content

- Applitools (SDKs and Selenium IDE extension)

Facts

- Efforts needed to maintain baseline images
- Respect the Test Pyramid
 - Include Unit tests, Service tests, Acceptance tests and Visual tests
- Best practices in Automating Visual tests:
 - Ensure full page validation
 - Do not have too many element specific tests
 - Avoid element locators maintenance
 - General rules for automating Acceptance tests apply here too:
 - Pick up the right candidates for Automation
 - Logical division of tests
 - Usage of Seams
- Do not expect overnight success

Where to go from here?

- No coding knowledge?
 - Use configuration based tools like BackstopJS, Wraith, AppliTools SIDE browser extension
 - Pair up with developers, SDETs to have the structure ready
- Good with coding?
 - Look for harmonious integration with your automated functional suite
 - Reduce the unnecessary functional assertions
 - Maintainable suite
 - Better execution time
 - Be brave and bring the tests in your CI pipeline
 - Let the whole team benefit

References

- [BackstopJS](#)
- [Applitools for Selenium IDE Tutorial](#)
- <https://applitools.com/cypress/>
- [Developer Guide](#)
- [WebdriverIO - Visual Regression Service](#)
- [Visual Regression Testing Using Wraith](#)
- [Run Selenium tests with WebDriverIO](#)
- [Percy - Getting started](#)

Q & A



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